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Lake Trout Monitoring Program

2020 Program Update

January 2022

Lake Trout Monitoring Program
2020 Program Update

Government of Yukon
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Summary

The Department of Environment conducts yearly population assessments of lake trout. This document provides an overview of the program as well as providing results from all individual lakes, as assessed from 2010 through 2020.

Updates within this report include the following:

- 2020 reports for conducted surveys for the following lakes: Dezadeash (2020), Frenchman (2020) and Pine (2020).
- Addition of program methods for performing length-frequency and age analysis.
- Updated age analysis through growth curves, for the following lakes: Aishihik (2017), Frances (2017), Atlin (2014), Bennett (2014), Kusawa (2014), Laberge (2016), and Mayo (2013).
- Updated age and growth to illustrate age-cohort frequency, as opposed to raw data scatter plots, as previously presented in the 2019 update, on the following lakes: Dezadeash (2013), Simpson (2014), Toobally (2019), Watson (2015), Braeburn (2016), Caribou (2012), Chadburn (2015), Fish (2012), Fox (2013), Frenchman (2012), Kluane (2013), Ladue (2017), Lewes (2010), Little Atlin (2015), Little Fox Lakes (2016), Little Salmon Lake (2015), Marsh (2015), Michie (2017), Morley(2018), Quiet (2012), Snafu Gazetted (2018), Tagish (2015), Tarfu (2010), Ten Mile (2016), Teslin (2016) Twin Lake West (2013), and Wolf (2018).

In addition to these updates, minor errors in data and formatting were updated as follows:

- Dezadeash (2013): correction to lake trout ages.
- Kluane (2013): correction to the number of lake trout aged.
- Tarfu (2020): Error in data to display lake whitefish, corrected to indicate round whitefish population structure.
- Minor formatting edits to match length/frequency bins across all lakes.
- Minor colour edits to length/frequency graphs to depict lake trout and lake whitefish in different colours.

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Introduction

The Department of Environment conducts yearly population assessments of lake trout (*Salvelinus namaycush* and lake whitefish (*Coregonus clupeaformis*) as part of its delegated mandate under the 1989 Canada-Yukon Freshwater Fisheries Agreement. These assessments provide data to aid in fisheries management decisions.

This document provides information on the Yukon Lake Trout Monitoring Program, including: an overview of the program and its goals; the key biological characteristics of lake trout and lake whitefish; current scientific methodology used in the program; and the current results of all assessed lakes from 2010 through 2020.

Overview

Freshwater fisheries have long been determined to be valued and integral components of Yukon society and culture (Department of Environment 2010).

Historically, fisheries have always played an important role in First Nations substance. However, in the early 1900s commercial fisheries became prevalent, to supply cheap and readily available food sources to miners associated with the Dawson gold rush. Later, commercial fisheries supplied food for workers developing the Alaska Highway. Historic records suggest that these commercial fisheries may have depleted many lake's fish populations.

Today, the value of recreational fishing to Yukon residents remains evident as recreational fishing pressures continue to grow (Sinclair and Perry 2019). For example, the 2015 National Recreational Fishing Survey (Fisheries and Oceans 2019) indicated that the amount of freshwater fish annually caught in Yukon was approximately 200,000. With this level of pressure, it is important for the Government of Yukon monitor fish stocks to ensure the sport fishery remains healthy and sustainable.

Since 1990, fish populations have been annually assessed across the territory by the Department of Environment. In 2010, the Lake Trout Monitoring Program was launched, which has been providing lake trout population estimates and lake whitefish population information.

The goals of this program are to provide scientific data on the status of fish populations and their health to aid in the management and establishment of regulatory decisions. The Lake Trout Monitoring Program has also provided data to determine population trends to further support population modelling in response to climate change.

The Lake Trout Monitoring Program in combination with Angler Harvest Surveys, the Fish Health program, and the Southern Lakes Lake Trout Movement Project, forms the basis of the Yukon's Fisheries Program, providing accurate data on the condition, life history and recreational us of Yukon's freshwater fish stocks.

Key Lake Trout and Lake Whitefish Biological Characteristics

While the principal objective of this program is to provide population data to assist fisheries management decisions, it is also important to understand the key biological characteristics of lake trout and lake whitefish. It is also important to understand that Yukon lakes have been found to be low in productivity, as compared to southern Canadian Lakes (Milligan 2018). Below is an overview of these characteristics which includes: distribution; habitat; diet; age and growth; and spawning information.

Lake Trout

Distribution

Lake trout are distributed across Canada and can be found throughout the Yukon (Scott and Crossman 1973). Current Yukon distribution of lake trout include

all watersheds, with an absence noted in northwestern Beringia (Lindsey 1964).

Habitat

The key habitat requirements of lake trout are cold, clear waters with suitable temperature and oxygen limits. While lake trout can tolerate a range of temperatures below 15ºC, the optimum thermal range for their habitat lies within 8ºC to 12ºC (Christie et. al. 1988). Within this range, the minimum dissolved oxygen level to support lake trout is above 4 mg/L (Clark et al. 2004), with optimal levels being greater than 7 mg/L (Evans 2005).

Diet

Lake trout are a top predator in Yukon lakes, feeding on a broad range of organisms from zooplankton and benthic invertebrates to fish (Scott and Crossman 1973). In Yukon lakes, stomach content analysis has continued to show that ciscoes and lake whitefish are a primary food source for lake trout.

Age and Growth

Lake trout in northern regions are known to be slow-growing and long-lived fish (Martin and Oliver 1980). In Yukon, it is not uncommon to find lake trout over 30 years of age, reaching upwards of 50 (Government of Yukon 2010). Lake trout growth rates are related to prey availability, particularly the presence or absence of lake whitefish and ciscoes. Studies have found that higher densities of large lake trout (large-bodied morphs) occur in lakes where lake whitefish are present, while lakes void of whitefish and ciscoes (simple biological communities) tend to support high densities of small non-piscivorous lake trout (small-bodied morphs; Carl 2008). Evidence from the Lake Trout Monitoring Program supports this observation. The Yukon's 'small-bodied' lake trout morphs have been found in lakes absent of lake whitefish (e.g., Kathleen Lake), and 'large-bodied' morphs have been found in lakes where lake whitefish are present (e.g., Mayo Lake).

Spawning

Lake trout are fall-spawners and can be found spawning in the Yukon throughout September and October, as water temperatures cool. Unlike many other salmonids, lake trout do not construct spawning nests. Lake trout typically spawn over coarse or angular clean rocks, depositing eggs into the cracks between the rock substrate (McPhail 2007). While lake trout maturity is dependent on the individual population and morph-type, this species generally matures between 5 and 13 years of age.

Lake Whitefish

Distribution

Lake whitefish are a cold-water species, are widely distributed across Canada, mainly found in large, deep lakes and rivers (Scott and Crossman 1973). In Yukon lakes, where ciscoes are absent, lake whitefish have been found to co-occur with European whitefish (*Coregonus lazarettos*) (Mee et al. 2015). While these two species can exhibit physical differences (e.g., number and size of gill rakers), they are often hard to distinguish with the naked eye and require genetic analysis (Mee et al. 2015, COSEWIC 2018).

Habitat

While there is limited results on the defined habitat needs of lake whitefish, adults of this species are predominately found in deep, cool lakes, with temperatures ranging from 8ºC to 14ºC (McPhail 2007). Throughout the Yukon Lake Trout Monitoring Program, lake whitefish have been found to reside mainly in depths greater than 20 m. Dissolved oxygen levels suitable for lake whitefish are found at levels greater than 4 mg/L (Havens et al. 2014).

Diet

Lake whitefish feed on a variety of aquatic organisms, focusing on zooplankton as juveniles, and larger benthic invertebrates as adults (e.g., snails; McPhail 2007). In many systems lake whitefish are known to also prey on smaller coarse fish (Scott and Crossman 1973). By examining lake whitefish stomach content, we have seen evidence of this, as well as observing that lake whitefish feed on midges, mussels and caddisflies.

Age and Growth

Similar to lake trout, lake whitefish in Yukon lakes are a slow growing and long-lived fish species (Scott and Crossman 1973). Lake whitefish can be found to live upwards of 35 years within Yukon lakes. Growth rates in lake whitefish are a factor of lake productivity, temperature, age at maturity and population density (Healy 1980, McPhail 2007).

Spawning

Lake whitefish spawn in the fall, throughout September and October as temperatures cool, however exact spawning dates differ between lakes and temperature ranges, and may occur bi- annually (McPhail 2007, Kennedy 1953). Spawning occurs at night and is associated with increased activity, prior to eggs settling on the substrate (Becker 1983). Lake whitefish tend to reach maturity faster than lake trout, with age at maturity between 4 and 10 years (McPhail 2007).

Program Methods

SPIN

The methodology used to effectively assess lake trout populations in the Yukon has evolved over the years (Jessup and Millar 2011). Presently, the method used is the Summer Profundal Index Netting (SPIN) lake trout assessment model, developed by the Ontario Ministry of Natural Resources and Forestry (Sandstrom and Lester 2009). This method was adopted by the Department of Environment in 2010 to replace the previous technique, which primarily sampled nearshore habitat (Jessup and Millar 2011). In the Yukon, these surveys are conducted in several lakes in the summer months from late June through early August.

The SPIN method allows for the determination of harvestable lake trout population sizes through standardized gillnetting. Nets are set at varied depths across each lake, and the number of nets differ depending on catch rates and area of lake with depths >10 m (see Sandstrom and Lester 2009 for further information on methodology). By using this standardized method, the Department of Environment aims to produce results which will allow for detecting population changes over 25%. Standardization of sampling methods also provides the ability to compare collected data across years as well as geographical areas (Bonar, et al. 2009).

Length, Age and Growth

During each survey, lake trout are measured for length (mm) and weight (g), with mortalities assessed to determine sex, maturity and age (through the analysis of otoliths). This allows the Department of Environment to calculate growth rates, as well as define the age-class structure, for each population. Values such as these are an important tool when assessing population health, they provide information on the size and condition of these species at different life stages.

Length and Weight

Length-frequency data is presented throughout each individual lake report, when available, for both lake trout and lake whitefish. The inclusion of this data is vital, as it details the size structure of a fish population at the point-in-time of the survey, which can be used to interpret population dynamics such as growth rate and mortality (Guy and Brown 2007). This data is also used to provide analysis when comparing changes in population structure over time.

Age and Growth

An important component of assessing the health of fish stocks is through the determination and analysis of age. When age data is combined with length data, we can interpret growth, providing us with valuable tools to effectively monitor and manage fish stocks (Guy and Brown 2007).

Throughout this report, we present age data in two ways. In lake assessments, where we have collected greater than 40 aging structures from lake trout, we plot this data as a growth curve, utilizing the von Bertalanffy growth equation, as conducted through the FSA package for R (Ogle 2016). This program models length-at-age data for species in individual lakes. Such growth curves can be used to establish appropriate slot-sizes when establishing length-based regulations. Within this document, we present graphs of lake-specific growth curves and depict the current upper slot size as a horizontal line. (i.e., Aishihik 2007).

For lakes where we have collected less than 40 aging structures from lake trout, the age data is presented as age-cohort frequency. This analysis illustrates the frequency of age-cohorts sampled during the specific sampling event. This data should be interpreted with

caution due to the limited number of aging structures collected, which can lead to error.

Habitat

In addition to determining population levels, the Lake Trout Monitoring Program also collects relevant habitat data. At a minimum, during each lake assessment bathymetric mapping is conducted, and temperature (ºC) and dissolved oxygen (mg/L) profiles are conducted. As previously discussed, lake trout and lake whitefish require suitable oxygen and temperature habitats to survive.

Results

The results of the Lake Trout Monitoring Program are appended to this report as alphabetically categorized based upon watershed. These results provide a status overview of the lake trout and lake whitefish population within each lake, including: estimated population size and density; length range and frequency; age distribution; temperature and dissolved oxygen profiles as well as lake size classifications (Table 1); geographical and watershed location (Table 2, figure 1); access; and potential lake recommendations.

Table 1. Yukon lake size categories

Size category	Size range (ha)
A	< 100
B	101 – 1,000
C	1001 – 2,500
D	2,501 – 5,000
E	5,001 – 15,000
F	15,001 – 65,000

Table 2. Major Yukon drainages and watersheds

Major drainage	Watershed
Yukon River	Yukon Headwaters
	Upper Yukon
	Pelly
	Stewart
	Central Yukon
	Porcupine
Mackenzie River	Upper Liard
	Central Liard
	Peel and Southwestern
	Beaufort
Alsek	Alsek River

Data Uncertainties

The results contained within this report should be interpreted with a measure of caution. Many of the population estimates have large uncertainties, herein expressed as population ranges. The larger the range, the greater the uncertainty. As such, the population ranges herein should coupled with population structure to give an overview of the status of each lake. Additionally, many of the sampled lake trout and lake whitefish populations lack sufficient data for their age compositions. This makes it difficult to draw meaningful conclusions regarding population health.

The recommendations contained in this report have largely been based on the data and methods used in the program between 2010 and 2019. During this period, the programs principle direction was to improve certainties associated with population estimates through increased sampling (by an increase in net sets).

Going forward, the Department of Environment, Fish and Wildlife Branch, Fisheries section will be refocusing some of its efforts by gathering additional information on fish age, their growth and habitat variation. This information will advance our

understanding of these populations. For example, by improving our age data we will be able to further our analysis of growth and mortality rates. This will help us when determining lake-specific size and retention limits. Ultimately, this information will be incorporated when making management recommendations and will be added to fisheries reports in the years to follow.

Report Usage

These results are designed to provide communities, public, First Nations, Renewable Resource Councils and fisheries managers with an overview of lake trout and lake whitefish population estimates for individual lakes. They have been formatted to enable our fellow stakeholders to pull individual lake results as necessary, while providing a short program overview. For further information regarding the Lake Trout Monitoring Program, stakeholders are encouraged to contact the Department of Environment Fisheries section by email at fisheries@yukon.ca.

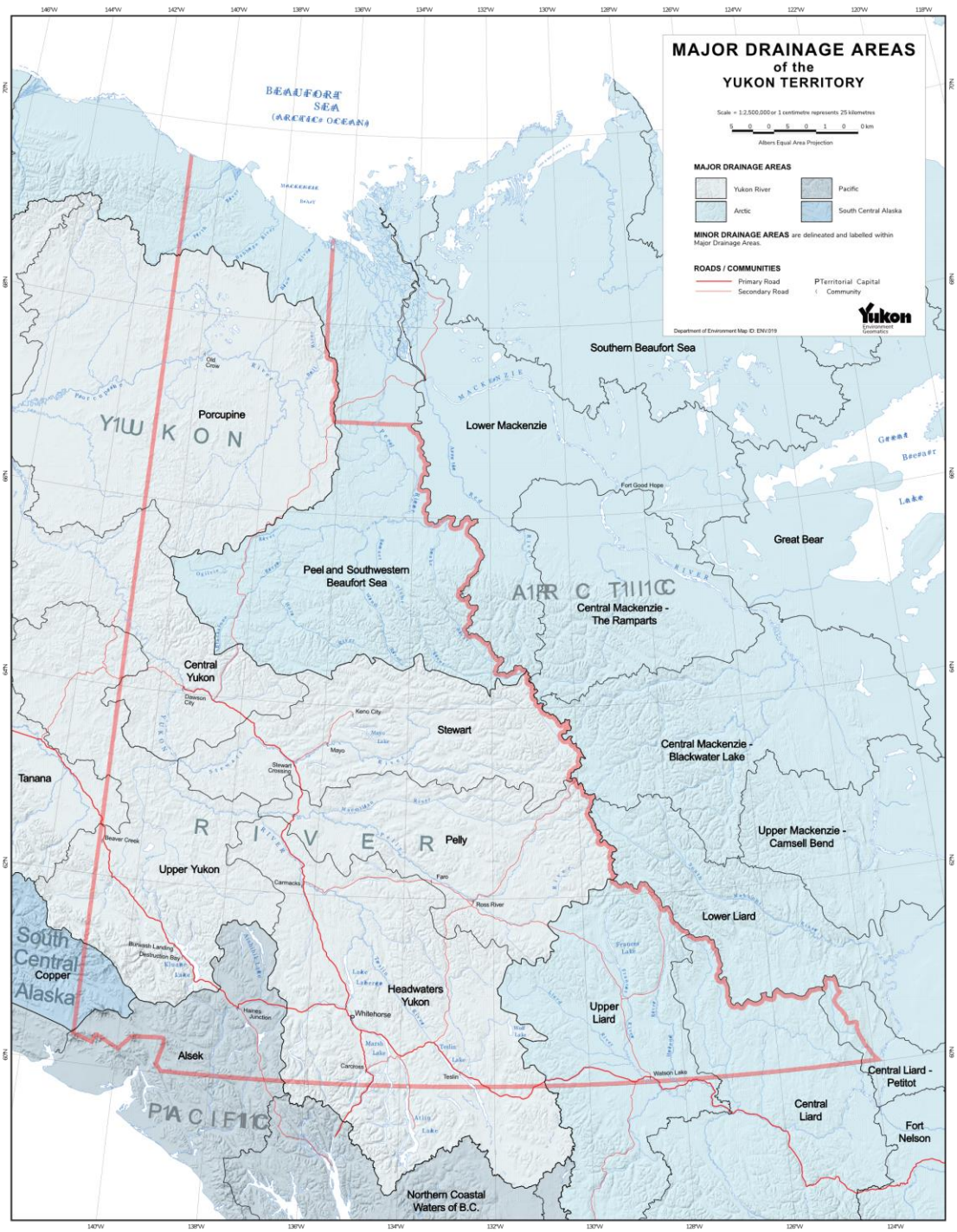

Figure 1. Major Yukon drainages.

Alsek River Watershed

Alsek River

Aishihik Lake 2017

Lake Information

WATERSHED	**LAKE CLASS**
Alsek	E
SURFACE AREA	**ELEVATION**
14,747 ha	930 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
120 m	35.5 m
SURFACE TEMP	**REGULATIONS**
11.1^{O}C	Conservation waters
SAMPLING DATES	**NET SETS**
July 31 – Aug 04	140

Location

Aishihik Lake is located in the southwest Yukon, within the Traditional Territory of the Champagne and Aishihik First Nations. It is located 43 km north of the Alaska Highway, on the Aishihik Road.

Access and Use

Aishihik Lake is accessed by the Aishihik Road, with a government campground on the southern end, and Aishihik Village on the north end. This lake serves as the Aishihik Generating Station reservoir, operated by Yukon Energy Corp, constructed in 1975. A fish ladder on the southern end, currently limits passage.

Overall Status

Lake Trout

The lake trout population in Aishihik Lake as observed during the 2017 survey, showed a moderate density of large-bodied lake trout, as compared to lakes within this size category. This population appears healthy, despite high angling pressure. An analysis of growth, indicates few individuals over 650 mm.

Lake Whitefish

Survey results indicate a healthy lake whitefish population within Aishihik Lake. Whitefish populations are being monitored for recruitment on a yearly basis by Yukon Energy. To date little variation in recruitment has been observed.

Recommendation

The recommendation for future surveys of the Aishihik Lake is to improve population estimate power, by increasing net sets and biological samples. This population should be monitored for any cumulative effects of the hydro system and incorporate monitoring with hydro operations. This lake trout population should be reviewed for slot size adequacy, as few individuals were found above the current regulation limit of 650 mm.

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Lake Trout

Lake trout captures totalled 134 during the 2017 survey of Aishihik Lake.

Population Estimate and Density

The population of lake trout in Aishihik Lake, as assessed in the 2017 survey, was **66,500** (estimate range: 40,700 to 93,300).

Length and Weight

These large-bodied lake trout ranged in fork length from 225 mm to 889 mm, with an average length of 510 mm and weight of 1,738 g.

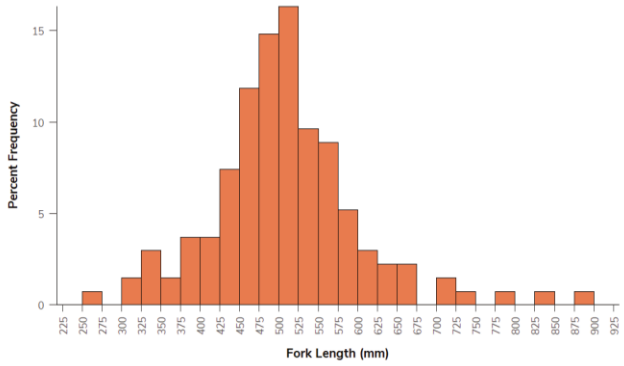

Figure 2. Length frequency distribution of lake trout as sampled in Aishihik Lake (2017), n = 134.

Age and Growth

Age structures, obtained from 48 lake trout, showed an age variation from 4 through 32 years of age.

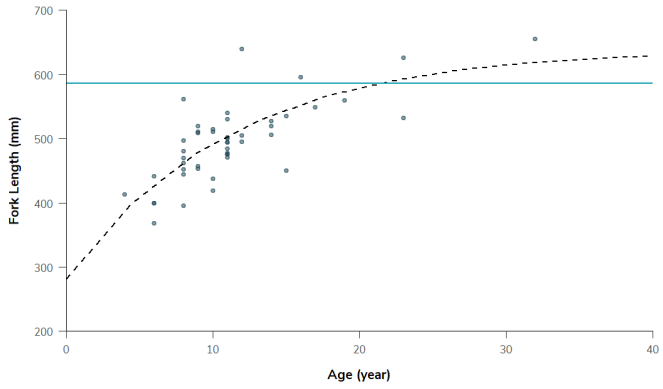

Figure 3. Von Bertalanffy growth curve of sampled lake trout in Aishihik Lake (2017), n = 48.

Lake Whitefish

During the 2017 survey, a total of 125 lake whitefish were sampled in Aishihik Lake.

Length and Weight

The size of these fish ranged from 235 mm to 540 mm, with an average fork length of 387 mm and weight of 863 g.

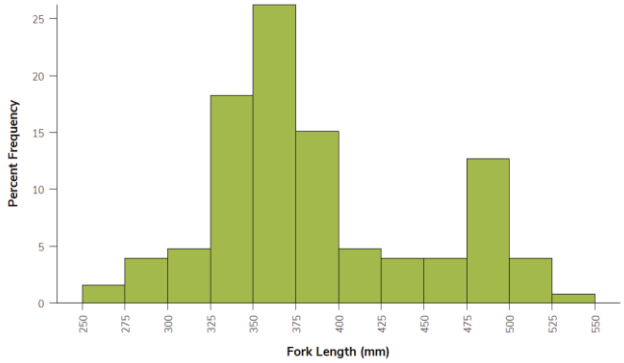

Figure 4. Length frequency distribution of sampled lake whitefish in Aishihik Lake (2017), n = 125.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were obtained on August 1. The temperature profile displayed a thermocline between 10 m and 18 m, followed by a slow decline to 72 m. Overall, optimal lake trout habitat existed throughout the entire water column.

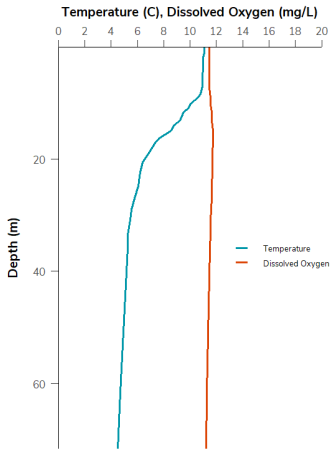

Figure 5. Temperature (C) and dissolved oxygen (mg/L) as measured in Aishihik Lake, August 1, 2017.

Dezadeash Lake 2013

Lake Information

WATERSHED	LAKE CLASS
Alsek	E
SURFACE AREA	ELEVATION
7,968 ha	690 m
MAXIMUM DEPTH	AVERAGE DEPTH
7.4 m	4.1 m
SURFACE TEMP	REGULATIONS
8.54°C	Special Management
SAMPLING DATES	NET SETS
June 03 - 09	140

Location

Dezadeash Lake is in the southwestern Yukon, within the Traditional Territory of the Champagne and Aishihik First Nations. This lake lies on the eastern border of Kluane National Park and Reserve, approximately 40 km south of Haines Junction.

Access and Use

Access to Dezadeash is along the Haines Road (Hwy 3). This lake has a government campground near the southern end with an accessible boat launch, as well as several residences.

Overall Status

Lake Trout

Dezadeash Lake is a shallow, productive lake with a healthy population of large-bodied lake trout. This finding agrees with previous sampling results. This population may be at risk due to decreasing thermal habitat availability as water temperatures increase with climate change.

Lake Whitefish

The lake whitefish population within Dezadeash Lake was healthy with a high relative density. Of interest, this lake also contains Squanga whitefish, a species listed federally as one of Special Concern.

Recommendation

The recommendation from the 2013 survey is to slightly increase the number of biological samples in future surveys to improve our certainty in the population status. This uniquely shallow lake should be monitored for habitat changes due to increasing temperatures associated with climate change.

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Lake Trout

During the 2013 survey, a total of 228 lake trout were captured.

Population Estimate and Density

The lake trout population in Dezadeash Lake was estimated at **50,205** individuals. However our confidence in the estimate was weak (estimate range: 34, 536 – 66,694). This corresponded to a density of 6.3 lake trout per hectare.

Length and Weight

Fork lengths ranged from 395 mm to 829 mm, with an average length of 642 mm and weight of 3,323 g.

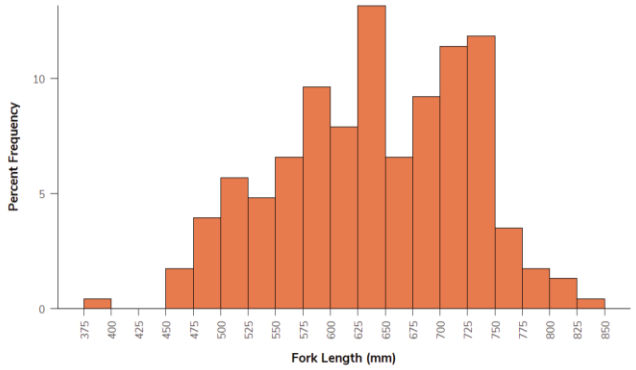

Figure 6. Length frequency distribution of sampled lake trout in Dezadeash Lake (2017), n = 228.

Age and Growth

Age structures were obtained from 14 lake trout during the 2013 survey, with ages ranging from 6 to 24 years.

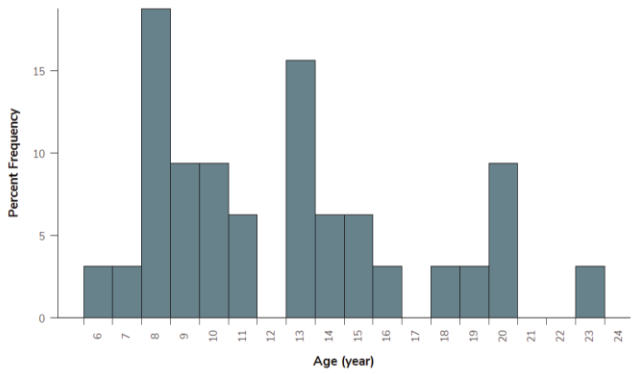

Figure 7. Age frequency distribution of 2017 sampled lake trout in Dezadeash Lake, n = 14

Lake Whitefish

A total of 629 lake whitefish were captured during this survey.

Length and Weight

They ranged in fork length from 208 mm to 510 mm, with an average length of 307 mm and weight of 386 g. Age structures were interpreted from 139 lake whitefish. Ages ranged between 3 and 16 years. This population appears healthy.

