Non-technical Project Description

English

Why is mercury rising in some northern lakes and not others?

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Summary of project background

Increases in mercury (Hg) concentrations have been widely reported in lake sediments, peat, surface waters, and fish throughout northern Canada (e.g., the Deh Cho region of the Northwest Territories, the Kivalliq region of Nunavut). Rising Hg is a concern for communities that rely on the land for sustenance and for industry that must follow strict environmental permitting conditions because Hg can be toxic.

Anthropogenic emissions of Hg to the atmosphere combined with continued input of Hg from watershed reservoirs (e.g., soil, wetlands) and climate-induced changes (e.g., increased primary production in surface waters, permafrost thaw, changes in fire regime) have increased Hg flux to some environments.

This study seeks to understand processes that are affecting Hg concentrations in northern lake sediments. We have conducted analyses on an existing dataset from 60 near-surface lake sediment samples collected from the central Northwest Territories, and we are herein aiming to conduct targeted studies on specific lakes of concern in the Kivalliq region of Nunavut.

Justification for the study

This project seeks to study the behaviour of Hg in lake sediments over hundreds to thousands of years in the Kivalliq region of Nunavut. By using a long-time perspective, we can better understand the cumulative effects of climate change and anthropogenic stressors affecting the accumulation of Hg in lakes. By determining the factors that have caused increases in Hg concentration in lake sediments, people can be better positioned to mitigate exposure and make informed land use decisions.

Where, when, and how long the field research will take place

We seek to sample the sediment from 4 lakes in the Kivalliq region of Nunavut. The lakes have been identified in consultation with the community of Rankin Inlet (HTO) and the Kivalliq Inuit Association. The timing of the field research has been determined through consultation with community members of Rankin Inlet and the KIA. It will take place during 7-10 days in August 2026 from a helicopter equipped with floats.

We would like to employ 1 or 2 wildlife monitor(s) at the daily rate set by the Kangiqliniq HTO for approx. 7-10 days. We would also like to hire a local interpreter, based on fair rates for their time and expertise. We will seek to rent a local venue space for use in public consultation and results-sharing sessions when results are ready.

Methods

Sampling of the lake-bed will occur using a gravity corer. The gravity corer is a 5 to 10 cm diameter wide by 0.5 to 1 m long open-tubed core that is lowered into the sediment. When drawn up, the corer takes the intercepted lake sediments with it (like a straw). We may also employ a freeze corer, which is a metal triangular tube about 30 cm in diameter in total and up to 1 m long. It freezes about 3 cm thick of sediment onto the surface of 1 or 2 metal faces.

The retrieved lake sediments are then sub-sampled on site (gravity corer) or in a lab (freeze corer). The resulting lake sediment sub-samples are then sent to laboratories for various analyses, including determination of the age of the sediment, concentration of Hg and other elements, determination of the type of organic matter, and sediment grain size.

Gravity core

Freeze core

How, when, and with whom research results will be shared in Nunavut

The communication strategy will be developed with community members of Rankin Inlet and will occur throughout 2025 and 2026 (when our funding will end) by means of community visits and community-based workshops. We will try our best to address any other knowledge transfer activities requested by community members. Data produced by this project will be numerical and will be reposited in the POLAR Data Catalogue, an online and open -source database hosted by the Government of Canada (Polar Data Catalogue).

ᐅᖃᐅᓯᖃᖅᑐᖅ ᐱᓕᕆᐊᖅ ᖃᓄᐃᑦᑑᓂᖓᓂᑦ

ᐃᓄᒃᑎᑐᑦ

ᓲᖕᒪᑦ ᒘᑯᓇ ᖁᑦᑎᒃᓯᕙᓪᓕᐊᕙ ᐃᓚᖏᓐᓂᑦ ᐅᑭᐅᖅᑕᖅᑐᒥᑦ ᑕᓯᕐᓂᑦ ᑕᐃᒪᓐᓇᐃᖏᔾᖢᓂᓗ ᐊᓯᖏᓐᓂᑦ?

