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NWT Cumulative Impact Monitoring Program

Polycyclic aromatic compounds and water quality in the Sahtú Settlement Area

Summary

Polycyclic aromatic compounds (PACs) are a group of hydrocarbon chemicals that have been increasing in some northern systems over the past 25 years. Environment and Climate Change Canada is working with community members to measure PAC concentrations within the Sahtú Settlement Area (SSA) and across the Mackenzie River Basin. Early project results suggest that the most common PACs found at sample sites are not caused by humans, and that filtration can potentially be used to remove PACs to improve water quality.

K'ahsho Got'ine Guardian Buddy Gully, prepares a semipermeable polyethylene membrane device (SPMD) to sample water. (Credit: K. Gurney)

Why is This Important?

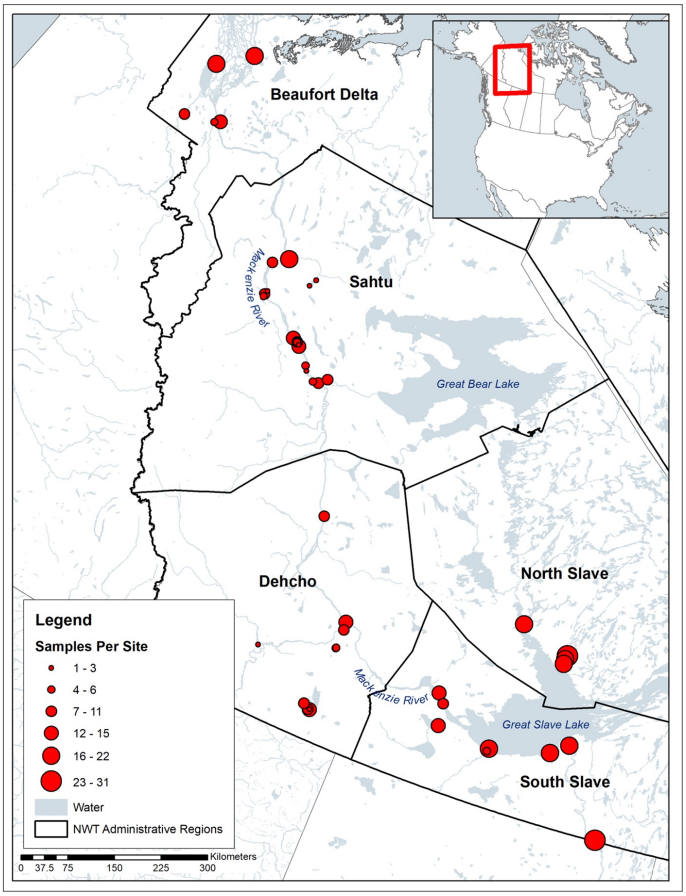
Rádeyɣlɣkóé (Fort Good Hope) community members have concerns about contaminants in water, particularly hydrocarbon contaminants. However, little is known about the concentration of PACs in water the Sahtú Settlement Area.

What Did We Do?

We co-developed a water quality sampling training program in Rádeyɣlɣkóé with the K'ahsho Got'ine Foundation Guardians. They collected water samples and deployed semipermeable polyethylene membrane devices (SPMDs) in lakes and rivers within the study area to measure PACs over three years from 2020-2022. We also compared our data to 2012-2023 PAC datasets collected by the GNWT's Community Based Monitoring (CBM) program throughout the Mackenzie River Basin.

What Did We Find?

- A higher concentration of PACs (both natural and human-caused) was found around Norman Wells than in other parts of the Mackenzie River Basin. However, these concentrations were below the Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life.
- Overall, the concentration of natural PACs was higher than human-derived PACs suggesting that natural oil seeps in the area have a stronger influence on the concentration of PACs in the water than human caused pollution.
- The composition of PACs did not vary among sites.
- The concentrations of PACs were consistent within sites over time.
- PAC levels measured in surface water grab samples were higher than those measured by SPMDs. However, all concentrations were below the CWQG for the protection of aquatic life.



Samples collected through this project and by the GNWT along the Mackenzie River Basin.

What Does This Mean?

These early results suggest that human activities have not strongly influenced PACs in the water within the SSA. The different concentrations measured by surface grab samples and SPMDs suggest that filtration may remove PACs that are bound to sediment, causing a natural improvement to water quality. Ongoing analyses are looking to identify which environmental variables (e.g., fire, oil development, snowmelt) influence PACs. Project results could help decision-makers better understand and predict changes in water quality.

What are PACs?

A group of hundreds of hydrocarbon chemicals that can be formed through incomplete burning of organic material or during the natural formation of oil and gas. Some PACs have carcinogenic (cancer causing) properties. PACs can be from natural (oil seeps, forest fires) or human sources (oil and gas combustion, oil spills, cooking fires).

For More Information

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NWT Cumulative Impact Monitoring Program (CIMP216)

Wallace, S. J., de Solla, S. R., Head, J. A., Hodson, P. V., Parrott, J. L., Thomas, P. J., Berthiaume, A. and Langlois, V. S. 2020. *Polycyclic aromatic compounds (PACs) in the Canadian environment: exposure and effects on wildlife.* Environmental Pollution, 265: 114863.