

Monitoring of deep-water conservation areas through AUV sidescan sonar mapping: checking the status of the Darwin cold-water coral mounds after 8 years of protection.

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The Darwin Mounds are small cold-water coral mounds, up to 5 m high and 75-100 m across, located at ca. 1000 m water depth in the Northern Rockall Trough, NE Atlantic. They were first discovered in 1998 as high-backscatter targets on 30 kHz TOBI sidescan sonar records of the area. Subsequent surveys, using a GeoAcoustics dual-frequency sidescan sonar (100 and 410 kHz) and the NOC WASP and SHRIMP video platforms, confirmed they were covered, and potentially built up by cold-water corals. However, this high-resolution dataset also revealed that the mounds were heavily damaged by deep-water bottom trawling. These findings eventually resulted in an emergency closure of the area for all bottom fisheries under the EU Common Fisheries policy in August 2003. The measure was made permanent in spring 2004. Since then, the Darwin Mounds have been designated as the UK's first deep-water Special Area of Conservation (SAC) under the EU Habitats Directive.

However, since the first surveys in 1998-2000, no further mapping had been carried out in the area, and the status of the Darwin Mounds and their associated cold-water coral habitats was unknown until a revisit took place in 2011. Using the Autosub6000 Automated Underwater Vehicle (AUV), 2 areas of the Darwin Mounds were re-surveyed with an EdgeTech dual frequency sidescan system (120 and 410 kHz). Ground-truthing was carried out with a Sea-Eye Lynx ROV, equipped with a Kongsberg OE14-366 colour zoom camera and a Kongsberg OE14-208 digital stills camera. Both the new and the legacy sidescan sonar datasets were processed with the NOC in-house PRISM software. Image texture attributes were calculated in Erdas Imagine 2011, and formed the basis for unsupervised classification, mapping out the mounds, live/dead coral stands and coral rubble.

The 2011 results were compared with the 1999/2000 records to assess the potential recovery of the area. Although there was no longer any evidence for on-going bottom trawling activities (trawl marks), there were no clear signs of coral recolonisation/expansion in the area. Cold-water corals are slow-growing, and recovery from physical impacts takes time, in the order of decades. Further repeated long-term monitoring will be necessary to follow up the recovery of the Darwin Mounds.