ᐱᓕᕆᐊᖑᔪᒥᑦ ᓯᕗᓕᖅᑎᐅᔪᖅ: ᔭᓂᕗ ᒑᓗᐃ, ᑲᓇᑕᒥᑦ ᓄᓇᒥᒃ ᖃᐅᔨᓴᐃᔨᒃᑯᑦ

ᓇᐃᓈᖅᓯᒪᔪᖅ ᐱᓕᕆᐊᕐᒥᑦ ᐱᔾᔪᑎᖃᖅᑐᖅ

ᐊᒥᓱᙳᓇᐊᕐᓂᖏᑦ ᒘᑯᓇ (Hg) ᑲᑎᓯᒪᔪᑦ ᐅᖃᐅᓯᐅᑦᑎᐊᖃᑦᑕᖅᓯᒪᔪᑦ ᑕᓲᑦ ᐊᓗᐊᓃᑦᑐᑦ, ᐃᑉᔪᓂᑦ, ᐃᒪᐃᑦ ᖀᖏᓐᓂᑦ, ᐊᒻᒪ ᐃᖃᓗᖕᓂᑦ ᐅᐊᖕᓇᖅᐸᓯᐊᓂᑦ ᑲᓇᑕᒥᑦ (ᓲᕐᓗ, ᑎᐊ ᑦᓲ–ᒥᑦ ᓄᓇᑦᑎᐊᕐᒥᑦ, ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ). ᐊᒥᓱᙳᖅᓯᒪᓂᖓ Hg ᐃᓱᒫᓘᑕᐅᔪᖅ ᓄᓇᓕᖕᓂᑦ ᓄᓇᒥᑦ ᐊᑐᓗᐊᖅᑐᓄᑦ ᓂᕆᕝᕕᒋᔭᖏᓐᓂᑦ ᐊᒻᒪ ᐱᓕᕆᐊᓕᖕᓄᑦ ᒪᓕᒃᑕᐅᑦᑎᐊᕆᐊᖅᑐᓂᒃ ᐊᕙᑎᒧᑦ ᐱᔪᖕᓇᖅᑎᑦᑎᔪᓄᑦ ᐳᒥᑦᓄᑦ ᖃᓄᐃᓐᓂᐅᔪᓂᒃ Hg ᐋᓐᓂᖅᓯᔪᖕᓇᕐᓂᖓᓄᑦ.

ᐃᓄᖕᓄᑦ ᐱᑎᑕᐅᔪᑦ ᐱᑦᑕᐅᖕᒋᑦᑐᑦ ᐊᓂᐊᔪᑦ Hg–ᒥᑦ ᓯᓚᒧᐊᖅᑐᑦ ᐃᓚᐅᑉᓗᑎᒃ ᑐᓂᓯᖃᑦᑕᐃᓐᓇᕐᓂᐅᔪᑦ Hg–ᒥᑦ ᐃᒪᕐᓂᑦ ᐱᔪᓂᒃ (ᓲᕐᓗ ᐃᑉᔪᓂᑦ, ᖃᐅᓯᕐᓂᕐᓂᑦ) ᐊᒻᒪ ᓯᓚᒥᑦ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᑎᑦᑎᔪᓂᑦ (ᓲᕐᓗ ᐊᒥᓱᙳᓇᐊᕐᓂᖏᑦ ᐱᓕᐅᕆᕙᓪᓕᐊᓃᑦ ᐃᒪᐃᑦ ᖀᖏᓐᓂᑦ, ᖁᐊᙳᐃᓐᓇᐅᔭᖅᑐᑦ ᐊᐅᑉᐸᓪᓕᐊᔪᑦ, ᐊᓯᐊᙳᖅᑐᑦ ᐃᑯᐊᓪᓚᒃᑎᑦᑎᖃᑦᑕᖅᑐᑦ) ᐊᒥᓱᙳᓇᐊᖅᑎᑦᑎᔪᑦ Hg–ᒥᑦ ᐃᓚᖏᓐᓂᑦ ᐊᕙᑎᒋᔭᐅᔪᓂᑦ.