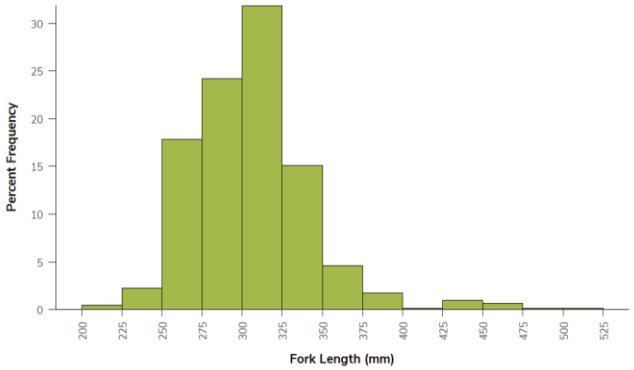

Figure 8. Length frequency distribution of sampled lake whitefish in Dezadeash Lake (2017), n = 629.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken from the middle of the lake on June 9, 2013. Both temperature and dissolved oxygen were consistent throughout the water column. This is expected in a system as shallow as Dezadeash Lake.

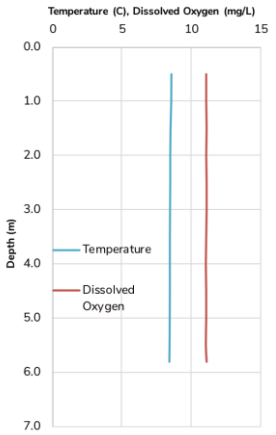

Figure 9. Temperature (C) and dissolved oxygen (mg/L) as measured in Dezadeash Lake, June 9, 2017.

Dezadeash Lake 2020

Lake Information

WATERSHED	LAKE CLASS
Alsek	E
SURFACE AREA	**ELEVATION**
7,968 ha	690 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
7.4 m	4.1 m
SURFACE TEMP	**REGULATIONS**
8.54^{O}C	Special Management
SAMPLING DATES	**NET SETS**
June 03 - 09	140

Location

Dezadeash Lake is in the southwestern Yukon, within the Traditional Territory of the Champagne and Aishihik First Nations. This lake lies on the eastern border of Kluane National Park and Reserve, approximately 40 km south of Haines Junction.

Access and Use

Access to Dezadeash is along the Haines Road (Hwy 3). This lake has a government campground near the southern end with an accessible boat launch, as well as several residences.

Overall Status

Dezadeash Lake experiences long, cold, winter conditions and tends to warm quickly in the summer because it is a shallow lake. At times, the lake rises above optimal temperatures for lake trout (Mackenzie-Grieve and Post 2006b). During these warmer periods, lake trout confine their movements to cold-water refugia, and forage for food less frequently (Mackenzie-Grieve and Post 2006b). Thus, there is a need to closely monitor its fish populations to ensure there are appropriate regulations in place.

Lake Trout

In accordance with the 2020 survey results, the lake trout population in Dezadeash Lake remains viable. Both the size and age compositions are indicative of a resilient population.

Whitefish

Compared to a previous survey the whitefish population's in Dezadeash also remains viable. Both the catch rates and population age composition were indicative of a sustainable population. Dezadeash has two species of whitefish, the lake whitefish (*Coregonus clupeaformis*) and the European whitefish (*Coregonus lavaretus*). Due to its limited distribution, the European Whitefish has been listed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Distinguishing between the two species can be difficult. As such, genetic samples of all collected whitefish will undergo further analysis for species identification.

Recommendation

Due to the lakes bathymetry, the recommendation for Dezadeash Lake is to continue monitoring fish populations to determine the impacts of climate change and angling pressure.

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Lake Trout

During the 2020 survey, we sampled 192 lake trout, with a mean catch rate per net of 3.22 fish per hour.

Population Estimate

Dezadeash Lake has an average depth of less than 10 m, making lake trout vulnerable to our nets. This creates a population estimate that is inflated and unreliable.

Length and Weight

Sampled lake trout ranged in fork length from 313 mm to 768 mm, with a mean fork length and weight of 550 mm and 2202 g, respectively.

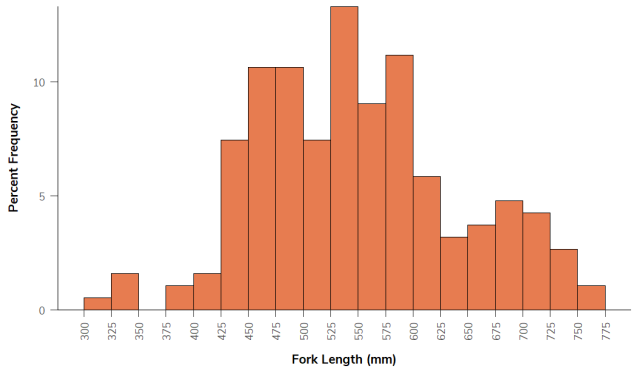

Figure 10. Length frequency distribution of lake trout as sampled in Dezadeash Lake (2020), n = 192.

Age and Growth

Ages interpreted from the 148 sampled lake trout ranged from 4 to 30, with an average age of 13.

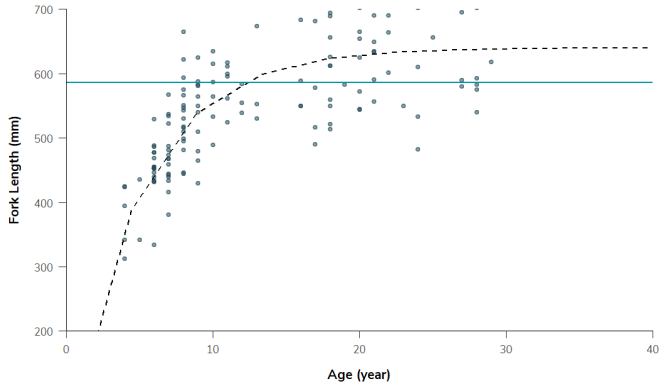

Figure 11. Von Bertalanffy growth curve of age-analyzed lake trout in Dezadeash Lake (2020), n = 148.

Lake Whitefish

During this survey, we sampled 1,220 whitefish resulting in an average catch rate of 17.42 whitefish per hour.

Length and Weight

Sampled whitefish varied in fork length from 147 mm to 521 mm, with a mean fork length and weight of 282 mm and 269 g, respectively.

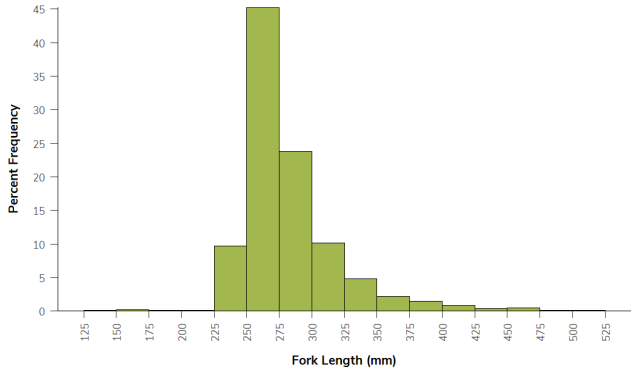

Figure 12. Length frequency of lake whitefish as sampled in Dezadeash Lake (2020), n = 1,220.

Age and Growth

Ageing structures interpreted from 145 whitefish indicates that the age distribution ranges from 6 to 26 years, with an average age of 12.

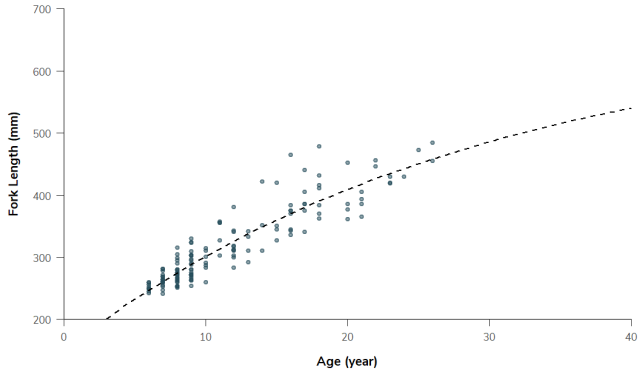

Figure 13. Von Bertalanffy growth curve of age-analyzed lake whitefish in Dezadeash Lake (2020), n = 145.

Temperature and Dissolved Oxygen

The June 15 temperature profile was homothermic with a lake temperature of 12.3^{O}C throughout the column. These temperatures were at the higher end of the optimal for lake trout (8 – 12^{O}C).

Pine Lake 2010

Lake Information

WATERSHED	**LAKE CLASS**
Alsek	B
SURFACE AREA	**ELEVATION**
603 ha	625 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
28 m	14.7 m
SURFACE TEMP	**REGULATIONS**
n/a	Special Management
SAMPLING DATES	**NET SETS**
July 05 – 07	27

Location

Pine Lake is near the community of Haines Junction along the Alaska Highway. It is in the Traditional Territory of the Champagne and Aishihik First Nations.

Access and Use

Pine Lake is accessed by the Alaska Highway via a popular government campground with an accessible boat ramp. There are also several permanent residences along the lakeshore.

Overall Status

Lake Trout

Results indicate that Pine Lake has a critically small population of lake trout. Evidence suggests that levels of lake trout in Pine Lake are depleted and the population may have collapsed.

Lake Whitefish

Pine Lake contains a healthy population of lake whitefish, which are likely the main diet for other predators in this lake, such as northern pike and burbot.

Recommendation

The recommendation from the 2010 survey is to minimize all lake trout harvest, in an effort to naturally rebuild this population. This process may take many years to occur. A secondary survey is recommended in 2020 to determine if the population is responding to newly established regulation changes.

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Lake Trout

Overview

Only two lake trout were captured during this survey, averaging 503 mm in length (as measured to the fork) and 1600 g in weight. Age structures were only taken from one of these fish, which was determined to be 23 years old.

Population Estimate and Density

Due to the limited number of lake trout captured during this survey, the population estimate is uncertain. The density calculated shows a potential of 1.4 lake trout per hectare, however there is little confidence in this estimate. Nevertheless, the limited number of lake trout captured suggests the population may have undergone a collapse.

The low numbers captured do not allow for accurate catch frequency or age comparisons.

Lake Whitefish

During this survey, 66 lake whitefish were captured.

Length and Weight

Sampled whitefish ranged from 460 mm to 620 mm in length (as measured to the fork), with an average length of 528 mm and weight of 2,287 g. Twenty-four lake whitefish were sampled for age, which showed a range from 11 to 24 years old, with an average age of 16.

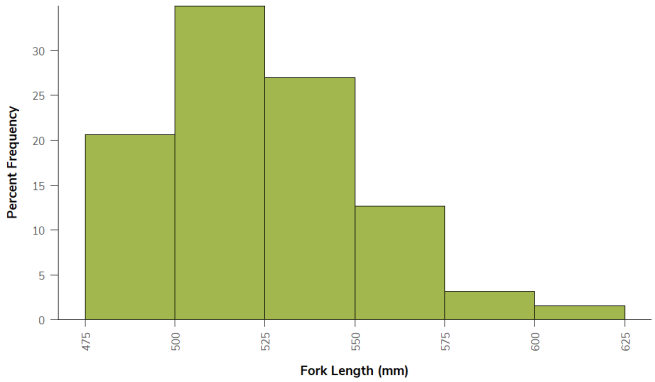

Figure 14. Length frequency distribution of sampled lake whitefish in Pine Lake (2010), n = 66

Temperature and Dissolved Oxygen

Temperature and oxygen profiles were not assessed during the 2010 survey, as this specialized equipment was not available.

Pine Lake 2020

Lake Information

WATERSHED	LAKE CLASS
Alsek	B
SURFACE AREA	**ELEVATION**
603 ha	625 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
28 m	14.7 m
SURFACE TEMP	**REGULATIONS**
15.1°C	Special Management
SAMPLING DATES	**NET SETS**
Aug 11 – 12	30

Location

Pine Lake is near the community of Haines Junction along the Alaska Highway. It is in the Traditional Territory of the Champagne and Aishihik First Nations.

Access and Use

Pine Lake is accessed by the Alaska Highway via a popular government campground with an accessible boat ramp. There are also several permanent residences along the lakeshore.

Overall Status

Lake Trout

To encourage population recovery, the harvesting of lake trout from Pine Lake is currently prohibited. Only a small number of lake trout were sampled during the 2020 survey and therefore no population estimates could be derived. However, given the small sample size, it is likely that the population remains low.

Lake Whitefish

Pine Lake continues to have a viable population of lake whitefish. With an average fork length of 549 mm, whitefish in Pine Lake tend to be larger than whitefish in the neighbouring lakes of Dezadeash and Aishihik, which have average fork lengths of 282 mm and 307 mm, respectively.

Recommendation

Given the results of the 2020 survey, the recommendation is to develop a **Lake Trout Recovery Plan** for Pine Lake. This would involve a synthesis and assessment of data from previous sampling efforts and creel surveys. The plan would also include the establishment of a sampling schedule to monitor for changes in lake trout abundance, growth and age composition.

This plan should be developed in collaboration with the Alsek Renewable Resource Council and the Champagne and Aishihik First Nations.

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Lake Trout

The 2020 survey sampled 8 lake trout.

Population Estimate and Density

Given the small number of lake trout sampled during the 2020 survey, a meaningful population estimate could not be determined for Pine Lake. However, given how few lake trout were sampled (n= 8) it is likely the population is small.

Length and Weight

Fork lengths of the sampled lake trout ranged from 355 mm to 460 mm, with a mean fork length and weight of 436 mm and 1017 g, respectively.

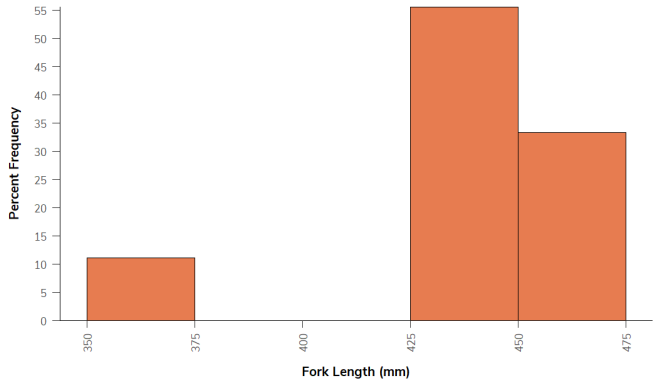

Figure 15. Length frequency distribution of lake trout as sampled in Pine Lake (2020), n = 8.

Lake Whitefish

The 2020 survey sampled 90 lake whitefish.

Length and weight

Sampled whitefish ranged in size from 446 mm to 598 mm, with a mean fork length and weight of 540 mm and 2,373 g, respectively.

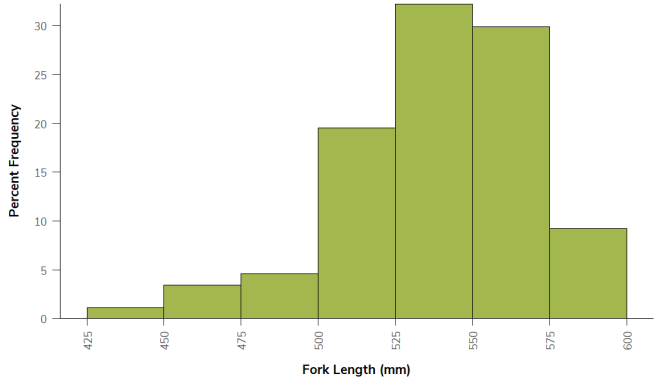

Figure 16. Length frequency distribution of sampled lake whitefish in Pine Lake (2020), n = 90.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were obtained on August 11. The temperature profile displayed a gradual thermocline between 10 m and 15 m, with optimal thermal habitat for lake trout between 12m and 15 m. Dissolved oxygen gradually declined with depth, with suitable oxygen levels for lake trout throughout the water column.

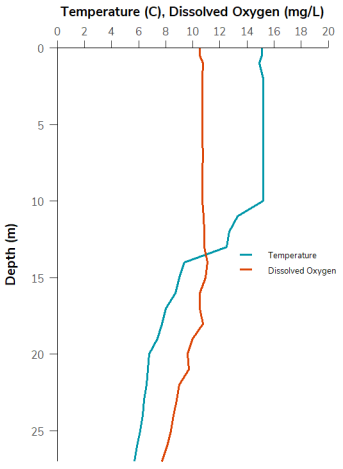

Figure 17. Temperature (C) and dissolved oxygen (mg/L) as measured in Pine Lake, August 11, 2020.

Sekulmun Lake 2010

Lake Information

WATERSHED	**LAKE CLASS**
Alsek	D
SURFACE AREA	**ELEVATION**
4985 ha	921 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
53 m	28 m
SURFACE TEMP	**REGULATIONS**
n/a	Conservation waters
SAMPLING DATES	**NET SETS**
Aug 18 – 21	86

Location

Sekulmun Lake lies to the west of Aishihik Lake, southwest of Aishihik Village. The lake is in the Traditional Territory of the Champagne and Aishihik First Nations.

Access and Use

Sekulmun Lake is accessed via a trail from Aishihik Village, as well as by the Sekulmun River, which connects to Aishihik Lake.

Overall Status

Lake Trout

Results from sampling indicated Sekulmun Lake has a healthy population of large-bodied lake trout. Due to its inaccessibility, the lake receives minimal recreational pressure. This may account for the healthy population.

Lake Whitefish

We could not determine the status of lake whitefish populations during the 2010 survey, as only a single lake whitefish was captured. Given the small sample, the population may not be large. Additional species that are present in the lake include: round whitefish, pygmy whitefish, arctic grayling, northern pike, burbot and longnose suckers.

Recommendation

The recommendation from the 2010 survey is to increase the number of net sets and biological samples for age analysis for future surveys.

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Lake Trout

Overview

Sixty lake trout were captured during this survey, averaging 506 mm in length (as measured to the fork) and 2,345 g in weight. Age structures were not obtained during this survey.

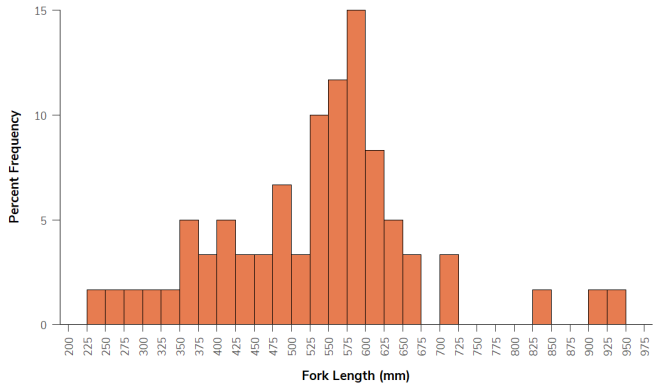

Figure 18. Length frequency distribution of lake trout as sampled in Sekulmum lake (2010), n = 60.

Population Estimate and Density

The population of lake trout is estimated at approximately 18,651 (ranging between 10,303 – 27,303). This corresponds with a density of 3.7 lake trout per lake hectare.

Lake Whitefish

Overview

During this survey only one lake whitefish was captured, which does not allow us to accurately estimate population status.

Temperature and Dissolved Oxygen

Temperature and oxygen profiles were not assessed during the 2010 survey, as this equipment was not available at the time.

Mackenzie River Watershed

Upper Liard, Central Liard, Peel and Southwestern Beaufort Sea

Frances Lake 2017

Lake Information

WATERSHED	LAKE CLASS
Upper Liard	E
SURFACE AREA	**ELEVATION**
9,941 ha	734 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
93 m	31 m
SURFACE TEMP	**REGULATIONS**
17.4^{O}C	Conservation waters
SAMPLING DATES	**NET SETS**
Aug 11 – 15	149

Location

Frances Lake is located in the southeast Yukon, approximately 171 km north of Watson Lake, along the Robert Campbell Highway. This lake lies within the Kaska Dena Council Traditional Territory.

Access and Use

Frances Lake is accessed by a government campground on the west arm, as well as a public boat launch and wilderness lodge, located on the southern end. There are a few cabins located along the shoreline.

Overall Status

Lake Trout

In accordance with 2017 survey results, the lake trout population in Frances Lake, is a healthy, large-bodied population. The lake had a moderate density and healthy age demographic of lake trout.

Lake Whitefish

The population of lake whitefish in Frances Lake is a healthy population, with a wide age range.

Recommendation

The recommendation for future surveys is to determine recreational angling pressure by conducting an Angler Harvest Survey. If this lake is sampled by the SPIN method again, an increase in biological data for age analysis will provide more information on the health of this population. This should focus on collecting age structures to provide a more accurate growth rate, and determining if the cohorts missing in this survey were a factor of chance, or suggest multiple years of recruitment failure.

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Lake Trout

During the 2017 survey of Frances Lake, a total of 106 lake trout were captured.

Population Estimate and Density

The population of lake trout in Frances Lake, as assessed in the 2017 survey, was **37,551** (estimate range: 19,189 to 56,525). This estimate equates to an average density of 3.4 lake trout per hectare.

Length and Weight

These large-bodied lake trout ranged in fork length from 154 mm to 917 mm with an average length of 476 mm and weight of 1,838 g.

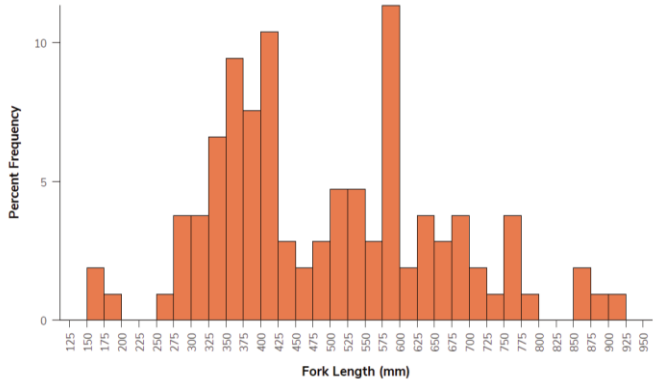

Figure 19. Length frequency distribution of sampled lake trout in Frances Lake (2017), n = 106.

Age and Growth

Age structures, obtained from 46 lake trout, showed an age variation from 4 through 40 years. The growth curve illustrates a near linear-relation, however it is skewed due to missing age cohorts captured from 17-23.

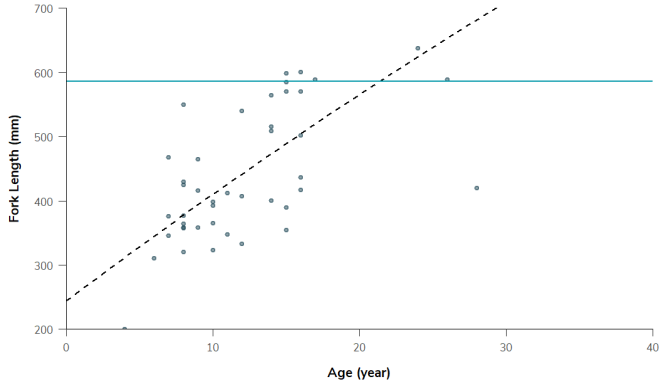

Figure 20. Von Bertalanffy growth curve of age-analyzed sampled lake trout in Frances Lake (2017), n = 46.

Lake Whitefish

During the 2017 survey, a total of 140 lake whitefish were captured in Frances Lake. The size range of these fish ranged from 240 mm to 617 mm, with an average fork length of 416 mm and weight of 1,181 g. The 74 sampled lake whitefish had an age range from 4 to 20 years of age.

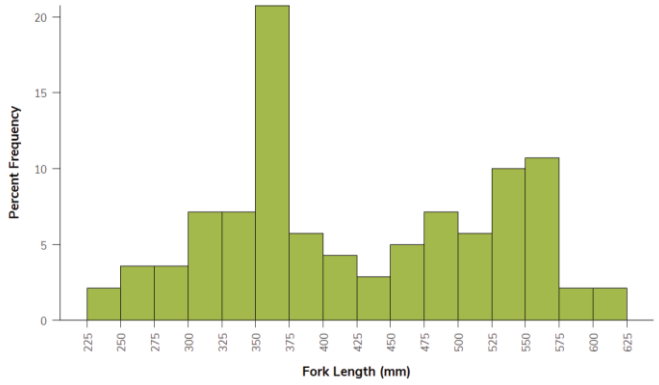

Figure 21. Length frequency distribution of sampled lake whitefish in Frances Lake (2017), n = 140.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were obtained on August 15. The temperature profile displayed a steep decline from the surface through 30 m, decreasing from 17°C to 5°C. From 30 m to the bottom the temperature remained constant. Dissolved oxygen was stable across the profile. Overall, optimum lake trout habitat ranged from 15 m to 90 m.

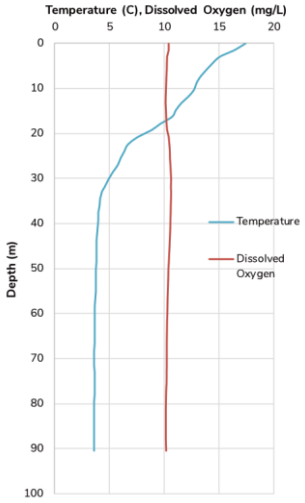

Figure 22. Temperature (C) and dissolved oxygen (mg/L) as measured in Frances Lake, August 15, 2018.

Simpson Lake 2014

Lake Information

WATERSHED	**LAKE CLASS**
Upper Liard	C
SURFACE AREA	**ELEVATION**
2,180 hs	694 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
58 m	38 m
SURFACE TEMP	**REGULATIONS**
16.5^{O}C	General waters
SAMPLING DATES	**NET SETS**
June 24 – 27	69

Location

Simpson Lake is located within the Liard watershed in the southeastern Yukon. This lake lies within the Traditional Territory of the Kaska Dena Council.

Access and Use

Simpson Lake is accessed along the Robert Campbell highway, 73 km north of Watson Lake. There is a government campground at the southern end of the lake, with an accessible boat ramp.

Overall Status

Lake Trout

In accordance with the 2014 survey, the results of Simpson Lake showed a moderate density of large-bodied lake trout. This population appears healthy.

Lake Whitefish

The 2014 survey of Simpson Lake captured few lake whitefish, an indication the population may be small. However, round whitefish were captured in larger numbers. This may be an important prey species for lake trout in this lake.

Recommendation

The recommendation for future surveys is to perform an Angler Harvest Survey on Simpson Lake to determine recreational pressure. In addition, if this lake is surveyed in the future, net sets should be increased to ensure greater precision in the population estimate.

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Lake Trout

During the 2014 Simpson Lake survey a total of 46 lake trout were sampled.

Population Estimate and Density

The population of lake trout in Simpson Lake, as assessed during the 2014 survey was estimated at **7,240** (estimate range: 3,663 – 10,936). This equates to a density of 3.3 lake trout per hectare.

Length and Weight

These lake trout ranged in size (fork length) from 337 mm to 812 mm, with an average length of 594 mm and weight of 2,784 g.

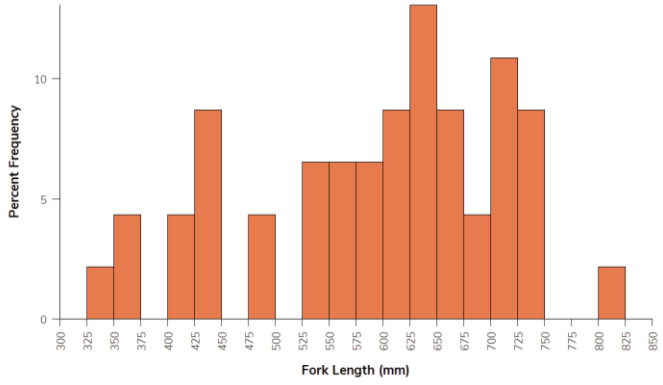

Figure 23. Length frequency distribution of sampled lake trout in Simpson Lake (2014), n = 46.

