Passive Ecological Enhancement at the Hartlepool Headland Coastal Protection Scheme

Mairi MacArthur, School of Geographical and Earth Sciences, University of Glasgow, macarthurmairi@gmail.com
Larissa Naylor, School of Geographical and Earth Sciences, University of Glasgow, Larissa.Naylor@glasgow.ac.uk

Aims

The main aim of this research was to determine whether passive ecological enhancement improves the biodiversity of a rock armour revetment at Hartlepool Headland. Passive enhancement involves making informed decisions on choice of rock material and selecting boulders with many surface features (pools, cracks and ledges) positioned optimally on the top surface of the boulder, maximising their ecological value by improving habitat provision.

Figure 1. Example of passively enhanced boulder at Hartlepool Headland.

Methodology

A new field sampling method was developed to accurately quantify species present and habitat complexity on passively enhanced boulders at Hartlepool and thus measure the links between geology, geomorphology and biodiversity interactions. Stratified random sampling was conducted along 60m horizontal, shore-parallel transects along the lowest row of the rock armour. Sample numbers varied due to ongoing construction activity, safe access to boulders and tidal restrictions at the site. Samples were split into enhanced (material choice and positioning) and partially enhanced (material choice at the site was selected as the most ecologically suitable of the options available - Shap granite).

The closest partially enhanced and enhanced boulders to each point along the transect were sampled with a spacing of at least 1.5m apart. The top surface of boulders were sampled and species were recorded as counts (fauna) and percentage cover (flora) The top surface of each boulder was sampled with species recorded as counts of individuals for mobile species and percentage cover estimated to the nearest 5% for sessile species, with surface area varying by boulder. The effect of surface area was not controlled for; however, the number of each geomorphic feature type was noted per boulder sampled, and all statistical tests compare species characteristics to geomorphic features. The presence and location of mobile species was also recorded on boulder surfaces and on/in specific features (Table 2) in order to better establish the link between species and habitat complexity. The count of each feature type (crack, crevice, pool, ledge, other) was recorded.

Key findings

Passive positioning of Shap granite boulders increased limpet (*Patella vulgata*) abundance within two years, which are a key prey species for birds at the site. The number of features was also higher with positioning, with positioning exerting a strong control on the mm and mm-dm scale geomorphic features present. There were clear ecological benefits when suitable features were selected for and optimally positioned to maximise habitat features. Ecologically informed rock selection and application is recommended where natural and nature-based solutions are not feasible and where rock armour is the preferred option for coastal defences.