

Research Bulletin

NWT Cumulative Impact Monitoring Program

Monitoring for Impacts of Fish Harvest and Climate Change on the Great Bear Lake Aquatic Ecosystem

Summary

Great Bear Lake (GBL) is valued culturally and recreationally by the community of Déljnë, NWT residents, and tourists. Lake Trout are vulnerable to fishing activity and environmental change due to their slow growth, low reproductive rate, and preference for cold, oxygen-rich waters. Understanding the impacts of fishing activity and climate change on GBL are important when considering sustainable harvest levels.



Lake Trout fillets drying in the community of Déljnë. 2023. (Credit: C. Gallagher)

Why is This Important?

Extensive fish research and baseline data collection have been ongoing since 2000 and have contributed to understanding the cumulative impacts of harvest and climate change on large northern lake ecosystems. These data provide a reference for detecting future changes in GBL. Project results are important for developing strategies for maintaining community-led aquatic monitoring programs and managing of natural resources. This is very important as fish are, and continue to be, valued culturally and an essential food source.

What Did We Do?

Biological and environmental data (including species composition, catch-per-unit-effort (CPUE), length, and age, and water temperature) were collected from 2021 to 2023 in collaboration with local community members. These data were used to update population trends of key subsistence fish as well as water temperature and stratification trends.

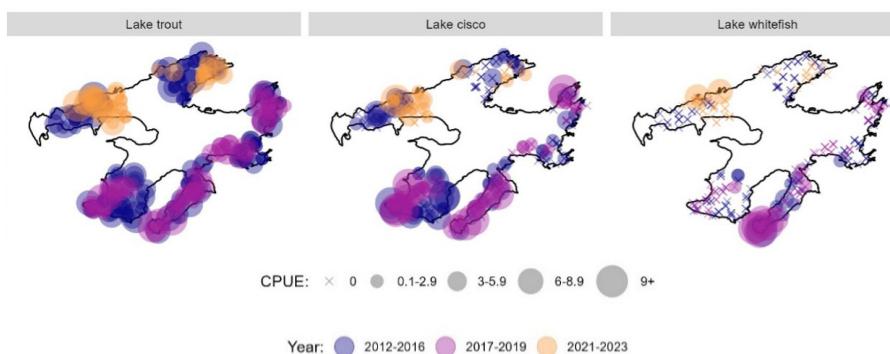


What Did We Find?

- Lake Trout catch per unit effort remains stable and average age has increased since initial sampling in 2000.
- In the Dease Arm, located in the northeast corner of GBL, maximum surface water temperatures reached 18°C in 2023, compared to 14°C recorded in 2015 and 13°C recorded in 2021.
- In recent years, summer water temperature profiles in the different arms of GBL all showed clear thermoclines extending as deep as 50 m, with the exception of McTavish Arm (which had some deeper offshore isothermal sites). Before 2017, the 3 northernmost arms of the lake had both stratified and isothermal water temperature profiles.

What Does This Mean?

Stable CPUE in Lake Trout indicates healthy harvest and population levels. Increases in GBL's water temperature and stratification indicate lake warming due to climate change which may impact fish ecology.



Relative abundance of key harvested fish species captured in multi-mesh nets during Great Bear Lake surveys from 2012-23. Size of circles represents the number of fish caught/100m net/24 hours (CPUE) at a given site and year; X's represent sites/years where nets were set, but a species was not captured.

For More Information

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NWT Cumulative Impact Monitoring Program (CIMP127)

What's Next?

- Continued data collection and monitoring to assess trends in fish populations, water quality, and primary productivity.
- Evaluating stock status (Lake trout and other fish species) and demographic characteristics (for example, age, weight, etc.).
- Community leadership and capacity building through community-led sampling, youth involvement, and community meetings.
- Conducting a peer review of project results through the Canadian Science Advisory Secretariat.

Thermocline, stratification and isothermal:

A *thermocline* is a sharp temperature change in a lake, where the layers of water above and below the thermocline are at distinctly different temperatures. This can lead to stratification in cold northern lakes.

Stratification occurs when warm water, which is less dense, sits on top of colder, more dense water, with a thermocline separating them. This limits lake mixing, further exacerbating warming of surface waters.

Isothermal is when the water column is the same temperature throughout.

NWT CIMP is a source of environmental monitoring and research. The program coordinates, conducts and funds the collection, analysis and reporting of information related to NWT environmental conditions. If you're conducting environmental monitoring and research, consider sharing your information with northern residents and decision-makers in a Bulletin.