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Patchwork and edges: Using seascape metrics to examine habitat heterogeneity and seafloor biodiversity near a coral conservation area

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The seafloor is characterised by a patchwork of habitats, forming a mosaic, which recent acoustic mapping methods can quickly describe in finer detail over large extents. In terrestrial systems much thought has been given to quantifying the composition, spatial configuration and complexity of habitat heterogeneity in order to examine its links to biodiversity. However, this landscape ecology approach has rarely been employed in deeper benthic ecosystems. We present here on a hierarchical survey which was carried out as part of the CODEMAP project on Rockall Bank, a ~200 m deep plateau off the northwest coast of the UK. Inside and outside the boundary of a fisheries closure zone, video surveys of the megabenthos were carried out using a remotely operated vehicle (ROV). Larger areas surrounding these transects were also mapped at high resolution (50 cm) using a side-scan sonar mounted on the autonomous underwater vehicle Autosub6000. Ship-based bathymetry linked all the sites at a coarser resolution (10 m). The ROV imagery was examined and three distinct faunal assemblages were found; soft-bottom (e.g. sand), hard-bottom (e.g. cobbles, boulders and exposed bedrock) and coral associated (e.g. live and dead corals as well as rubble). Based on the side-scan sonar imagery, it was possible to distinguish between soft and hard substratum, thus yielding larger extent habitat maps. Seascape metrics (e.g. patch and edge density, division and cohesion indices as well as fractal dimensions) were compiled to describe the complex spatial arrangement of the areas surveyed which are characterized by iceberg ploughmark formations. Combining this information with biodiversity indices obtained from the smaller-scale imagery makes it possible to test the hypothesis that habitats exhibiting increased heterogeneity show higher species richness. Live coral stands were found to harbour higher diversity of species, but both trawled corals and remaining live coral stands were observed on the outside edge of the protected zone, highlighting the need to better describe benthic habitats in order to design effective conservation measures. The creation of larger extent habitat maps may help define areas of high biodiversity and conservation need without having to rely on time consuming collection of biological data.