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Office of Ocean Exploration and Research
NOAA/Office of Oceanic and Atmospheric Research
1315 East West Highway
Silver Spring MD 20910

Dear Drs. Mowitt and France,

Description of Topic or Region Recommended for Exploration

We are writing in response to the NOAA call for white papers from the National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Exploration and Research under the Atlantic Seafloor Partnership for Integrated Research and Exploration (ASPIRE). Deep-sea coral and sponge communities significantly enhance biodiversity, contribute to habitat complexity and provide biogenic substrate for associated invertebrate and fish species. Morphology of deep-sea megafauna increases the surface area of available substrate through provision of secondary substrate for species such as brittle stars, gastropods, and others (Beaulieu, 2001; Buhl-Mortensen et al., 2010), enable sessile organisms to reach bottom currents (Edwards et al., 2012), and provide areas of protection for communal fauna (Roark et al., 2009). These associations can benefit their host species. Girard et al. (2016) demonstrated that brittle stars improve the health and resilience of corals by keeping them free of sediment and other epifauna. Previous studies report enhanced fish diversity with certain Lophelia reefs (Ross and Quattrini 2007), however, it is unclear whether this relationship can be generalized to all deep water Lophelia or deep water coral habitats and their associated fishes (Quattrini et al. 2015). There is a need to better characterize fauna and their distributions, provide mechanisms that shape their distribution, and examine the linkages between abiotic factors and biological processes. Understanding these linkages and how associated species use deep-sea reefs will help to predict how the loss of coral communities may add to current pressures on commercially important fishes. While deep sea coral reefs habitats in the North Atlantic appear to enhance invertebrate and fish biodiversity, they still remain poorly explored or understood.

Corals and reef building sponges can be found in aggregations, and are often patchily distributed on and across seamounts and outcrops. Quality and availability of food, suitable substrate, and oceanographic factors such as temperature and currents among others are drivers/constrainers of their distribution (Buhl-Mortensen et al., 2010). Substrate type is also a strong contributor for species distribution as many corals, sponges and other sessile species require hard substrate for attachment. These parameters have been integrated into species distribution models for the prediction of deep-water coral communities. However, these coral communities are not present on hard bottom seafloor, even in areas that appear to be have optimal conditions. Current patterns, re-suspension, variable recruitment, mortality, and predation are factors that contribute to dispersal and population connectivity, and consequently determine spatial and temporal distribution of deep-water coral and sponge communities on seafloor features. Factors that regulate deep-water reef communities are still poorly understood, yet critical to the stability and function of these ecosystems.

Geomorphic features such as seamounts and mid-ocean ridges are considered to be environmentally complex with a variety of hard bottom substrates, and water column properties. These features influence the distribution and abundance of organisms, including many of commercial importance, while increasing both local and regional biodiversity. It is estimated that 25 million seamounts >100m height exist on the seafloor, however, due to the difficulty of mapping small outcrops by means of echo-sounders and satellite altimetry, they are often overlooked (Wessel et al., 2010). The ASPIRE 2019-2020 planning region covers many topographically complex and rugged hard bottom seafloor features, including the Mid-Atlantic Ridge and potentially many not-yet discovered seamounts. These areas can act as "stepping stones" for dispersal, hubs of refugia and speciation for deep-sea populations. The North Atlantic is ideal for examining similarities in overall benthic habitats, especially across the ASPIRE planning sites. These sites provide a setting to determine the influence of geomorphic structures on the composition and diversity of deep-sea fauna, the influence of environmental variables for the maintenance of invertebrate and fish biodiversity, and to examine linkages in deep-sea population connectivity. Improved understanding of the habitats in these off-shore areas will expand the capacity to predict the distribution of benthic habitats with respect to management in response to environmental change and exploration and exploitation of natural resources such as minerals and oil.

Respectively yours,

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Willing to Attend Workshop
Yes

Target Names
New England Seamounts and Mid-Atlantic Ridge, ASMWG Pilot Area Mapping

Geographic Areas(s) of Interest within the North Atlantic Ocean
Northwest, North Central, Southwest

Relevant Subject Area(s)
Biology, Geology, Physical Oceanography

Relevant Partnerships
Canada Healthy Oceans Network, SponGES