ᖃᐅᔨᓴᐃᓂᖅ ᑐᑭᓯᐊᓕᕈᒪᑉᓗᑎᒃ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᓂᒃ ᐊᒃᑐᖅᓯᔪᓂᒃ Hg–ᒥᑦ ᑲᑎᓯᒪᔪᓂᑦ ᐅᐊᖕᓇᖅᐸᓯᖕᒦᑦᑐᓂᑦ ᑕᓲᑦ ᐊᓗᐊᓃᑦ. ᖃᐅᔨᓴᐃᓚᐅᖅᑐᒍᑦ ᑕᐃᒪᐅᔪᓂᒃ 60–ᓂᑦ ᓈᓴᐅᑎᓂᑦ/ᑎᑎᖅᑲᓂᑦ ᖄᖓᓃᑦᓚᒃᑐᓂᑦ ᑕᓲᑦ ᐊᓗᐊᓂᑦ ᐆᒃᑐᕋᐅᑕᐅᔪᓂᒃ ᑲᑎᑕᐅᓚᐅᖅᑐᓂᑦ ᕿᑎᐊᓂᑦ ᓄᓇᑦᑎᐊᕐᒥᑦ, ᐊᒻᒪ ᑕᒃᑯᓂ ᑐᓃᓚᖅᑐᒍᑦ ᑐᓃᖅᑕᐅᔪᓂᒃ ᖃᐅᔨᓴᕐᓂᐊᕐᓗᑕ ᐃᓚᖏᓐᓂᑦ ᑕᓯᕐᓂᑦ ᐃᓱᒫᓘᑎᒋᔭᐅᔪᓂᑦ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ.

ᐃᑲᔪᐃᓂᖃᖅᑎᑦᑎᔪᖅ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ

ᐱᓕᕆᐊᖅ ᖃᐅᔨᓴᕈᒪᔪᖅ ᖃᓄᐃᓕᐅᕐᓂᖏᓐᓂᒃ Hg ᑕᓲᑦ ᐊᓗᐊᓂᑦ Hᐊᓐᓇᖏᓐᓃᑦᑐᓂᒃ ᑕᐅᓯᓐᖏᓐᓄᑦ ᐅᑭᐅᓂᑦ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ. ᐊᑐᕐᓗᒋᑦ ᐊᑯᓂᐅᔪᒃᑯᑦ ᑕᐅᑐᒐᐅᔪᑦ, ᑐᑭᓯᐊᓂᖅᓴᐅᔪᖕᓇᖅᑕᕗᑦ ᑲᑎᑉᐸᓪᓕᐊᔪᓂᑦ ᖃᓄᐃᖓᓕᖅᑎᑦᑎᓂᐅᔪᑦ ᓯᓚᐅᑉ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᖏᓐᓂᑦ ᐊᒻᒪ ᐃᓄᖕᓄᑦ ᐱᑎᑕᐅᔪᑦ ᑲᑎᑉᐸᓪᓕᐊᑎᑦᑎᑉᓗᑎᒃ Hg–ᒥᑦ ᑕᓯᕐᓂᑦ. ᖃᐅᔨᓗᒋᑦ ᐱᔾᔪᑕᐅᔪᑦ ᐊᒥᓱᙳᓇᐊᕐᓂᖏᓐᓄᑦ Hg ᑲᑎᓯᒪᔪᑦ ᑕᓲᑦ ᐊᓗᖏᓐᓂᑦ, ᐃᓄᐃᑦ ᐋᖅᑭᐅᒪᓂᖅᓴᐅᔪᖕᓇᖅᑐᑦ ᐊᖏᓗᐊᖏᒋᐊᖅᑎᓪᓗᒋᑦ ᐊᒃᑐᖅᑕᐅᓂᖏᑦ ᐊᒻᒪ ᖃᐅᔨᒪᓂᒃᑯᑦ ᓄᓇᒥᒃ ᐊᑐᕐᓂᐊᕐᓗᑎᒃ ᐃᓱᒪᓕᐅᕆᓗᑎᒃ.

