



Effects of atmospheric nitrogen deposition on nutrient limitation and phytoplankton biomass in unproductive Swedish lakes

Bergström, Ann-Kristin, Peter Blomqvist, Mats Jansson

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ABSTRACT: We used chemical data (3,907 lakes) and phytoplankton biomass (chlorophyll *a*) data (225 lakes) from Swedish lake monitoring programs to assess the effects of atmospheric nitrogen (N) deposition on nutrient limitation and phytoplankton biomass in unproductive Swedish lakes. There was a clear north-south gradient of increasing lake concentrations of dissolved inorganic nitrogen, which was related to the pattern of atmospheric N input. On the basis of positive relationships between total phosphorus (P) concentrations and phytoplankton biomass we conclude that lakes in areas of enhanced N deposition are mainly P limited during summer. This relationship was not detected in lakes in pristine areas with low N deposition, which, together with experimental evidence from the literature, suggest possible N limitation. During summer, lakes in high N-deposition areas had clearly higher phytoplankton biomass relative to the total phosphorus concentrations compared to lakes in low N-deposition areas. Thus, in Swedish unproductive lakes, high atmospheric N input is reflected by increased lake concentrations of dissolved inorganic nitrogen and, possibly, by a shift from natural N limitation of phytoplankton to P limitation. Our results also reveal that increased N input has caused a eutrophication with higher phytoplankton biomass as the result.

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