Age and Growth

Age structures were obtained from seven fish, with an age range from 5 to 30 years.

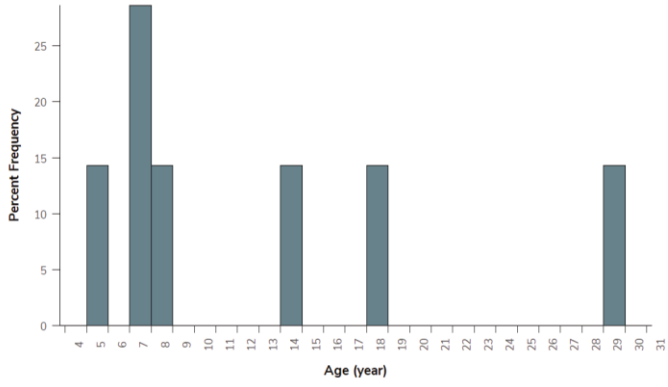

Figure 24. Age frequency distribution of age-analyzed lake trout in Simpson Lake (2014), n = 7.

Lake Whitefish

Only 8 lake whitefish were captured during the 2014 survey.

Length and Weight

Sampled whitefish ranged in length from 364 mm to 570 mm in length, with an average fork length and weight of 501 mm and 2,000 g. Age structures were not obtained.

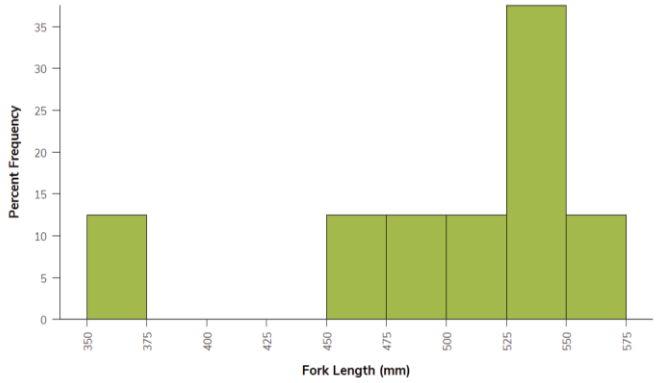

Figure 25. Length frequency distribution of sampled lake whitefish in Simpson Lake (2014), n = 8.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken in the main basin, near the center of the lake on June 27, 2014. Dissolved oxygen levels gradually decreased with depth, however they remained optimal for lake trout throughout the water column.

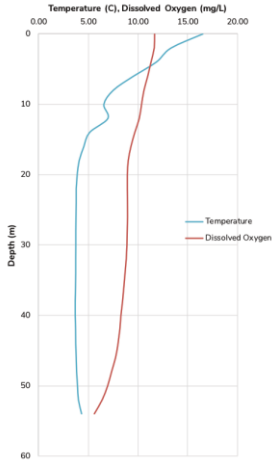

Figure 26. Temperature (C) and dissolved oxygen (mg/L) as measured in Simpson Lake, June 27, 2014.

Toobally Lakes 2019

Lake Information

WATERSHED	**LAKE CLASS**
Central Liard	C
SURFACE AREA	**ELEVATION**
1170(U), 1080(L) m	623 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
118(U), 60(L) m	22.8(U), 16.7(L) m
SURFACE TEMP	**REGULATIONS**
17.3°C(U), 17.3°C(L)	General waters
SAMPLING DATES	**NET SETS**
July 24 – 28	45(U), 44(L)

Location

The Toobally Lakes (Upper and Lower) are located in the southeastern corner of the Yukon, approximately 140 km east of town of Watson Lake. These lakes lie within the Traditional Territory of the Kaska Dena Council.

Access and Use

The Toobally Lakes are accessible by fly-in only, with an established outfitting lodge operating with cabins at each lake. There is no road access, nor additional private residences on these lakes.

Overall Status

Lake Trout

As estimated from the 2019 survey, the lake trout populations in Upper (U) and Lower (L) Toobally, are heathy and moderately sized.

The oxygen levels were found to be at the low end of optimal for lake trout in Lower Toobally, however there is no indication that this population is currently being limited by these low levels.

Lake Whitefish

The lake whitefish populations in the Toobally Lakes also appear healthy, at a low to moderate level.

Recommendation

The recommendation for future surveys of the Toobally Lakes is to continue working with the sport fishing lodge to determine their angling pressure and to monitor dissolved oxygen levels. Additional age analysis will assist in providing more information on the health of this population.

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Lake trout

Population Estimate and Density

The 2019 survey indicated a population in Upper Toobally of **4,564** (estimate range: 2,589 – 6,614) and in Lower Toobally of **4,235** (estimate range: 2,419 – 6,121). This corresponded to densities of 3.9 lake trout /ha in both lakes.

Length and Weight

Sampled lake trout ranged in size from 240 to 915 mm (U), 269 to 876 mm (L), with a mean fork lengths of 625 mm (U) and 672 mm (L). This resulted in mean lake trout weights of 3243 g (U) and 4342 g (L).

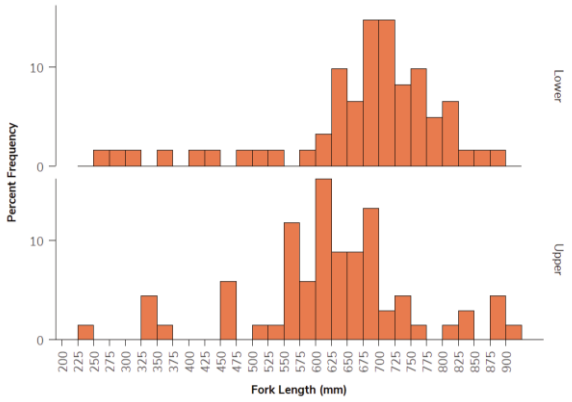

Figure 27. Length frequency distributions of lake trout in Upper (n=68) and Lower (n=61) Toobally Lakes, in 2019.

Age and Growth

Ages ranged from 5 to 45, with the mean age in the Lower lake of 15 and for the Upper lake at 14.

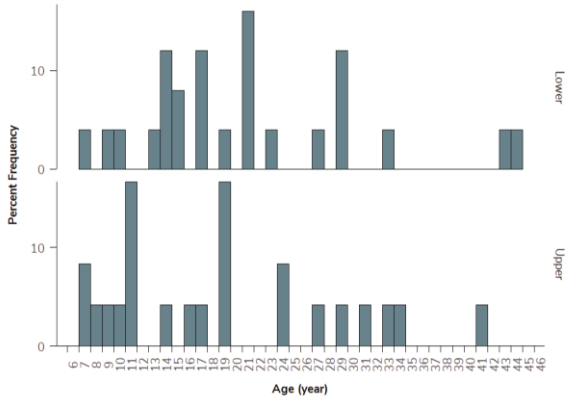

Figure 28. Age frequency distributions of age-analyzed lake trout in Upper (n=24) and Lower (n=25) Toobally Lakes, in 2019

Lake Whitefish

Overview

A total of 55 (U) and 29 (L) lake whitefish were captured in 2019. These fish ranged in size from 215 to 460 mm (U), 196 to 509 mm (L), with an average fork lengths of 388 (U) and 509 (L). This resulted in average weights of 859 g (U) and 932 g (L). Ages were interpreted from 68 lake whitefish (24L, 44U). Ages ranged from 5 to 22, with the average age in the Lower lake of 9 and the Upper lake of 11.

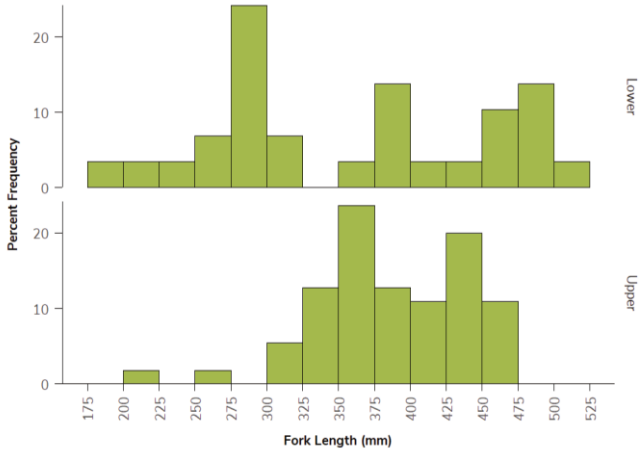

Figure 29. Length frequency distributions of sampled lake whitefish in Upper and Lower Toobally Lakes in 2019.

Temperature and Dissolved Oxygen

Profiles in both lakes display a sharp thermocline from 5 m to 12 m, with temperatures decreasing gradually throughout the rest of the water column. Overall, Upper Toobally provided optimum lake trout habitat from 8 m to lake bottom, with Lower Toobally providing suitable habitat from 8 m to 20m, with tolerable, but low oxygen levels below 20m.

Watson Lake 2015

Lake Information

WATERSHED	**LAKE CLASS**
Upper Liard	C
SURFACE AREA	**ELEVATION**
1,410 ha	680 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
32 m	14.5 m
SURFACE TEMP	**REGULATIONS**
17.3^{o}C	Special Management
SAMPLING DATES	**NET SETS**
July 7-12	46

Location

Watson Lake is located approximately 4 km north of the community of Watson Lake, in the southeastern Yukon, along the Robert Campbell highway. This lake lies within the Kaska Dena Council Traditional Territory.

Access and Use

Watson Lake is a popular recreational lake with access available at the government campground and along the Robert Campbell highway. The Watson Lake airport is situated on the north shore, it was constructed just prior to the development of the Alaska Highway.

Overall Status

Lake Trout

The lake trout population in Watson Lake displayed a lower than average density, when compared to Yukon lakes of similar size and productivity. This may indicate that the lake trout population in Watson Lake is small and at risk of depletion if fishing pressures increase.

Lake Whitefish

Results from the 2015 survey indicated a healthy population of lake whitefish, with considerable habitat for this species.

Recommendation

The recommendation for future surveys of Watson Lake is to increase the number of net set and collection of age structures for analysis. This will help increase out ability to detect changes in population and provide information on the health of this population.

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Lake Trout

Overview

During the Watson Lake 2015 survey a total of 41 lake trout were captured.

Population Estimate and Density

The population estimate of lake trout in Watson Lake was 4,105 (range: 1,831 – 6,445). This equated to a density of 2.9 large-bodied lake trout per hectare.

Length and Weight

These lake trout were ranging in size (fork length) from 182 mm to 830 mm, with an average length of 513 mm and weight of 1,728 g.

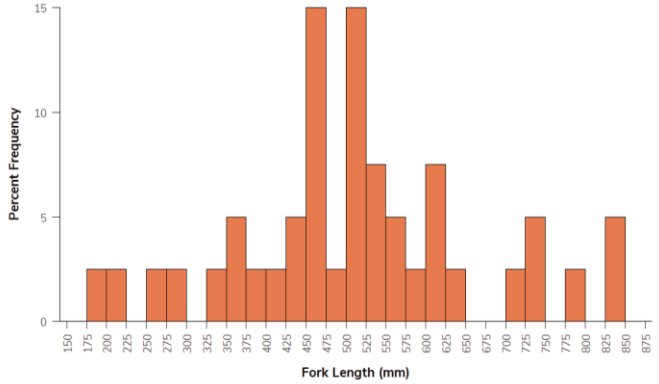

Figure 30. Length frequency distribution of sampled lake trout in Watson Lake (2015), n = 41.

Age and Growth

Age Structures were obtained from 14 lake trout. Ages ranged from 6 to 25 years.

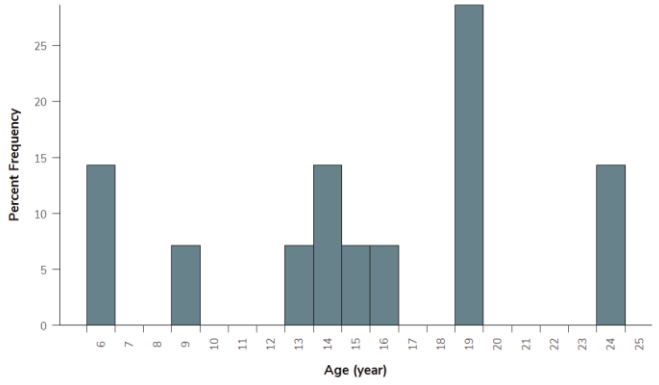

Figure 31. Age frequency distribution of age-analyzed lake trout in Watson Lake (2015), n = 14.

Lake Whitefish

Overview

A total of 415 lake whitefish were captured during the 2015 Watson Lake survey, ranging in size from 219 mm to 472 mm in length. The average fork length was 396 mm and weight was 808 g. Age structures were obtained from 61 lake whitefish. Ages ranged from 4 through 31 years.

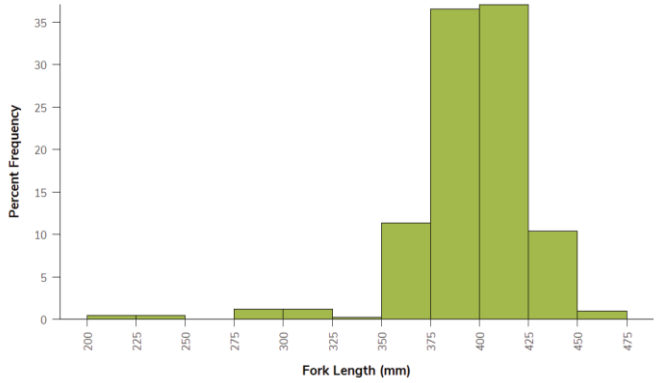

Figure 32. Length frequency distribution of sampled lake whitefish in Watson Lake (2015), n = 415.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken on July 23, 2015. Given the observed temperatures, suitable lake trout habitat was found between 10 m and lake bottom.

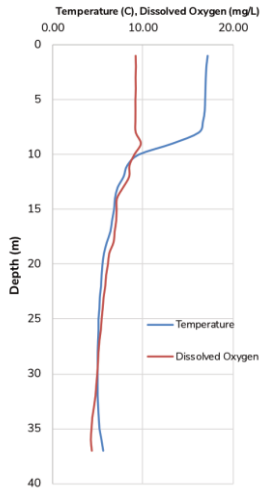

Figure 33. Temperature (C) and dissolved oxygen (mg/L) as measured in Simpson Lake, July 23, 2015.

Yukon River Watershed

Yukon Headwaters, Upper Yukon, Pelly, Steward, Central Yukon and Porcupine

Atlin Lake 2014

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	F
SURFACE AREA	**ELEVATION**
58,792 ha	670 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
283 m	85.6 m
SURFACE TEMP	**REGULATIONS**
21°C	Special Management
SAMPLING DATES	**NET SETS**
August 5 – 13	150

Location

Atlin Lake is a large, deep lake primarily located in northwestern British Columbia, with only the northern end extending into the southern Yukon. It is approximately 120 km southeast of Whitehorse. Altin Lake forms the headwaters of the Yukon River drainage. Atlin Lake lies within the Traditional Territories of the Taku River Tlingit and Carcross/Tagish First Nations.

Access and Use

Atlin Lake is accessed via the Atlin Road and the town of Atlin, BC, with accessible boat ramps. Atlin is a popular recreational fishery.

Overall Status

Lake Trout

In accordance with the 2014 survey results, the lake trout population in Atlin Lake is of the large-bodied form and population is healthy. Although this is a popular recreational angling destination, due to the size of the lake, its lake trout population is larger and can sustain greater pressure.

Lake Whitefish

Given the 2014 survey results, the population of lake whitefish in Atlin Lake appears to be small. Care needs to be taken to ensure the population remains healthy.

Recommendation

The recommendation for future surveys is to maintain the sampling protocols implemented in 2014, by using the same number of net sets. This number of sets gave suitable confidence for the population estimate. Future assessment should continue to focus on gathering increased age data, as the analysis showed few aged fish were over 22 years of age.

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Lake Trout

During the 2014 survey, a total of 140 lake trout were captured.

Population Estimate and Density

The population of lake trout within Atlin Lake was estimated to be at **243,000** (estimate range: 142,808 – 346,689). This equates to a density of 4.2 lake trout per hectare.

Length and Weight

Lake trout ranged in size from 248 mm to 960 mm in fork length. Sampled lake trout had an average length of 499 mm and weight of 1,677 g.

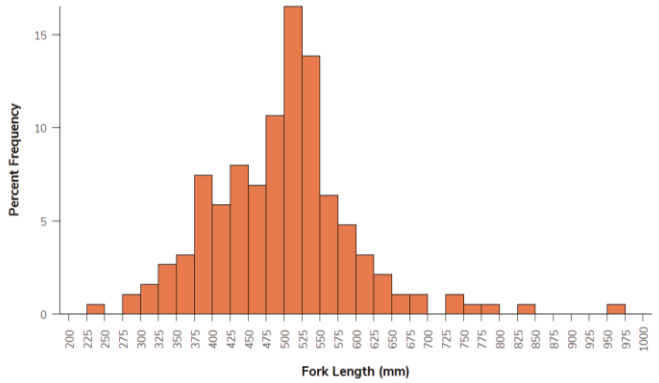

Figure 34. Length frequency distribution of sampled lake trout in Atlin Lake (2014), n = 140.

Age and Growth

Age structures were obtained from 68 individuals. Ages ranged from 5 to 22 years old.

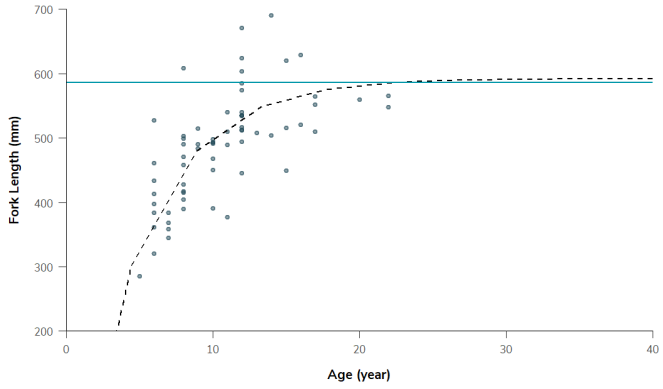

Figure 35. Von Bertalanffy growth curve of age-analyzed sampled lake trout in Atlin Lake (2014), n = 68. Horizontal line indicates current upper slot limit.

Lake Whitefish

Overview

During this survey, 11 lake whitefish were captured in Atlin Lake. The lake whitefish captured ranged from 429 mm to 520 mm, with an average length of 482 mm and weight of 1,479 g. No aging structures were obtained from these fish.

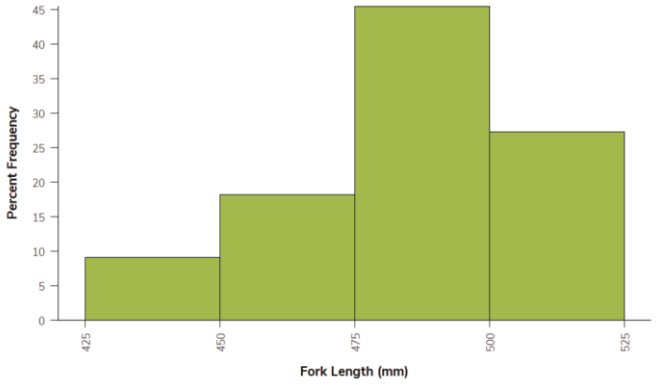

Figure 36. Length frequency distribution of sampled lake whitefish in Atlin Lake (2014), n = 11.

Temperature and Dissolved Oxygen

There was a defined thermocline observed in the northern section between 25 m and 30 m, however no sharp thermocline was evident at the Atlin, BC sampling location. Temperature and dissolved oxygen levels were suitable for lake trout and whitefish from the surface to 60 m.

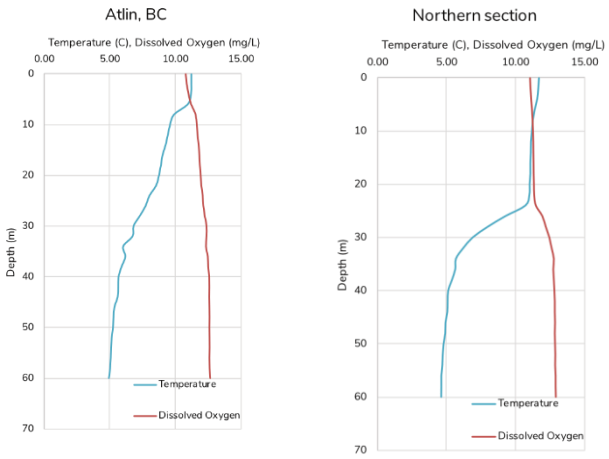

Figure 37. Temperature (C) and dissolved oxygen (mg/L) as measured at two locations (Atlin, Northern Section) on Atlin Lake, August 5, 2015.

Bennett Lake 2014

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	E
SURFACE AREA	ELEVATION
9,068 ha	656 m
MAXIMUM DEPTH	AVERAGE DEPTH
123 m	62 m
SURFACE TEMP	REGULATIONS
14.2°C	Special Management
SAMPLING DATES	NET SETS
July 15-24	136

Location

Bennett Lake is located within the southern lakes complex in the southern Yukon and is adjacent to the community of Carcross. Bennett Lake lies within the Traditional Territory of the Carcross/Tagish First Nation. This is a transboundary water, with the southern portion in British Columbia.

Access and Use

Bennett Lake is accessed via Carcross, with an accessible boat ramp. This lake is known for its high winds and as such, sees little recreational pressure, however this is an important lake as identified by the Carcross/Tagish First Nation.

Overall Status

Lake Trout

In accordance with the 2014 survey results, the lake trout population in Bennett Lake is healthy. The lake has a moderate density of lake trout when compared to lakes of similar size. This finding is consistent with previous surveys, which used alternate sampling methods.

Lake Whitefish

The population of lake whitefish in Bennett Lake appears small. Given the low productivity of the lake, this result may be normal. Nevertheless, as this is a large and deep lake, there is a potential that this survey did not adequately sample lake whitefish.

Recommendation

The recommendation for future surveys is to continue using the same number of net sets performed in 2014, as we were capable of generating a reliable population estimate. A more focused review of the adequacy of the current slot size should be conducted for this lake, as growth rates indicate this population will exhibit few if any fish above the current limit of 650 mm.

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Lake Trout

During the 2014 survey of Bennett Lake, a total of 128 lake trout were captured.

Population Estimate and Density

The population of lake trout in Bennett Lake was estimated at **28,629** (estimate range: 13,855 – 43,870). This equates to a density of 3.2 lake trout per hectare.

Length and Weight

Lake trout ranged in size from 177 mm to 795 mm in fork length. Sampled lake trout had an average length of 462 mm and weight of 1,315 g.

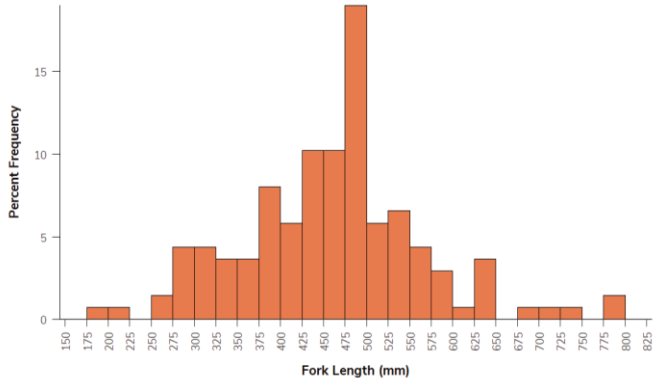

Figure 38. Length frequency distribution of sampled lake trout in Bennett Lake (2014), n = 128.

Age and Growth

Age structures were obtained from 82 individuals. Ages ranged from 3 to 22, with few individuals greater than 650mm.

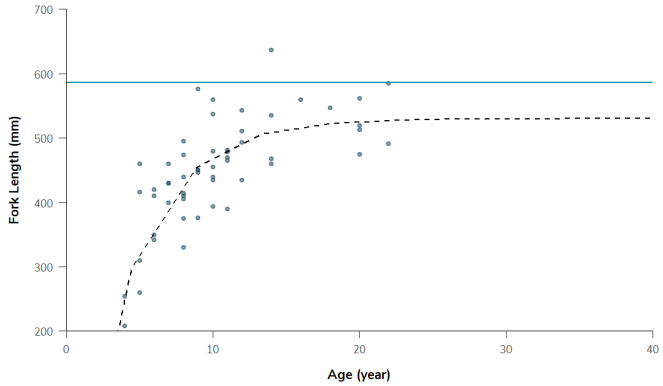

Figure 39. Von Bertalanffy growth curve of age-analyzed sampled lake trout in Bennett Lake (2014), n = 82. Horizontal line indicates current upper slot limit.

Lake Whitefish

Overview

During this survey, there were 39 lake whitefish sampled in Bennett Lake. The captured lake whitefish ranged in size from 280 mm to 580 mm, with an average length of 424 mm and weight of 1, 034 g. Age structures were obtained from six lake whitefish. Ages ranged from 5 to 20 years.

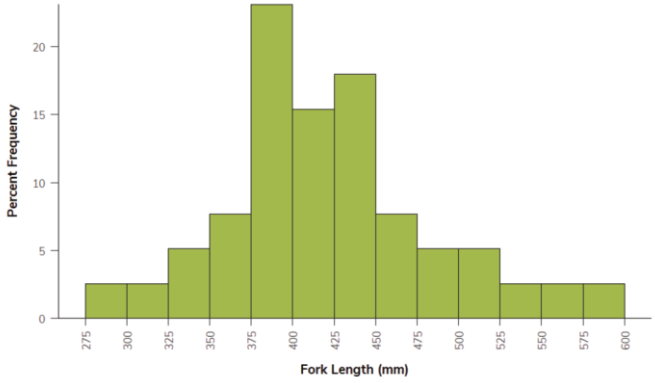

Figure 40. Length frequency distribution of sampled lake whitefish in Bennett Lake (2014), n = 39.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken within the main basin, Milhaven Bay, west arm and south arm. Measurements were taken to a depth of 60 m, which was the limit of our equipment. The main basin, west and south arms, showed similar profiles, with a weak thermocline between 5 and 11 m. Milhaven bay was shallow and exhibited a higher surface temperature, which gradually declined with depth. No thermocline was evident. Overall, Bennett Lake profiles illustrated suitable habitat throughout the water body for lake trout and lake w

Braeburn Lake 2016

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
562 ha	695 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
50 m	14.3 m
SURFACE TEMP	**REGULATIONS**
15.6^{O}C	Special Management
SAMPLING DATES	**NET SETS**
June 22-23	50

Location

Braeburn Lake is located approximately 103 km north of Whitehorse, near the North Klondike Highway, surrounded by a small community. This lake lies within the Traditional Territories of the Ta'an Kwäch'än Council, Little Salmon/Carmacks First Nation, Champagne/Aishihik First Nation and Kwanlin Dün First Nation.

Access and Use

Braeburn Lake is accessed through a public boat launch, near the north end of the lake, with multiple private residences along the east and west shoreline.

Overall Status

Lake Trout

Survey results from 2016 indicate Braeburn Lake has a small population of large-bodied lake trout when compared across Yukon lakes of similar size. Populations this size may not indicate collapse or depletion, however they should be monitored to prevent overharvest.

