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NWT Environmental Research Bulletin (NERB)

NWT Cumulative Impact Monitoring Program (NWT CIMP)

A source of environmental monitoring and research in the NWT. The program coordinates, conducts and funds the collection, analysis and reporting of information related to environmental conditions in the NWT.

NWT Environmental Research Bulletin (NERB)

A series of brief plain language summaries of various environmental research findings in the Northwest Territories. If you're conducting environmental research in the NWT, consider sharing your information with northern residents in a bulletin. These research summaries are also of use to northern resource decision-makers.

Stable Isotope Analysis of Mercury in Fish of the Slave River Delta Region

Fish are an important resource for people living near the Slave River and Delta. Community members continue to voice concerns about the health of ecosystems due to potential impacts of upstream development and climate change. In this study, a method called Stable Isotope Analysis (SIA) was used to understand fish habitat use and how habitat may be related to the gradual build-up of mercury in fish over time.

Why is this research important?

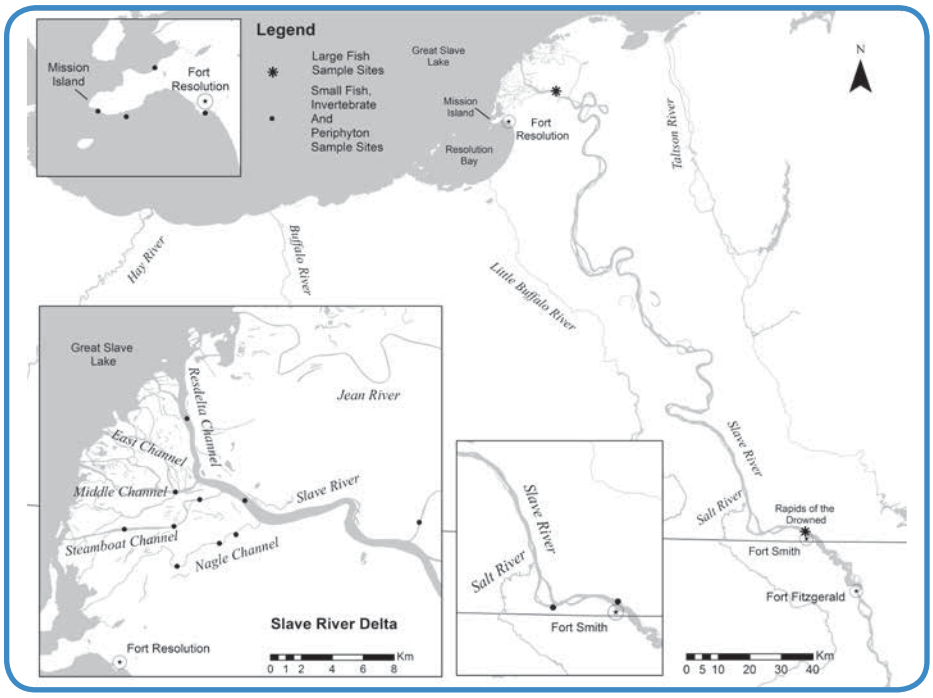
Communities near the Slave River and Delta depend on the commercial and subsistence harvest of fish. A better understanding of fish and fish habitat will help these communities and northern regulators make more informed decisions about fish harvesting.

What did we do?

We collected insects and small fish from three locations: the Slave River Delta, the Slave River at Fort Smith, and Great Slave Lake. We also collected large fish (>30cm in length) in the Slave River Delta and the Slave River at Fort Smith. They were classified as *resident* (remain near the location they were caught year round) or *migrant* (migrate to the Slave River from Great Slave Lake) based on carbon and sulphur isotopes in their flesh (for definition see inset box). We looked at differences in nitrogen isotopes in insects, small and large fish to understand how mercury increases with each step in the food chain.

What did we find?

- The large majority of insects and small fish were resident of where they were caught.
- The majority of large fish were shown to migrate between Great Slave Lake and the Slave River. There were few fish that spent their entire life in the river.
- As expected, mercury concentrations increased with each step in the food chain. This process is known as biomagnification. Large river resident fish (particularly pickerel and northern pike) tended to have higher mercury concentrations than large fish from the lake (inconnu).
- More work is needed to understand why there are higher levels of mercury in the large river fish. Scientists guess that it could be due to greater use of energy and consumption of food to maintain their position in the fast-flowing Slave River.



Sampling locations for insects, small and large fish in the Slave River and Slave Delta.

What does this mean?

Stable Isotope Analysis helped us to:

1) determine whether fish caught in the Delta and at Fort Smith are resident or migratory
2) understand which areas different species use to feed
3) determine which fish species have greater mercury concentrations (pickerel and northern pike) and should be monitored to ensure they are safe to eat

Information on general fish consumption guidelines and site-specific fish consumption notices can be found at http://www.hss.gov.nt.ca/en/services/fish-consumption-guidance.

What do we do next?

This information can be used to guide how fish are managed in the Slave River Delta region and contribute to making informed fish consumption recommendations.s and contexts.

Contacts

Karl-Erich Lindenschmidt
University of Saskatchewan
karl-erich.lindenschmidt@usask.ca

NWT Cumulative Impact Monitoring Program (CIMP166)
nwtcimp@gov.nt.ca www.nwtcimp.ca

What is an Isotope?

Isotopes are atoms that have the same number of protons and electrons, but a different number of neutrons. Changing the number of neutrons changes the atom's mass, but does not change the element. Every chemical element has one or more isotopes.

What is Stable Isotope Analysis (SIA)?

It is a method that allows us to infer what and where animals are eating using isotopes of carbon, nitrogen and sulphur. We use isotopes because their proportions differ among different food resources that insects and fish eat ("you are what you eat").

Victor Mandeville (DKFN) collecting insect samples for isotope analyses. (Credit: T. Jardine)

Recommended Reading

Carr, M.C., Jardine, T.D., Doig, L.E., Jones, P.D., Bharadwaj, L., Tendler, B., Chételat, J., Cott, P., and Lindenschmidt, K.-E. 2017. Stable sulfur isotopes identify habitat-specific foraging and mercury exposure in a highly mobile fish community. Science of the Total Environment 586: 338-346.

Jardine, T.D., Kidd, K.A., and Fisk, A.T. 2006. Applications, considerations and sources of uncertainty when using stable isotope analysis in ecotoxicology. Environmental Science and Technology 40: 7501-7511.