Government of
Northwest Territories

Northwest Territories
Cumulative Impact Monitoring Program (NWT CIMP)

FINAL REPORT FORM 2021-2022

1. Project Information			
NWT CIMP #	154		
Project Title	Understanding fish mercury concentrations in Dehcho lakes		
Date Submitted	May 31, 2022	**Project Length:** *years of NWT CIMP funding*	3 (1 year no-cost extension due to COVID)
Type of Research	☒ Science ☐ Indigenous Knowledge		
Valued Component *Check all that apply. If 'other' please specify.*	☐ Caribou ☒ Fish ☒ Water ☐ Other:		
Area/Region of Study and Closest NWT Community	☐ North/South Slave ☒ Dehcho ☐ Sahtú ☐ Gwich'in ☐ ISR ☐ Wek'èezhìı ☐ Community:		
Location *(provide specific coordinates; or if regional, provide 4 coordinates for the bounding box.)*	SE: 60.534714, -116.913701 SW: 60.463440, -123.293406 NE: 63.226760, -123.128893 NW: 62.454140, -118.498581		
Project Keywords *(at least four)*	Fish, mercury, water chemistry, catchments		
Author(s) and their Organizations	Heidi Swanson, University of Waterloo Michael Low, Dehcho AAROM George Low, Dehcho AAROM		
Contact Information *(include mailing address, email, phone number and website)*	1. Department of Biology, University of Waterloo, 200 University Ave W, Waterloo, ON N2L 3G1 2. Dehcho AAROM, 13 Riverview Drive, Hay River, NT X0E 0R7		

2. Consent

I acknowledge that the completed report will be posted for public access on the NWT Discovery Portal.

☒ I agree

3. Abstract

In this project, Dehcho AAROM and University of Waterloo have been working together for ~ 10 years to investigate why mercury levels in fish vary among lakes in the Dehcho region, and how mercury levels in fish might change in the future in response to ongoing environmental change. In this three-year phase of the project, we sampled several more lakes (Fish Lake, Greasy Lake, Deep Lake) for fish, water, benthic invertebrates, sediment, and zooplankton. Catchments for all lakes in the study were also characterized. We compiled all available data for this project (dating back to 2013) to model mercury levels in Northern Pike from 11 lakes using piecewise structural equation models. Integrating feedback, ideas, and knowledge from Indigenous Guardians who work together with University researchers on the land each summer, we developed a model that explains >80% of the among-lake variation in mercury levels in Northern Pike. The among-lake variation in fish mercury levels is explained by a complex interaction of catchment characteristics, water chemistry, levels of mercury in lower trophic levels, and fish ecology. Levels of mercury in Northern Pike are lower in lakes that are large relative to their catchments, and which are located in less steep catchments that have proportionally less forest cover. Relatively large lakes located in less forested catchments with shallow slopes have clearer water (less dissolved organic carbon) and lower concentrations of mercury in water and sediment. These lakes also have lower levels of mercury in benthic invertebrates, faster-growing fish, and ultimately lower levels of mercury in Northern Pike.

4. Key Messages

- Mercury levels in fish reflect a complex interaction among catchment, water chemistry, and fish ecology variables
- The best proximate drivers of mercury levels in Northern Pike are mercury levels in benthic invertebrates and Northern Pike growth rates; these drivers are in turn affected by water chemistry and catchment characteristics
- Mercury levels in Northern Pike are lower in lakes that are relatively large relative to their catchments, located in less steep catchments, and surrounded by relatively less forest
- Dissolved organic carbon concentrations in water and catchment vegetation cover should be prioritized for monitoring

5. Project Objectives and Relevance to Cumulative Impact Monitoring and Research

Objectives:

1) Build on past research in the Dehcho region and assess in-lake vs catchment controls on concentrations of mercury ([Hg]).

2) Combine all past and new data, and identify the most important explanatory variables for mercury levels in fish (and thus those that are a priority for future cumulative effects monitoring).

3) Use the Broad-scale fish community monitoring (BsM) protocol to determine relative abundance of fish species for Sanguez Lake (2018), and assess the utility of the BsM protocol for small, northern lakes.

Questions:

1) What variables best predict [Hg] in food fish species in the Dehcho region? Can we use structural equation modeling to better understand how direct and indirect interactions among catchment, lake, and fish ecology variables act to affect fish [Hg]?
2) How do Broad-scale fish community monitoring (BsM) protocols need to be adapted for small, northern lakes that are used by subsistence fishers?

Investigation of Drivers of Fish Mercury Levels – Relevance to Cumulative Impacts Monitoring and Research:

Fish mercury levels are driven by many variables that interact and act at multiple spatial scales, including in lakes and in catchments. By studying links and relationships among catchment characteristics, water quality, fish and food web ecology, and fish mercury levels, we can identify the most important drivers of fish mercury levels and ***can then prioritize these predictor variables for future desktop analyses (existing data) and long-term monitoring (new data).*** Prioritization can be achieved by considering: i) the importance of each predictor variable in explaining variability in fish [Hg]; ii) the vulnerability of each predictor variable to anthropogenic stressors, such as climate change and resource development; and, iii) the feasibility and efficiency of long-term monitoring. Of particular utility is ***identification of driver and/or proxy variables that can be remotely sensed***, as these are much more cost-efficient to monitor over long time scales and over large spatial areas. For variables that must be measured *in situ*, efficiencies in monitoring schedules and protocols can be gained by prioritizing: i) those that have been quantitatively linked to indicators of safety and security of water and fish resources; ii) those for which 'baseline' data exist; and iii) those for which we understand the mechanisms by which stressor-induced change may occur.

