

# Temporal trend studies of mercury in Mackenzie River burbot, Fort Good Hope, NWT



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## Introduction

The burbot (*Lota lota*) community-based monitoring project is a collaboration between the Fort Good Hope Renewable Resources Council (FGH RRC), the University of Manitoba and the Northern Contaminants Program (NCP). The purpose of this project is to monitor the concentrations and trends of contaminants which bioaccumulate and biomagnify (such as Hg) in burbot.

This freshwater species was selected for monitoring because it is a country food, and as such, contaminants from these fish can be transferred to the people that consume them. In addition to informing the Fort Good Hope community and regional health authorities about consumption safety, this project also provides a long-term baseline information from which change can be monitored.

## Methods



Fig 1. Fort Good Hope community and Mackenzie River where the burbot have been collected over the past 33 years.

- Collected annually (1985-2020) during the winter (Dec-Feb) from the Mackenzie River by residents of Fort Good Hope, NWT.
- Fish were shipped whole and frozen to Winnipeg where they were measured, dissected, and sexed (when possible).
- Otoliths were removed for ageing and tissues (dorsal muscle and liver) were sub-sampled for analysis (total mercury and carbon and nitrogen stable isotope analysis).

## Discussion and conclusion

- Despite the Minamata Convention to reduce mercury emissions, Hg concentrations have increased approximately 2- and 3-fold in muscle and liver in the burbot since the mid-1980s.
- Climate change and warming weather are increasing the number of forest fires and thawing permafrost that have potential to release Hg into the environment.
- It is interesting to note that mean concentrations of Hg are higher than values reported for burbot collected at downstream sampling locations in the Mackenzie River watershed (Evans et al. 2016, Cott et al. 2016), however the increase in Hg over the years is also present in both studies.

## References

- Cott, P.A., B.A. Zajdlik, M.J. Palmer and M.D. McPherson. 2016. Arsenic and mercury in lake whitefish and burbot near the abandoned Giant Mine on Great Slave Lake. *J Great Lakes Res.* 42: 223-232
- Evans, M.S. and D. Muir. 2016. Spatial and long-term trends in persistent organic contaminants and metals in lake trout and burbot from the Northwest Territories. In: S. Kalhok (ed.), *Synopsis of Research Conducted under the 2015-2016 Northern Contaminants Program, Supporting Information*. Ottawa: Indigenous and Northern Affairs Canada. pp. 258-269.
- Health Canada. 2004. *Mercury: Your Health and the Environment. A Resource Tool*. Ottawa: Health Canada. 54 pp.

## Results

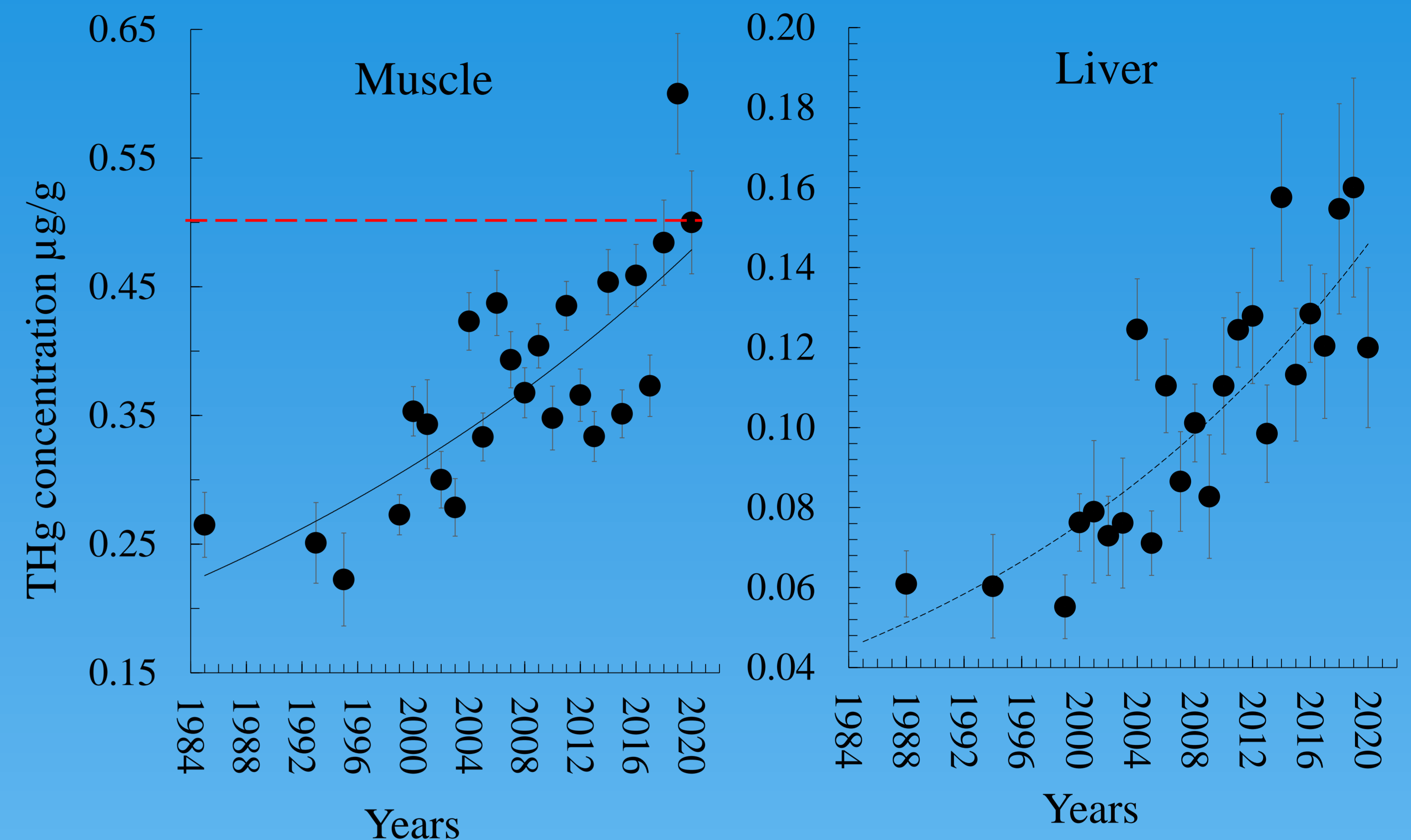


Fig 2. Mean total mercury concentrations (with standard error bars) in the muscle (left) and liver (right) from Fort Good Hope burbot, 1985-2020. Red dotted line shows 0.5 ppm guideline for fish consumption.

- Time trend data from Fort Good Hope burbot tissues cover 36 years and 27 time points (1985, 1988, 1993, 1995, 1999-2020).
- A total number of 820 fish were collected with length ranging from 440 to 1090 mm ( $697 \pm 108$ ).
- Mean concentrations in muscle and liver over the entire data sets are  $0.377 \pm 0.145$  ( $n = 802$ ) and  $0.104 \pm 0.088$  ( $n = 778$ )  $\mu\text{g/g}$  wet weight, respectively.
- No significant correlation between length and mercury concentration was observed with muscle or liver.
- There were no statistical differences in stable isotope data ( $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$ ) among years (2012-2020).
- In 2019, it was the first time that the mean was over 0.5 ppm ( $\mu\text{g/g}$  wet weight) which is the recommended guideline level for total mercury in fish (Health Canada, 2004)