Characterisation of hard-substrate habitats in the German Bight (SE North Sea) from video observation

Rune Michaelis, Finn Mielck, Svenja Papenmeier, Lasse Sander, and H. Christian Hass

Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Wadden Sea Research Station, List/Sylt, Germany

Accumulations of cobble- to boulder-sized material provide important habitat functions for many plant and animal species in the marine environment. These include nursery for fish, anchor point for sessile marine species and feeding ground for many different organisms. Detailed knowledge of such reef habitats and their properties is thus crucial for the determination of marine protected areas and consequently also for the management of the North Sea. As stones and boulders usually cannot be recovered from the seafloor to be investigated in the lab most analyses have to rely on non-invasive methods like e.g. underwater video- and diver-observation data. Due to these limitations these habitats are not well understood with regard to their spatial distribution, temporal development and ecology. Furthermore, there is no standardized way to assess the structure and cover of biological communities on such hard-substrates, which discourages comparison of data between different regions.

We here present a standardized workflow to analyse underwater videos of hard-substrate habitats recorded in different areas of the North Sea. The idea is to combine these detailed information with an area-wide habitat classification based on sidescan sonar data. For image-based evaluation, the videos are transformed into single frames, extracted every five seconds of video running time and imported into a self-developed image analysis script. This script allows the user to select and count different descriptors in numerical categories. These include amongst others the different size classes of stones, the areal coverage of sessile marine organisms, the surrounding sediment properties or the presence of grazers. These semi-quantitative data are subsequently statistically analysed to produce a set of standardized characteristics of the hard-substrate habitats and the controlling factors of their current state and development.

Preliminary results show that boulders in sandy environments are predominantly covered by sessile invertebrate organisms (e.g. the soft coral *Alcyonium digitatum* and the sea-anemone *Metridium senile*), while cobbles are largely uncovered. In muddy areas, however, even cobbles show a higher amount of sessile coverage though at an earlier or reduced state of development.

The proposed method allows to obtain detailed data on the distribution, kind and composition of marine sessile organisms populating hard-substrate habitats in the North Sea. Already at this stage, the practical assumption of many investigations that stones are all and always inhabited by the typical organisms, which is utilized in many investigations can hardly be supported. Our research further shows the need to develop methodologies to upscale these observations to be able to assess spatial patterns between and within larger reef complexes. The video analysis presents a valuable first step towards a full-scale characterization of hard-substrate habitats under difficult survey conditions.