Multiple expeditions to explore and map deep-sea coral ecosystems in the Southeast United States in 2017

National Oceanic and Atmospheric Administration (NOAA)

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Last year, the National Oceanic and Atmospheric Administration (NOAA) launched the Southeast Deep Coral Initiative (SEDCI), a four-year effort that aims to study deep-sea coral and sponge ecosystems across the Southeast U.S., a region including the U.S. waters of the South Atlantic Bight, Caribbean Sea, and Gulf of Mexico. The initiative is the latest regional research effort by NOAA’s Deep Sea Coral Research and Technology Program. It is led by a multidisciplinary science team from multiple NOAA offices, including National Ocean Service, National Marine Fisheries Service, and Office of Oceanic and Atmospheric Research, that works in close collaboration with other federal and academic institutions.

Guided by the SEDCI science plan, the initiative has five research expeditions planned for this year, in addition to ten complementary research projects focused on seafloor mapping, species identification, environmental monitoring, habitat suitability modeling, and data mining. Expeditions planned for 2017 include (1) two expeditions aboard the NOAA Ship Nancy Foster that will survey deep-sea coral habitats off Florida using an ROV and multibeam mapping, (2) a 12-day expedition aboard the NOAA Ship Pisces that will survey deep-water canyons off North Carolina using AUV Sentry, and (3) two expeditions aboard the R/V Manta that will survey deep-water banks in the Northwestern Gulf of Mexico using ROV Mohawk. These research expeditions will be led by NOAA scientists Peter Etnoyer, Martha Nizinski and Emma Hickerson, respectively, and include partners from academic institutions and federal agencies.

Figure 1 (Left): ROV Mohawk will be used during two 2017 expeditions that will survey deep-water (50-300 m) banks in the Northwestern Gulf of Mexico in support of management of the Flower Garden Banks National Marine Sanctuary (credit: NOAA/UNCW-UVP). Figure 2 (Right): AUV Sentry will be used during a 2017 expedition that will survey deep-water canyons off North Carolina (credit: NOAA/WHOI).

The overall objective of SEDCI is to collect scientific information in order to improve the management and conservation of deep-sea coral ecosystems. In particular, there are several proposals for the establishment of managed areas in deep waters of the Southeast U.S., including proposed expansions of the Flower Garden Banks National Marine Sanctuary, potential new habitat areas of particular concern in the Gulf of Mexico, and new special management zones in the
Deep-sea modelling

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The National Oceanography Centre, along with UK and international collaborators, has been applying a spectrum of modelling tools to address questions relating to ecology and human impact in the deep sea. This research has investigated how variations in time, location, depth, currents, temperature, seafloor shape, as well as other ecological factors influence benthic communities.

The partitioning of stocks and flows of carbon in the abyss were examined using linear inverse models to estimate the importance of benthic functional groups under differing periods of food supply (Dunlop et al., 2016), and topographic settings (Durden et al., in press). Three-dimensional, time-resolved particle tracking has been used to investigate the pathways by which potential accidental oil releases from the seafloor or water column in the West of Shetland area may impact the ocean and seafloor (Main et al., 2017). At a global scale, our benthic modelling has used forcing from Intergovernmental Panel on Climate Change (IPCC) greenhouse gas emission scenarios to explore future change. This work has included examination of expected changes in deep-sea temperature, oxygen, pH, and food supplies (Sweetman et al., 2017). Additionally, changing food supply has been used to force a global-scale benthic model to estimate future change in size-specific biomass (Yool et al., in press).

The evolution of these tools in the future should allow for improvement in both their ability to represent benthic ecosystems, and in their utility for bridging knowledge from scales of in situ observations to scales of management and policy.