ᓇᓂ, ᖃᖓ, ᐊᒻᒪ ᖃᓄᖅ ᐊᑯᓂᐅᑎᒋᔪᖅ ᖃᐅᔨᓴᐃᓂᖃᕐᓂᐊᖅᐸᑦ

ᐆᒃᑐᕋᕈᑎᓂᒃ ᐱᔪᒪᔪᒍᑦ 4 ᑕᓲᑦ ᐊᓗᐊᓂᑦ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ. ᑕᓲᑦ ᖃᐅᔨᔭᐅᓯᒪᓕᖅᑐᑦ ᐅᖃᖃᑎᒋᔭᐅᑉᓗᑎᒃ ᑲᖏᖅᖠᓂᕐᒥᑦ (ᐆᒪᔪᓕᕆᔨᐊᓛᒃᑯᑦ) ᐊᒻᒪ ᑭᕙᓪᓕᕐᒥᑦ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᒃᑯᑦ. ᖃᖓᒃᑰᓂᐊᕐᓂᐊᖅ ᖃᐅᔨᓴᐃᓂᖅ ᖃᐅᔨᓴᐃᔨᒃᑯᑦ ᐅᖃᖃᑎᒋᔭᐅᓂᐊᖅᑐᑦ ᑲᖏᖅᖠᓂᕐᒥᐅᑕᓄᑦ ᐊᒻᒪ ᑭᕙᓪᓕᕐᒥᑦ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᒃᑯᑦ. 7–ᓂᑦ 10–ᓄᑦ ᐅᑉᓘᓇᔭᖅᑐᑦ ᐊᑯᓪᓕᕈᕝᕕᒃ 2026–ᒥᑦ ᖁᓕᒥᒨᓕᒃᑯᑦ ᐃᒫᓂᑦ ᐳᒃᑕᒑᕈᑎᖅᑐᒥᑦ.

ᐱᓕᕆᔨᑖᕈᒪᔪᒍᑦ 1–ᒥᒃ 2–ᓂᒡᓘᓃᑦ ᓂᕐᔪᑎᓂᒃ ᖃᐅᔨᓴᐃᔨᐅᓂᐊᖅᑐᒥᑦ(ᓂᑦ) ᖃᐅᑕᒫᑦ ᖄᓇᐅᔭᓕᐊᖃᑦᑕᕐᓗᑎᒃ ᐋᖅᑭᒃᑕᐅᓂᐊᖅᖢᓂ ᑲᖏᖅᖠᓂᕐᒥᑦ ᐆᒪᔪᓕᕆᔨᐊᓛᒃᑯᓐᓄᑦ 7–ᓂᑦ 10–ᓄᑦ ᐅᐸᓗᓄᑦ. ᑐᓵᓵᑖᕈᒪᔪᒍᑦ, ᓈᒻᒪᒃᑐᓂᒃ ᐊᑭᓕᖅᑐᖅᑕᐅᓗᓂ ᐱᕕᖅᓯᓂᖓᓄᑦ ᐊᒻᒪ ᖃᐅᔨᒪᓂᖅᓯᓂᖓᓄᑦ. ᐊᑐᖅᑐᐊᕈᒪᓂᐊᖅᑐᒍᑦ ᐃᓂᐅᔪᒥᒃ ᑭᑐᑐᐃᓐᓇᓂᒃ ᐅᖃᖃᑎᖃᕐᓂᐊᖅᓯᓗᑕ ᐊᒻᒪ ᖃᓄᐃᙵᓂᐅᔪᓂᒃ ᑐᓂᓯᓗᑕ ᒪᓂᒪᓕᖅᐸᑕ.

ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑦ

ᐆᒃᑐᕋᐃᓗᑎᒃ ᑕᓰᑦ ᐊᓗᐊᓂᑦ ᐊᑖᓂᑦ ᐲᖅᓯᔾᔪᑎᒥᑦ ᐊᑐᕐᓗᑕ. ᐲᖅᓯᔾᔪᑎ 5−ᓂᑦ 10 cm−ᓂᒃ ᐊᖕᒪᓗᖅᑎᒋᓂᐊᖅᑐᖅ ᓯᓕᖕᓂᖓ 0.5−ᓂᑦ 1 ᓴᓐᑎᒦᑕᓄᑦ ᑕᑭᑎᒋᑉᓗᓂ ᓱᑉᓗ ᐊᑦᑎᒃᓯᑎᑕᐅᖃᑦᑕᖅᖢᓂ ᐊᓗᐊᓄᑦ. ᐃᒪᐅᑉ ᐊᓗᐊᓂᑦ ᐱᔭᐅᒃᐸᑦ, ᐲᖅᓯᔾᔪᑎ ᑕᓯᐅᑉ ᐊᓗᐊᓃᑦᑐᓂᒃ ᐱᓗᓂ (ᒥᓗᑲᐅᑎᑎᑑᖅᑐᖅ). ᐃᓕᓯᑐᐃᓐᓇᕆᐊᖃᖅᑐᒍᑦ ᕿᐊᖅᑎᑦᑎᓲᒥᒃ ᐲᖅᓯᔾᔪᑎᒥᑦ, ᓴᕙᒃ ᐱᖓᓯᓂᒃ ᓴᓂᕋᖃᖅᑐᖅ ᓱᑉᓗ 30 cm−ᓐᓗᐊᓂᒃ ᐊᖕᒪᓗᒃᑎᒋᓂᖓ ᐊᖏᑎᒋᑉᓗᓂ ᐊᒻᒪᓗ 1 m−ᒥᒃ ᑕᑭᑎᒋᑉᓗᓂ. ᕿᐊᖅᑎᑦᑎᖃᑦᑕᖅᑐᖅ 3 cm−ᓐᓗᐊᓂᒃ ᐃᑉᔪᑎᒋᔪᒥᑦ ᖄᖓᓂᑦ ᐊᓗᐊᓂᑦ ᐱᔭᐅᔪᒥᑦ 1−ᒥᑦ 2−ᓂᓐᓘᓐᓃᑦ.

ᐊᓗᐊᓂᑦ ᐱᔭᐅᔪᑦ ᐃᓚᖓ ᐆᒃᑐᕋᖅᑕᐅᑉᓗᓂ ᑕᐃᑲᓂ ᐲᖅᑕᐅᖕᒪᑦ (ᑕᐅᓇᖓ ᐲᖅᓯᔾᔪᑎᒥᑦ ᐱᔭᐅᔪᖅ) ᐅᕝᕙᓘᓐᓃᑦ ᖃᐅᔨᓴᐃᕝᕕᖕᒥᑦ (ᕿᐊᖅᓯᒪᔪᒥᑦ ᐲᖅᓯᔾᔪᑎᒥᑦ ᐱᔭᐅᔪᖅ). ᐃᒪᐅᑉ ᐊᓗᐊᓂᑦ ᐱᔭᐅᔪᑦ ᐃᓚᖓ ᐆᒃᑐᕋᐅᑏᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᓕᖅᖢᑎᒃ ᖃᐅᔨᓴᐃᕝᕕᖕᓄᑦ ᐊᔾᔨᒌᙱᑦᑐᓂᒃ ᖃᐅᔨᓴᖅᑕᐅᓂᐊᕐᓗᑎᒃ, ᐃᓚᐅᔪᖅ ᖃᐅᔨᓂᐊᕐᓗᒋᑦ ᐅᑭᐅᒋᔭᖏᑦ ᐊᓗᐊᓂᑦ ᐱᔭᐅᔪᑦ, ᑲᑎᓯᒪᔪᑦ Hg ᐊᓯᖏᓪᓗ ᐃᓚᒋᔭᐅᔪᓂᑦ, ᖃᐅᔨᓗᒋᑦ ᖃᓄᐃᑦᑑᖕᒪᖔᑕ ᐱᔭᐅᔪᒦᑦᑐᑦ, ᐊᒻᒪᓗ ᐊᓗᐊᓂᑦ ᐱᔭᐅᔫᑉ ᓯᐅᕋᐃᑦ ᐊᖏᑎᒋᓂᖏᑦ.