Lake Whitefish

The 2016 survey results indicate a small population of lake whitefish. The harvest pressure on lake whitefish is unknown. However our survey results suggest a conservative approach to harvest may be warranted, given the importance of this species as a lake trout food source.

Recommendation

The recommendation for future surveys would be to increase the number of net sets and biological samples for age analysis. This would help increase the accuracy of our population estimates and to detect changes in abundance and population structure. The performance of an Angler Harvest Survey on this lake would also assist in determining recreational fishing pressures.

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Lake Trout

During the 2016 survey of Braeburn Lake a total of 18 lake trout were sampled.

Population Estimate and Density

The population of lake trout in Braeburn Lake, as assessed during the 2016 survey was estimated to be 1,034 (estimate range: 135 – 1,950). This equated to a density of 1.8 large-bodied lake trout per hectare. Given the small sample size, there is little confidence in this estimate.

Length and Weight

Lake trout ranged in size (fork length) from 258 mm to 712 mm. Their average length was 527 mm and their average weight was 1,978 g.

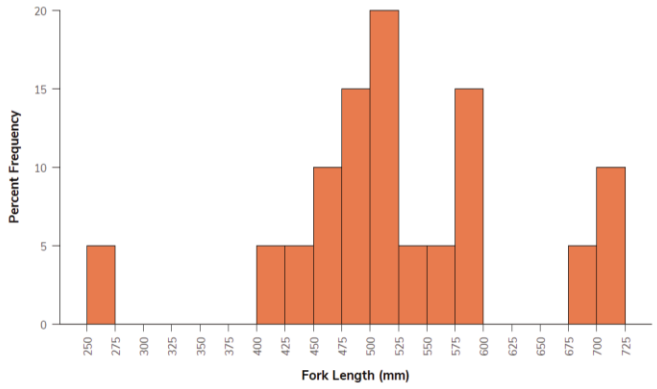

Figure 41. Length frequency distribution of sampled lake trout in Braeburn Lake (2016), n = 18.

Age and Growth

Age structures were obtained from eight lake trout. Ages ranged from 6 to 20 years.

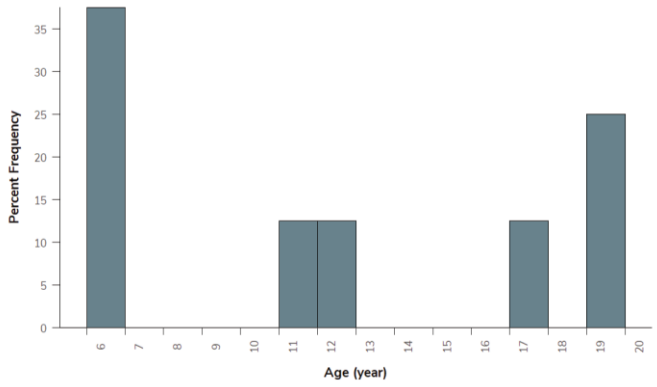

Figure 42. Age frequency distribution of age-analyzed lake trout in Braeburn Lake (2016), n = 8.

Lake Whitefish

Overview

A total of only seven lake whitefish were sampled, ranging in size from 312 mm to 521 mm, with an average fork length of 491 mm and an average weight of 1,811 g. Age structures were obtained from 6 lake whitefish. Ages ranged from 4 to 26 years.

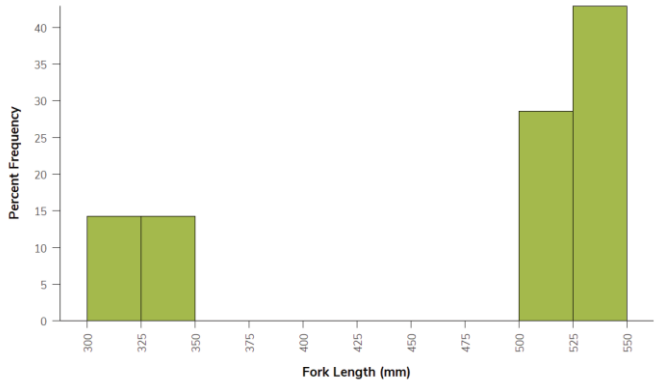

Figure 43. Length frequency distribution of sampled lake whitefish in Braeburn Lake (2016), n = 7.

Temperature and Dissolved Oxygen

The temperature profile displayed a gradual thermocline from 6 m to 15 m and a temperature range suitable for lake trout between 9 m and 40 m. Dissolved oxygen was relatively stable, decreased with depth and was suitable for lake trout throughout the water column.

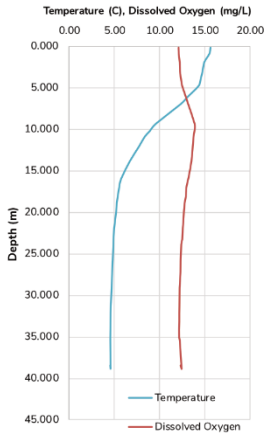

Figure 44. Temperature (C) and dissolved oxygen (mg/L) as measured in Braeburn Lake, June 22, 2016.

Caribou Lake 2011

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	A
SURFACE AREA	**ELEVATION**
51 ha	820 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
21 m	16.5 m
SURFACE TEMP	**REGULATIONS**
17.2^{O}C	Special Management
SAMPLING DATES	**NET SETS**
July 5 – 7	32

Location

Caribou Lake is located approximately 50 km southeast of Whitehorse, east of Marsh Lake. This lake is found within the Traditional Territories of the Carcross/Tagish and Kwanlin Dün First Nations.

Access and Use

Access to Caribou Lake is by an unmaintained road from the Alaska Highway. There is no boat launch at the lake. There is one residence on the lake.

Overall Status

Lake Trout

Survey results indicated the lake is productive and has a large density of small-bodied lake trout. This finding agrees with historical Angler Harvest Surveys and previous netting surveys. The population of lake trout in Caribou Lake appears healthy.

Lake Whitefish

There were no lake whitefish captured during this survey. Additional species captured during the survey included arctic grayling and round whitefish.

Recommendation

The recommendation from the 2011 survey was to replicate this survey in 2012 and to use this lake to determine the accuracy of SPIN methods.

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Lake Trout

Overview

A total of 87 lake trout were captured during the 2011 survey, ranging from 280 mm to 460 mm in fork length. Age structures were not obtained during the 2011 survey.

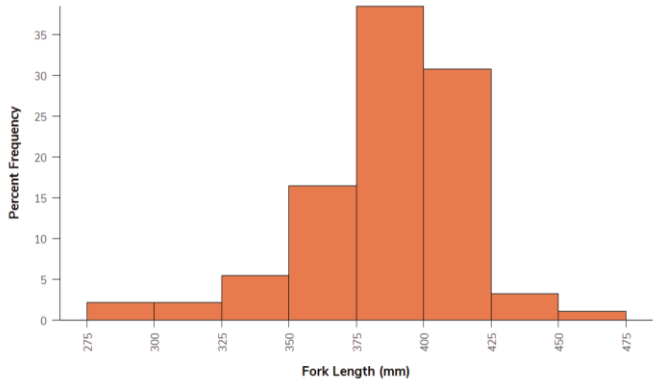


Figure 45. Length frequency distribution of sampled lake trout in Caribou Lake (2011), n = 87.

Population Estimate and Density

The lake trout population was estimated at **2,716** (estimate range: 2,238 – 3,237). This equates to a density of 53.2 lake trout per hectare, which is the largest recorded density of all sampled Yukon lakes.

Lake Whitefish

Overview

No lake whitefish were captured in Caribou Lake during the 2011 survey.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profile were taken in the north basin of Caribou Lake. The lake exhibited stratification at 6.5 m. Dissolved oxygen levels were optimal (>7 mg/L) down to 13 m, and suitable between 13 and 15 m.

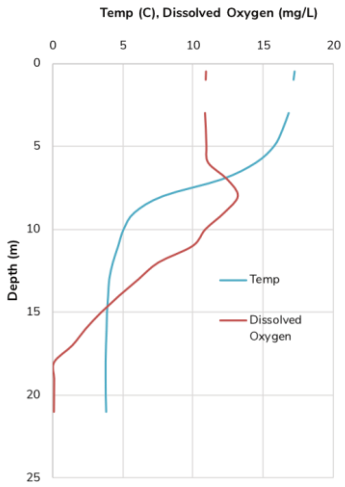
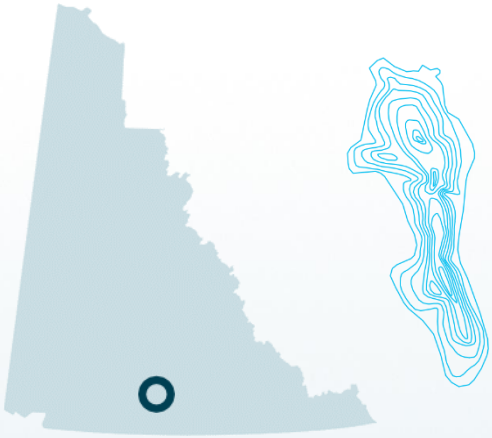


Figure 46. Temperature (C) and dissolved oxygen (mg/L) as measured in Caribou Lake, July 6, 2011.



Caribou Lake 2012

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	A
SURFACE AREA	ELEVATION
51 ha	820 m
MAXIMUM DEPTH	AVERAGE DEPTH
21 m	16.5 m
SURFACE TEMP	REGULATIONS
17.2^{O}C	Special Management
SAMPLING DATES	NET SETS
July 5 – 7	32

Location

Caribou Lake is located approximately 50 km southeast of Whitehorse, east of Marsh Lake. This lake is found within the Traditional Territories of the Carcross/Tagish and Kwanlin Dün First Nations.

Access and Use

Access to Caribou Lake is by an unmaintained road from the Alaska Highway. There is no boat launch at the lake. There is one residence on the lake.

Overall Status

Lake Trout

Caribou Lake was found to have a healthy population of small-bodied lake trout in 2012. This survey showed no statistical difference in population or density for lake trout, when compared to the 2011 survey. This result helped to validate the effectiveness of the SPIN method in estimating lake trout population size.

Lake Whitefish

There were no lake whitefish captured during this survey.

Recommendation

The recommendation from the 2012 survey is to continue using the SPIN methodology. Given our experimental results, in most instances, the number of nets should be increased to improve the precision of our population estimates.

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Lake Trout

A total of 83 lake trout were captured during the 2012 survey.

Population Estimate and Density

The lake trout population in Caribou Lake was estimated at **2,851** (estimate range: 2,360 – 3,381). This equates to a density of 55.9 lake trout per hectare.

Length and Weight

They ranged in size from 260 mm to 490 mm in fork length. The sampled lake trout had an average length of 390 mm and average weight of 630 g.

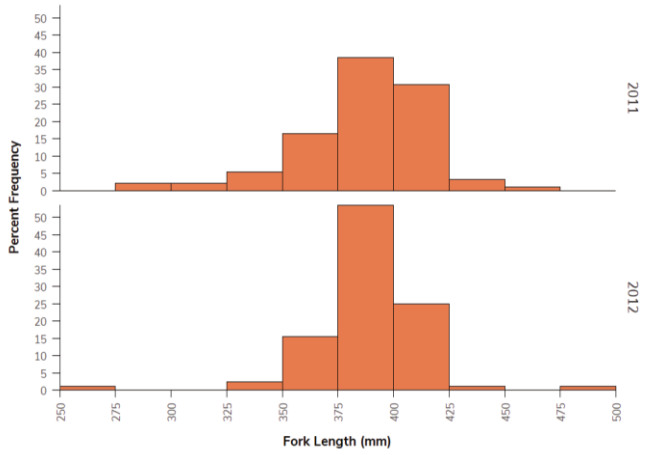


Figure 47. Length frequency distribution of sampled lake trout in Caribou Lake (2012), n = 83.

Age and Growth

Age structures were obtained from 22 lake trout. Ages ranged from 7 to 24 years.

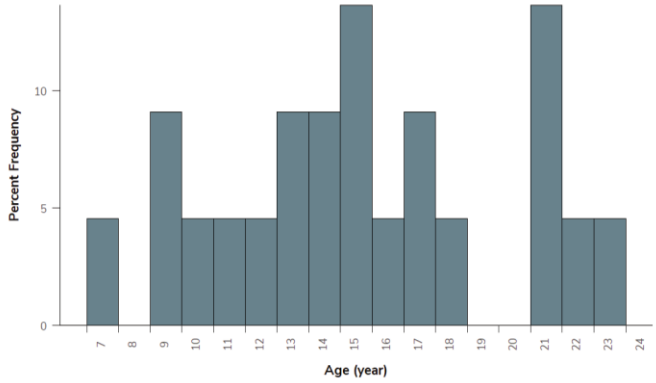


Figure 48. Age frequency distribution of age-analyzed lake trout in Caribou Lake (2012), n = 22.

Lake Whitefish

Overview

No lake whitefish were captured in Caribou lake during the 2012 survey.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken in the north basin of Caribou Lake on June 25, 2012. This location was the deepest part of the lake. Temperatures and oxygen levels were within suitable levels for lake trout. We found a thermocline occurring between 3 m and 4 m with a sudden drop from 15°C to 12°C. Optimal dissolved oxygen levels were found to a depth of 15 m.

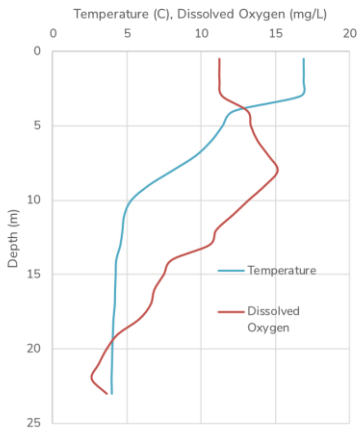
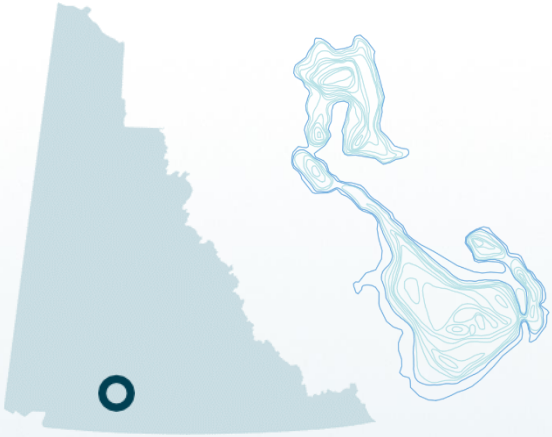


Figure 49. Temperature (C) and dissolved oxygen (mg/L) as measured in Caribou Lake, June 25, 2012.



Chadburn Lake 2015

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
144 ha	877 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
43 m	15 m
SURFACE TEMP	**REGULATIONS**
15.8°C	Special Management
SAMPLING DATES	**NET SETS**
June 23-25	37

Location

Chadburn Lake is located within the city of Whitehorse, in the southern Yukon. This lake is found within the Traditional Territories of the Kwanlin Dün First Nation and the Ta'an Kwäch'än Council.

Access and Use

Chadburn Lake is accessed via the Chadburn Lake Road, in the Whitehorse subdivision of Riverdale. This is a popular recreational lake with an accessible dock. This lake is part of Whitehorse's Chadburn Lake Park.

Overall Status

Lake Trout

Chadburn Lake has a large density of small-bodied lake trout when compared to most other Yukon lakes. However, this density is slightly lower when compared to other lakes of a similar size. The population appears healthy; however, given our estimate of population size a harvest strategy that is conservative may be warranted.

Lake Whitefish

There were no lake whitefish captured during this survey. Other sampled species included round whitefish.

Recommendation

The recommendation for future surveys is to increase the amount of net sets and collection of biological data for age analysis. This would improve our precision for population estimates and our ability to detect changes.

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Lake Trout

Overview

During the 2015 survey of Chadburn Lake, a total of 53 lake trout were captured.

Population Estimate and Density

The population estimate was **2,941** (estimate range: 2,014 – 3,916). This equates to a density of 20.4 lake trout per hectare. To date, this is one of the largest densities assessed within Yukon lakes.

Length and Weight

Lake trout ranged from 260 mm to 580 mm in fork length. The average length and weight of sampled fish were 406 mm and 817 g.

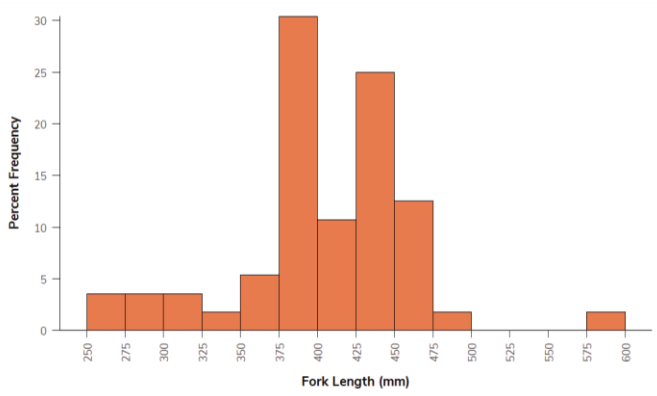

Figure 50. Length frequency distribution of sampled lake trout in Chadburn Lake (2015), n = 53.

Age and Growth

Age structures were obtained from 27 lake trout. Ages ranged from 5 to 36 years.

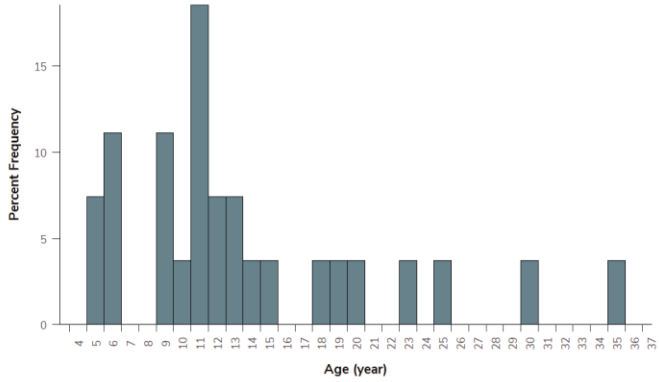

Figure 51. Age frequency distribution of age-analyzed lake trout in Chadburn Lake (2015), n = 27.

Lake Whitefish

Overview

There were no lake whitefish captured during this survey. The only additional species captured was round whitefish, of which 139 were captured. This species had an average length of 345 mm and an average weight of 410 g. Given the number of round whitefish sampled, this species may serve as the principle prey species for lake trout.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken on June 25. The temperature profile shows a strong thermocline between 5 m and 8 m, with temperatures unsuitable for lake trout within the first 5 m. Dissolved oxygen was found to be within a acceptable level throughout the water column.

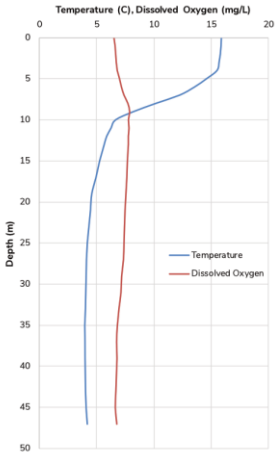

Figure 52. Temperature (C) and dissolved oxygen (mg/L) as measured in Chadburn Lake, June 25, 2015.

Ethel Lake 2011

Lake Information

WATERSHED	**LAKE CLASS**
Upper Stewart	D
SURFACE AREA	**ELEVATION**
4610 ha	760 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
62 m	31 m
SURFACE TEMP	**REGULATIONS**
14.7°C	Conservation waters
SAMPLING DATES	**NET SETS**
July 18 – 21	90

Location

Ethel Lake is located approximately 20 km east of Stewart Crossing. Ethel Lake is in the Traditional Territory of the First Nation of Na-Cho Nyäk Dun.

Access and Use

A seasonal access road is located approximately 10 km south of Stewart Crossing off the Klondike Highway. There is a government campground and a boat launch at the western end of the lake, along with several private residences.

Overall Status

Lake Trout

The density of lake trout in Ethel Lake was lower than expected, in comparison to similar sized Yukon lakes. This may be related to recreational harvest pressures, as well as a former commercial fishery, which closed in 1967.

Lake Whitefish

Only 15 lake whitefish were captured during the 2011 survey. This may indicate small lake whitefish numbers in Ethel Lake. Additional species sampled included: arctic grayling and round whitefish.

Recommendation

The number of net sets used during the survey should be increased as well as the collection and analysis of age structures. This will help increase the precision of our population estimates and understanding of the population structure.

fisheries@yukon.ca

Lake Trout

Overview

A total of 30 lake trout were captured during the 2011 survey. Age structures were not obtained during the 2011 survey.

Population Estimate and Density

The lake trout population was estimated at **9,102** (estimate range: 1,902 – 16,450). This equates to a density of 2.0 lake trout per hectare. However given the small sample size, our confidence in this estimate is weak.

Length and Weight

Sampled fish ranged from 290 mm to 910 mm in fork length, with an average length of 573mm and weight of 3,333g.

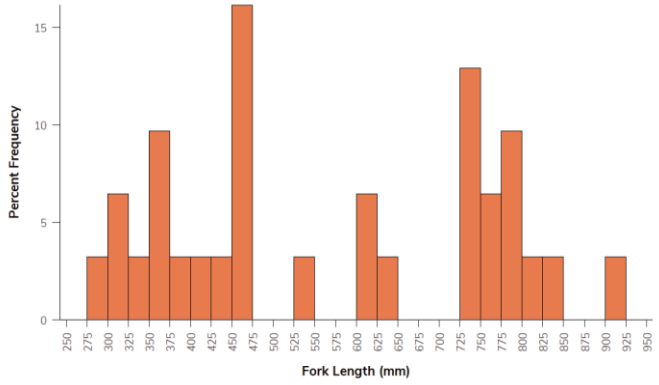

Figure 53. Length frequency distribution of sampled lake trout in Ethel Lake (2011), n = 30.

Lake Whitefish

Overview

A total of 15 lake whitefish were captured during the 2011 survey. As such, we did not determine population numbers. Given the small sample size, we have concerns the population may be low, or there is limited habitat for lake whitefish.

Temperature and Dissolved Oxygen

The profiles of oxygen and temperature indicated water conditions were suitable for lake trout. However, optimal habitat ranged from 8 – 38 m. There may be less suitable habitat at the surface due to higher temperatures.

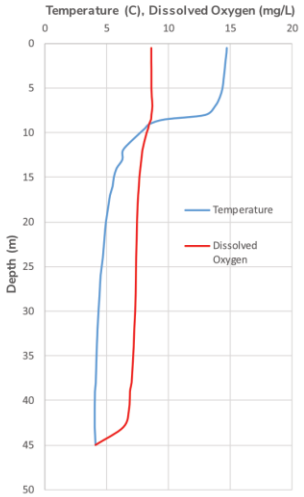

Figure 54. Temperature (C) and dissolved oxygen (mg/L) as measured in Ethel Lake, July 20, 2011.

Fish Lake 2010

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	C
SURFACE AREA	**ELEVATION**
1386 ha	1123 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
37 m	16.5 m
SURFACE TEMP	**REGULATIONS**
14.3^{O}C	Special Management
SAMPLING DATES	**NET SETS**
August 19 – 20	29

Location

Fish Lake is located approximately 15 km southwest of Whitehorse at the end of the Fish Lake Road. The lake is found within the Traditional Territory of the Kwanlin Dün First Nation.

Access and Use

Fish Lake is accessed by Fish Lake Road, along the Alaska Highway near Whitehorse. There is an accessible boat launch at the lake and a private campground nearby.

Overall Status

Lake Trout

The results from this survey indicated Fish Lake has a large population of small-body lake trout. This population appears healthy. Lake trout appear to be the top predators in this moderately productive lake.

Lake Whitefish

Fish Lake does not contain lake whitefish. The additional fish species sampled in this lake included arctic grayling and a small population of round whitefish.

Recommendation

The recommendation from the 2010 survey is to revisit and sample this lake in 2012 to compare results.

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Lake Trout

Overview

Fifty lake trout were captured during the survey. No lake trout were sampled for age structures. As such, we are unable to present length/age relationships.

Population Estimate and Density

The lake trout population was estimated at approximately **41, 787** (ranging between 31,770 – 52, 486). This corresponds to an estimate of 30.1 lake trout per hectare.

Length and Weight

Lake trout ranged in size from 265 mm to 865 mm in fork length. The average length was 426 mm, while the average weight was 926 g.

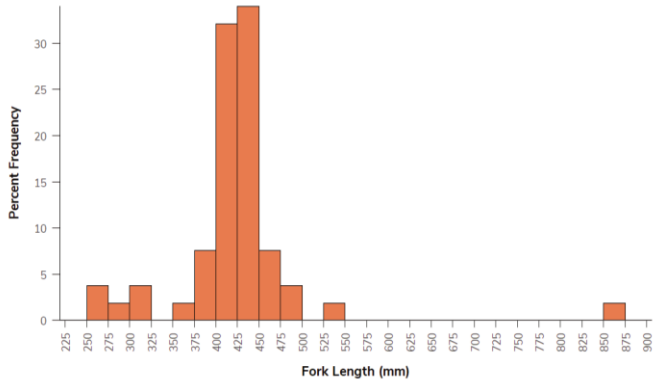

Figure 55. Length frequency distribution of sampled lake trout in Fish Lake (2010), n = 50.

Lake Whitefish

Overview

During the survey of Fish Lake, no lake whitefish were captured.

Temperature and Dissolved Oxygen

Temperature and oxygen profiles were not assessed during the 2010 survey, as this specialized equipment was not available.

Fish Lake 2012

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	C
SURFACE AREA	**ELEVATION**
1386 ha	1123 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
37 m	16.5 m
SURFACE TEMP	**REGULATIONS**
7.16^{O}C	Special Management
SAMPLING DATES	**NET SETS**
July 5 - 12	45

Location

Fish Lake is located approximately 15 km southwest of Whitehorse at the end of the Fish Lake Road. The lake is found within the Traditional Territory of the Kwanlin Dün First Nation.

Access and Use

Fish Lake is accessed by Fish Lake Road, along the Alaska Highway near Whitehorse. There is an accessible boat launch at the lake and a private campground nearby.

Overall Status

Lake Trout

The small-bodied lake trout population in Fish Lake remains healthy. Fish Lake continues to have a high density of lake trout.

Lake Whitefish

During the 2012 survey, no lake whitefish were captured.

Recommendation

The recommendation from the 2012 survey is to maintain consistent survey timing for repeated SPIN sampling. This shift in sampling dates when compared to the 2010 survey may have created changes in lake trout distributions associated with habitat availability. Their preferred temperatures may have been confined to deeper waters. As such, it is difficult to compare these two surveys. Additionally, for the Yukon a standardized sampling period should be adopted for all SPIN surveys. It is also recommended to sample for temperature and dissolved oxygen content.

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Lake Trout

A total of 122 lake trout were captured during the 2012 survey.

Population Estimate and Density

The lake trout population within Fish Lake was estimated to be **75,562** (estimate range: 62,403 – 89,955). This equates to a density of 54.4 lake trout per hectare.

Length and Weight

Lake trout ranged from 225 mm to 640 mm in fork length. Sampled fish had an average length of 390 mm and average weight of 732 g.

