EGU22-8577
https://doi.org/10.5194/egusphere-egu22-8577
EGU General Assembly 2022

Bioprotection and Maritime Built Heritage: A Preliminary Investigation of the Protective Role of Seaweed on Natural Cement

Timothy Baxter, Martin Coombes, and Heather Viles
School of Geography and the Environment, University of Oxford, Oxford, United Kingdom

Historic maritime structures, including harbours and breakwaters that are valued as heritage assets, are common along the coastlines of Europe. As with other hard substrates in coastal environments, these structures often support the growth of marine wildlife. As well as contributing to the geomorphic evolution of rocky coasts, sessile organisms including those that form dense biological covers (e.g., seaweed, barnacles, mussels etc.) alter engineering materials by both enhancing and retarding weathering and erosion. Due to their age and traditional construction, historic maritime structures may support unique abiotic-biotic interactions. However, compared to natural rock and modern infrastructure constructed of concrete, there is limited understanding of how biogeomorphological processes operate on built heritage assets. This includes on materials such as natural cement that is commonly used as a hydraulic binder in the construction and restoration of maritime built heritage across Europe. An improved understanding of these interactions should allow practitioners responsible for the conservation of marine biodiversity and the historic built environment to make more informed decisions about their long-term sustainable management.

As part of a larger project exploring the two-way interactions between marine wildlife and historic maritime structures, this study assesses the influence of seaweed canopies (*Fucus vesiculosus* and *F. serratus*) on the deterioration of natural cement. After six months exposure to intertidal conditions at Portland Port (Dorset), UK, sample blocks of natural cement attached to substrates with 95–100% seaweed cover were compared to those attached to bare surfaces. Preliminary analysis suggests that surface hardness, surface roughness, and material loss vary between seaweed-covered blocks and those left uncovered, indicating they may have experienced different levels of breakdown during exposure to intertidal weathering and erosion. Monitoring of near-surface microclimates showed that temperature extremes and fluctuations were significantly dampened under seaweed canopies compared to adjacent areas of uncolonised rock. As mechanical rock weathering processes are influenced by surface temperature regimes, we infer that these stabilising effects may translate to a reduction in the efficacy of particular rock breakdown processes over a relatively short period of time.

Overall, this study presents the first empirical evidence of the bioprotective potential of seaweed on materials commonly used to construct and repair historic maritime structures. This implies that opportunities exist for the application of nature-based solutions for the management and protection of historic structures in marine environments alongside habitat provision and biodiversity conservation. Future work is now needed to examine the geomorphic roles of seaweed and other marine organisms on different types of materials used in built heritage conservation, and the extent to which the impacts of these organisms vary in time and space in relation to other biological, chemical, and physical agents of change.