Pilot Test of BsM Methods – Relevance to Cumulative Impacts Monitoring and Research:
For many lakes in the Northwest Territories, relative abundance data for fish are lacking or entirely absent. Monitoring community composition and abundance of fishes is resource-intensive, and the Northwest Territories faces a particularly acute resourcing issue for fisheries monitoring activities because of the vastness and remoteness (and thus the cost) of the area to be monitored. Also, because the human population is relatively small, alternative semi-quantitative monitoring methods (e.g., creel surveys) are only effective in a small number of systems.

Other jurisdictions have implemented standardized and regularly scheduled gill netting protocols that are deployed across large spatial scales; data from these iteratively optimized campaigns are used for assessing composition and abundance of fish communities. One of the largest and perhaps well-known of these types of sampling programs in Canada is the Broad-scale monitoring (BsM) protocol, which is a program used in Ontario. Application of a known and well-tested set of protocols (that includes guidance on sampling and data analysis) could lend several efficiencies for agencies and organizations in the Northwest Territories that are looking to assess and monitor fish populations. Before this can happen, however, strengths and weaknesses of the protocol needed to be assessed on a pilot scale, with a particular emphasis on small lakes. ***Results indicate several modifications to the BsM protocol that should be considered – particularly for small, northern lakes. These modifications may be appropriate for testing on a subregional or regional scale.***

6. Methods

Note: Full scientific methods for the fish mercury portion of the study are detailed in Moslemi-Aqdam et al. 2021[1] and Moselmi-Aqdam et al. 2022[2]

Fish Mercury Study

Field Methods

- On-the-land camps occurred in August and September of 2018, 2019, and 2021. Crews included Guardians from the Dehcho AAROM program, cooks, cook helpers, camp leads, camp helpers, and University researchers
- McGill, Tathlina, Sanguez, Fish, Deep, and Greasy lakes were sampled for water chemistry, mercury in water and sediment, mercury in benthic invertebrates and zooplankton, and mercury in fish. Note: data for Deep and Greasy lakes are not yet available (sampled in 2021), and all modeling and publications to date have included lakes for which all data were available

- Fish were measured and weighed, sex and maturity were assessed visually, flesh tissue was removed for future analysis of stable isotope ratios, and otoliths (cleithra for pike) were removed for future analysis of age
- Benthic invertebrates were coarsely sorted in the field to taxonomic Family (each for littoral and profundal invertebrates)
- Samples were frozen (fish, benthic invertebrates, zooplankton) or preserved (water) in the field
- If tissue was in good condition, fish were filleted, dried, or smoked after processing for distribution within the community and/or for dog food

Laboratory Analysis

- Fish, benthic invertebrate, and zooplankton tissues were analyzed for mercury at Biotron laboratory (Western University) and for stable isotope ratios (University of Waterloo)
- Water samples were analyzed for total mercury, methyl mercury, and dissolved organic carbon quantity and quality at Western University, and for general chemistry at University of Alberta
- Fish age was determined by qualified readers at AAE Technical Services
- Sediment samples were analyzed for mercury and general chemistry at Biotron laboratory (Western University)

GIS Analysis

- Data layers were obtained from publicly available repositories and from GNWT
- Catchments were delineated, and then quantified for: size, slope, elevation, wetland cover, and vegetative cover (proportion). Lake area was also quantified

Data Analysis

- Fish growth rates were quantified, compared among lakes, and related to catchment and water quality drivers using general linear models
- Fish mercury concentrations were compared among lakes, and relationships among catchment, water chemistry, fish ecology, and fish mercury concentrations were assessed using general linear models and piecewise structural equation modeling
- Rates of mercury biomagnification through food webs were quantified and compared among lakes, and related to catchment and water quality characteristics using stepwise linear regression
- Results were discussed with communities and harvesters at least annually, and discussions were used to refine *a priori* model sets that were tested, and to guide inference and interpretation

Pilot assessment of Broad-scale Monitoring Protocol

Field methods

- BSM protocols developed by the Ontario Ministry of Natural Resources and Forestry were used at Sanguez Lake between 17th and 29th May, 2018. Single gangs of small- and large-multimesh gill nets were randomly set throughout the lake and covered four depth strata. The multi-mesh net gangs were comprised of multiple panels; there were fewer small-mesh nets than large-mesh nets. Gangs were set mid-afternoon and soaked overnight for 18 hours. Captured fish were tracked by net, panel, and depth, identified to species, and sampled according to the BSM protocol. In addition, profile data of temperature and dissolved oxygen were generated, and Secchi depth was estimated.

Data Analysis

- Range of captured fish species and sizes were compared to what was previously known from this lake, which was intensively sampled in previous years.
- Histograms were prepared, logistical difficulties and challenges were assessed, and recommendations for future sampling were developed.

7. Results

Fish Mercury Study

Data from 11 lakes that were sampled as part of CIMP 154 between 2013 and 2019 were collated and synthesized. The lakes represented four ecoregions, and included collaborations with Samba'a K'e, Pehdzeh Ki, Liidlii Kue, Deh Gah Gotie, Jean Marie River, and Ka'a Gee Tu First Nations. Lakes included in the modeling of fish mercury concentrations are shown in Figure 1. We focused on Northern Pike because they tend to have some of the highest fish mercury concentrations due to their relatively high trophic position, and because they were present and captured in every lake sampled (better sample size when modeling whole ecosystems).