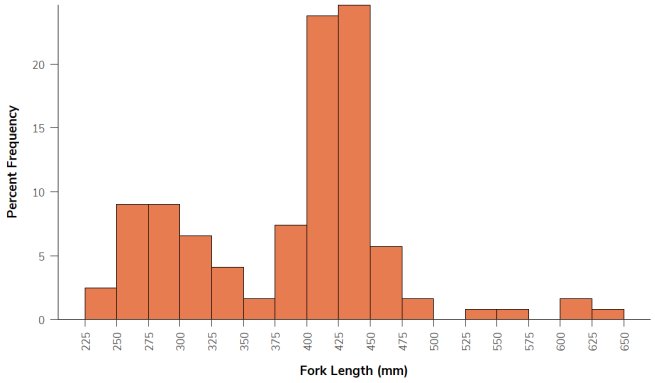

Figure 56. Length frequency distribution of sampled lake trout in Fish Lake (2012), n = 122.

Age and Growth

Age structures were obtained from 18 lake trout during the 2012 survey, ages ranged from 7 to 27 years old.

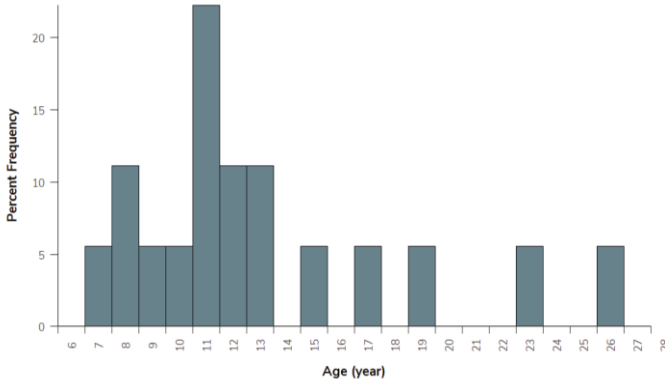

Figure 57. Age frequency distribution of age-analyzed lake trout as sampled in Fish Lake (2012), n = 18.

Lake Whitefish

Overview

During the survey of Fish Lake, no lake whitefish were captured.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken near the middle of Fish Lake, on July 5, 2012. We did not record temperature stratification and there was an odd shift recorded for dissolved oxygen levels between 9 and 17 m. There is an uncertainty associated with instrument error. Future surveys should resample to ensure accuracy.

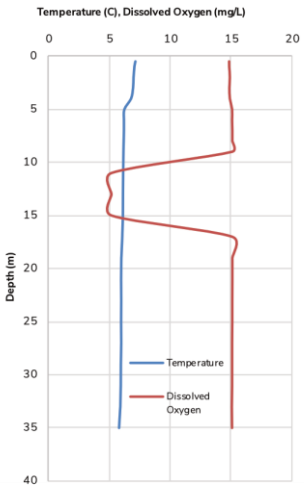

Figure 58. Temperature (C) and dissolved oxygen (mg/L) as measured in Fish Lake, July 5, 2012.

Fox Lake 2013

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	C
SURFACE AREA	**ELEVATION**
1602 ha	957 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
47 m	28.6 m
SURFACE TEMP	**REGULATIONS**
14.54^{O}C	Special Management
SAMPLING DATES	**NET SETS**
July 3-5, 10	81

Location

Fox Lake is located approximately 60 km north of Whitehorse and is found within the Ta'an Kwäch'än Council and Kwanlin Dün First Nation Traditional Territories.

Access and Use

Access to Fox Lake is along the North Klondike Highway. There is a popular campground on the eastern shore, with an accessible boat launch. There is a second boat launch near the southern end, along with several residences along the eastern shoreline.

Overall Status

Lake Trout

Fox Lake has a population of lake trout that are large-bodied. When compared to lakes of similar size, this population appears smaller. This may be due to the lakes popularity as a recreational angling destination.

Lake Whitefish

The lake whitefish population in Fox Lake was found to be healthy with a large relative density, as well as a large average size, when compared to other Yukon lakes. This healthy population may be an indication of a decreased lake trout (predator) population size.

Recommendation

The recommendation from the 2013 survey is to place this lake into Special Management regulations, wherein we will limit harvest pressure. This may assist with this populations natural recovery. An increase in net sets and collection of biological data for age analysis is recommended to increase confidence in our population estimates and provide more information on population structure.

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Lake Trout

Overview

During the 2013 survey, a total of 73 lake trout were captured.

Population Estimate and Density

The lake trout population in Fox Lake was estimated at **5,397** (estimate range: 2,763 – 8,120). This equates to a density of 3.4 lake trout per hectare.

Length and Weight

Lake trout ranged in length from 232 mm to 730 mm. The average length and weight of sampled fish were 448 mm.

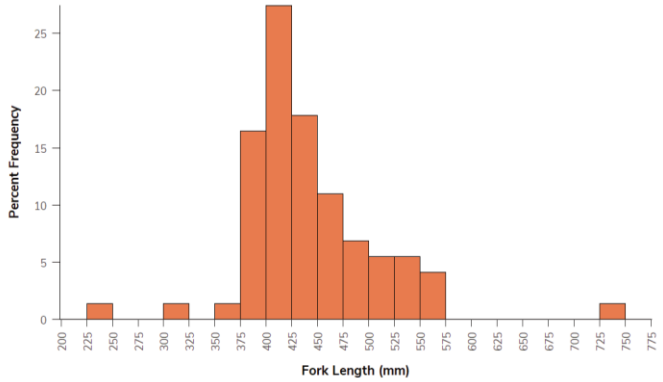

Figure 59. Length frequency distribution of sampled lake trout in Fox Lake (2013), n = 73.

Age and Growth

Age structures were obtained from 15 lake trout. Ages ranged from 7 to 24 years.

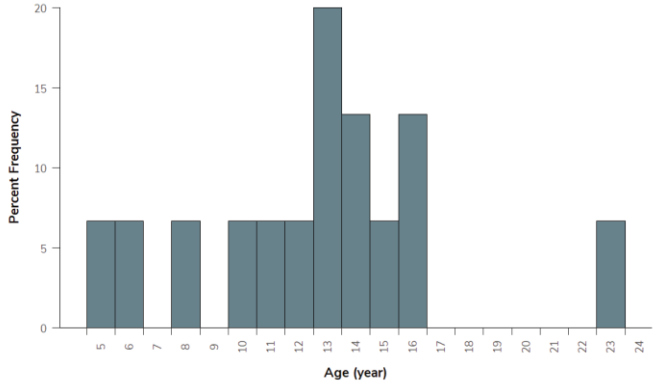

Figure 60. Age frequency distribution of age-analyzed lake trout in Fox Lake (2013), n = 15.

Lake Whitefish

Overview

A total of 261 lake whitefish were sampled during the survey, ranging in size from 173 mm to 565 mm in fork length. The mean length was 469 mm and the mean weight was 1,328g. Age structures were analyzed from 93 lake whitefish. Ages ranged from 4 to 34 years.

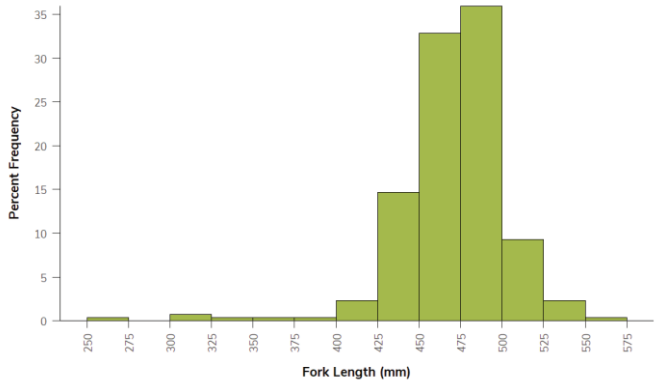

Figure 61. Length frequency distribution of sampled lake whitefish in Fox Lake (2013), n = 261.

Temperature and Dissolved Oxygen

Temperatures were suitable throughout the water column. Dissolved oxygen levels were optimal between 7 m and 42 m.

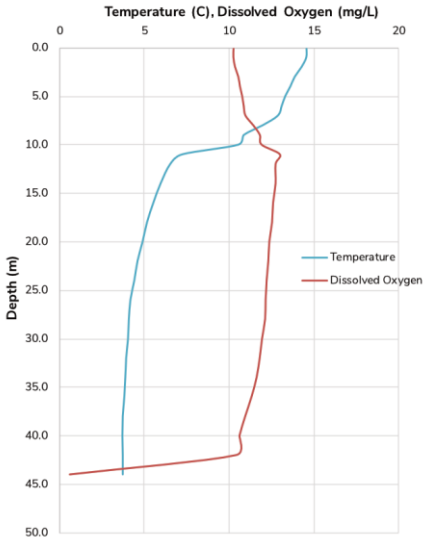

Figure 62. Temperature (C) and dissolved oxygen (mg/L) as measured in Fox Lake, July 3, 2013.

Frenchman Lake 2012

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	C
SURFACE AREA	**ELEVATION**
1441 ha	575 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
65 m	14.6 m
SURFACE TEMP	**REGULATIONS**
14.3^{o}C	Special Management
SAMPLING DATES	**NET SETS**
June 18, 19	58

Location

Frenchman Lake is located approximately 26 km east of the Village of Carmacks within the Traditional Territory of the Little Salmon/Carmacks First Nation.

Access and Use

Access to Frenchman Lake is via the seasonal Frenchman Lake Road which turns north off of the Robert Campbell Highway 39 km east of the Village of Carmacks and connects with the Klondike Highway at km 384, just north of Tatchun Creek. There are two government campgrounds along Frenchman Lake with accessible and popular boat launches.

Overall Status

Lake Trout

The lake trout population in Frenchman Lake appears to be smaller in density than similar sized lakes in the Yukon. This large-bodied population may be showing signs of depletion due to higher angler activity and competition for prey with northern pike.

Lake Whitefish

The lake whitefish population appears healthy, however it was observed that the average fork length of this population is slightly smaller than observed in other Yukon lakes.

Recommendation

We recommend an increase in the number of net sets used when this lake is resampled in the future. This will aid in detecting population changes and increase the precision of our estimates. It is also recommended that catch and possession limits are reduced, to allow this population to recover.

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Lake Trout

Overview

A total of 15 lake trout were captured during the 2012 survey.

Population Estimate and Density

The lake trout population estimate for Frenchman Lake was **2,874** (estimate range: 624 – 5,172). This equated to a density of 2.0 lake trout per hectare.

Length and Weight

Lake trout ranged in size from 267 mm to 870 mm. Sampled fish averaged 533 mm in length and 870 g in weight.

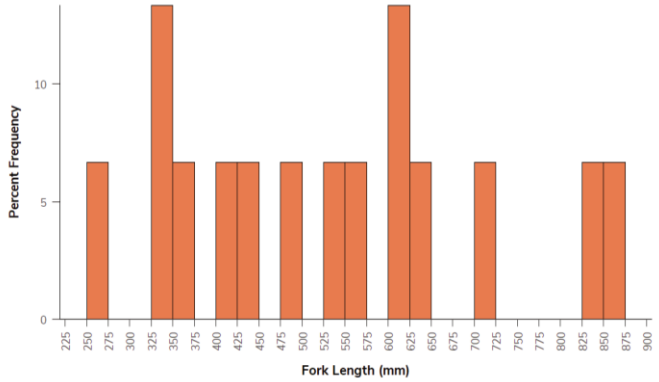

Figure 63. Length frequency distribution of sampled lake trout in Frenchman Lake (2012), n = 15.

Age and Growth

Age structures were obtained from 4 lake trout. Ages ranged from 7 to 15 years.

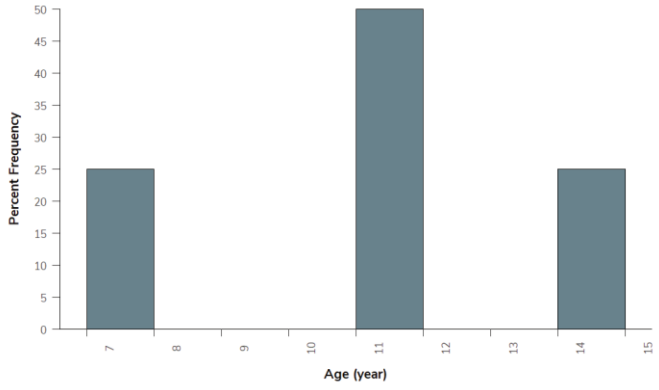

Figure 64. Age frequency distribution of age-analyzed lake trout in Frenchman Lake (2012), n = 4

Lake Whitefish

Overview

A total of 158 lake whitefish were captured during this survey. They ranged in fork length from 202 mm to 387 mm. Sampled fish had an average length of 300 mm and weight of 392 g. Age structures were analyzed from 33 lake whitefish. Ages ranged from 4 to 17 years.

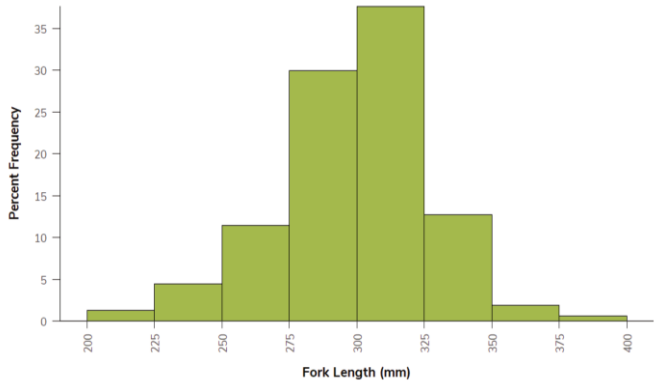

Figure 65. Length frequency distribution of sampled lake whitefish in Frenchman Lake (2012), n = 158.

Temperature and Dissolved Oxygen

Basins were sharply stratified, with suitable lake trout temperatures beginning at 7 m and continuing to lake bottom. Dissolved oxygen levels were optimal over the depth range of both profiles.

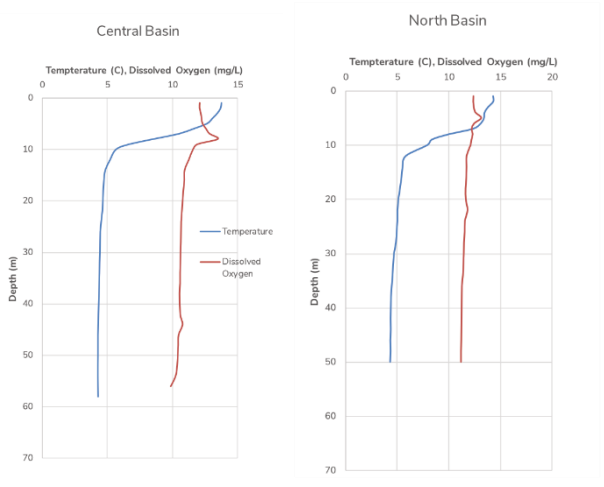

Figure 66. Temperature (C) and dissolved oxygen (mg/L) as measured in the north and central basins of Frenchman Lake, June 18, 2012.

Frenchman Lake 2020

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	C
SURFACE AREA	ELEVATION
1441 ha	575 m
MAXIMUM DEPTH	AVERAGE DEPTH
65 m	14.6 m
SURFACE TEMP	REGULATIONS
17.6^{0}C	Special Management
SAMPLING DATES	NET SETS
June 14 - 16	58

Location

Frenchman Lake is located approximately 26 km east of the Village of Carmacks within the Traditional Territory of the Little Salmon/Carmacks First Nation.

Access and Use

Access to Frenchman Lake is via the seasonal Frenchman Lake Road which turns north off of the Robert Campbell Highway 39 km east of the Village of Carmacks and connects with the Klondike Highway at km 384, just north of Tatchun Creek. There are two government campgrounds along Frenchman Lake with accessible and popular boat launches.

Overall Status

Lake Trout

To encourage population recovery, the harvesting of lake trout from Frenchman Lake has been prohibited since 2016. Results from the 2020 survey indicate that the population remains small, and is similar in size when compared to 2012 estimates.

Lake Whitefish

Given the whitefish catch rates and age composition, the population of lake whitefish in Frenchman lake appears resilient.

Recommendation

The recommendation from the 2020 survey is to develop a **Lake Trout Recovery Plan** for Frenchman Lake. The plan should include a habitat assessment and a long-term monitoring program to detect changes in lake trout abundance, recruitment, growth rate, and prey composition.

This plan should be developed in collaboration with the Carmacks Renewable Resource Council and the Little Salmon/Carmacks First Nation.

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Lake Trout

During the 2020 survey, we set 65 nets and caught 20 lake trout, for a catch rate of 0.31 fish per hour.

Population Estimate and Density

The lake trout population estimate for Frenchman Lake was 2,164, but ranged between 100 – 6,912. Given the range, there is little certainty in this estimate. The large variability is a common issue when estimating populations based on a small sample size. Nevertheless, given how few fish were sampled, it is likely the population is depleted.

Length and Weight

Sampled lake trout ranged in size from 223 mm to 809 mm, with a mean fork length of 557 mm. The average weight of sampled lake trout was 2693 g.

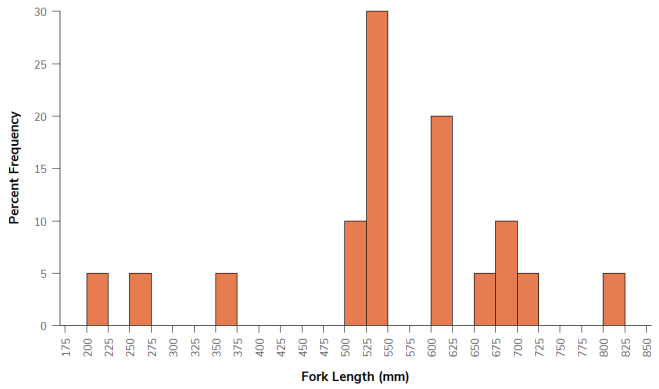

Figure 67. Length frequency distribution of sampled lake trout in Frenchman Lake (2020), n = 20.

Age and Growth

Age structures were obtained from five lake trout. Ages ranged from 13 to 28. Given the small sample size, further growth analysis will be difficult.

Lake Whitefish

There were 155 lake whitefish sampled during this survey.

Length and Weight

Sampled lake whitefish ranged in fork length from 229 mm to 400 mm, with an average fork length of 302 mm. The average weight of 346 g

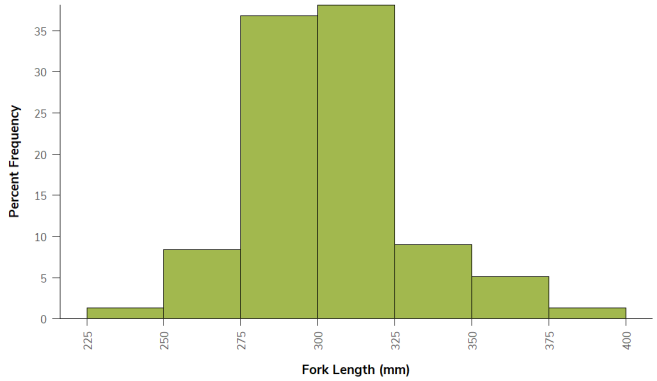

Figure 68. Length frequency of lake whitefish, as sampled in Frenchman Lake (2020), n = 155.

Age and Growth

Age structures were interpreted from 81 lake whitefish. Ages ranged from 4 to 18 years, with a mean age of 7.

Temperature and Dissolved Oxygen

The lake was thermally stratified, with temperatures dropping rapidly between 9 m and 12 m.

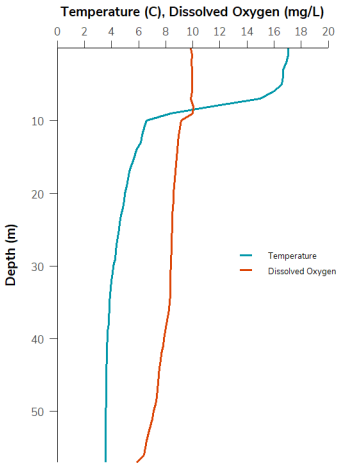

Figure 69. Temperature (C) and dissolved oxygen (mg/L) as measured in Frenchman Lake, July 14, 2020.

Kathleen Lakes 2019

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	C
SURFACE AREA	**ELEVATION**
1389 ha	723 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
59 m	4.4 m
SURFACE TEMP	**REGULATIONS**
17.3°C	Special Management
SAMPLING DATES	**NET SETS**
July 07 – 09	31

Location

The Kathleen Lakes are located 109 km northeast of the community of Mayo. These lakes are found within the Traditional Territory of the First Nation of Na-Cho Nyäk Dun.

Access and Use

The Kathleen Lakes are accessible by fly-in only, with an established outfitting lodge on the west basin. There is no road access, nor additional private residences on these lakes.

Overall Status

Lake Trout

The lake trout population in the two basins of the Kathleen Lakes were small in number, when compared to lakes of similar size. However, due to high temperatures and low oxygen levels lake trout habitat is limited in the east basin and this may be contributing to the smaller population size.

Lake Whitefish

There were no lake whitefish captured within this system.

Recommendation

The recommendation for future surveys of the Kathleen Lakes is to continue monitoring the depth profiles and to determine recreational harvest pressures. If this lake is repeated, an effort to increase net sets and determine age cohorts will assist in determining population size and health.

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Lake Trout

Overview

During the 2019 survey of the east and west basins of the Kathleen Lake, there were only 6 lake trout captured. Age structures were not obtained from these fish.

Population Estimate and Density

The lake trout population estimate for Kathleen Lakes was estimated at **593** (estimate range: 1 to 1,218). This resulted in a density of 1.5 lake trout per hectare. However due to the small sample size there is little confidence in this estimate.

Length and Weight

The sampled lake trout ranged in fork length from 522 mm to 601 mm. They had an average length of 565 mm and an average weight of 2158 g.

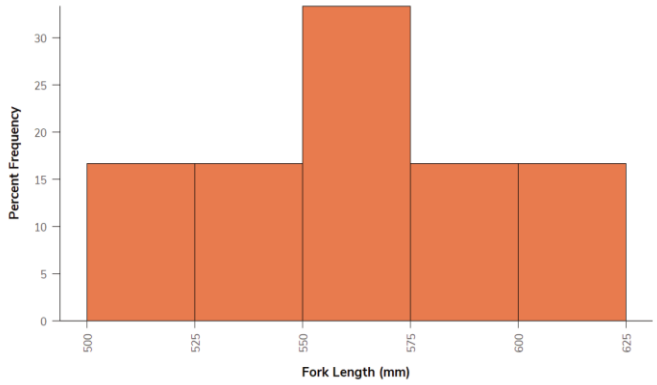

Figure 70. Length frequency distribution of sampled lake trout in Kathleen Lakes (2019), n = 6.

Lake Whitefish

Overview

No lake whitefish were captured during this survey.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken in both the west and east basin on July 8 and 9 , respectively. The temperature profiles indicated a sharp thermocline between 4 m and 7 m, with temperatures decreasing from 16°C to 5°C within the thermocline. Temperatures gradually declined below this, through the rest of the water column. Dissolved oxygen profiles in both basins displayed a sharp decrease from 5 m through 10 m. In the east basin, below 9 m, oxygen levels were unsuitable to support lake trout. Suitable lake trout habitat in the west basin was found from 5 m to the lake's bottom.

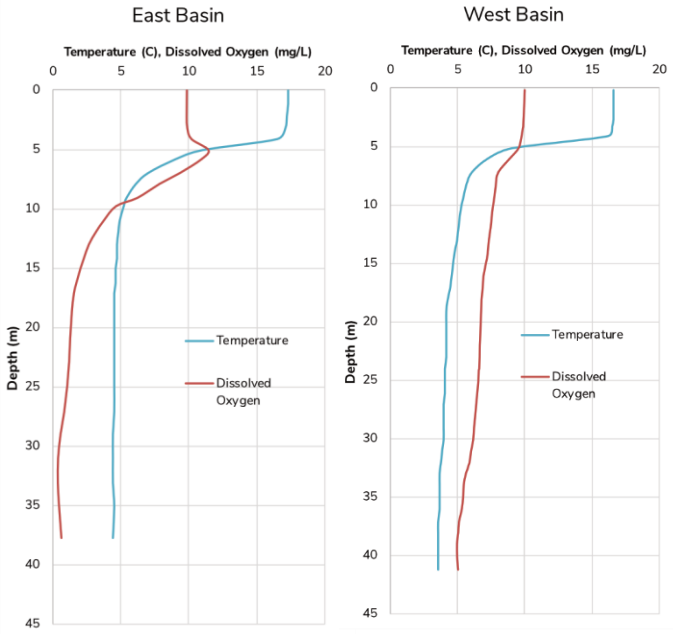

Figure 71. Temperature (C) and dissolved oxygen (mg/L) as measured in the East and West basins of the Kathleen Lakes, on July 8 and 9, 2019.

Kluane Lake 2013

Lake Information

WATERSHED	**LAKE CLASS**
Alsek	F
SURFACE AREA	**ELEVATION**
40, 821 ha	781 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
91 m	31 m
SURFACE TEMP	**REGULATIONS**
9.4^{O}C	Conservation waters
SAMPLING DATES	**NET SETS**
August 6 – 11	129

Location

Kluane Lake is located approximately 60 km northwest of Haines Junction and borders Kluane National Park and Reserve. Kluane Lake is within the White River First Nation and Kluane First Nation Traditional Territories.

Access and Use

Kluane Lake is accessed along the Alaska Highway, with a government campground at Congdon Creek, as well as multiple private campgrounds and residences along the lake. Boat ramps are available in several locations, however not all of them are in useable condition.

Overall Status

Lake Trout

Kluane Lake has a high density and healthy population of large-bodied lake trout. The lake trout population in Kluane receives minimal angling pressure, relative to other Yukon lakes, due to its remote location, wind and size.

Lake Whitefish

The lake whitefish population in Kluane Lake was found to be healthy, with a higher relative density when compared to similar sized lakes in the Yukon.

Recommendation

The 2013 survey of Kluane Lake was conducted prior to the natural diversion of the Kaskawalsh Glacier away from Slims River, historically a major input to this lake. As such, the data from this survey serves as baseline for lake trout and lake whitefish population levels. It is recommended that Kluane lake is reassessed based on these prior levels. A slight increase in the number of net sets, should also occur to increase our ability to determine population change. It is also recommended that habitat mapping of lake trout spawning locations is conducted along with analysis of ages.

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Lake Trout

During the 2013 survey, a total of 168 lake trout were captured. Age structures were obtained from 51 lake trout. Ages ranged from 4 to 38 years.

Population Estimate and Density

The population of lake trout within Kluane Lake was estimated at **168,712** (estimate range: 99,487 – 240,691). This equates to a density of 4.3 lake trout per hectare.

Length and Weight

Lake trout ranged in fork length from 240 mm to 950 mm. The sampled fish had an average length of 552 mm and average weight of 2,348 g.

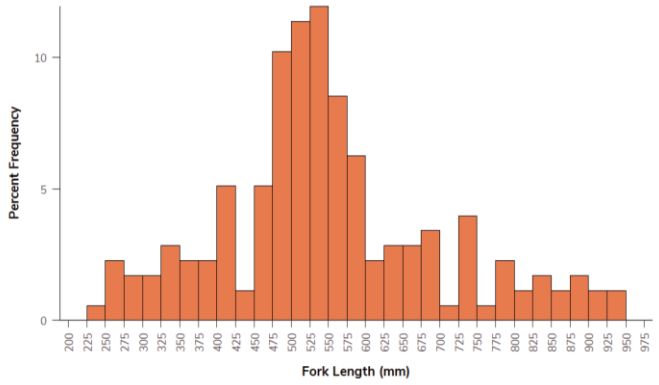

Figure 72. Length frequency distribution of sampled lake trout in Kluane Lake (2013), n = 168.

