Effects of phosphorus and N:P stoichiometry on methane oxidation in wetlands

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Wetlands are important sources and sinks of the greenhouse gas methane. The only known methane sink of biological nature is the oxidation by methanotrophic microorganisms. Although wetlands are under strong environmental pressure, impacts of environmental stressors on methane oxidation remain unclear. Human impacts cause strong misbalances in the availability of N and P, which can change methanotroph community composition and may alter their potential to oxidize methane.

In this study, we determined how methanotrophs are affected by changes in environmental N:P stoichiometry. We show relations between N, P and methane oxidation in wetlands, and present experimental results on the effect of P on methanotroph growth and functioning. Species belonging to the alpha- and gammaproteobacteria were cultured at different P concentrations. Their growth characteristics, methane oxidation rates and expression of key proteins were compared. In line with field observations, growth and functioning of methanotrophic gammaproteobacteria were most sensitive to P limitation and excess, whereas methanotrophic alphaproteobacteria were most resilient.