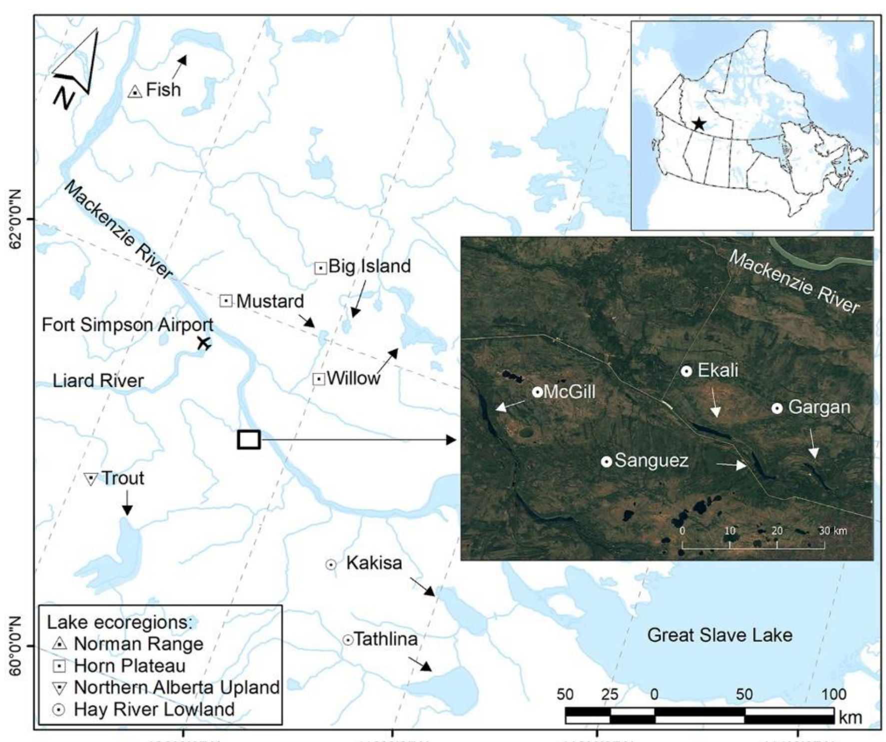

Figure 1. Location of study lakes in the Dehcho Region, NT, Canada. Base data source: Northwest Territories Centre for Geomatics and Google Earth v7.1.8. Taken from: Moslemi-Aqdam et al. 2022. Science of the Total Environment.

Results from piecewise structural equation models greatly increased our understanding of how catchment characteristics, water and sediment chemistry, and fish ecology interact to affect fish mercury concentrations, and drive among-lake variability in fish mercury concentrations.

More than 80% of among-lake variability in Northern Pike [Hg] was explained by fish growth rates (negative) and concentrations of methyl Hg ([MeHg]) in benthic invertebrates (positive). These variables were in turn explained by concentrations of dissolved organic carbon, concentrations of methyl mercury in water, and concentrations of total mercury in sediments, which were ultimately driven by catchment characteristics. Lakes in relatively larger catchments, with more temperate and subpolar broadleaf deciduous or mixed forests had higher [Hg] in Northern Pike (Figure 2). Our results provide a plausible mechanistic understanding of how interacting processes at scales ranging from whole catchments to individual organisms influence fish [Hg] (Figure 2, Figure 3), and give insight into factors that could be considered for prioritizing lakes for monitoring in subarctic regions. ***Based on our results, we recommend the following variables as highest priority for monitoring: 1) vegetative cover in catchments (remote sensing); 2) dissolved organic carbon concentrations in water.***

