FLOWBEC: Assessing spatial variation in epifaunal communities in response to flow modification by a tidal stream turbine.

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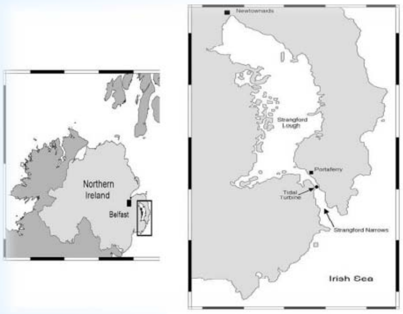

Fig.1: Map showing the location of the Strangford Lough Narrows and the turbine.

Introduction: The advent of marine renewable energy devices brings with it the need for new methods of assessing the associated impacts of energy extraction from the marine environment.

Fig. 2: Picture showing the turbine with its crossbeams and rotors raised from the water column.

Aims: The aim of this study is to create a predictive model for change in benthic community structure in relation to velocity and turbulence change caused by the presence of a turbine.

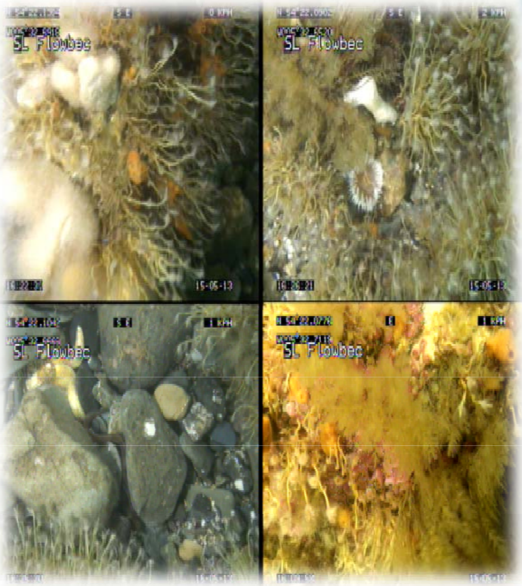

Fig. 3: TL; The sponges *Amphilectus fucorum* and *A. lobata*. The hydroid *Tubularia indivisa* and the coral *Alcyonium digitatum*. TR; The hydroids *Sertularia argentea* and *T. indivisa*, the anemone *Sagartia elegans*. BL; The sea-star *Asterias rubens*, The fish *Pholis gunnelus*. BR; The anemone *Corynactis viridis*, the sponge *Halichondria panicea* and the hydroid species *Obelia spp.*

Methodology: High resolution drop-down video footage of the seafloor will be used in conjunction with computational fluidity dynamics (CFD) model data and an artificial neural network in order to develop the predictive model.

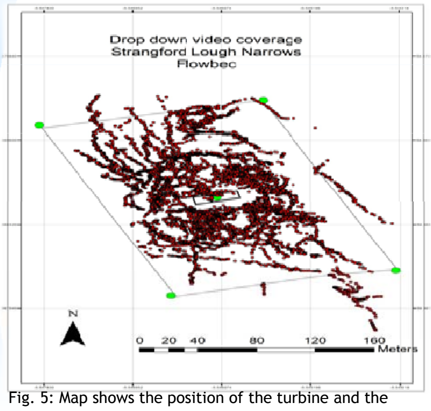

Fig. 5: Map shows the position of the turbine and the positions of the drop-down video transects.

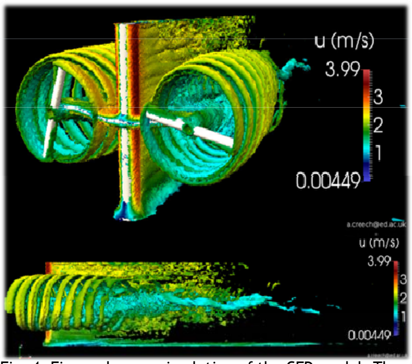

Fig. 4: Figure shows a simulation of the CFD model. The turbulent wake created by the turbine can be seen dissipating downstream

Conclusions: A halo of disturbance (10-12m) can be observed around the turbine. This occurrence of this halo of disturbance was also detected by the HEHS index. The predictive model will give us an integrated prediction of disturbance which will encompass biological, environmental and hydromorphological predictor variables. This study may lead to improved ability to model the effects of proposed tidal devices in other locations.

$$HEHS = \left((1 - PiBR) \times 0.65\right) + \left(\left(\frac{H'}{H'max}\right) \times 0.07\right) + \left(\left(\frac{S}{Smax}\right) \times 0.06\right) + [illegible]$$

Fig. 6: The HEHS index equation. Where *PiBR*= decimal proportion of barerock. *H*=Shannon Weinner value. *S*= No. of species. *% massive*=% coverage of massive/errect species. *% crust*= % coverage of encrusting species. ES class boundaries are assigned as follows; Bad 0-0.12 Poor 0.12-0.25 Moderate 0.25-0.45 Good 0.45-0.75 High 0.75-1.

Fig. 7: Pictures show the camera system (left) and the on-board operating unit (right).