Benthic Interactions with Renewable Energy Installations in a Temperate Ecosystem

Emma Victoria Sheehan*, Matthew James Witt2, Sophie Louise Cousens1, Sarah Caroline Gall1, Martin James Attrill1

1Plymouth University Marine Institute
Plymouth, Devon, UK
* Corresponding author

2College of life & Environmental Sciences, University of Exeter
Cornwall Campus
Tremough Campus, Cornwall, UK

ABSTRACT

Wave Hub is a Marine Renewable Energy Installation (MREI) off the southwest peninsular of the UK. Wave Hub’s seabed infrastructure, including the main connection unit and 18 km of seabed cable were deployed in 2010. This study assesses the species assemblages present within the Wave Hub development zone in the context of the ecological processes they contribute to local ecosystems. To enhance knowledge on the potential future impacts of MREI the effect of the power cable was quantified, with its associated 80,000 tonnes of rock armoring. Species assemblages were compared between rock armored and control sites two years after installation.

KEY WORDS: Impact; epi-benthic fauna; wave energy convertor; seafloor cable; habitat enhancement; marine protected area

INTRODUCTION

While Marine Renewable Energy Installations (MREI) could help meet the demands of a growing global need for ‘clean’ energy (Pelc and Fujita, 2002;) it is essential that their local impacts are quantified to ensure that future installations do not negatively affect benthic habitats and their associated species (Boehlert and Gill, 2010; Gill, 2005; Inger et al., 2009; Pelc and Fujita, 2002). Species and habitats provide numerous beneficial ecosystem functions and services, and an appreciation of these and the links between them is vital to ensure minimal disturbance. While some species have a direct commercial value as food, others are valuable through the provision of ecosystem goods and services, such as primary and secondary production, the integrity of which is vital for ecosystem resilience (Fletcher et al., 2012; TEEB, 2010). Gaining detailed knowledge of the habitats and species present at a potential MREI site is therefore vital to aid understanding of the likely potential effects of development on the supply of ecosystem goods and services.

Sites selected for MREI are generally not well understood as these high energy environments are difficult and dangerous to study (Sheehan et al., 2013; Sheehan et al., 2010; Shields et al., 2009). The construction, operation and decommissioning of an MREI can lead to physical disturbance of the seabed (Gill, 2005), and it is likely there will be positive and negative effects for coincident habitats and species (Inger et al., 2009). For example, while MREI may cause barriers to movement for marine organisms (Gill & Kimber, 2005) installations may act as artificial reefs (Langhamer et al., 2009; Linley et al., 2007; Wilhelmsson et al., 2006) and provide refuge and feeding grounds for marine fauna. Safety exclusion zones surrounding installation sites are likely to exclude benthic trawling and dredging that damage the seabed (Kaiser et al., 2006) and therefore act as de facto Marine Protected Areas (MPAs) (Inger et al., 2009; Sundberg and Langhamer, 2005; Witt et al., 2012). Conversely, the infrastructure associated with these developments may entangle marine organisms, create anthropogenic sound, electromagnetic energy and/or cause scouring of the seabed (Gill, 2005; Grecian et al., 2010; Inger et al., 2009).

Fig. 1 Wave Hub development zone showing sampling Areas (A-D) and sampling Plot locations along the cable route (not to scale).

Wave Hub is an 8 km2 MREI located off the north coast of Cornwall, south west UK. Seabed cable connecting Wave Hub to an electricity sub-station south of the site in Hayle, north Cornwall, was deployed in summer 2010. At the time of deployment, only a small area surrounding the hub (the cable plug) benefited from a safety exclusion zone, prohibiting other sea users from entering the region. To avoid fishing gear damaging the subsea cable, it was buried when passing through near shore sandy habitat and was laid on the seabed for the remaining distance to the offshore hub, upon which boulders and