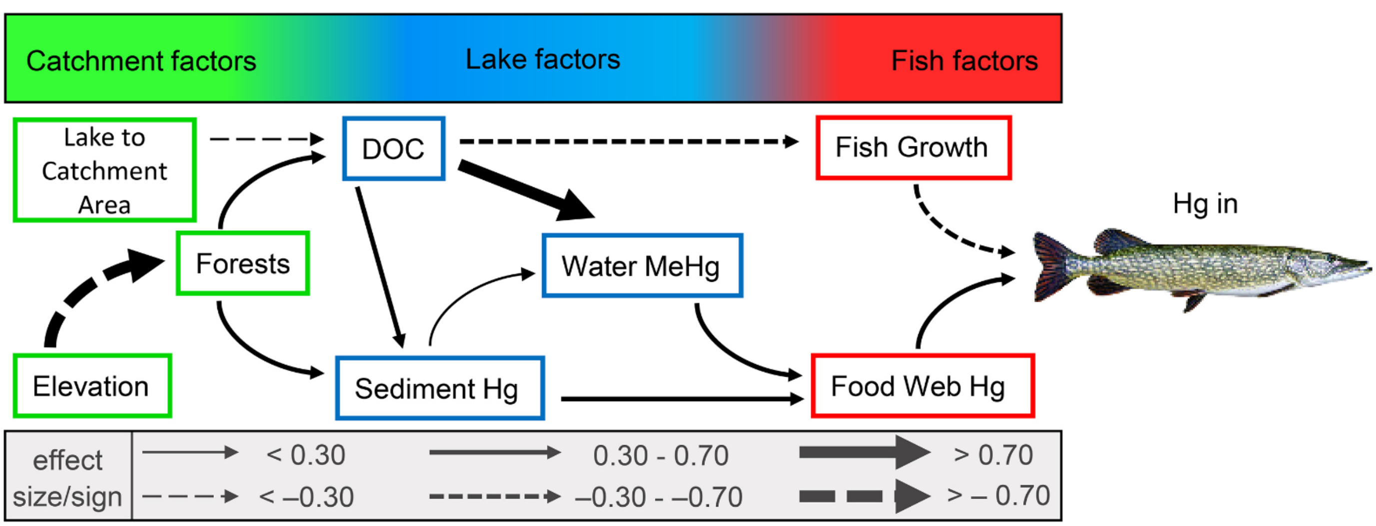

Figure 2. Graphical interpretation of results of piecewise structural equation model. Using whole-ecosystem data collected from 11 lakes over 7 field seasons, we found that the best proximate predictors of mercury levels in Northern Pike were fish growth rates and methyl mercury concentrations in benthic invertebrates (red boxes) on right side of figure. Mercury levels in Northern Pike were higher in lakes where Pike grew more slowly, and higher in lakes where concentrations of methyl mercury in benthic invertebrates were higher. Moving left to the blue part of the figure, variability in fish growth rates was primarily driven by concentrations of dissolved organic carbon (DOC) in water; in lakes with higher DOC, Northern Pike grow more slowly. An in-depth analysis of the causal reasons behind this DOC-

growth relationship indicated that the effect of DOC on Northern Pike growth were indirect rather than direct (see Moslemi-Aqdam et al. 2021 in Aquatic Sciences for details), and reflect catchment influence and quality of food at the base of the food chain. Still in the blue part of the figure, variability in methyl mercury concentrations at the base of the food chain (in benthic invertebrates) was driven by concentrations of mercury in water and sediment, which were themselves driven by DOC; DOC can transport mercury from catchments to lakes. Moving left again to the green part of the figure, mercury levels in sediment and DOC levels in water were driven by catchment characteristics, including relative catchment size and proportional forest cover. Dashed arrows in the figure indicate a negative relationship between variables whereas solid arrows in the figure indicate a positive relationship between variables. The thickness of the arrow represents the strength of the relationship (thicker is stronger). See Figure 3 for a plain language graphic.

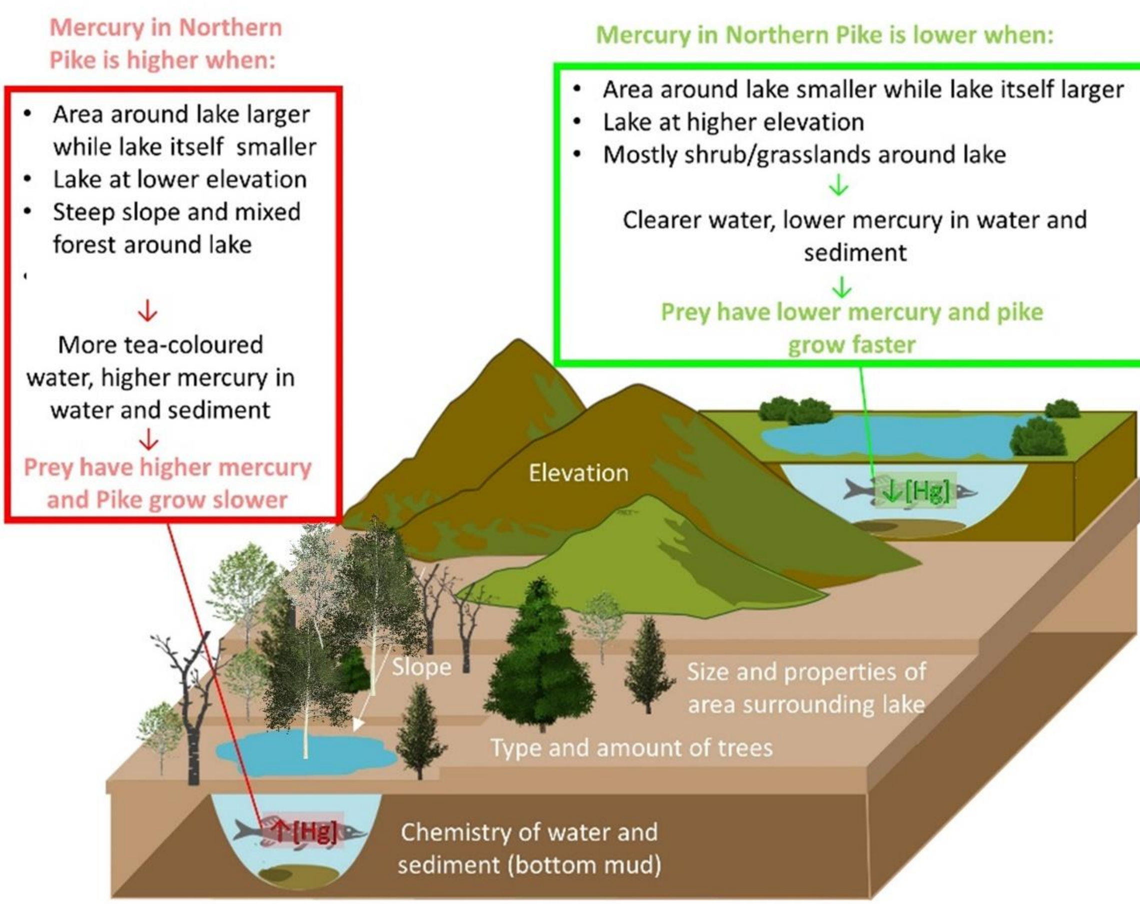

Figure 3. Plain-language graphical representation of linkages among catchment characteristics, lake characteristics, and fish mercury levels. Northern Pike have higher mercury levels in catchments that are relatively larger, and with steeper slopes and more trees. The lakes in these catchments have higher levels of dissolved organic carbon (DOC; tea-coloured water) and mercury in water sediment, higher levels of mercury at the bottom of the food chain, and slower fish growth rates. All together, this results in higher levels of mercury in Northern Pike. Northern Pike have lower mercury levels in catchments that are small relative to the lake, are surrounded more by grasses and shrubs, and have lower slopes (like on the Horn Plateau).

