



Methanotrophs Contribute to Peatland Nitrogen

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Atmospheric nitrogen (N₂) fixation is potentially an important N input mechanism to peatland ecosystems, but the extent of this process may have been underestimated because of the methods traditionally used inhibit the activity of methanotrophs. We examined the linkage of methane (CH₄) oxidation and N₂ fixation using ¹⁵N₂ technique. Dominant flark and hummock Sphagnum species were collected from twelve pristine peatlands in Siikajoki, Finland, which varied in age from 200 to 2,500 y due to the postglacial rebound. The mosses were incubated in a two-day field ¹⁵N₂ and ¹³CH₄ pulse labelling experiment and the incorporation of ¹⁵N₂ and ¹³CH₄ in biomass was measured with Isotope Ratio Mass Spectrometer. The rates of Sphagnum-associated N₂ fixation (0.1-2.9 g N m⁻² y⁻¹) were up to 10 times the current N deposition rates. Methane-induced N₂ fixation contributed to over 1/3 of moss-associated N₂ fixation in younger stages, but was switched off in old successional stages, despite active CH₄ oxidation in these stages. Both the N₂ fixation rates and the methanotrophic contribution to N₂ fixation during peatland succession were primarily constrained by phosphorus availability. Previously overlooked methanotrophic N contribution may explain rapid peat and N accumulation during fen stages of peatland development.

Reference. Larmola T., Leppänen S.M., Tuittila E.-S., Aarva M., Merilä P., Fritze H., Tirola M. (2014) Methanotrophy induces nitrogen fixation during peatland development. *Proceedings of the National Academy of Sciences USA* 111 (2): 734-739.