
The Ocean Sciences Meeting is one of the biggest gatherings of marine scientists held every two years and is a joint venue of the American Geophysical Union (AGU) and the Association for Sciences in Limnology and Oceanography (ASLO). This year it gathered in Salt Lake City, Utah, USA and there were around 4000 people in attendance.

The MASTS Small Grants Scheme paid for my flight to Salt Lake City and was integral to ensuring I was able to attend this conference, which was a fantastic opportunity to publicise my work to an international audience. In addition, MASTS benefited from representation at a well respected and long standing international conference.

**Figure 1.** Some of the 4000 strong crowd attending the Ocean Sciences Meeting 2012.


**Figure 2.** Me giving my presentation to over 100 people at the Ocean Sciences Conference 2012.

In addition to giving my own talk the conference also gave me the opportunity to attend many of the networking sessions, talks by other people and poster session. This has been invaluable in terms of making international contacts and getting up to date with the current state-of-the-art of ocean sciences research.

Please find below an extended abstract detailing aspects of the talk I did at the conference.

# Synergistic effects of temperature and $pCO_2$ on the protein profile of the calcifying red alga, *Lithothamnion glaciale*

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**Keywords:** Ocean acidification, Photosynthesis, Calcifying algae

One of the greatest challenges currently facing marine ecosystems is that of anthropogenically accelerated global climate change (GCC). This phenomenon includes ocean acidification (OA, decreasing ocean pH as a result of increasing seawater $pCO_2$) (Caldeira and Wickett 2003) and rising global sea surface temperatures (Solomon et al. 2007).

All living organisms respond to environmental changes through changes in the expression of multiple genes and proteins. These ongoing anthropogenic environmental changes (including OA and rising seawater temperatures) represent additional environmental stimuli which may induce expression changes in marine organisms. The red free-living coralline algae, *Lithothamnion glaciale*, is a high-Mg marine biogenic calcite which is likely to be structurally very sensitive to the changing climate. *L. glaciale* performs a crucial role in maintaining biodiversity and ecosystem provision (Kamenos et al. 2004) and also impacts on the climate system including cloud nucleation and ozone stability (Ohsawa et al. 2001). Therefore, any OA or temperature induced changes at the molecular level may have an unprecedented impact on these marine biogenic habitats.

Here we examined the *L. glaciale* proteome under control conditions ($pCO_2$ 380 ppm, temperature 12°C), elevated $pCO_2$ (750 ppm, 12°C), elevated temperature (380 ppm, 16°C) and combined elevated $pCO_2$ and temperature (750 ppm, 16°C) and analysed concentration changes of distinct proteins known to be involved in photosynthesis and calcification, in response to the different environmental conditions.

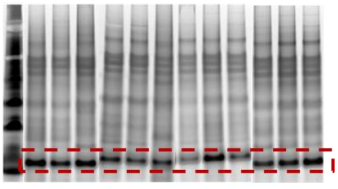

**Figure 1.** Bis-Tris 4-12% Gel of *L. glaciale* proteome stained with silver staining. Each band represents a protein. Bands were cut out and a mass spectrometer was used to identify the proteins. Dotted box indicates a protein band identified as Phycoerythrin, a protein critical to photosynthesis in red algae.

Image analysis of the gel measures individual protein concentration based on the intensity of the band. Here we examine Phycoerythrin:

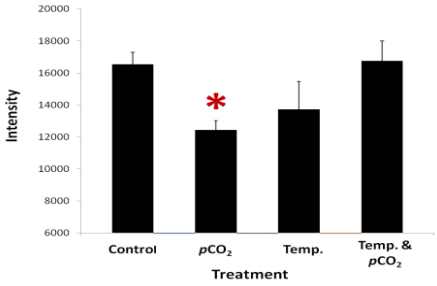


**Figure 2.** *L. glaciale*. Synergistic effects (mean ± SE) of seawater $pCO_2$ and temperature on the concentration of Phycoerythrin. (* )represents a significant difference among treatments.

Exposure of algae to elevated $pCO_2$ caused a significant reduction in Phycoerythrin concentration ($p < 0.05$) in comparison to algae exposed to control conditions (fig. 2). However, the concentration of Phycoerythrin did not differ between algae exposed to control conditions and algae exposed to the combined treatment of elevated $pCO_2$ and temperature (fig. 2). This suggests a synergistic effect; at the elevated temperature algae may be able to compensate, in terms of Phycoerythrin expression, for elevated seawater $pCO_2$ levels.

This study presents evidence of how OA and elevated temperature have a synergistic effect on the molecular physiology of *L. glaciale* and highlights the importance of using this systems based approach to identify key physiological processes within marine organisms that will be impacted by global climate change.

**References:**

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