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Understanding autotrophic bacterial community structure and function along a naturally occurring iron deposit gradient

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Introduction

Naturally occurring iron deposits in upland streams have been studied in the context of their chemical composition, epilithic biomass, and impacts upon invertebrate community structure over an iron gradient in the Sperrin Mountains, Northern Ireland. The Sperrin Mountains consist of metamorphosed schist and unconsolidated glacial drift with peaty podzol soils. Anthropogenic influences on the study sites are limited, with only low intensity sheep farming and localised conifer plantation forestry: there is no evidence of mining occurring now or in the past in the study catchments. There is limited information on the functional diversity of autotrophic bacteria along the iron gradient.

Aims

1. Explore differences in autotroph communities along the Iron gradient.
2. Investigate spatial & temporal difference in bacterial & archaeal community structure along the iron gradient.

Chemical Data

Fe measurements displayed as mg cm⁻² in red for sediments.

Fig. 3. Percentage (%) Iron measured in river sediment from eight sites in the Sperrins. Sampling took place in May 2008.

Methodology

- SIP incubations (with ¹³C labelled substrate)
- DNA extraction
- Fractionation
- 16S rRNA Gene PCR
- Functional Gene PCR (cbb genes for RuBisCO)

Microbial Diversity

Fig. 4. Phylogenetic tree of 16s rRNA gene sequences for site 11.

- Elevated Iron concentrations within the region has resulted in the growth of specific bacterial species within the river sediment. ¹³C labelling achieved using ¹³C bicarbonate & ¹³C Methanol as Carbon source, for sediment samples from site 11.
- Bacteria within the class Alphaproteobacteria dominate the sequences from heavy DNA at site 11.
- Bacteria involved in iron-cycling e.g. Iron (III)- reducing Geobacter psychrophiles and methanotroph e.g. Methylocystis echinoides have also been identified as members of the microbial ecosystem.