Penelope Donohue

Small Grant Report:

Intraspecific variation in the molecular physiology of the cold water coral *Lophelia pertusa* in response to global climate change

The aim of the study was to examine how ocean acidification (OA) and elevated temperature may have a synergistic effect on the molecular physiology of the cold water coral *Lophelia pertusa.* Using state-of-the-art techniques this study aims to identify proteins key to coral survival and quantify the impact global climate change (GCC) may have on these proteins and subsequent physiological processes. Furthermore, the experiment has been designed in such a way that it will allow us to examine intraspecific variances and compare populations that naturally experience different environmental conditions. This will allow us to make conclusions about the potential for adaptation to the changing environmental conditions of this coral species. This will be the first study of its kind to be carried out in the context of global climate change and a deep water marine organism.

As part of the NERC UK Ocean Acidification Programme's Benthic Consortium I was chosen to represent the University of Glasgow on the Changing Oceans Expedition 2012. The expedition took place May 17-June 15 2012 and we spent a month aboard the RRS James Cook visiting deep sea coral reefs in the North Atlantic.

Deep sea coral reefs are synonymous with high biodiversity and the complex structure supports many thousands of species. In particular, the coral reefs that were the focus of this expedition are off the coast of Scotland and support many important commercial fish species. Therefore, the future of these deep sea ecosystems have significant implications for local and global economic, political and social development and information gained from these studies will be integral to our understanding of how anthropogenically accelerated climate change may impact these areas in Scotland.

Results thus far:

The MASTS small grant allowed me to purchase consumables to analyse the coral samples, this included 1D gels, Western Bolt equipment and protein antibodies.

Thus far I have identified HSP 70 (heat shock protein 70). HSP 70 are a family of conserved ubiquitously expressed heat shock proteins. Proteins with similar structure exist in virtually all living organisms. The HSP 70s are an important part of the cell's machinery for protein folding, and help to protect cells from stress. Members of the HSP 70 family are strongly upregulated by stress, for example environmental change. In the present study, it is likely coral in the increased pCO2 and temperature treatments will have a higher concentration of HSP 70 protein. Using the Western Blot equipment and protein antibodies purchased with the MASTS small grant I have begun to quantify the concentration of HSP 70 in corals from each of the treatments and will compare the effect of elevated pCO2 and temperature on HSP 70 protein in cold water corals in response to environmental change.