Ageand Growth

Age structures were obtained from 33 lake trout. Ages ranged from 5 to 38 years.

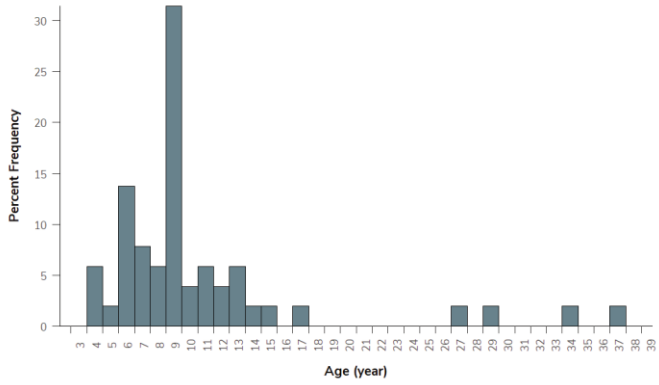

Figure 73. Age distribution of age-analyzed lake trout in Kluane Lake (2013), n = 33.

Lake Whitefish

Overview

A total of 471 lake whitefish were captured during this survey. These sampled whitefish ranged in size from 217 mm to 545 mm in fork length, with an average length of 376 mm and weight of 792 g. Age structures were analyzed from 202 lake whitefish. Ages ranged from 3 to 37 years.

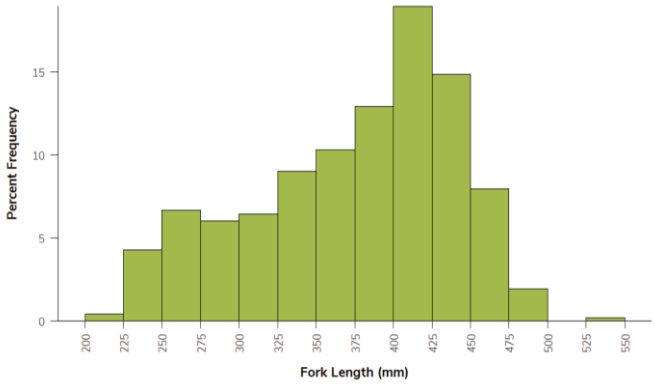

Figure 74. Length frequency distribution of sampled lake whitefish in Kluane Lake (2013), n = 471.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken in two locations, the main basin and Talbot Arm. Temperatures and dissolved oxygen were optimal in the main basin from the surface to 60 m (maximum equipment depth). In Talbot Arm, temperatures steadily declined, with dissolved oxygen relatively constant through the water column.

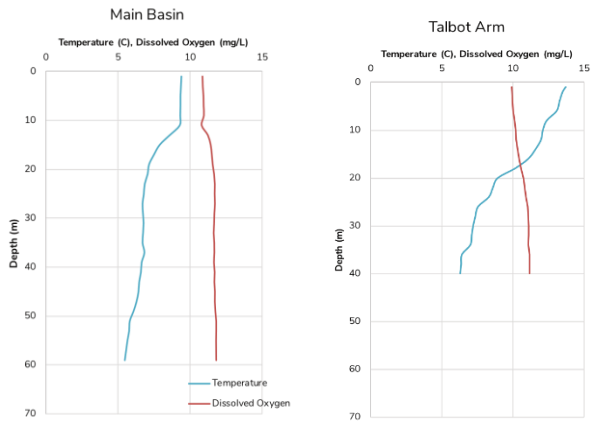

Figure 75. Temperature (C) and dissolved oxygen (mg/L) as taken in the Main and Talbot Arms basins of Kluane Lake on August 8, 2013.

Kusawa Lake 2014

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	E
SURFACE AREA	**ELEVATION**
14,018 ha	671 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
140 m	54 m
SURFACE TEMP	**REGULATIONS**
12.2^{O}C	Conservation waters
SAMPLING DATES	**NET SETS**
Jul 2,3,7-10	158

Location

Kusawa Lake is located in the southern Yukon and forms the basis of Kusawa Territorial Park. This lake is within the Traditional Territories of the Carcross/Tagish First Nation and the Champagne/Aishihik First Nation.

Access and Use

Kusawa Lake is accessed via the Kusawa Lake Road, from the Alaska Highway. There is a popular government campground at the lake, with an established boat ramp. This is a popular recreational angling site for Yukon residents.

Overall Status

Lake Trout

In accordance with our sampling results the lake trout population in Kusawa Lake, appears healthy. The population appears to be of a slightly smaller physical size than can be found in similar sized lakes.

Lake Whitefish

The population of lake whitefish in Kusawa Lake appears to be smaller than expected for a lake of it's size and productivity. However detailed baseline information on this population is not available.

Recommendation

We achieved acceptable precision in our population estimate, therefore the recommendation for future surveys is to repeat the number of net sets performed in 2014. The results of this SPIN survey should taken under consideration when examining the results of the 2014 Angler Harvest Survey. In combination it will help us better understand the influences of recreational angling on the resource. Detailed analysis of length-at-age and growth should be reviewed to ensure slot sizes are accurate.

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Lake Trout

During the 2014 survey of Kusawa Lake, a total of 213 lake trout were sampled.

Population Estimate and Density

The population of lake trout within Kusawa Lake during the 2014 survey was estimated at 78,045 (estimate range: 51,860 – 105,506). This equates to a density of 5.6 lake trout per hectare.

Length and Weight

Lake trout ranged from 174 mm to 875 mm in fork length. The sampled fish had an average length of 443 mm and an average weight of 1,174 g.

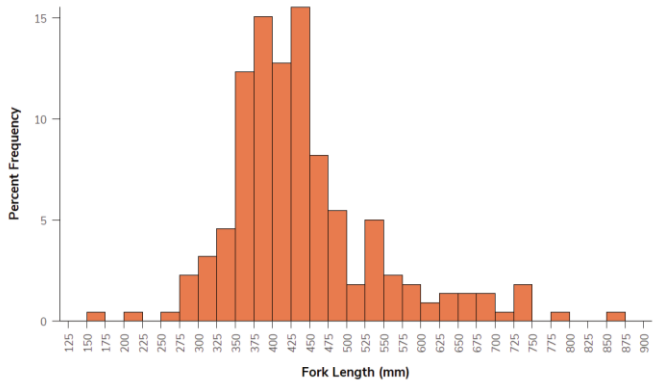

Figure 76. Length frequency distribution of sampled lake trout in Kusawa Lake (2014), n = 213.

Age and Growth

Age structures were obtained from 80 individuals,. Ages ranged from 3 to 28 years.

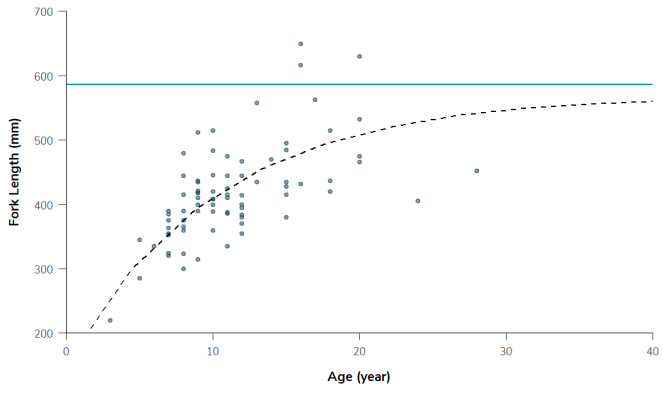

Figure 77. Von Bertalanffy growth curve of age-analyzed sampled lake trout in Kusawa Lake (2014), n = 80. Horizontal line indicates current upper slot limit.

Lake Whitefish

Overview

During this survey, there were 37 lake whitefish sampled. The lake whitefish ranged from 325 mm to 450 mm. These sampled fish had an average length of 383 mm and an average weight of 730 g. Age structures were obtained from eight lake whitefish. Ages ranged from 5 to 24 years. The catch rate for lake whitefish was less than we would expect for a lake of similar size and productivity.

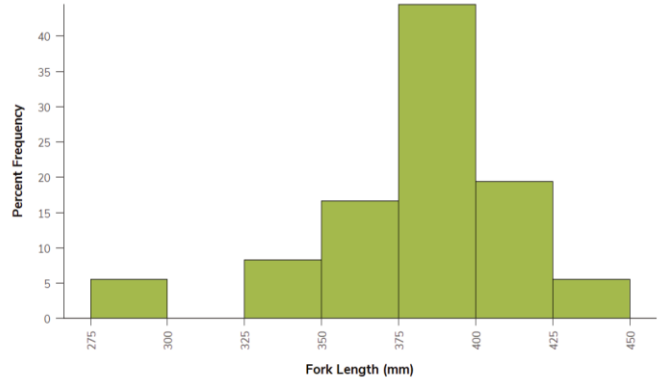

Figure 78. Length frequency distribution of sampled lake whitefish in Kusawa Lake (2014), n = 37.

Temperature and Dissolved Oxygen

The north and central profiles exhibited relative stability in the water column, with slightly warmer surface water. The south profile, in a shallower section of the lake, indicated a stratified water column, with a thermocline between 9°C and 12°C. All profiles displayed optimal dissolved oxygen levels.

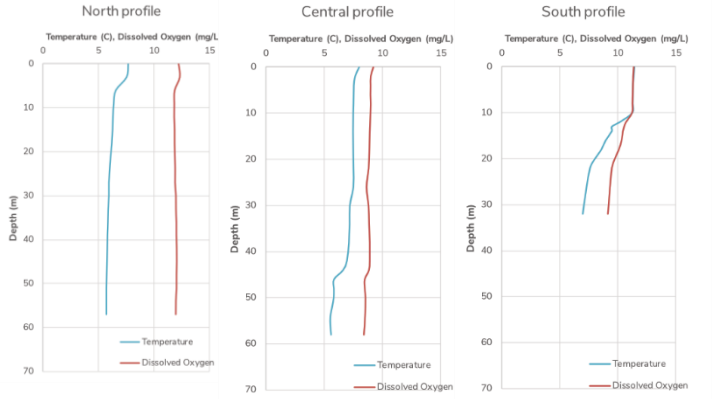

Figure 79. Temperature (C) and dissolved oxygen (mg/L) as measured in the North, Central and South Basins of Kusawa Lake, 2014.

Ladue Lake 2017

Lake Information

WATERSHED	**LAKE CLASS**
Stewart	B
SURFACE AREA	**ELEVATION**
253 ha	717 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
48 m	n/a
SURFACE TEMP	**REGULATIONS**
16.89^{o}C	Special Management
SAMPLING DATES	**NET SETS**
June 26-28	32

Location

Ladue Lake is located approximately 15 km north of Keno City. Ladue Lake is found within the Traditional Territory of the First Nation of Na-Cho Nyäk Dun.

Access and Use

Ladue Lake is accessed by a 4x4 trail, off the Mayo Elsa Road. There are no government campground and no accessible boat launches at the lake.

Overall Status

Lake Trout

Survey results from 2017 indicated the lake trout population in Ladue Lake appears to be low to moderate in abundance when compared to lakes of similar surface area. However this lake is small and relatively shallow, therefore the lake may only be capable of supporting a small population of lake trout, based on habitat availability.

Lake Whitefish

The population of lake whitefish in Ladue Lakes seems healthy. A wide age demographic was sampled, suggesting the population is stable.

Recommendation

To increase our confidence in population estimates the recommendation for future surveys of Ladue Lake is to increase net sets. Also, lake trout habitat availability should be determined and increased age analysis. Subsequent to improved access, an Angler Harvest Survey should also be performed.

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Lake Trout

Overview

During the 2017 survey of Ladue Lake, a total of 33 lake trout were sampled.

Population Estimate and Density

The population estimate for lake trout was **789** (estimate range: 377 to 1,215). This resulted in a density of 3.1 lake trout per hectare.

Length and Weight

These large-bodied lake trout ranged in fork length from 317 mm to 698 mm. The average length of sampled fish was 561 mm with an average weight of 1,866 g.

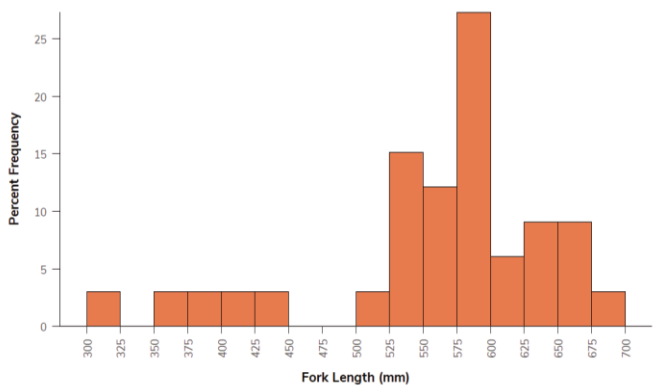

Figure 80. Length frequency distribution of sampled lake trout in Ladue Lake (2017), n = 33.

Age and Growth

Age structures were only obtained from 10 lake trout. Ages ranged from 11 to 31 years.

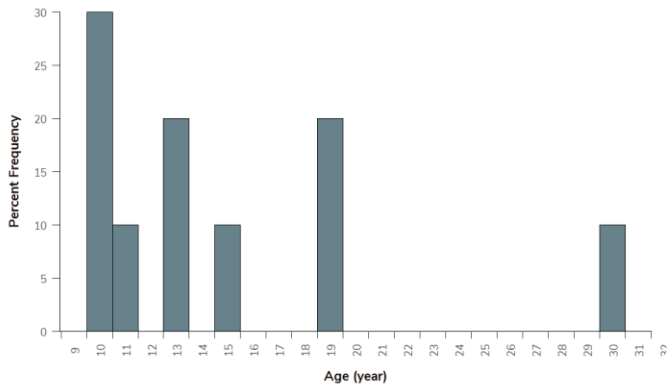

Figure 81. Age frequency distribution of age-analyzed lake trout in Ladue Lake (2017), n = 10.

Lake Whitefish

Overview

During the 2017 survey, a total of 28 lake whitefish were sampled. The size of these fish ranged from 265 mm to 528 mm. Sampled fish had an average fork length of 446 mm and an average weight of 1,224 g. Age structures were taken from 18 lake whitefish. Ages ranged from 6 to 30 years.

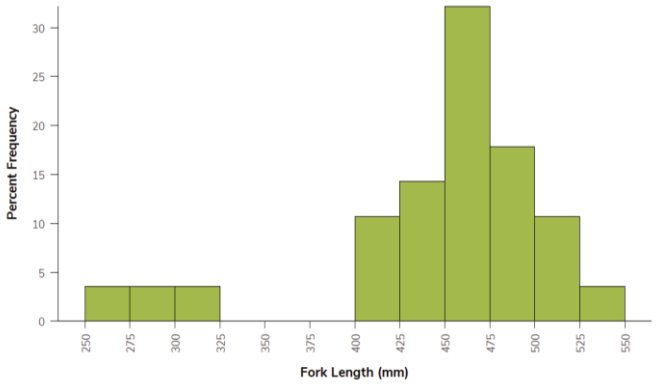

Figure 82. Length frequency distribution of sampled lake whitefish in Ladue Lake (2017), n = 28.

Temperature and Dissolved Oxygen

The temperature profile displayed a sharp thermocline from 3 m to 7 m, followed by a gradual decline through the water column. Dissolved oxygen displayed a slight increase from 4 m to 7 m, followed by a gradual decline. Overall, optimum habitat existed between 6 m to the lake's bottom.

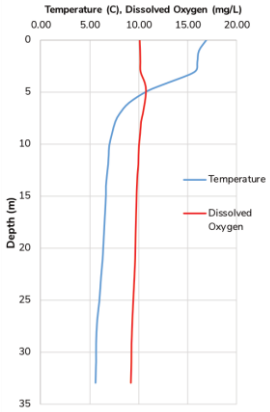

Figure 83. Temperature (C) and dissolved oxygen (mg/L) as measured in Ladue Lake on June 27, 2017

Lake Laberge 2016

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	F
SURFACE AREA	**ELEVATION**
20,099 ha	628 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
146 m	54 m
SURFACE TEMP	**REGULATIONS**
14.2°C	Conservation Waters
SAMPLING DATES	**NET SETS**
July 27 –Aug 1	141

Location

Lake Laberge is located approximately 47 km north of Whitehorse, on the North Klondike Highway. This lake is found within the Traditional Territories of the Ta'an Kwäch'än Council and Kwanlin Dün First Nation. This lake is part of the Yukon River.

Access and Use

Lake Laberge is accessed through a public boat launch, which is available at a government campground. There are several private residences along the lake shore. Historically, lake trout in this lake were depleted by commercial fishing in the early 1900s.

Overall Status

Lake Trout

The 2016 survey results for Lake Laberge indicate a moderate to low density of lake trout, when compared to lakes of similar size. Survey results also indicated a younger than expected lake trout population, which may suggest overharvest.

Lake Whitefish

The 2016 Lake Laberge survey indicated a moderate and healthy population of lake whitefish.

Recommendation

The recommendation for future surveys is to potentiallhy increase the number net sets during sampling. This would help increase the precision of our population estimate. An increase in the number of collected age structures to analyze is also recommended, as the assessed growth rates indicate few if any individuals are greater than 650mm. Lakes of this size category are difficult to accurately assess.

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Lake Trout

During the 2016 survey of Lake Laberge a total of 109 lake trout were captured.

Population Estimate and Density

The lake trout population estimate was **51,121** (estimate range: 19,475 – 83,602). This equates to a density of 2.6 large-bodied lake trout per hectare.

Length and Weight

Lake trout were sampled, ranging in size (fork length) from 310 mm to 716 mm. The sampled fish had an average length of 485 mm and an average weight of 1,737 g.

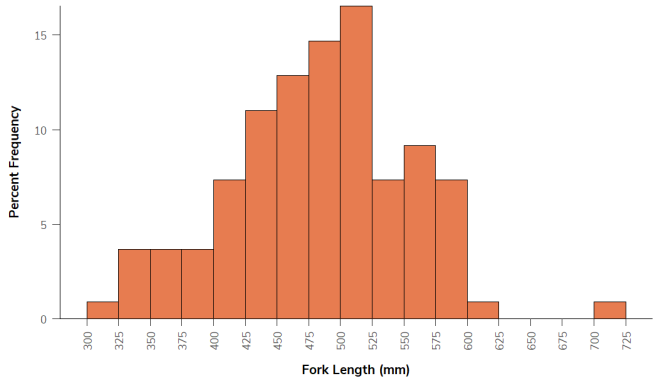

Figure 84. Length frequency distribution of sampled lake trout in Lake Laberge (2016), n = 109.

Age and Growth

Age structures were obtained from 43 lake trout. Ages ranged form 4 to 22 years.

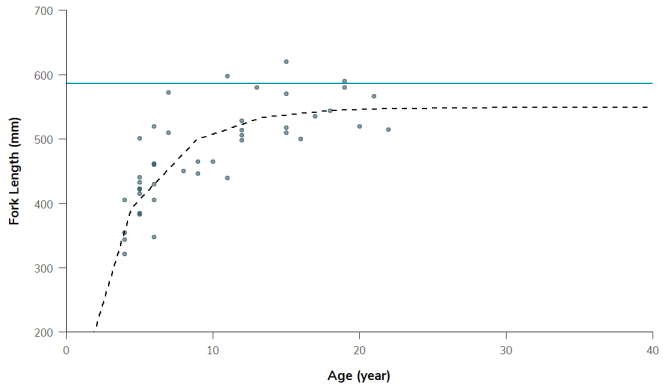

Figure 85. Von Bertalanffy growth curve of age-analyzed sampled lake trout in Lake Laberge (2016), n = 43. Horizontal line indicates current upper slot limit.

Lake Whitefish

Overview

A total of 100 lake whitefish were captured during the 2016. The size of these fish ranged from 215 mm to 550 mm in length, with an average fork length of 339 mm and an average weight of 520 g. Age structures were obtained from 53 lake whitefish. Ages ranged from 5 to 16 years.

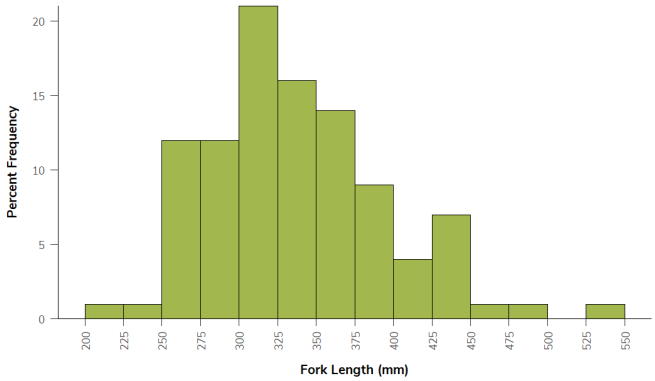

Figure 86. Length frequency distribution of sampled lake whitefish in Lake Laberge (2016), n = 100.

Temperature and Dissolved Oxygen

The temperature profile displayed a gradual decline from the surface to 12 m, followed by a sharp thermocline to 18 m. Optimal temperatures for lake trout occurred between 14 m and 57 m. Dissolved oxygen remained stable and optimal throughout the water column.

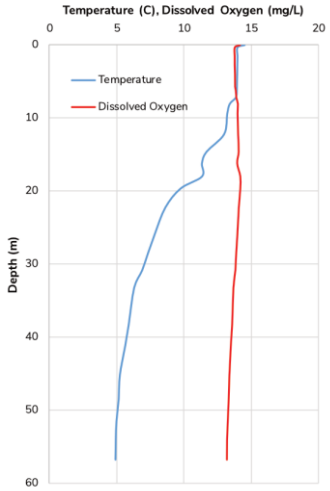

Figure 87. Temperature (C) and dissolved oxygen (mg/L) as measured in Lake Laberge on July 22, 2016

Lewes Lake 2010

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
131 ha	728 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
40 m	17 m
SURFACE TEMP	**REGULATIONS**
12.2^{O}C	General Waters
SAMPLING DATES	**NET SETS**
June 26,27 + Aug 16,17	24 per survey

Location

Lewes Lake is located near the South Klondike Highway between Whitehorse and Carcross in the Yukon River watershed. Lewes Lake is in the Traditional Territories of the Carcross/Tagish and Kwanlin Dün First Nations.

Access and Use

Lewes Lake is accessed by Lewes Lake Road, off the South Klondike Highway. There are a number of permanent residences along the road, with makeshift campsites near the lake. There is no boat ramp available at the lake.

Overall Status

Lake Trout

Two surveys of Lewes Lake were conducted in the summer of 2010. The two surveys were used in an experiment to test the efficacy of the SPIN methodology. The combined results indicated that Lewes Lake has a high density of small-bodied lake trout. This population appears healthy based on this survey.

Lake Whitefish

Lewes Lake does not contain lake whitefish. The additional fish species sampled included arctic grayling and round whitefish.

Recommendation

This lake was used as an experimental waterbody to test the efficacy of the Summer Profundal Index Netting program (SPIN) for the Yukon. The recommendation from the 2010 survey is to perform future surveys in June or July, when water temperatures are cooler, resulting in more available habitat.

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Lake Trout

Eighty-eight lake trout were captured during the two surveys.

Population Estimate and Density

The estimated population of lake trout was **6,369** (ranging between 5,202 – 7,639). Density estimated from the June survey was 48.6 lake trout per hectare and was 30.5 lake trout per hectare from the August survey.

Length and Weight

Lake trout sampled averaged 358 mm in length (as measured to the fork) and 533 g in weight.

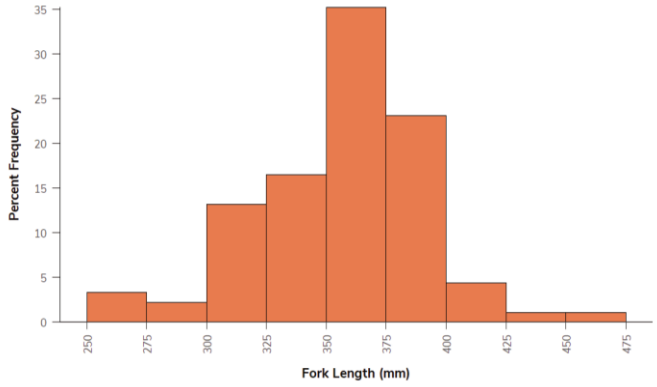

Figure 88. Length frequency distribution of sampled lake trout in Lewes Lake (2010), n = 88.

Age and Growth

Age structures were taken from 34 lake trout. Ages ranged from 6 to 26 years.

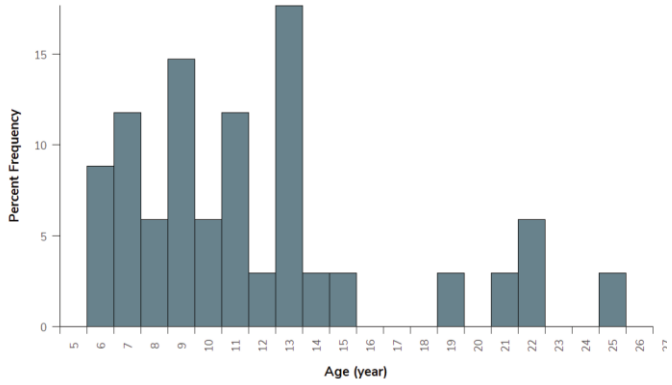

Figure 89. Age frequency distribution of age-analyzed lake trout in Lewes Lake (2010), n = 34.

Lake Whitefish

Overview

During the two surveys of Lewes Lake, no lake whitefish were captured.

Temperature and Dissolved Oxygen

Temperature profiles for June and August show that the lake was strongly stratified during both months. The thermocline (zone of steep temperature decline) was located at a shallower depth in June (8.5 -10.5 m) when compared to August (10.5 -12.5 m). Dissolved oxygen levels were obtained in the August survey. Optimal oxygen levels were found at a depth of 11 m and extended to the lakes bottom.

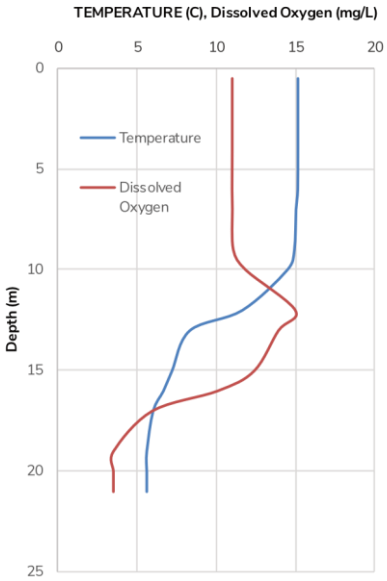

Figure 90. Temperature (C) and dissolved oxygen (mg/L) as measured in Lewes Lake on June 26, 2010.

Little Atlin Lake 2015

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	D
SURFACE AREA	**ELEVATION**
4032 ha	669 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
42 m	10.6 m
SURFACE TEMP	**REGULATIONS**
18.0^{O}C	Special Management
SAMPLING DATES	**NET SETS**
July 7 – 10	67

Location

Little Atlin Lake is located 4 km south on of Jake's Corner, on the Atlin Road. This lake is located within the Traditional Territory of the Carcross/Tagish First Nation and the Taku River Tlingit First Nation, in the southern Yukon.

Access and Use

Little Atlin Lake is accessed primarily by a boat ramp, located in the northeast end of the lake. This is a popular destination for northern pike fishing.

