

# EMPOWERING STUDENT ENGAGEMENT AND ENVIRONMENTAL UNDERSTANDING: THE COASTAL HEALTH MONITORING SCHEME (CHMS) IN THE BALEARIC ISLANDS, SPAIN

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**Abstract:** A partnership between the Iberostar Foundation and the University of the Balearic Islands (Spain) through the Chair of the Sea, Coastal Health Monitoring Scheme has a dual purpose: training students in marine biodiversity monitoring and collecting critical coastal ecosystem data. Launched in 2021 on Ibiza with 12 stations, it now boasts 50 stations: 20 in Mallorca, 15 in Menorca, 10 in Ibiza, and 5 in Formentera. Undergraduate Biology students from the University of the Balearic Islands conduct this project. Each station undergoes comprehensive surveys in spring and summer, including three 60 m<sup>2</sup> transects to quantify species density, focusing on sea urchins, sponges, sea cucumbers, and anemones. Population structure analysis is performed by measuring diameters of sea urchins and anemones. Variable-length transects assess benthic species like sea snails and limpets, while others study crab species diversity and Blennoidea fish abundance. Data collected forms a comprehensive biodiversity inventory, enhanced by submerged sand samples to measure organic content and granulometric composition. The CHMS's success is supported by the Iberostar Fdn., Baleària Fdn., local councils, and Island Councils, aiding in transportation, accommodation, and mobility. This collaborative approach enriches marine biology education and contributes valuable insights into coastal ecosystems.

**Keywords:** Biodiversity, Monitoring Coastal Ecosystems, Coastal Health, Student empowering

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## Introduction

In higher education, motivating and engaging students in projects with practical social value is a challenge for universities. Nowadays, students can actively participate in research projects initiated by their professors. While this participation is seen as valuable formative activity, it is important to emphasize that its primary purpose is to contribute to the successful execution of the specific research projects, rather than being the core focus of their educational journey.

The Coastal Health Monitoring Scheme (CMHS) serves as a prime example of this educational approach. This initiative is the result of a collaborative partnership between the Iberostar Foundation and the University of the Balearic Islands, made possible through the Chair of the Sea. The project is distinctive in that it has a dual purpose; first, it provides a significant training platform for students, enabling them to gain practical experience in monitoring marine biodiversity. Second, it plays a crucial role in collecting essential data related to the health of coastal ecosystems. This is achieved through the utilization of bioindicator species and the measurement of specific physicochemical parameters.

The origins of this projects can be traced back to 2021 when it was launched as a pilot test on the island of Ibiza, involving the setup of 12 monitoring stations.

The effective execution of this extensive project is achieved with undergraduate Biology students at the University of the Balearic Islands.

This collaborative and integrated approach not only contributes to valuable insights into the health of coastal ecosystems but also provides a unique educational opportunity for students pursuing marine biology. By bringing together multiple stakeholders and actively involving dedicated students, the CHMS exemplifies how practical engagement, and research can lead to a deeper understanding of our natural environment.

## Materials and Methods

The network of 50 monitoring stations has been established, with distribution as follows: 20 stations in Mallorca, 15 in Menorca, 10 in Ibiza, and 5 in Formentera (Figure 1).

Each campaign starts with a training day of learning all the methodologies that encompasses the whole Coastal Health Monitoring Scheme, together with the way the information is recorded and written down in each type of datasheet.

Each monitoring station becomes the focal point for a comprehensive set of surveys conducted during the spring and summer seasons.

The data collection process involves the meticulous execution of three transects of 60 m<sup>2</sup>. These transects play a vital role in quantifying the number of each zoological group, with a particular focus on sea urchins (*Paracentrotus lividus* and *Arbacia lixula*), sponges (*Sarcotragus spinosulus* and *Sarcotragus fasciculatus*), sea cucumbers (*Holothuria tubulosa* and *Holothuria sanctori*), and anemones (*Anemonia sulcata* and *Aiptasia mutabilis*) (Figure 2). Furthermore, the study extends to population structure analysis, which is facilitated by the measurement of the diameter of sea urchins and the basal diameter of anemones.

