Influence of dissolved organic matter source on lake bacterioplankton structure and function – implications for seasonal dynamics of community composition

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Abstract

It has been suggested that autochthonous (internally produced) organic carbon and allochthonous (externally produced) organic carbon are utilized by phylogenetically different bacterioplankton. We examined the relationship between the source of organic matter and the structure and function of lake bacterial communities. Differences and seasonal changes in bacterial community composition in two lakes differing in their source of organic matter were followed in relation to environmental variables. We also performed batch culture experiments with amendments of various organic substrates, namely fulvic acids, leachates from algae, and birch and maple leaves. Differences in bacterial community composition between the lakes, analysed by terminal restriction fragment length polymorphism, correlated with variables related to the relative loading of autochthonous and allochthonous carbon (water colour, dissolved organic carbon, nutrients, and pH). Seasonal changes correlated with temperature, chlorophyll and dissolved organic carbon in both lakes. The substrate amendments led to differences in both structure and function, i.e. production, respiration and growth yield, of the bacterial community. In conclusion, our results suggest that the source of organic matter influences community composition both within and among lakes and that there may be a coupling between the structure and function of the bacterial community.