Overall Status

Lake Trout

Survey results from 2015 indicate the lake trout population in Little Atlin Lake is small. Bathymetric analysis of Little Atlin Lake indicates that less than 20% of this lake is deeper than 20 m, which limits lake trout habitat. This may suggest that the lake trout population may not be depleted, but rather is a small population, limited by habitat availability. Conversely, this lake has an abundance of shallow water habitat and is suitable for northern pike.

Lake Whitefish

The lake whitefish population within Little Atlin Lake appears healthy.

Recommendation

The recommendation for future surveys is to increase the amount of net sets. This will increase our precision when estimating population size. Another recommendation is to increase thermal habitat mapping of this lake and increase the number of age structures analyzed.

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Lake Trout

A total of 44 lake trout were captured during the survey.

Population Estimate and Density

The population of lake trout was estimated at **7,178** (estimate range: 913 – 13,559). This equates to a density of 1.8 lake trout per hectare. Given the wide range of our population estimate, we have little confidence in this number.

Length and Weight

These sampled lake trout ranged from 465 mm to 620 mm in fork length, with an average length of 554 mm and an average weight of 2,255 g.

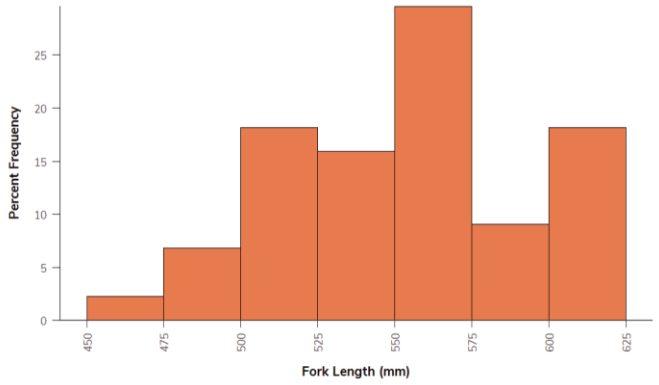

Figure 91. Length frequency distribution of sampled lake trout in Little Atlin Lake (2015), n = 44.

Age and Growth

Age structures were obtained from 19 lake trout. Ages ranged from 9 to 33 years.

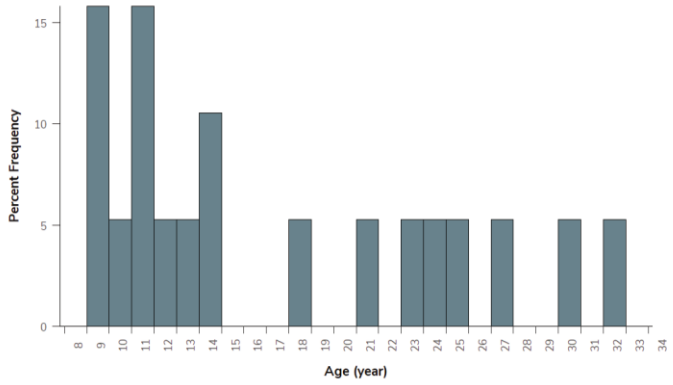

Figure 92. Age frequency distribution of age-analyzed lake trout as sampled in Little Atlin Lake (2015), n = 19.

Lake Whitefish

Overview

A total of 341 lake whitefish were captured during the 2015 survey. These fish ranged in size from 240 mm to 470 mm in length. Sampled whitefish had an average length of 351 mm and an average weight of 606 g. Age structures were obtained from 33 lake whitefish. Ages ranged from 5 to 19 years.

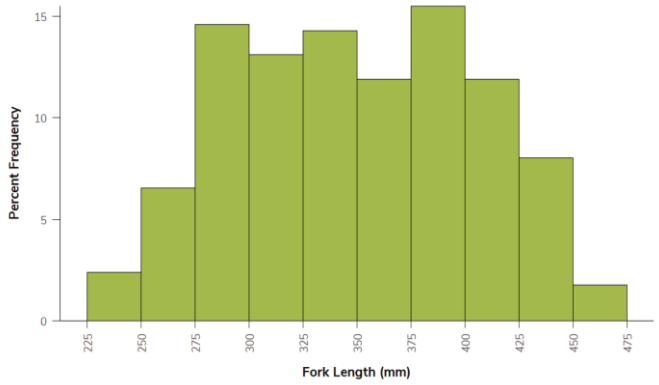

Figure 93. Length frequency distribution of sampled lake whitefish in Little Atlin Lake (2015), n = 341.

Temperature and Dissolved Oxygen

The temperature profile illustrated a strong thermocline between 4 m and 8 m, with temperatures unsuitable for lake trout within the first 5 m.

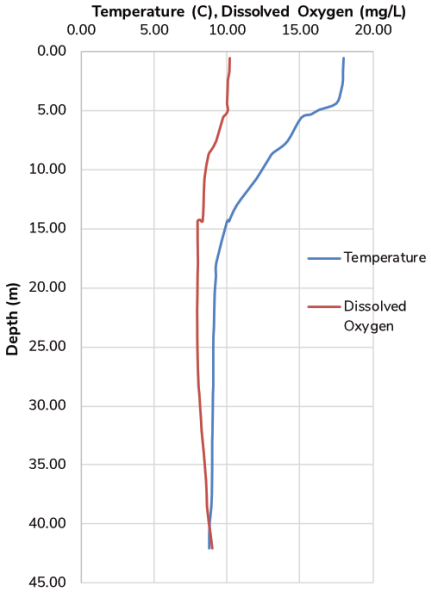

Figure 94. Temperature (C) and dissolved oxygen (mg/L) as measured in Lewes Lake on July 7, 2015.

Little Fox Lakes 2016

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	A(N), B(S)
SURFACE AREA	**ELEVATION**
227 ha	818 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
44 m(N), 50 m(S)	16.3 m(N), 10.7 m(S)
SURFACE TEMP	**REGULATIONS**
17.1^{O}C	Special Management
SAMPLING DATES	**NET SETS**
July 4-5, 13	24(N), 30(S)

Location

Little Fox Lakes, is a system of two basins (North basin, South basin), located approximately 85 km north of Whitehorse, on the North Klondike Highway. This lake system is within the Traditional Territories of the Little Salmon Carmacks First Nation, Champagne Aishihik First Nation, Ta'an Kwäch'än Council and the Kwanlin Dün First Nation.

Access and Use

Little Fox Lakes are accessed through a public boat launch, with some private residences along the shores of both basins. These are popular recreational angling lakes.

Overall Status

Lake Trout

The lake trout populations in the Little Fox Lakes are healthy, containing a large density of small-bodied lake trout. The southern basin was found to have the largest density of lake trout, in comparison to all previously sampled Yukon lakes.

Lake Whitefish

Lake whitefish do not inhabit this system.

Recommendation

The recommendation for future surveys of the Little Fox Lakes systems is to perform an Angler Harvest Survey to determine the recreational pressure. It is also recommended that we increase the number of net sets to improve the precision of our population estimates.

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Lake Trout

Population Estimate and Density

The population estimates for lake trout in the Little Fox Lakes was **1,584** (estimate range: 1,009 – 2,186) in the north basin and **12,069** (estimate range: 10,267 – 14,068) in the south. Densities resulted in 17 and 88 lake trout / ha, respectively.

Length and Weight

Lake trout ranged from 288 mm – 421 mm in the north basin and 290 mm to 437 mm in the south basin.

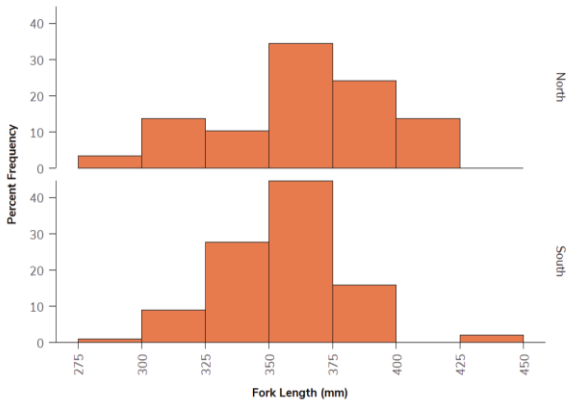

Figure 95. Length frequency distribution of sampled lake trout in the north and south basins of Little Fox Lake (2016), n = 28(N), 100(S).

Age and Growth

Age structures taken from lake trout in both basins displayed an age range from 4 to 25 years.

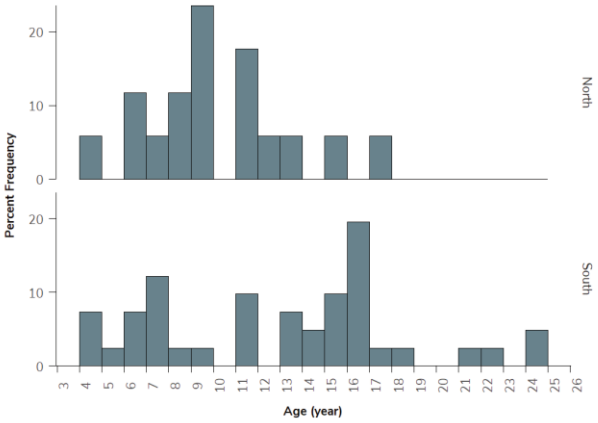

Figure 96. Age frequency distribution of age-analyzed lake trout in the north and south basins of Little Fox Lake (2016), n = 18(N), 41(S).

Lake Whitefish

Overview

There are no lake whitefish in either the north or south basins of Little Fox Lakes. Other species known in these lakes include arctic grayling and burbot.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken in both basins. A sharp thermocline occurred between 6 m and 9 m. Dissolved oxygen in both basins showed an increase between 5 m and 10 m, followed by a gradual decline. Overall, suitable lake trout habitat existed between 12 m and 40 m.

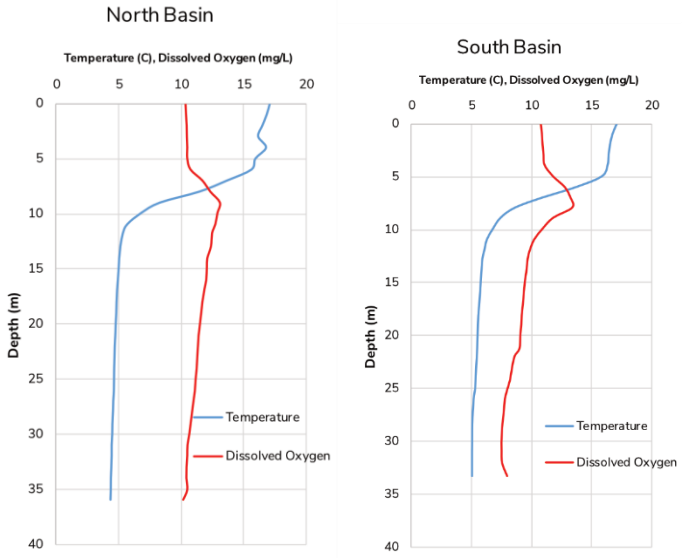

Figure 97. Temperature (C) and dissolved oxygen (mg/L) as measured in the north and south basis of Little Fox Lake on July 4, 2016.

Little Salmon Lake 2015

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	E
SURFACE AREA	**ELEVATION**
6,321 ha	885 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
n/a	92.6 m
SURFACE TEMP	**REGULATIONS**
11.46^{O}C	Special Management
SAMPLING DATES	**NET SETS**
July 30 – Aug 06	143

Location

Little Salmon Lake is located in the central Yukon, between Carmacks and Faro, off of the Robert Campbell Highway. This lake is located within the Traditional Territory of the Little Salmon/Carmacks First Nation and the Kaska Dena Council.

Access and Use

Little Salmon Lake is accessed primarily from two campgrounds (Drury Creek and Little Salmon), both of which have accessible boat ramps. There are a number of residences along the lake. There was a commercial fishing operation on the lake, which closed in 1969, which had operated with a quota of 2,727 kg.

Overall Status

Lake Trout

Results from the 2015 survey of Little Salmon Lake were uncertain and as a result, we have little confidence in our population estimate. This was in part due to the bathymetric properties of the lake, which are very deep with a steep gradient. These properties make it difficult to apply the SPIN methodology appropriately.

Lake Whitefish

We also had difficulty sampling lake whitefish. This resulted in an insufficient number being sampled to generate an accurate population estimate.

Recommendation

The recommendation for future surveys is to increase the amount of net sets, as well as obtain more lake trout samples. It is anticipated that future surveys will also encounter the same sampling difficulty, however we may be able to overcome this by increasing the number of fish sampled. We would gain more information on the age structure of the population, along with natural mortality rates.

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Lake Trout

There were a total of 74 lake trout sampled during this survey.

Population Estimate and Density

The population estimate for lake trout within Little Salmon Lake was estimated at **10,008** (estimate range from 232 – 19,947). This equates to a density of 1.6 lake trout per hectare.

Length and Weight

These fish ranged in size (fork length) from 310 mm to 649 mm. They had an average length of 434 mm and an average weight of 988 g.

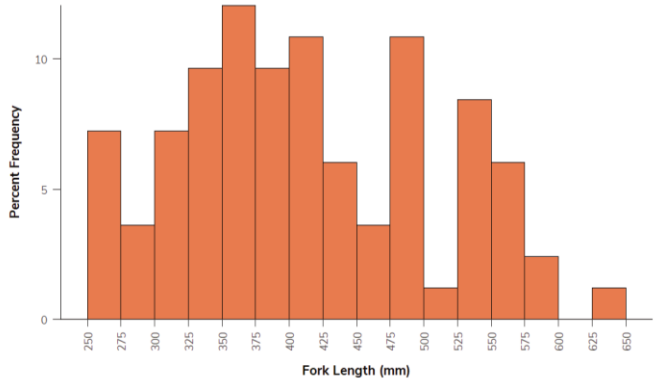

Figure 98. Length frequency distribution of sampled lake trout in Little Salmon Lake (2015), n = 74.

Age and Growth

Age structures were obtained from 31 lake trout. Ages ranged from 7 to 20 years.

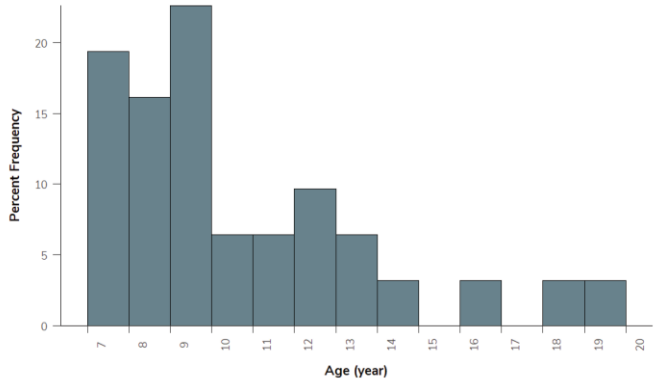

Figure 99. Age frequency distribution of age-analyzed lake trout as sampled in Little Salmon Lake (2015), n = 31.

Lake Whitefish

Overview

A total of 15 lake whitefish were sampled during the 2015 survey. They ranged in size from 270 mm to 576 mm in length, with an average fork length of 463 mm and an average weight of 1,483 g. Age structures obtained from 9 fish. Ages ranged from 6 to 30 years.

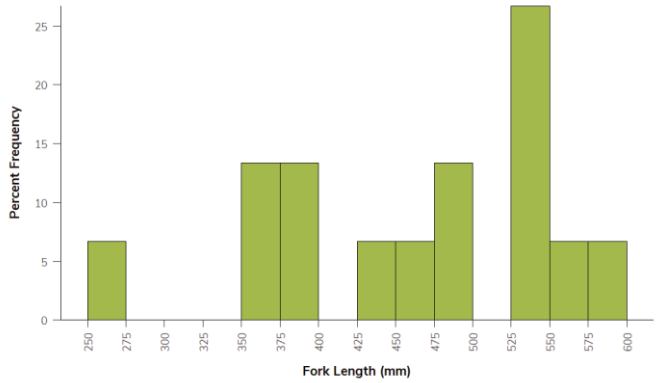

Figure 100. Length frequency distribution of sampled lake whitefish in Little Salmon Lake (2015), n = 15.

Temperature and Dissolved Oxygen

A thermocline was evident between 7.5 m and 12 m across the lake. The dissolved oxygen profiles were relatively stable through the water column. We were unable to determine temperature and dissolved oxygen at depths greater than 60 m as that was the limit for our instruments.

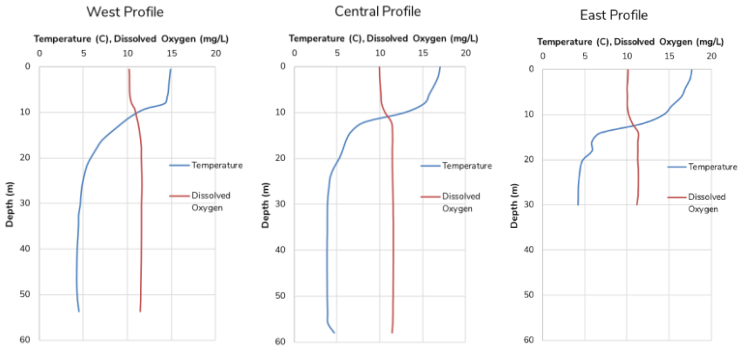

Figure 101. Temperature (C) and dissolved oxygen (mg/L) as measured in the north and south basis of Little Salmon Lakes' west, central and east basins on July 30, 2015.

Louise (Jackson) Lake 2011

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	A
SURFACE AREA	**ELEVATION**
58 ha	1020 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
13 m	6.8 m
SURFACE TEMP	**REGULATIONS**
11.7^{O}C	Special Management
SAMPLING DATES	**NET SETS**
July 27-29	24

Location

Louise Lake (locally known as Jackson) is located approximately 12 km west of Whitehorse, off the Fish Lake Road. The lake is within the Traditional Territory of the Kwanlin Dün First Nation.

Access and Use

There are several private residences, mostly along the north shoreline. There are no formal campgrounds, day use areas or boat launches on the lake. The lake drains via Porter Creek to the northeast where flows get diverted through a micro-hydroelectric generating facility into McIntyre Creek, part of the Yukon River system.

Overall Status

Lake Trout

The 2011 survey results indicate there is a small population of lake trout in Louise Lake. This lake is a popular angling destination and is potentially at risk for over harvest (given the current catch limits).

Lake Whitefish

During the 2011 survey, there were no lake whitefish captured. Additional species sampled included arctic grayling and round whitefish.

Recommendation

The recommendation from the 2011 survey is to increase the number of net sets used on subsequent surveys to increase our precision when making population estimates. It is also recommended that catch limits are reduced through regulation changes. This will assist in maintaining this population.

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Lake Trout

A total of 40 lake trout were sampled during the survey.

Population Estimate and Density

The lake trout population in Louise Lake was estimated at **2,024** (estimate range from 1,534 – 2,546). This equates to a density of 29.8 lake trout per hectare. Lake trout found in Louise lake were of the small-bodied type.

Length and Weight

These fish ranged in fork length from 270 mm to 670 mm. The sampled fish had an average length of 409 mm and average weight of 971 g.

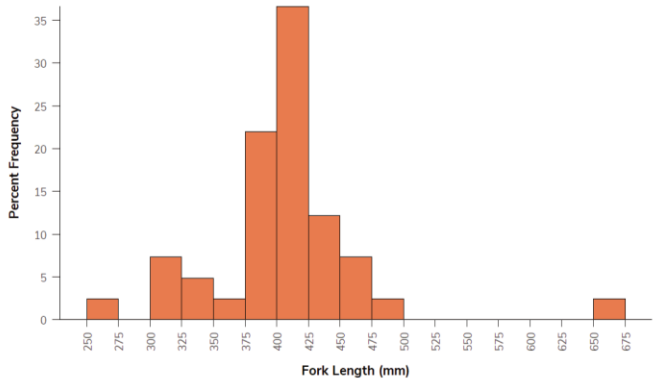

Figure 102. Length frequency distribution of sampled lake trout in Louise Lake (2011), n = 40.

Age and Growth

Age structures were obtained from 16 lake trout. Ages ranged from 7 to 26 years.

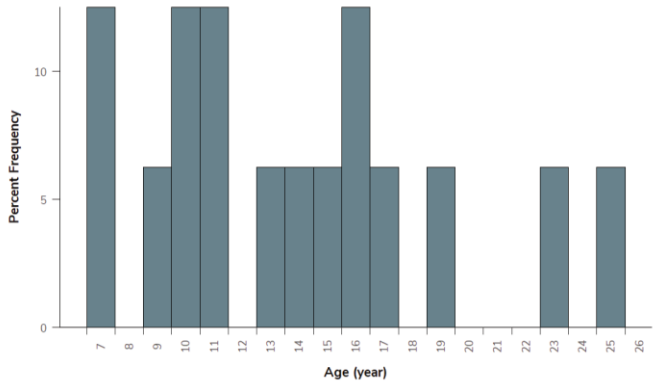

Figure 103. Age frequency distribution of age-analyzed lake trout in Louise Lake (2011), n = 16.

Lake Whitefish

Overview

No lake whitefish were captured during the 2011 survey. This may explain why this lake contains small-bodied lake trout.

Temperature and Dissolved Oxygen

The lake was strongly stratified in the larger basin, with a thermocline from 6.5 m – 9.5 m. The small basin was not stratified. Oxygen profiles did not fall below 4 mg/L. However, below 7 m oxygen levels did drop beneath 7mg/L.

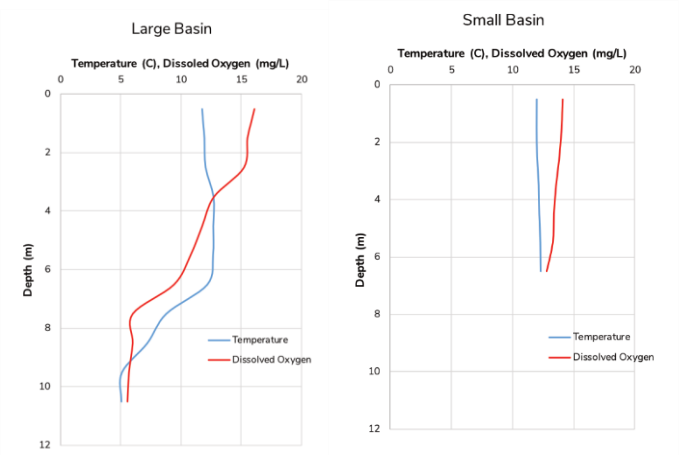

Figure 104. Temperature (C) and dissolved oxygen (mg/L) as measured in the large and small basins of Louise Lake on July 28, 2011.

Mandanna Lake 2013

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
786 ha	781 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
64 m	21 m
SURFACE TEMP	**REGULATIONS**
18.01°C	Special Management
SAMPLING DATES	**NET SETS**
Aug 18-22	48

Location

Mandanna Lake is located within the central Yukon, approximately 30 km southeast Carmacks, within the Little Salmon/Carmacks First Nation Traditional Territory.

Access and Use

Mandanna Lake can be accessed by float plane in the summer and snowmachine in the winter months, along the Yukon Quest trail system. Management of Mandanna Lake is guided by the ***Manadanna Lake Management Plan.***

Overall Status

Lake Trout

The lake trout population in Mandanna Lake was found to have a moderate density when compared to lakes of similar size. This indicates that the population is healthy. Although these lake trout were slightly smaller than lake trout in comparable lakes, the observed age/length data suggests this may be typical for this lake.

Lake Whitefish

The lake whitefish population in Mandanna Lake was found to be of moderate to low density when compared to similar sized lakes. However their size was slightly larger. Overall this population appears healthy.

Recommendation

It is recommended to increase the number of net sets to improve the accuracy of population estimates and to obtain more age structures for analysis.

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Lake Trout

A total of 94 lake trout were captured during this survey of Mandanna Lake.

Population Estimate and Density

The population estimate for lake trout was **3,487** (estimate range: 2,123 – 4,903). This equates to a density of 4.4 lake trout per hectare. This suggests the population is healthy.

Length and Weight

These lake trout were of the large-bodied form and ranged in fork length from 261 mm to 770 mm. They had an average length of 487 mm and average weight 1,439 g.

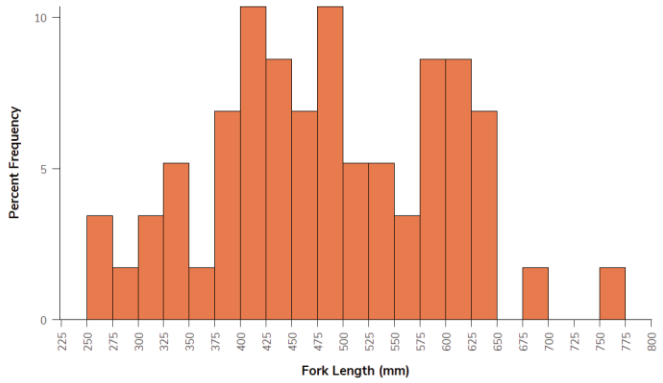


Figure 105. Length frequency distribution of sampled lake trout in Mandanna Lake (2013), n = 94.

Age and Growth

Age structures were obtained from 22 lake trout. Ages ranged from 9 to 30 years.

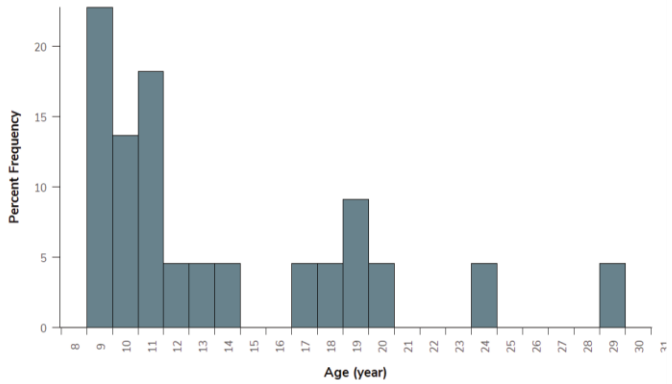


Figure 106. Age frequency distribution of age-analyzed lake trout as sampled in Mandanna Lake (2013), n = 22.

Lake Whitefish

Overview

During this survey, 31 lake whitefish were sampled. The sampled lake whitefish ranged in fork length from 449 mm to 530 mm, with an average length of 491 mm and average weight 1,692 g. The lake whitefish in Mandanna Lake were larger than other Yukon lakes of comparable size. Age structures were analyzed from 17 lake whitefish. Ages ranged from 7 to 17 years.

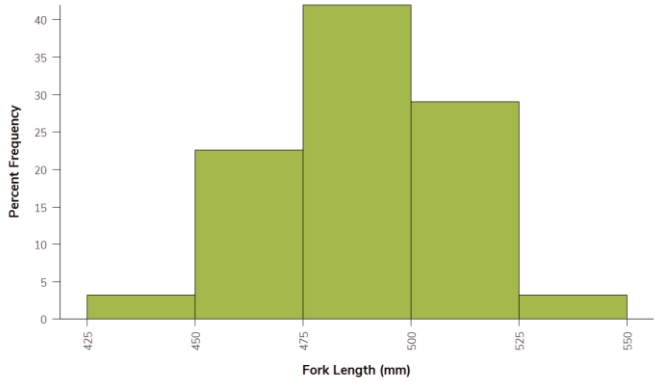


Figure 107. Length frequency distribution of sampled lake whitefish in Manadanna Lake (2013), n = 31.

Temperature and Dissolved Oxygen

The lake was stratified with the thermocline between 5 m and 8 m. Temperatures were unsuitable for lake trout between the surface and 6 m, with dissolved oxygen levels being suitable from the surface to a depth of 56 m.