Pilot assessment of Broad-scale Monitoring Protocol

Eighty-nine fish were captured from 4 species: Northern Pike, Cisco (Coregonus artedi), Lake Whitefish (C. clupeaformis), and Walleye (Sander vitreus). Northern Pike was the most commonly caught and largest species. Most fish were captured in the 1-3 m depth strata (Fig. 5). Temperature and oxygen decreased with depth, but without the steep stratification observed the previous fall (2017; Fig. 6).

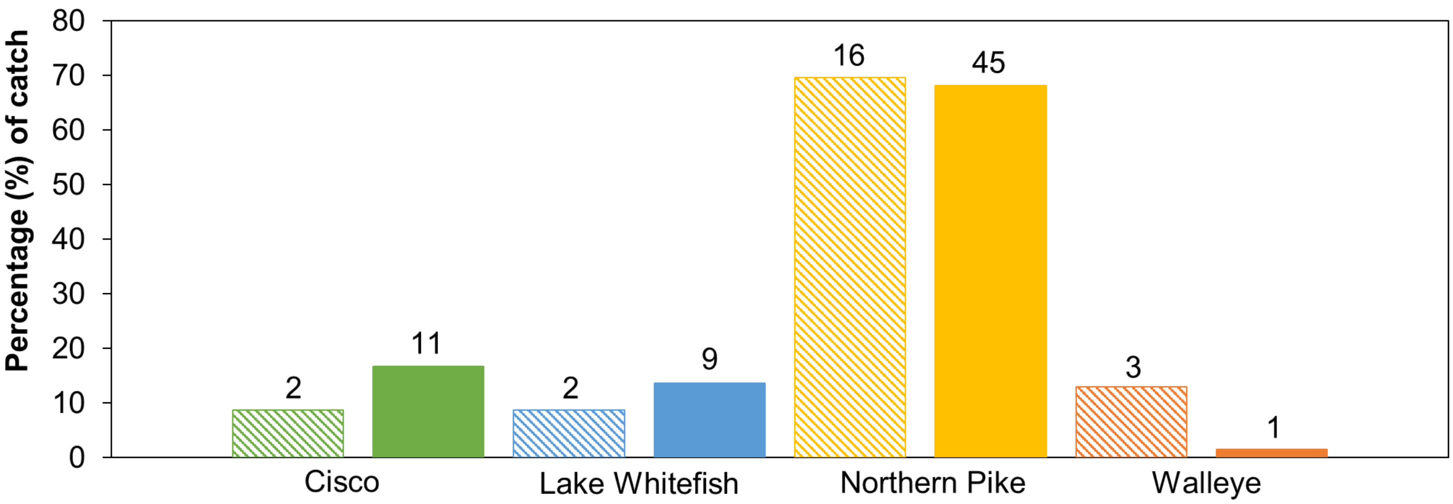

Figure 4. Percentage of each species in the total catch for small- (striped bars) and large-mesh (solid bars) nets. Sample size is indicated on top of each bar

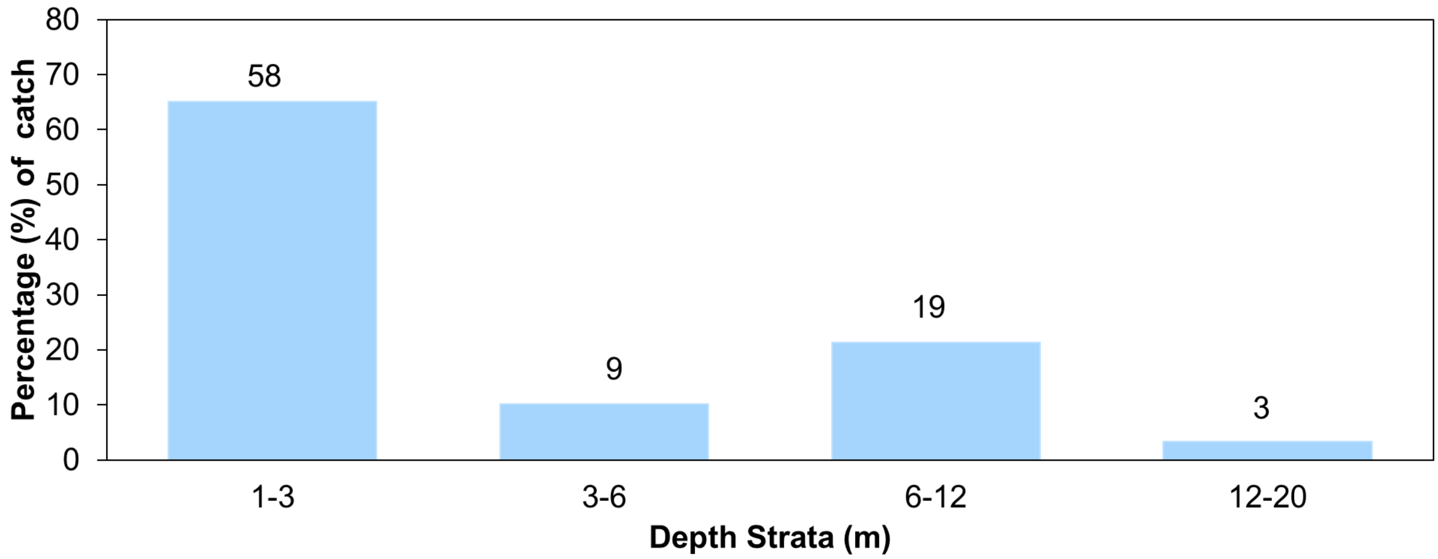

Figure 5. Percentage of total catch caught in each depth strata. Sample size is indicated on top of each bar

