Benthic Interactions with Renewable Energy Installations in a Temperate Ecosystem

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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. To enhance knowledge on the potential future impacts of MREI, this study assessed the effect of the power cable, with its associated 80,000 tonnes of rock armouring on the benthos. Two years after installation, species assemblages were compared between Cable rock armoured sites and Control sites located away from the cable route.

Introduction

- Wave Hub is an 8 km^2 MREI located off the north coast of Cornwall, south west UK (Fig. 1).
- Seabed cable connecting Wave Hub to an electricity sub-station was deployed in summer 2010. Deployment of the first wave energy device is planned for summer 2014 (Fig.1).
- To protect the subsea cable from demersal fishing gear, it was buried in sandy areas, and covered with cable armouring on harder ground. Cable armouring comprised boulders and concrete mattressing.
- This study quantified the effect of the cable and rock armouring on the benthic epifauna community 2 years after deployment (1).

Methods

- The Cable route survey was carried out in June 2012 to quantify the effect of the cable armouring on the seabed fauna. Data were collected at sites located in water depths between 24 – 60 m.
- The survey employed a method of filming the seabed using High Definition (HD) video mounted on a towed 'flying array' described in (2)(Fig. 2).
- 6 Plots were identified along the Wave Hub subsea cable to investigate faunal assemblages that had colonized the cable armouring 2 years after installation (Fig.3). 3 Cable sites and 3 Control Sites were surveyed at each Plot.
- Number of taxa, Abundance and Assemblage composition were measured using frame grabs extracted from video transects and compared between treatments using PERMANOVA (3).

Results and Conclusions

- After 2 years, there were similar Numbers of taxa and Abundance of organisms between the Cable route and the Control ($P > 0.05$), but the Assemblage Composition was significantly different ($P = 0.017$) (Fig. 4).

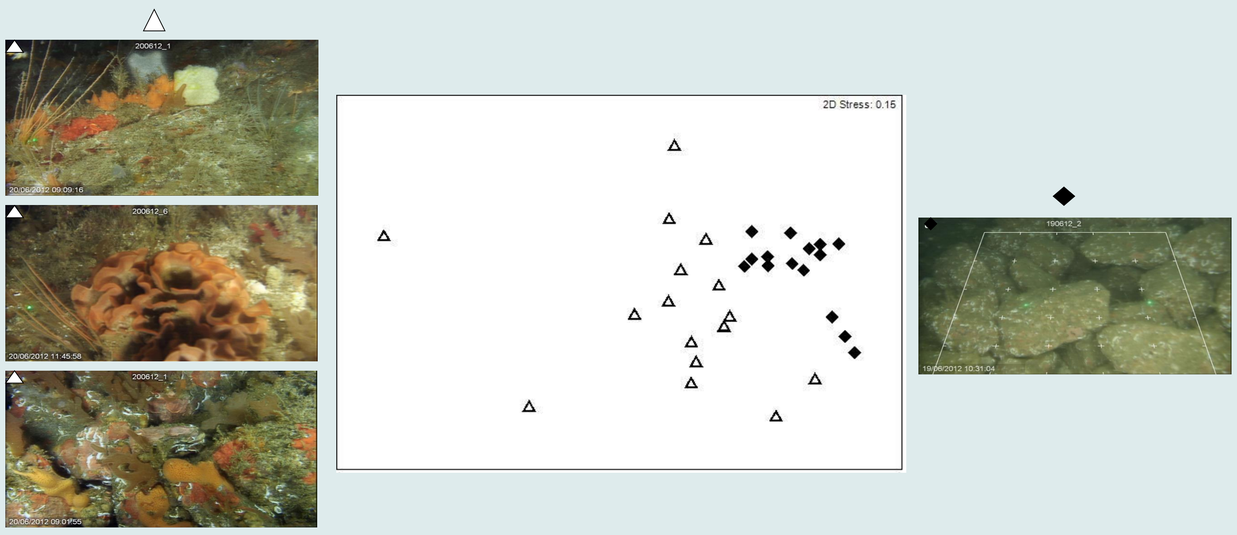

Fig.4. nMDS indicating relative differences in assemblage composition between Cable route sites and Control sites. Each point represents a site. Images represent typical assemblages found at Cable route (black diamonds) and Control (open triangle) sites.

