

Combination of morphometric and textural techniques for mapping coastal benthic habitats

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For many years, seafloor maps of coastal waters have been based on high resolution multibeam bathymetric data. Visual interpretation of these data, integrated with ROV photos, videos and samples, has been the preferred tool to outline provinces of benthic habitats and biotopes. Over the years, the quality of multibeam bathymetric data has improved sufficiently to enable numerical techniques to be applied and to allow objective, accurate and statistically valid interpretations to be made. Many of these numerical techniques, however, have been based on a single method and, so far, a standard automated seabed classification technique that works well for all habitat types in all kinds of environments has never been defined.

In this study we present a new multi-method approach for benthic habitat mapping of shallow coastal areas. The data sets available include high-resolution multibeam bathymetry and backscatter from a 28 km² area of seafloor offshore the Maltese Islands, Mediterranean Sea. The acoustic data are ground-truthed with ROV imagery and seafloor photographs and samples from dive surveys. Our approach is based on a set of geomorphometric and textural analysis techniques to map specific seafloor morphologies and composition classes. Morphometric attributes, the Bathymetric Position Index and geomorphometric mapping segment the seafloor into five morphological classes – flat and sloping zones, crests, depressions and breaks of slope. Subdivision into the predominant classes of seabed composition – medium sand, maerl associated with sand and gravel, seagrass settled on sand and gravel, and seagrass settled on bedrock – is carried out through supervised classifications of morphometric attributes and backscatter textures (TexAn). The morphological and seabed composition classes are subsequently combined to chart 12 predominant habitats.

We have developed a simple GIS-based method for an accurate characterisation of coastal habitats while using all the information available in the multibeam echosounder data. The method is not a fully automated one and it does require some expert input. As the Government of Malta embarks on mapping of its coastal waters in fulfilment of the EU Marine Strategy Directive, we expect our approach to provide an efficient and cost-effect tool to map and manage the Maltese coastal waters.

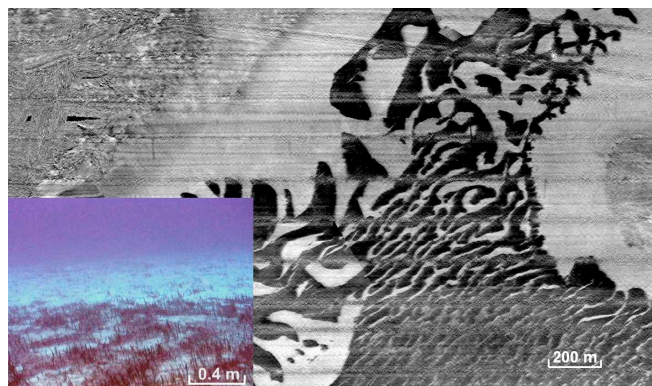


Figure 1 – Backscatter imagery showing curved and elongated patches of medium sand draping a smooth flat surface of maerl, sand and gravel. ROV Imagery (inset) showing patches of photophilic algae.