Proposal for an ASPIRE mission to the Azores archipelago and the Mid-Atlantic Ridge

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Willing to attend the workshop? Yes (Joana Xavier)

Target name(s): Azores EEZ - oceanic islands slopes; seamounts; Mid-Atlantic-Ridge (MAR); benthic habitats (particularly sponge grounds).

Geographic areas of interest within the North Atlantic Ocean: North Central

Relevant subject area(s): Biology, Geology, Chemistry, Physical Oceanography

Description of topic or region recommended for exploration

The Azores archipelago is a key region in the North Central Atlantic, due to its geographic and oceanographic setting and its complex geological history. It lays on the triple-junction of the North American, Eurasian and African plates, on either side of the Mid-Atlantic-Ridge (MAR), a key topographic feature of the Atlantic. Oceanography in the region is influenced by two eastward currents branching from the Gulf Stream, the North Atlantic Current in the north and the Azores Current to the south, resulting in a complex circulation, high salinity and temperature, and a low nutrient regime that typifies the Azores. The region has a spatial, seasonal and inter-annual variability typical of mid-latitudes, influenced by the Atlantic Meridional Overturning (AMOC). It comprises nine islands, numerous islets and over 60 large seamounts. Over relatively short distances from the islands' shorelines, deep-sea and open ocean conditions are found, with a variety of shelf/slope/ridge/seamount features being home to a diversity of species and habitats of conservation priority such as cold-water coral gardens, sponge grounds and hydrothermal vents (Fig. 1).

Despite ongoing deep-sea research in the area by various national and international teams in recent years, its wide expanse (an EEZ of nearly a million km^2) makes of the Azores a yet largely unexplored region, especially west of the MAR, on the North American plate. We propose an ASPIRE mission to map, describe and characterize the benthic habitats of the shelf and slopes of Faial/Pico (E of the MAR) and Flores/Corvo (W of the MAR) islands, as well as two seamounts (Cavala and Ferradura), and the section of the Mid-Atlantic-Ridge separating these islands' pairs (Fig. 1).

The campaign could comprise high resolution multibeam mapping of target features at night, alternated with: 1) exploration dives in areas never visited before, but where vulnerable marine habitats are expected to occur (e.g. Cavala/Ferradura seamounts and the MAR section); and 2) characterization dives in sites where sponge grounds and coral gardens have been reported but await detailed characterization (e.g. the *Pheronema* sponge grounds and *Narella* sp. coral gardens on the slope of Pico island).

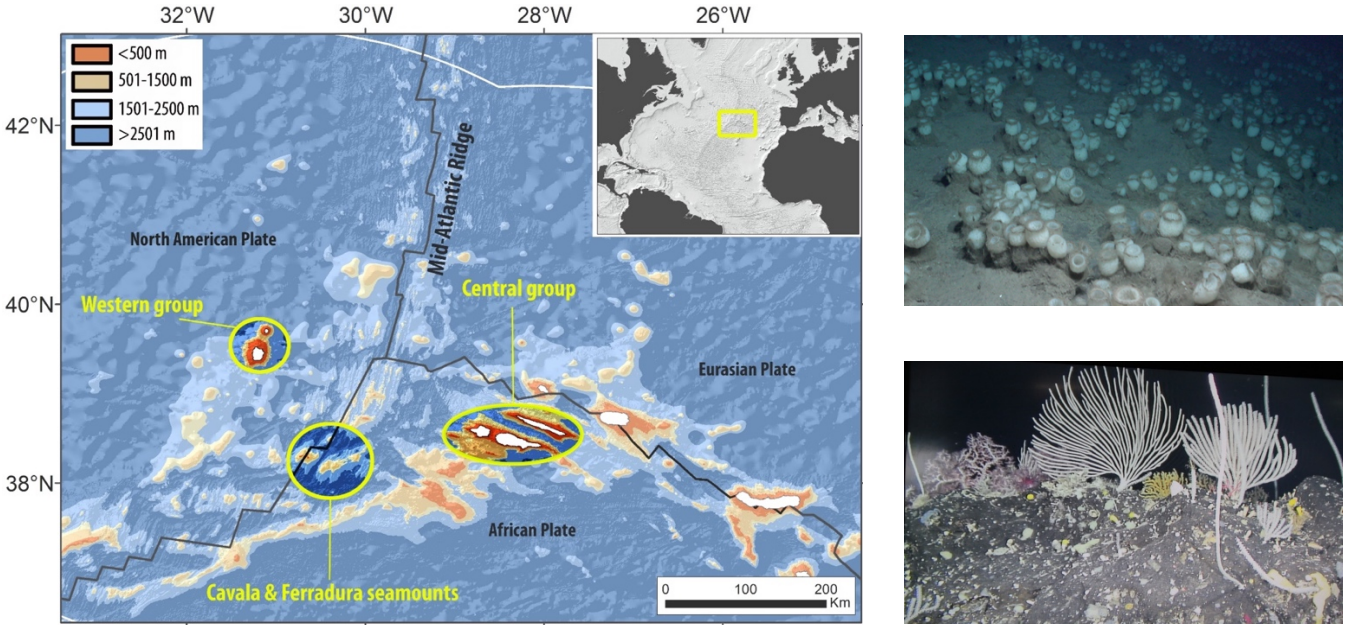

Figure 1. Map of the area proposed for exploration under an ASPIRE campaign, and examples of some benthic habitats to be characterized (sponge grounds and coral gardens). Circles highlight the main target features: Western group (Flores and Corvo islands); the Cavala and Ferradura seamounts (and the MAR section); Central group (Pico, Faial and São Jorge).

Recorded species and habitats will contribute to studies aimed at understanding regional to basin scale biodiversity and biogeographic patterns, as well as validate distribution models under development. Targeted sampling will allow us to assess the patterns of genetic diversity and connectivity across the North Atlantic, by complementing ongoing population genomics studies of key structuring species (e.g. the sponges *Pheronema carpenteri, Aphrocallistes beatrix, Acanella arbuscula*); and Gulf Stream mediated connectivity (e.g. the sponges *Vazella pourtalesi* and *Geodia* spp.) with the eastern seaboard of the US, the Canadian Scotian Shelf and even the NAFO high seas areas on Flemish Cap (see sister proposal submitted by Ellen Kenchington and Fred Whoriskey).
As bottom fishing in the area is mostly of small-scale and artisanal characteristics using bottom longline and handline (trawling is banned in the region) we expect to find pristine habitats which will provide baseline data (community composition and structure, density, extent, etc.) for comparative assessments of the environmental and ecological status of such habitats.

Relevant partnerships

This campaign would benefit from (and leverage) the work in progress in scope of two large Horizon 2020 projects (SponGES – www.deepseasponges.org and ATLAS - https://www.eu-atlas.org, grant agreements nos. 679849 and 678760) funded by the European Union under the Blue Growth call aimed at "Improving the preservation and sustainable exploitation of Atlantic marine ecosystems". Both projects are undertaking in-depth characterization of deep-sea benthic ecosystems, as well as biodiversity, biogeographic and connectivity assessments across the North Atlantic, and include Case Study areas in the Azores region. The global Ocean Tracking Network (OTN), a partner in the SponGES project also manages an acoustic receiver line in the area – the Azores Array - which supports work on migratory and resident species over the MAR. The proposed ASPIRE work in the Azores will provide information that will inform current OTN telemetry studies on the valued species that use the area's seamounts and slopes.