- Opportunistic, fast growing species that are typical of early colonisation, on new habitat, such as hydroids (Table 1) were found in greater abundances on the Cable route than in Controls.
- Slow growing, long lived species, such as Ross coral that increase habitat complexity were only found in Control sites.
- Whilst some recovery was seen for fast growing species within two years, appropriate monitoring is needed over longer timescales to assess recovery of slower growing, long lived species such as sessile sponges and soft corals that are essential ecosystem engineers (4). This is vital to determine the positive and negative impacts of MREI post deployment, and its potential impacts on ecosystem goods and services (5).

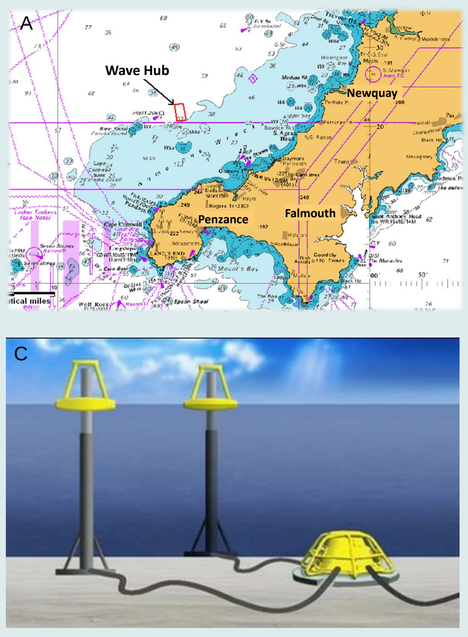

Fig. 1. A – Location of Wave Hub. B and D are proposed wave energy devices for deployment at Wave Hub. C is a diagrammatic representation of the Wave Hub connection. Photographs copyright Wave Hub.

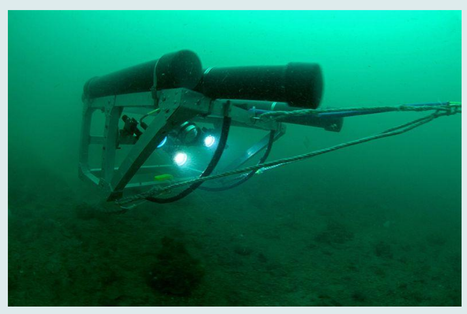

Fig. 2. The towed flying array with high definition video.

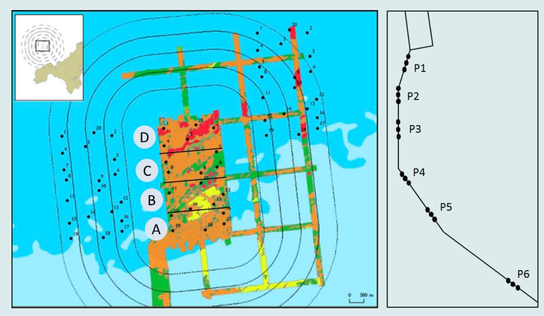

Fig.3. Wave Hub development zone showing sampling Areas (A-D) (see ref 1 for Wave Hub survey design) and sampling Plot locations along the cable route (not to scale).

Table 1. Simper analysis showing 6 taxa, which contributed to the differences in assemblages between the Cable route and Controls. Key ecosystem processes and services are shown in colour. Photographs copyright Keith Hiscock.

Species	Common name	1° production	2° production	Habitat complexity	Stabilising	Recycling	Commercial value	Control Av. abundance	Cable route Av. abundance
Hydroids 	Hydroids							7.24	11.35
Alcyonidium diaphanum 	Bryozoan							0.32	3.08
Alcyonium digitatum 	Dead man's fingers							2.05	0.06
Pentapora foliacea 	Ross coral (bryozoan)							0.75	0
Echinus esculentus 	Edible sea urchin							0.48	0.39
Aequipecten opercularis 	Queen scallop							0.11	0

Acknowledgements

This work was supported by the South West Regional Development Agency. We gratefully acknowledge our video analysts: Eryn Hooper, Alex Meadows and Danielle Bridger. We are sincerely thankful to Skipper John Walker and our volunteers.

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