ᑕᐅᓇᖓ ᐲᖅᓯᔾᔪᑎ

ᕿᐊᖅᓯᒪᔪᒥᑦ ᐲᖅᓯᔾᔪᑎ

ᖃᓄᖅ, ᖃᖓ, ᐊᒻᒪᓗ ᑭᑐᓐᓄᑦ ᖃᐅᔨᓴᐃᓂᕐᒥᑦ ᖃᓄᐃᖓᓂᐅᔪᑦ ᑐᓂᔭᐅᓂᐊᖅᐸᑦ ᓄᓇᕗᒻᒦᑦᑐᓄᑦ

ᖃᓄᖅ ᑐᓴᖅᑎᑦᑎᓂᐊᖅᒪᖔᑕ ᐋᖅᑭᒃᓯᓂᐊᖅᑐᑦ ᓄᓇᓕᖕᒥᐅᓄᑦ ᑲᖏᖅᖠᓂᕐᒥᑦ ᐊᒻᒪᓗ 2025−ᒥᑦ ᐊᒻᒪᓗ 2026−ᒥᐅᖃᑦᑕᕐᓂᐊᖅᑐᑦ (ᑮᓇᐅᔭᖃᖅᑎᑕᐅᓂᕗᑦ ᐃᓱᓕᑉᐸᑦ) ᓄᓇᓕᖕᒧᙵᐅᖃᑦᑕᕐᓗᑎᒃ ᐊᒻᒪᓗ ᓄᓇᓕᖕᒥᑦ ᑲᑎᒪᑎᑦᑎᓗᑎᒃ. ᐱᓕᕆᐊᕆᓇᓱᖕᓂᐊᖅᑕᕗᑦ ᓱᓇᑐᐃᓐᓇᐃᑦ ᐊᓯᖏᑦ ᖃᐅᔨᒪᓂᕆᔭᐅᔪᓂᑦ ᑐᓂᓂᐊᕐᓗᒋᑦ ᑐᒃᓯᕋᖅᑕᐅᔪᑦ ᓄᓇᓕᖕᒥᐅᓄᑦ. ᓈᓴᐅᑏᑦ/ᑎᑎᖅᑲᐃᑦ ᐱᑖᖑᔪᑦ ᐱᓕᕆᐊᕐᒥᑦ ᓈᓴᐅᑎᑎᒎᓂᐊᖅᑐᑦ ᐊᒻᒪᓗ ᐃᓯᔭᐅᓗᑎᒃ ᐅᑭᐅᖅᑕᖅᑐᒥᑦ ᓈᓴᐅᑎᓂᑦ/ᑎᑎᖅᑲᓂᑦ ᑲᑎᑎᓯᒪᔪᓄᑦ, ᖃᕆᑕᐅᔭᒃᑰᖅᑐᖅ ᐊᒻᒪᓗ ᐅᒃᑯᐃᖓᐸᓗᓂ ᓈᓴᐅᑎᓂᒃ/ᑎᑎᖅᑲᓂᒃ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᒃ ᑲᒪᒋᔭᐅᔪᖅ ᑲᓇᑕᒥᑦ ᒐᕙᒪᒃᑯᓐᓄᑦ (ᐅᑭᐅᖅᑕᖅᑐᒥᑦ ᓈᓴᐅᑎᓂᑦ/ᑎᑎᖅᑲᓂᑦ ᑲᑎᑎᓯᒪᔪᑦ).