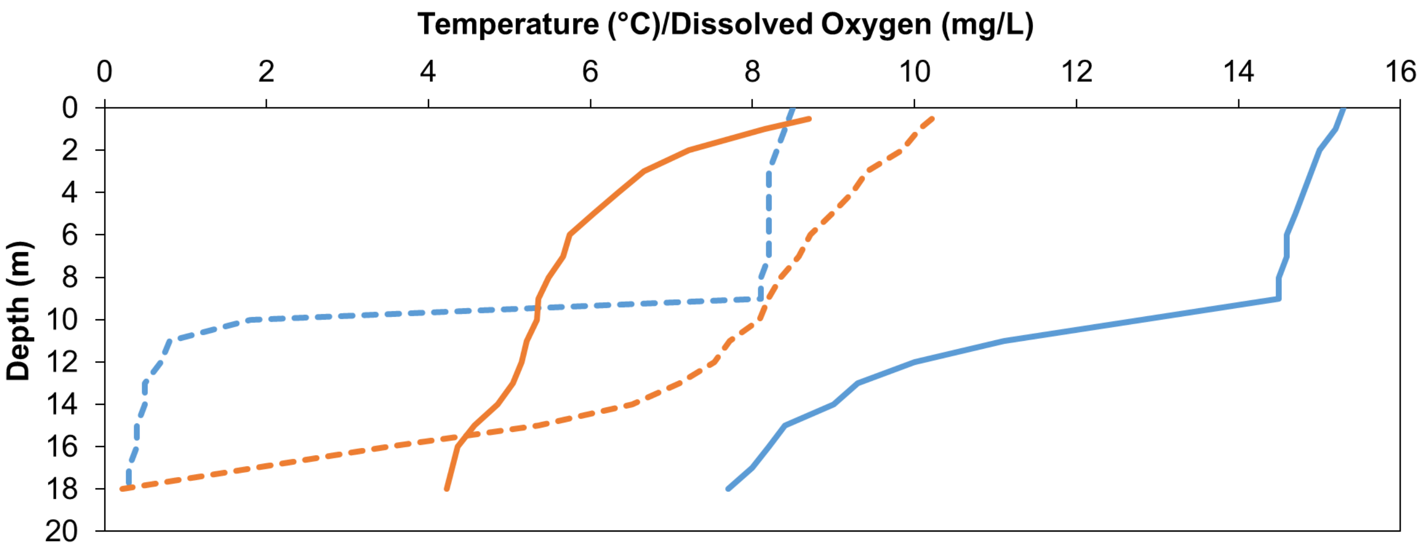

Figure 6. Water temperature (solid lines) and dissolved oxygen profiles (dashed lines) from Sanguez Lake in September 2017 (blue) and May 2018 (orange).

Sampling using BSM protocols was largely successful in Sanguez Lake, although the relatively steep bathymetry meant that some depth strata were very narrow, making it hard to find places to set gangs. A broad size range of fish were sampled, although small forage fish <150 mm were not well represented (Figure 7), and Stickleback (whose presence in the lake is known) were not captured.

Application of the BSM protocol was limited by temperature and the size of depth strata. Logistical constraints, which are common in northern environments, led to sampling occurring outside of the recommended lake temperature. Optimal sampling time would be when the majority of fish species that are suspected to be in the lake are the most randomly distributed. As this may not be at the suggested temperature of ≥18 °C, an adaptation of the BSM protocol may be in order for this and other northern lakes. In addition, a reduction on the recommended number of gangs deployed per set (from two to one) would be beneficial for small, northern lakes. These suggested modifications could be used by CIMP or another northern agency to develop and trial a protocol at the scale of several lakes that span gradients of size and depth.

