



## **Methanotrophs Contribute to Peatland Nitrogen**

Tuula Larmola (1,2), Sanna M. Leppänen (3), Eeva-Stiina Tuittila (4), Maija Aarva (3), Päivi Merilä (1), Hannu Fritze (1), and Marja Tirola (3)

(1) Natural Resources Institute Finland, Vantaa, Finland (tuula.larmola@luke.fi), (2) Department of Forest Sciences, University of Helsinki, Helsinki, Finland, (3) Department of Biological and Environmental Science, University of Jyväskylä, Jyväskylä, Finland, (4) School of Forest Sciences, University of Eastern Finland, Joensuu, Finland

Atmospheric nitrogen (N<sub>2</sub>) 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 (CH<sub>4</sub>) oxidation and N<sub>2</sub> fixation using <sup>15</sup>N<sub>2</sub> 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 <sup>15</sup>N<sub>2</sub> and <sup>13</sup>CH<sub>4</sub> pulse labelling experiment and the incorporation of <sup>15</sup>N<sub>2</sub> and <sup>13</sup>CH<sub>4</sub> in biomass was measured with Isotope Ratio Mass Spectrometer. The rates of Sphagnum-associated N<sub>2</sub> fixation (0.1-2.9 g N m<sup>-2</sup> y<sup>-1</sup>) were up to 10 times the current N deposition rates. Methane-induced N<sub>2</sub> fixation contributed to over 1/3 of moss-associated N<sub>2</sub> fixation in younger stages, but was switched off in old successional stages, despite active CH<sub>4</sub> oxidation in these stages. Both the N<sub>2</sub> fixation rates and the methanotrophic contribution to N<sub>2</sub> 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.