

# Research Bulletin

## NWT Cumulative Impact Monitoring Program

### Understanding Great Slave Lake Productivity and Food-web Dynamics

#### Summary

Fisheries and Oceans Canada has been working with local communities to study Great Slave Lake (GSL) since 2011. Water, invertebrate, and fish samples have been collected to understand how cumulative impacts such as those from mining, climate change, fisheries, and regulation of water flow upstream can affect the structure and function of the GSL ecosystem. This information is key to understanding how potential changes could impact the sustainability of the largest freshwater fishery in western Canada.

#### Why is This Important?

GSL is a vulnerable freshwater ecosystem because of its depth, high latitude, and longer slow-growing season. Little is known about the current conditions and this project assesses the potential for acclimation and sustainability of culturally and ecologically important fish species impacted by a changing hydroclimate and habitats. Continuing long-term monitoring allows for changes from the 'usual' (baseline) environmental conditions to be detected and is needed for decision-makers to be able to manage and protect GSL fisheries.



*K'atl'odeeche First Nation Field Technician keeping watch in the western basin of Great Slave Lake, summer 2022. (Credit: L. Alsip)*

#### What Did We Do?

Working with local community members from K'atl'odeeche, West Point, Deninu K'ue First Nations, and NWT Metis Nation, we collected information about:

- Lake depth, temperature, and water quality
- Zooplankton and benthic invertebrates (aquatic bugs)
- Fish species

Each fish was sampled for biological information including length, weight, and maturity. As well, tissue samples and ear bones (otoliths) were taken and analyzed to determine what the fish ate and its age.



## What Did We Find?

We found that:

- During the summer, most of the lake has warm water ( $>5^{\circ}\text{C}$ ) to depths of 10-15 meters and cool water ( $<5^{\circ}\text{C}$ ) below.
- The amount of invertebrates varied over time, depth, and lake bottom types. This is due to due variations in nutrient availability and predator-prey relationships across GSL.
- Fish of 24 different species were collected, including Lake Whitefish, Lake Trout and Inconnu, which are all culturally and economically important.

A food-web dynamics model was built to understand predator-prey relationships in GSL. Based on the variety of connections among species in the food web, Lake Trout, Inconnu, and Walleye are top predators, while Lake Whitefish is a mid-level predator.