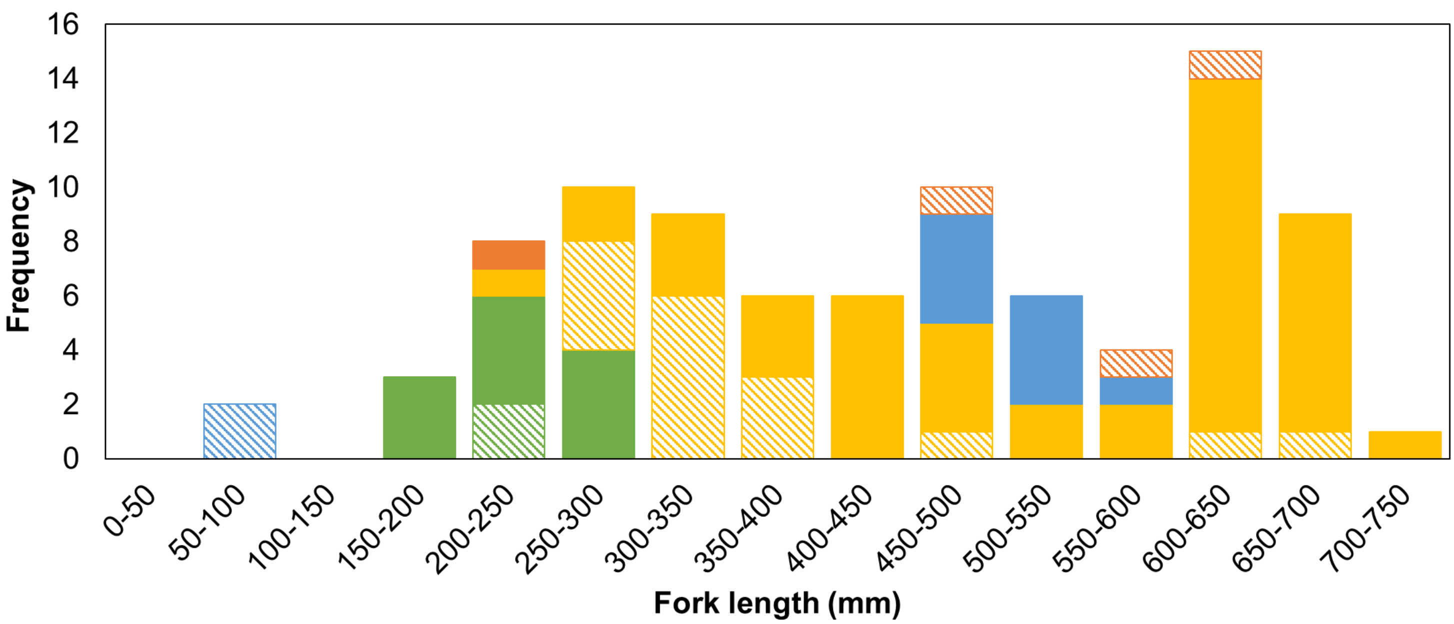

Figure 7. Histogram of fork lengths of fish caught in small- (striped bars) and large-mesh (solid bars) nets

8. Discussion and Contribution to Understanding

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Cumulative Impact Monitoring Program (NWT CIMP)

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Part 1: *Check all boxes that apply for the* **duration of the project** *and provide a numbered reference to a text explanation in Part 2.*
Part 2: *Provide a brief description and explanation of each of the areas checked in Part 1. Use plain language. Provide enough detail to give an understanding of the progress that was made and its significance. It should be clearly articulated how the project advances the understanding of cumulative impact monitoring in the NWT.*

Part 1

Monitoring and research conducted *during this year* led to:		**Numbered reference to Part 2**
New or enhanced knowledge in the field of study	☒	1
New or enhanced knowledge of cumulative effects	☒	1
Directly impacted a current decision-making process* * Must provide evidence that project results have been directly used in a NWT environmental decision-making process between April 1, 2021 and March 31, 2022.	☒	2,3
Could contribute to a future decision-making process	☒	2,3,4
Development of a standardized monitoring protocol(s)	☒	5
Adoption of standardized monitoring protocol(s) by decision-maker	☐	
Responded to a community concern	☒	1
New or enhanced community capacity	☒	1
New or enhanced analytical tool	☐	
New or enhanced modeling capacity	☒	1
Other:	☐	

Part 2

1. In this study, we identified key variables in catchments and lakes that explain a substantial amount (>80%) of among-lake variability in mercury levels in Northern Pike from lakes in the Dehcho region. These key predictor variables include: catchment slope, catchment vegetation cover, relative catchment size, DOC levels in water, and mercury levels in water and sediment. Understanding how catchment attributes affect water chemistry and ultimately mercury levels in fish is incredibly useful because many disturbances are more easily measured and quantified in catchments than in water, catchment attributes can be remotely sensed, and effects of climate change and land use on forests and permafrost are actively being researched in the NWT. Thus, in combination with other research, results from this study advance our understanding of cumulative stressors on lake ecosystems, and specifically fish mercury levels. Elucidating the interactions among catchment, water chemistry, and fish ecology variables that drive among-lake variability in fish mercury levels allows us to: i) prioritize variables for future monitoring (catchment attributes, DOC levels in water); ii) answer community questions as to why some lakes have higher fish mercury levels than others; iii) help communities, regulators, scientists, and agencies understand how cumulative effects of climate change, resource development, and harvest levels will interact to affect fish mercury levels in future. Through our annual (except for 2020; COVID) weeks-long camps on the land with Indigenous Guardians and community members, significant capacity-building and reciprocal learning was fostered and advanced. Our application of an advanced modeling technique (piecewise structural equation modeling) that allowed us to untangle complex interactions at multiple scales can also serve as a template for future research that includes more lakes and species.
2. Our data and findings have been provided to the management board for the new Edézhíe Protected Area, and were used in meetings (including in March 2022, which we attended virtually) to discuss researcher access to the Protected Area and what data were a priority for ongoing monitoring.
3. Our fish mercury data are provided annually to the GNWT HSS to facilitate updates of site-specific consumption guidelines. Our water quality data, dating back to 2013, have also been provided to GNWT CIMP to facilitate an analysis of long-term temporal trends in water quality parameters, in a test of a site-selection tool for water quality monitoring, and in an assessment of key monitoring variables.
4. For lakes that support either current or past commercial fisheries, our data are shared with Fisheries and Oceans Canada (upon request) to support stock and other assessments.
5. Through pilot work, we identified several considerations that should be taken into account if the Broad-scale Monitoring Protocol for fish community composition is applied at a larger geographic scale in the NWT.

9. Resource Management Implications

The results directly answer several questions posed by **Indigenous communities** to the research team, namely, "Why do fish mercury levels vary so much among lakes? How will mercury levels change with climate change and resource development? Which lakes have the lowest mercury levels?"

We found that fish mercury levels vary among lakes because of differences among catchment characteristics that drive mercury loading, mercury availability, and mercury accumulation. Lakes that are most vulnerable to stressor-induced increases in fish mercury are those that are in relatively large catchments, lakes that are in catchments where the vegetation is transitioning to more forest (particularly more broadleaf/deciduous forest), and lakes subject to climate- or development-induced increases in dissolved organic carbon. The lakes with the lowest mercury levels have fish that grow relatively faster. These lakes tend to be larger relative to their catchments, have clearer water, and be in catchments with more grasses and shrubs and less forest.

