Food and Agriculture Organization of the United Nations

1
WORK PACKAGE

Ecosystem characterization and mapping

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Objectives:

The aim of this Work Package is to fill the knowledge gap about the extent and distribution of sponge grounds by collating known distributional data, and by collecting fine scale geological, hydrological, and biological data through in-situ surveys of different types of sponge ground ecosystems in case study areas. To achieve this, the following objectives will be addressed:

- Develop a Geographical Information System for deep-sea sponges – SponGIS;
- Characterize the geological setting;
- Characterize the oceanographic setting;
- Map past and present distribution of deep-sea sponge grounds; and
- Develop ecosystem maps at different spatial scales.

Focus

The Work Package aims to understand the environmental and geological drivers influencing sponge grounds by acquiring new knowledge to determine the factors for sponge ground distribution for the past and present. The Work Package will combine existing data on sponge ground occurrences, and collect new geological, biological, and hydrological data. All data of sponge ground systems in the North Atlantic will be implemented in a new Geographical Information System for deep-sea sponges: SponGIS.

Why this is important?

Very little is known about the past and present distribution of sponge grounds in the North Atlantic. To better predict where sponge grounds occur, more knowledge is needed of the underlying environmental as well as geological drivers of these ecosystems. The analysis and detailed mapping within *SponGIS* will lead to the production of maps of past and present distributions thereby providing decision makers with the scientific knowledge necessary to improve biodiversity conservation and to achieve efficiency and sustainability in the use of sponge grounds. Knowledge on the environmental and geological settings around sponge grounds will be used for distribution maps of the wider North Atlantic using predictive models, which will support policy makers to manage these vulnerable ecosystems.

What are the key knowledge gaps to be addressed?

Since the distribution and extent of sponge grounds are still largely unknown, we aim to define the underlying environmental and geological parameters that influence sponge growth and therefore the presence of sponge grounds. Furthermore, this knowledge is applied to explain changes in sponge growth in the past through

SponGES

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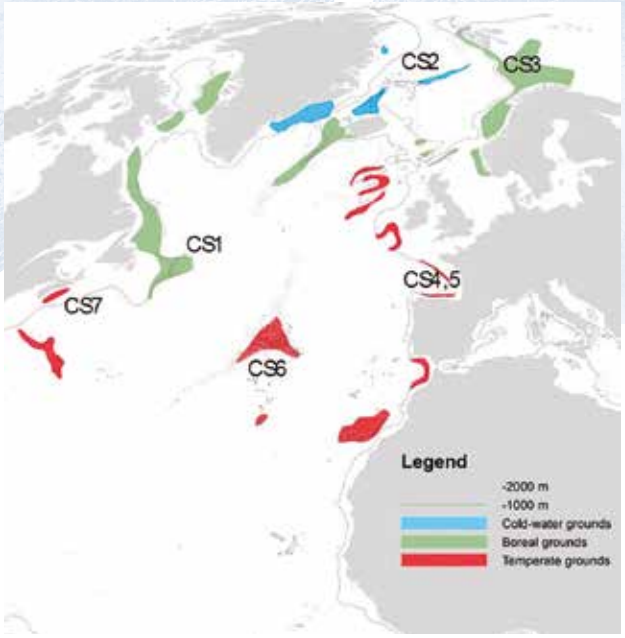

Case study areas investigated by SponGES and the core distribution of the main types of sponge grounds in the North Atlantic (Photo credit: University of Bergen).

the analysis of sediment cores, and to link presence/absence of sponges and changes in community composition, hydrographic conditions and climate change.

Expected major outputs

The expected major outputs of this work package are:

- Development of a Geographic Information System to integrate, store, analyze, display, and manage datasets of different sources that will be made available to scientists, managers, policy makers, and the general public. SponGIS will collate historic data as well as data collected during the project.
- Improved understanding of the geological setting and the classification of the substrate on which sponges live.
- Wide area coverage maps made with multibeam and high-resolution mapping, and photo mosaicking made with ROV and AUV to characterize different habitats.
- Demonstration of the fundamental interactions between sponges and their environment, recording near bed environmental conditions and overlying water column characteristics.
- Analysis of [food] particle supply and quality.

Results achieved so far

- Major cruises have been carried out at the Schultz Massif sponge grounds, the Karasik Seamount, and the *Vazella* grounds near Nova Scotia. In addition, smaller surveys have investigated areas near the Azores, and Swedish and Norwegian fjords.
- The SponGIS system has been developed and is receiving both existing data, and data from the first field season.
- Mapping surveys have been carried out at the Schultz Massif with Multibeam, AUV, and ROV to characterize substrate and habitats.
- CTD transects were carried out at the Schultz Massif, the *Vazella* grounds, seamounts near the Azores, and the *Geodia* grounds in the Norwegian fjords to measure the environmental and hydrodynamic conditions. A lander system has been deployed amidst the sponges on the Schultz Massif for the duration of the cruise, and data have been collected and analyzed. Currently the lander is deployed for the long term, and will be recovered in the summer of 2018.
- Sediment cores were taken at the Schultz Massif and have been analyzed for sponge spicules. A preliminary overview of sponge spicule compositions has been made.
- Fine-scale maps on the first year's field data are currently being produced for the Schultz Massif and the Nova Scotia *Vazella* grounds.

What methods/technologies/approaches are you using

During research cruises, geological data are collected using shipboard mapping tools (Multibeam) as well as more detailed mapping with AUVs and ROVs. This combination of mapping techniques provides a powerful tool to classify and identify different habitats. In addition, mapping will be used to identify suitable sites for lander deployments as well as sediment coring.

Benthic lander ready to be deployed (Photo credit: Furu Mienis, Royal Netherlands Institute for Sea Research).

To map past and present distributions of sponge grounds, sediment cores will be taken at selected sites by gravity coring. The sediment layers in the core will be analyzed on the presence or absence, abundance and diversity of sponge spicules via microscopy. These analyses will inform us about the Holocene and Pleistocene abundance of sponge grounds in relation to AMOC variability and climate change.

Environmental conditions will be monitored on different time scales in and near sponge grounds using ship board equipment like CTD and ADCPs as well as stand-alone benthic observatories. CTD/Rosette systems and ADCPs are used to monitor the characteristics of the overlying water column. A rosette sampler is used to collect water samples at selected depths that will be analyzed for a variety of geochemical parameters, including inorganic nutrients and particle fluxes. To monitor near bed environmental conditions benthic observatories with a large variety of equipment are deployed amidst the sponges. These stand-alone systems can measure the environmental conditions over a whole year, providing information on the fluctuations in near bed conditions through time.

High resolution maps of past and present sponge distributions will be made and will also form the basis for the production of maps at a regional or even wider scale by the use of predictive models.

The EU-funded SponGES project will contribute to the sustainable management of deep-sea fisheries, and the protection of sponge-dominated vulnerable marine ecosystems in the North Atlantic through the collection of data and the development of knowledge on the vulnerability and threats as well as protection measures leading to a sustainable use of the deep-sea areas.

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