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Methylmercury in thawing peatlands on a trophic gradient in boreal Western Canada

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Ongoing permafrost thaw in the extensive peatlands of boreal western Canada may mobilize previously frozen mercury (Hg) and result in enhanced production of the neurotoxin methylmercury (MeHg). The often waterlogged conditions in thermokarst wetlands may represent ideal environments for Hg methylation to MeHg, but methylation potential could vary across distinct wetland types (i.e., nutrient-poor bogs and nutrient-rich fens) that emerge after the thawing of drier peat plateaus, depending on landscape position and groundwater connectivity. Here, we examined MeHg concentrations in twelve wetlands of varying nutrient richness in the Taiga Plains of western Canada across a 500 km permafrost gradient. We analyzed peat porewater chemistry (Hg, MeHg, dissolved organic matter composition), inferred the degree of groundwater connection (electrical conductivity, ions), and assessed the vegetation composition at each wetland. The key research objectives of this study were to 1) determine how methylmercury concentrations vary amongst wetland types in the Taiga Plains and amongst permafrost zones, and 2) understand how physicochemical characteristics and groundwater connectivity may influence methylation potential. Through this, we hope to understand the factors that lead to hotspots of MeHg production in the rapidly thawing peatlands of the Taiga Plains.