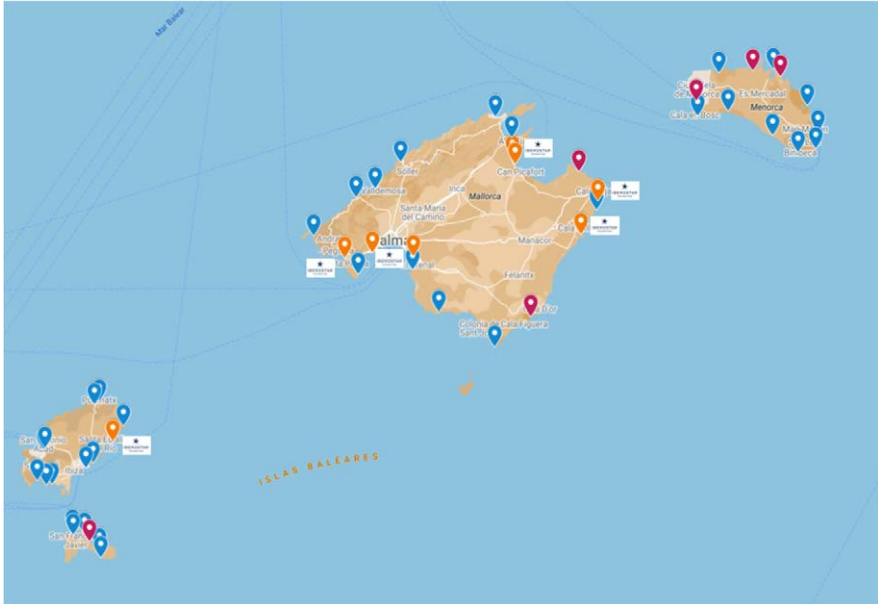


Figure 1 – Distribution of the stations of the Coastal Health Monitoring Scheme at the Balearic Islands.

Additionally, variable-length transects are utilized to quantify the abundance and population structure of another group of benthic species, such as sea snails (*Phorcus turbinatus*) and limpets (*Patella rustica* and *P. caerulea*). Other transects are conducted to assess the diversity and abundance of 11 crab species highlighting (*Pachygrapsus marmoratus*, *Eriphia verrucosa* or *Percnon gibbesi*). Complementarily, a specific inventory and abundance estimation are carried out for Blennoidea fishes. Finally, a global registration of biodiversity of the station is recorded indicating just presence or absence of a pre-established list of species. This way a recorded dataset that effectively serves as a comprehensive biodiversity inventory.

To further augment of value of the data collected, submerged sand samples are diligently gathered. These samples are integral in quantifying the organic matter content and granulometric composition of the sand.

## Results and discussion

Since its beginning in 2021 the Coastal Health Monitoring Scheme has allowed the participation to a group of close to 45 different students, some of them repeated up to three times during the summer campaigns (Figure 3).



Figure 2 – Coastal rocky habitat in the Balearic Islands, showing the typical conditions under which the three 60 m<sup>2</sup> transects are established for biodiversity monitoring.

The massive amount of information has been partially presented in local science meetings such as the VIII Jornades de Medi Ambient de les Illes Balears in up to seven different communications about sea cucumber monitoring<sup>1</sup>, anemone monitoring<sup>2</sup>, sea crab<sup>3</sup>, sea urchins<sup>4</sup>, sea snails and limpets<sup>5</sup>, sponges<sup>6</sup> or fish diversity<sup>7</sup>. All these communications about the Coastal Health Monitoring Scheme partial results led to be recognized this monitoring program as a Biodibal students prize ant the VIII Jornades de Medi Ambient de les Balears.

The experience in creating and implementing the CHMS in the Balearic Islands has allowed to improve the early monitoring in the pilot of 2021, emphasizing those techniques where students had more difficulties to develop. Although for a trained scientific it can be easy to follow a protocol or just to handle a specimen for a student is not that easy, so specific training must be followed to succeed in the fieldwork record of information.

First year of the CHMS bring with it some mistakes during the field sheet filling that quickly were corrected for next field days. One of the most challenging issues for CHMS coordination was to keep the concentration for the whole duration of each island campaign.



Figure 3 – Some students and principal researcher participating in the Coastal Health Monitoring Scheme, during a reception at Ibersotar Santa Eulalia Ibiza hotel.

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