

## INSIGHT INTO CYANOBACTERIAL NITROGEN-FIXATION IN MELTWATER PONDS OF THE MCMURDO ICE SHELF

AD Jungblut, BP Burns, BA Neilan

*The University of New South Wales, Sydney, NSW, Australia*

Cyanobacterial mat communities comprise a large part of the biomass in Antarctic freshwater environments such as the meltwater ponds of the McMurdo Ice Shelf (MIS) in Southern Victoria Land. In these environments cyanobacteria are exposed to low temperatures, short growth periods and high salinities, as well as nutrient limitations. In particular, low concentrations of dissolved inorganic nitrogen are characteristic of these environments. Under these conditions the ability to utilise dinitrogen is advantageous, and alternative nitrogen inputs through cyanobacterial nitrogen fixation into the ecosystem would also impact the nitrogen budget of these systems.

In order to gain further insights into cyanobacterial nitrogen fixation in these meltwater ponds of Bratina Island (MIS), we first described the cyanobacterial diversity present using molecular and morphological methods. Then, we investigated nitrogen fixation activity of total cyanobacterial mats using the *in situ* acetylene reduction assay. Finally, we compared the phylotypic diversity obtained and the nitrogen activities of the total mats with the cyanobacterial diversity of nitrogen-fixing genotypes in these mats and Antarctic isolates. This was achieved via the construction of clone-libraries targeting cyanobacterial *nifH* genes, which encode the nitrogen reductase.

Through the synopsis of molecular and physiological methods, nitrogen-fixation activities were determined in most of the ponds. In addition it was shown that the investigated cyanobacterial diversity was significant with identified phylo- and morphotypes belonging to the orders Oscillatoriales and Nostocales. Further, *nifH* genes were identified in the microbial mats and the ability to fix nitrogen was a characteristic of several cyanobacterial genera with some genera, such as *Nostoc* sp., more prevalent than others. In summary, this study has furthered our understanding on the community of cyanobacteria contributing to the nitrogen budget in the meltwater ponds of Bratina Island and potentially in other cyanobacterial mat communities of Antarctica.