Popular science summary of the PhD thesis

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Title of the PhD thesis	Restoration and non-invasive monitoring of geogenic reefs in temperate waters
PhD school/Department	DTU Aqua

Coastal marine habitats are among the most productive ecosystems on the planet, yet these habitats are simultaneously facing immense pressure from increasing urbanization, pollution and habitat degradation. The Baltic Sea provides an important example that shows how a long history of intense human pressure can create one of the most degraded coastal systems globally, but also illustrates cases in which science-based management is capable of reversing deteriorating trends. Geogenic reefs, i.e. reefs consisting of marine rocks or hard-bottom substrate, are an important type of coastal habitat in the Baltic Sea on which a wide variety of marine species depend for foraging, shelter and reproduction. However, marine rocks have been extracted from the Baltic seabed for more than a century to serve as material for the construction of e.g. jetties and piers, a practice that was eventually banned by Danish law in 2010. The removal of marine rocks constitutes a fundamental shift within geogenic reef systems, as large areas of habitat are degraded or even lost permanently, with detrimental effects to inhabiting flora and fauna. This thesis investigates the potential for recovering geogenic habitats, by focusing on two independent reef restoration projects conducted within degraded coastal areas in the western Baltic Sea. Monitoring of such restoration efforts requires survey methods with minimal impact to study organisms and habitat, i.e. non-invasive monitoring, and this thesis therefore provides a thorough evaluation of various techniques that fit this purpose. We show that geogenic reef restoration can provide suitable habitat for a range of reef species and even for some soft-bottom taxa, with a potential to strongly enhance the abundance of commercially important cod (*Gadus morhua*) and to benefit species diversity relative to reference sites. We demonstrate the importance of hard substrate in harboring a unique species community and in driving a large number of species correlations in our study area. Baited video systems are identified as a particularly useful method to monitor restored habitats in aquatic systems by producing high-quality data, while sampling of environmental DNA is rapidly evolving to further expand our knowledge on marine species and their association with surrounding habitats. The results obtained from this thesis call for an increase in efforts to conserve and restore geogenic habitats in the Baltic Sea, and will be relevant for various related fields such as developing methods for coastal protection and the management of rapidly expanding artificial structures in the world's oceans.