The results allow **regulators,** particularly GNWT HSS, to update and refine consumption advisories for wild-caught fish that are related to mercury. Together with Dr. Brian Laird, we work to link fish mercury data with fish nutrient data, patterns of fish consumption by people, and levels of mercury in people. This level of comprehensive knowledge will allow more nuanced guidance. Results also allow refinement of science and monitoring activities undertaken by Dehcho AAROM.

The results provide the only comprehensive western science data on water chemistry to the **management board** of the Edézhíe Protected Area, which is tasked with land-use planning, access requirements, and priority monitoring activities.

Results allow **community members** to understand fish mercury as a product of interconnections among land, water, and fish. Demystifying mercury is an important component of promoting safe consumption of traditional foods.

10. Project Linkages

Dehcho First Nations, through its AAROM program, co-led this project by:

i) Identifying priority research questions;
ii) Routinely engaging with communities to co-report results (with Swanson);
iii) Prioritizing lakes for study; and,
iv) Linking with existing monitoring and Indigenous Guardian programs.

Meetings with communities to report on results and plan for future work occurred at least annually, and informal meetings (led by Mike or George Low) occurred more frequently. Individual First Nations decided which personnel would participate in on-the-land field camps in addition to AAROM Guardians (e.g., camp workers, camp helpers, cooks, cook helpers, youth, elders). In addition to community meetings, results were communicated to resource managers and are currently being packaged in preferred formats (e.g., GIS layers). Approximately 9 weeks of on-the-land camps took place during the course of this project with Ka'a Gee Tu, Jean Marie River, Liidlii Kue, and Pehdzeh Ki First Nations.

GNWT CIMP was included in the project through regular phone calls. Identification of several extension analyses (e.g., regional water quality) were developed and implemented as a result.

GNWT HSS was provided annually with data in their preferred format, and researchers worked with Dr. Brian Laird's team (human health and biomonitoring) to ensure that human, water, and fish data were complimentary and able to be integrated.

The management board of the Edézhíe Protected Area requested data and a description of our activities through Heidi Weibe and several community coordinators, including Arial Sanguez and James Tsetso.

Fisheries and Oceans Canada was kept apprised of our work on Tathlina and Kakisa lakes via email (Colin Gallagher), and a PhD student on this project recently completed fisheries analyes that integrated results from this CIMP-funded research as well as historical DFO-funded research.

Science results have been linked with Dr. Olefeldt's work on effects of beaver dams on mercury, Dr. Marlene Evans work on temporal trends of mercury, and Dr. Brian Laird's work on human and community health.

11. Deliverables

Deliverable (*report, presentation, model, etc.*)	**Intended user(s)** (*be specific*)	**Significance of the deliverable** (*'So what?'*)	**Sent to NWT CIMP?** ☐Yes ☐No (*if no, state reason*)
Annual reports (2018, 2019, 2020)	CIMP	Communicated Progress	Yes – in previous years
Water data uploaded to Mackenzie Data Stream	Agencies, Communities, Other researchers	Allows water quality data to be accessed by others	Uploaded and publicly available
Plain language posters and presentations to communities	Communities	Communicates the design and priorities of the work (and facilitates gathering feedback) and results regarding where fish mercury is higher vs lower, and what drives the variability among lakes	Yes – Google Drive Link https://drive.google.com/drive/folders/1JPFZs2kJmqncew43AzPfjI-h_D22dynA?usp=sharing
Oral presentation at northern results meeting	Communities, GNWT CIMP, other researchers, land use managers, agencies	Communicates the community-driven design and immersive field approach, as well as novel science results	Yes – video of CIMP presentation, power point file of NCP presentation in Google Drive Folder https://drive.google.com/drive/folders/1JPFZs2kJmqncew43AzPfjI-h_D22dynA?usp=sharing
Fish mercury data submitted to GNWT HSS	GNWT HSS	Allows refinement of consumption guidance	No, but available upon request (at request of communities and Dehcho AAROM)
Peer-reviewed publication(s)	Other researchers in academia and agencies	Advances our understanding of catchment-lake-fish interactions that drive both fish mercury levels and fish growth rates	Yes – PDFs of two published papers in Google Drive https://drive.google.com/drive/folders/1JPFZs2kJmq

			ncew43AzPfjI-h_D22dynA?usp=sharing
Plain language representation of mercury results	Communities	Illustrates complex land-water-fish interactions in an infographic that allows efficient feedback and information sharing with communities	Yes – PDF in Google Drive https://drive.google.com/drive/folders/1JPFZs2kJmqncew43AzPfjI-h_D22dynA?usp=sharing
GIS layers of data	Land use managers in FNs	Allows Nations easier access to comprehensive data in their traditional territories	No – still performing QA/QC with contractor

12. Budget *(see separate template)*

Thank you for your submission!

Final Report Submission Checklist

Please ensure your Final Report is complete with the following:

- ✓ All sections are complete in the correct font style and size.
- ✓ Complete budget template (provided).
- ✓ All deliverables stated in the original proposal and subsequent annual reports if not yet submitted to NWT CIMP. If not available, rationale is to be provided.
- ✓ I sent my Final Report in PDF format to nwtcimp@gov.nt.ca

Reminder: Deadline for Final Report is April 29th, 2022.

Contact Us!
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Government of the Northwest Territories
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