World Academy of Science, Engineering and Technology
International Journal of
Vol:8, No:, 2014

# The Taxonomic and Functional Diversity in Edaphic Microbial Communities from Antarctic Dry Valleys

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**Abstract :** McMurdo Dry Valleys are a largely ice-free polar desert protected by international treaty as an Antarctic special managed area. The terrestrial landscape is dominated by oligotrophic mineral soil with extensive rocky outcrops. Several environmental stresses: low temperature, lack of liquid water, UV exposure and oligotrophic substrates, restrict the major biotic component to microorganisms. The bacterial diversity and the putative physiological capacity of microbial communities of quartz rocks (hypoliths) and soil of a maritime-influenced Dry Valleys were interrogated by two metagenomic approaches: 454 pyro-sequencing and Geochp DNA microarray. The most abundant phylum in hypoliths was Cyanobacteria (46%), whereas in solils Actinobacteria (31%) were most abundant. The Proteobacteria and Bacteriodetes were the only other phyla to comprise >10% of both communities. Carbon fixation was indicated by photoautotrophic and chemoautotrophic pathways for both hypolith and soil communities. The fungi accounted for polymer carbon transformations, particularly for aromatic compounds. The complete nitrogen cycling was observed in both communities. The fungi in particular displayed pathways related to ammonification. Environmental stress response pathways were common among bacteria, whereas the nutrient stress response pathways were more widely present in bacteria, archaea and fungi. The diversity of bacterialphage was also surveyed by Geochip. Data suggested that different substrates supported different viral families: Leviviridae, Myoviridae, Podoviridae and Siphoviridiae were ubiquitous. However, Corticoviridae and Microviridae only occurred in wetter soils.

**Keywords :** Antarctica, hypolith, soil, dry valleys, geochip, functional diversity, stress response