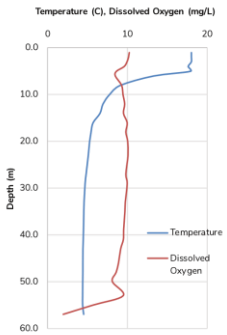


Figure 108. Temperature (C) and dissolved oxygen (mg/L) as measured in Mandanna Lake on August 18, 2013.

Marsh Lake 2015

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	E
SURFACE AREA	**ELEVATION**
2,015 ha	660 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
51.5 m	12.8 m
SURFACE TEMP	**REGULATIONS**
15.2^{O}C	Conservation Waters
SAMPLING DATES	**NET SETS**
July 13-18	48

Location

Marsh Lake is located 50 km south of Whitehorse, along the Alaska Highway in the southern Yukon. Marsh Lake is within the Traditional Territories of the Carcross/Tagish First Nation and the Kwanlin Dün First Nation.

Access and Use

Marsh Lake is accessed along the Alaska Highway, with three accessible boat ramps along the lake. The lake also has a government campground at the northern end, along with a high number of residences along the lake, when compared to all other Yukon lakes.

Overall Status

Lake Trout

In accordance with the 2015 survey, the lake trout population in Marsh Lake was smaller than expected. This lake has a higher productivity value than the other southern lakes (Bennett and Tagish), however Marsh Lake has a shallower profile. This may indicate less available habitat for lake trout and their top prey, lake whitefish. As such, this population may not be small in number due to angling pressure but rather naturally small, due to a lack of available habitat.

Lake Whitefish

The 2015 Marsh Lake survey indicated a small population of lake whitefish. However, this species prefers depths which are greater than 20 m, of which there is a limited amount of habitat in Marsh Lake. Therefore, it is likely that this population is limited based on habitat availability.

Recommendation

The recommendation for future surveys is to perform an Angler Harvest Survey on the southern lakes system to gauge angling pressure. In addition, these results should be incorporated into the Southern Lakes Lake Trout Telemetry, to compare seasonal habitat usage.

Lake Trout

Overview

A total of 108 lake trout were sampled during this survey.

Population Estimate and Density

The population of lake trout within Marsh Lake was estimated at **17,392** (estimate range: 2,532 – 32,525). This equates to a density of 1.8 lake trout per hectare.

Length and Weight

These sampled fish ranged in size (fork length) from 265 mm to 669 mm. The average length was 552 mm and the average weight was 2,212 g.

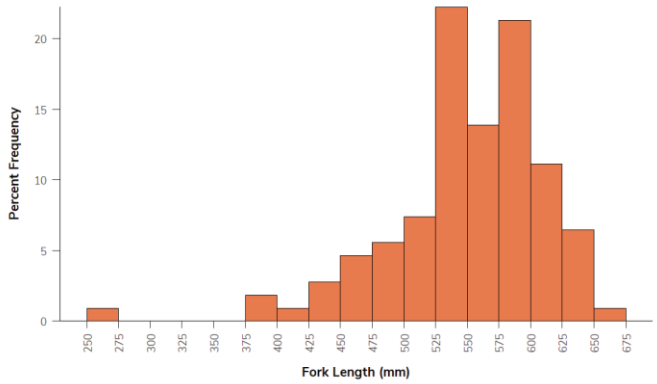


Figure 109. Length frequency distribution of sampled lake trout in Marsh Lake (2015), n = 108.

Age and Growth

Age structures were obtained from 38 lake trout. Ages ranged from 6 to 30 years.

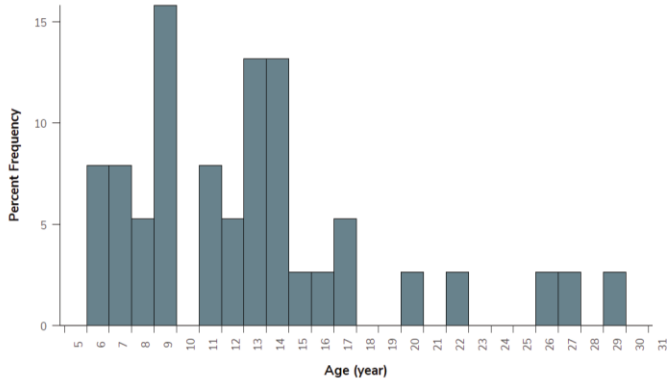


Figure 110. Age frequency distribution of age-analyzed lake trout as sampled in Marsh Lake (2015), n = 38.

Lake Whitefish

Overview

A total of 46 lake whitefish were captured during the 2015 survey. They ranged in size from 240 mm to 520 mm in length, with an average fork length of 430 mm and an average weight of 1,139 g. Age structures were obtained from 14 lake whitefish. Ages ranged from 4 to 17 years.

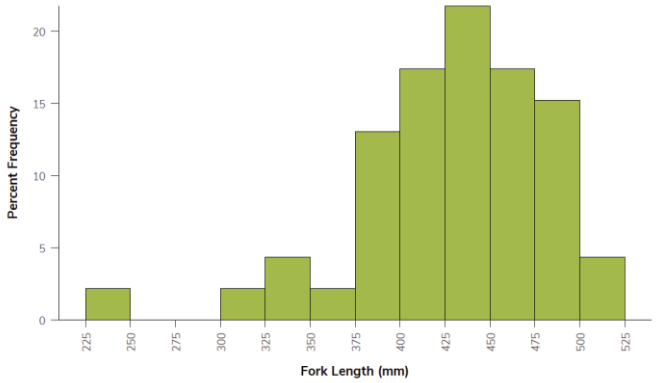


Figure 111. Length frequency distribution of sampled lake whitefish in Marsh Lake (2015), n = 46.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken on July 13. The temperature profile indicated a sharp thermocline between 19 m and 22 m, followed by a gradual temperature decline to 60 m. Dissolved oxygen levels were stable throughout the profile.

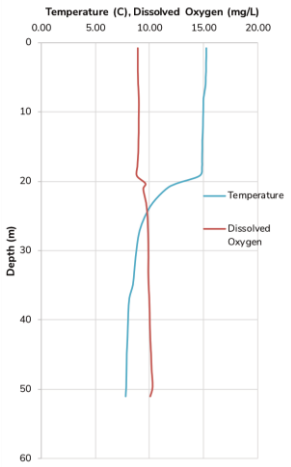


Figure 112. Temperature (C) and dissolved oxygen (mg/L) as measured in Mandanna Lake on July 13, 2015.

Mayo Lake 2013

Lake Information

WATERSHED	**LAKE CLASS**
Stewart	E
SURFACE AREA	**ELEVATION**
9,963 ha	583 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
106 m	56.5 m
SURFACE TEMP	**REGULATIONS**
15.1^{o}C	Conservation Waters
SAMPLING DATES	**NET SETS**
July 24 – Aug 04	140

Location

Mayo Lake is located in the central Yukon, approximately 50 km northwest of Mayo, within the Traditional Territory of the First Nation of Na-Cho Nyäk Dun. Mayo Lake is the reservoir for the Mayo electrical generating station and as such, the lake levels are controlled by this facility.

Access and Use

Mayo Lake is primarily accessed from the public boat launch at the west end of the lake, near the hydro dam. There are several private residences along the northwest shore of the lake.

Overall Status

Lake Trout

The lake trout population in Mayo Lake was found to be smaller in number than other comparably sized Yukon lakes. However our confidence in the population estimate is weak. This may be due to the morphology of the lake, making it difficult to thoroughly sample.

Lake Whitefish

The lake whitefish population appeared healthy, however this population is also difficult to assess.

Recommendation

The recommendation from this survey is to increase the number of age structures obtained and analyzed. The current assessment indicated few, if any individuals are greater than 650 mm. This will allow for increased knowledge of the population structure and further management of the lake trout and lake whitefish populations within this lake.

Lake Trout

Population Estimate and Density

The population of lake trout within Mayo Lake was estimated to be at **21,229** (estimate range: 5,603 – 37, 202). This equates to a density of 2.1 lake trout per hectare, however there was a low confidence level with this population estimate, as evident by the wide range.

Length and Weight

The sampled lake trout ranged in size from 250 mm to 835 mm in fork length, with an average length of 456 mm and average weight 1,261 g.

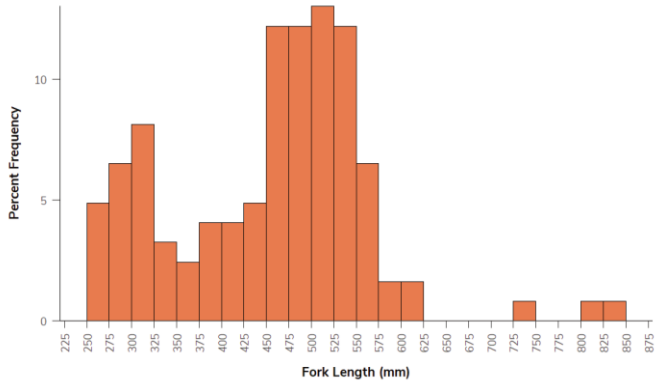


Figure 113. Length frequency distribution of sampled lake trout in Mayo Lake (2013), n = 123.

Age and Growth

Age structures were obtained from 42 individuals. Ages ranged from 6 to 41 years, with few individuals greater than 650 mm.

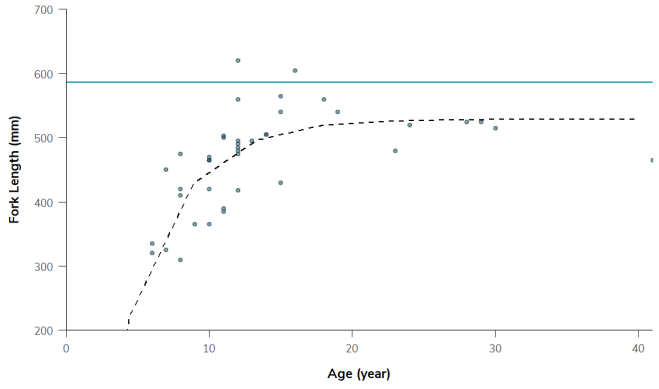


Figure 114. Von Bertalanffy growth curve of age-analyzed sampled lake trout in Mayo Lake (2013), n = 42. Horizontal line indicates current upper slot limit.

Lake Whitefish

Overview

During this survey, 72 lake whitefish were captured. The captured lake whitefish ranged from 385 mm to 525 mm in fork length, with an average length of 430 mm and average weight 1,175 g. Age structures from 39 lake whitefish. Ages ranged from 7 to 30 years.

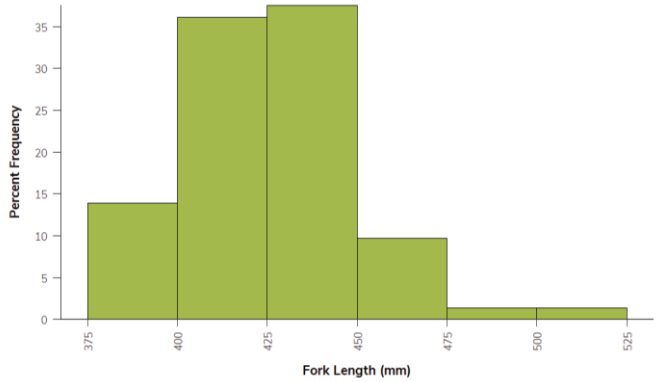


Figure 115. Length frequency distribution of sampled lake whitefish in Mayo Lake (2013), n = 72.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken within the Main arm, Roop arm and Nelson arm of the lake. Each of the three lake arms, were stratified in temperature, displaying a thermocline between 6 m and 12 m in depth. Dissolved oxygen levels were found to be suitable for lake trout throughout the water column in all three arms.

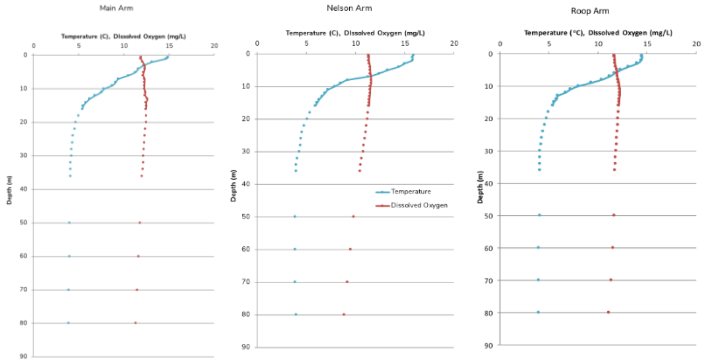
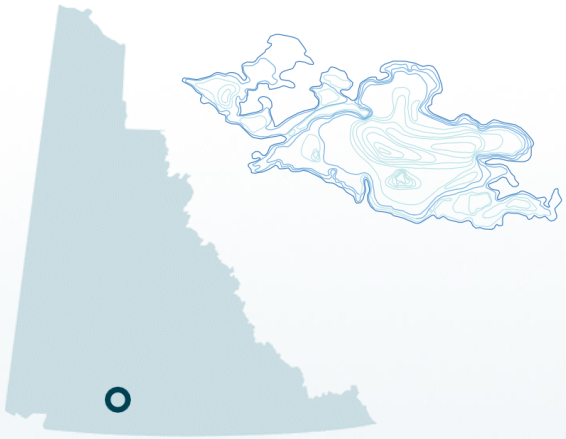


Figure 116. Temperature (C) and dissolved oxygen (mg/L) as measured in the Main Arm, Nelson Arm and Roop Arm of Mayo Lake on July 2013.



Michie Lake 2017

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
371 ha	795 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
50 m	n/a
SURFACE TEMP	**REGULATIONS**
15.55^{O}C	General Waters
SAMPLING DATES	**NET SETS**
July 10-13	43

Location

Michie Lake is located approximately 50 km southeast of Whitehorse. Michie lake lies within the Traditional Territories of the Ta'an Kwach'an Council and the Kwanlin Dun First Nation.

Access and Use

Michie Lake is accessed by a 4x4/ATV trail, which branches off from the M'Clintok River agricultural area. There is a small trappers cabin and rough campsite on the northern shore.

Overall Status

Lake Trout

In accordance with the 2017 survey results, Michie Lake has a small to moderate sized population of lake trout, when compared to similar sized lakes.

Lake Whitefish

The population of lake whitefish within Michie Lake appears healthy and stable, given the small size of the lake.

Recommendation

The recommendation for future surveys of Michie Lake is to increase net sets. This will help improve our confidence in the population estimate. Additional habitat information will help quantify viable lake trout habitat for this population.

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Lake Trout

Population Estimate and Density

The population estimate of lake trout within Michie Lake, was **562** (estimate range: 0 to 1,144). This equates to a density of 1.5 lake trout per hectare. However our confidence in the population estimate is weak.

Length and Weight

These sampled fish were large-bodied lake trout and ranged in fork length from 494 mm to 631 mm. They had an average length of 543 mm with an average weight of 2,082g.

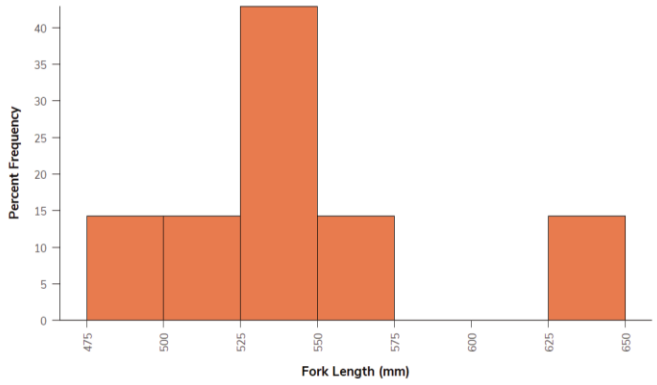

Figure 117. Length frequency distribution of sampled lake trout in Michie Lake (2017), n = 7.

Age and Growth

Age structures were only obtained from three lake trout, with ages of 10, 24 and 25.

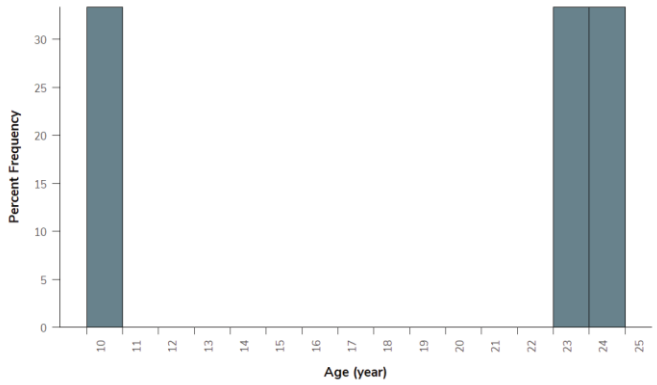

Figure 118. Age frequency distribution of age-analyzed lake trout from Michie Lake (2017), n = 3.

Lake Whitefish

Overview

During the 2017 survey, a total of 63 lake whitefish were sampled. The size of these fish ranged in fork length from 320 mm to 477 mm, with an average length of 377 mm and an average weight of 728 g. Age structures were obtained from 29 lake whitefish. Ages ranged from 6 to 35 years.

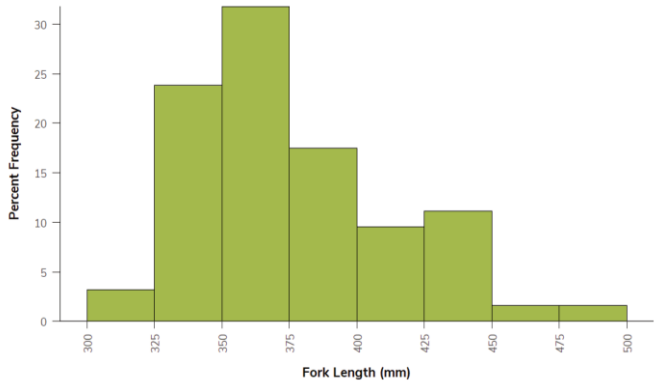

Figure 119, Length frequency distribution of lake whitefish as sampled in Michie Lake (2017), n = 63.

Temperature and Dissolved Oxygen

The temperature profile displayed a sharp thermocline from 5 m to 9 m, followed by a gradual decline through the water column. Dissolved oxygen displayed a slight increase from 6 m to 8 m. Overall, optimum habitat for lake trout existed from 7 m to 50 m.

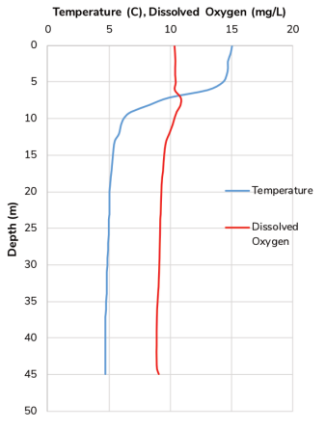

Figure 120. Temperature (C) and dissolved oxygen (mg/L) as measured in Michie Lake on July 13, 2017.

Minto Lake 2014

Lake Information

WATERSHED	**LAKE CLASS**
Stewart	B
SURFACE AREA	**ELEVATION**
420 ha	761 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
37 m	13.8 m
SURFACE TEMP	**REGULATIONS**
15.8^{O}C	Special Management
SAMPLING DATES	**NET SETS**
July 16 – 18	34

Location

Minto Lake is a small lake located about 16 km north-west of the community of Mayo, in the central Yukon. Minto Lake is within the Traditional Territory of the First Nation of Na-cho Nyäk Dun.

Access and Use

Minto Lake is accessible from an unpaved road off the Silver Trail. There are several seasonal residences along the lake and a small boat launch along the east shore. Recreational angling has not been assessed on this lake.

Overall Status

Lake Trout

The lake trout population in Minto Lake was smaller than expected for a lake of this size. However this is a small unproductive lake, which would not naturally support a large population. As such, regulations that promote a conservative approach to harvest should be established. This will help support a sustainable fishery.

Lake Whitefish

The population of lake whitefish in Minto Lake appears healthy, although smaller in physical size, compared to other populations from similar sized lakes.

Recommendation

To improve confidence in the population estimate, we recommend that for future surveys, to increase the amount of net sets. This will increase our sample size, however as this is a small population, caution should be taken when setting nets, to ensure minimal mortalities.

fisheries@yukon.ca

Lake Trout

Overview

During the 2014 survey, a total of 14 large-bodied lake trout were sampled. Age structures were only obtained from a single lake trout, which was 7 years old.

Population Estimate and Density

The population estimate of lake trout in Minto Lake was **1,062** (estimate range: 396 – 1,745). This equates to a density of 2.5 lake trout per hectare. This represents a small population, however we have little confidence in this estimate.

Length and Weight

These fish ranged in fork length size from 394 mm to 799 mm. These sampled fish had an average length of 674 mm and an average weight of 3,927g.

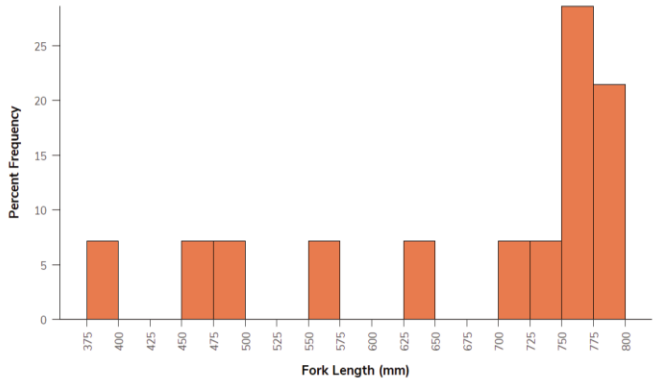

Figure 121. Length frequency distribution of sampled lake trout in Minto Lake (2014), n = 14.

Lake Whitefish

Overview

During this survey 56 lake whitefish were sampled. The sampled lake whitefish ranged in fork length from 230 mm to 368 mm. They had an average length of 298 mm and an average weight of 385 g. Age structures were obtained from 13 lake whitefish. Ages ranged from 6 to 18 years.

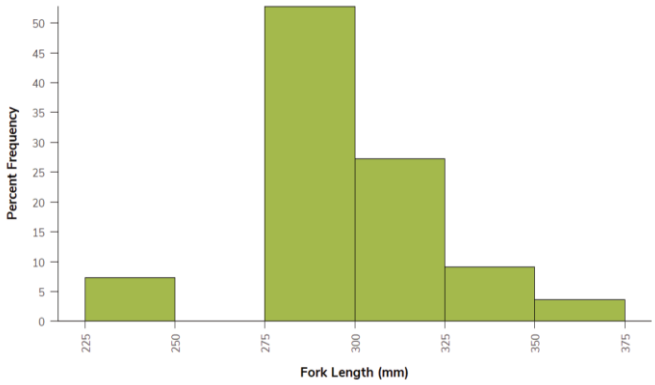

Figure 122. Length frequency distribution of lake whitefish, as sampled in Minto Lake (2014), n = 56.

Temperature and Dissolved Oxygen

The temperature profile showed a strongly stratified water column, with a thermocline evident between 7 m and 10 m. The dissolved oxygen levels were relatively stable down to a depth of 30 m, at which point they decreased. Overall, there was suitable habitat for lake trout below 6 m.

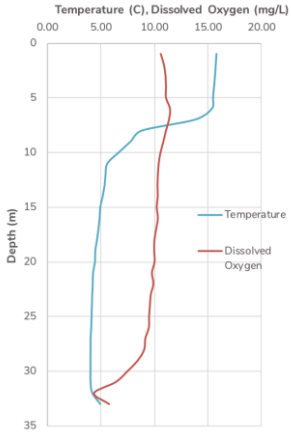

Figure 123. Temperature (C) and dissolved oxygen (mg/L) as measured in Minto Lake on July 16, 2014.

Morely Lake 2018

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	C
SURFACE AREA	**ELEVATION**
1,114 ha	814 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
30 m	8.07 m
SURFACE TEMP	**REGULATIONS**
15.6^{O}C	Conservation Waters
SAMPLING DATES	**NET SETS**
July 09 – 12	34

Location

Morley Lake is located approximately 220 km southeast of Whitehorse, along the Alaska Highway, in the south-central Yukon. Morley Lake is within the Traditional Territory of the Teslin Tlingit Council, with the southern end of the lake crossing into British Columbia.

Access and Use

Morley Lake is accessed via the Morley Lake Recreational Site, located on the southwest shore. This location contains camping sites and a gravel shoreline, which can be used as a boat ramp. The rest of the lake shoreline is undeveloped.

Overall Status

Lake Trout

The lake trout population in Morley Lake was low to moderate in density, when compared to lakes of similar size and productivity. This population of large-bodied lake trout appears healthy.

Lake Whitefish

The population of lake whitefish in Morley Lake appears healthy. There was a large density of lake whitefish, with a large availability of suitable habitat.

Recommendation

The recommendation for future surveys is to increase net sets and obtain a greater number of aging structures to analyze. This will give us a larger sample size from which to base our population estimates upon. Our current confidence in the population estimate is low. An Angler Harvest Survey would assist in determining recreational pressure for the lake.

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Lake Trout

Overview

A total of 37 lake trout were sampled.

Population Estimate and Density

The population estimate of lake trout within Morley Lake was **3,963** (estimate range: 2,122 - 5,868). This corresponds to a density of 3.6 lake trout per hectare.

Length and Weight

These large-bodied lake trout ranged in fork length from 279 mm to 714 mm. They had an average length of 482 mm with an average weight of 1,367g.

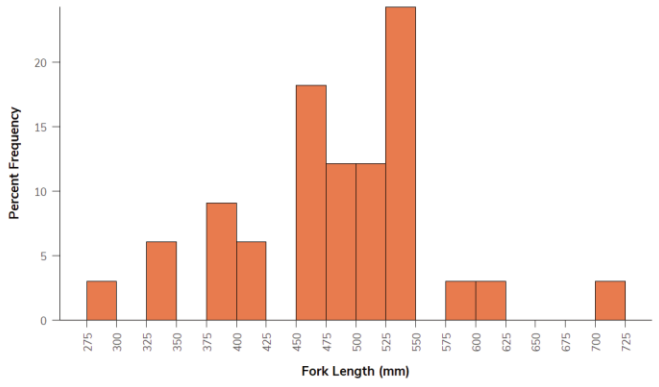

Figure 124. Length frequency distribution of sampled lake trout in Morely Lake (2018), n = 37.

Age and Growth

Age structures were obtained from 23 lake trout. Ages ranged from of 5 to 40 years.

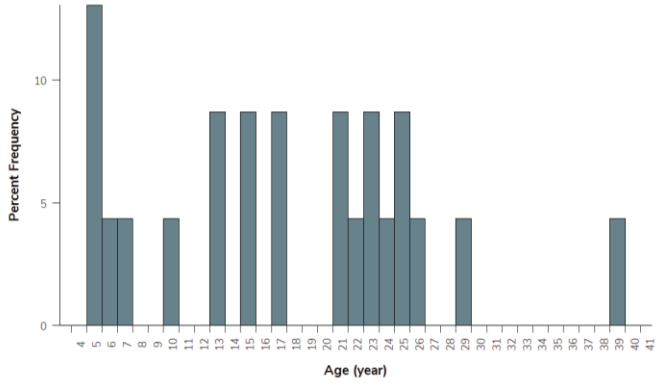

Figure 125. Age frequency distribution of age-analyzed lake trout in Morely Lake (2018), n = 23.

Lake Whitefish

Overview

During the 2018 survey, a total of 78 lake whitefish were sampled in Morley Lake. The size of these fish ranged from 226 mm to 492 mm, and had an average fork length of 377 mm and an average weight of 750 g. Age structures were obtained rom 34 sampled lake whitefish. Ages ranged from 3 to 26 years.

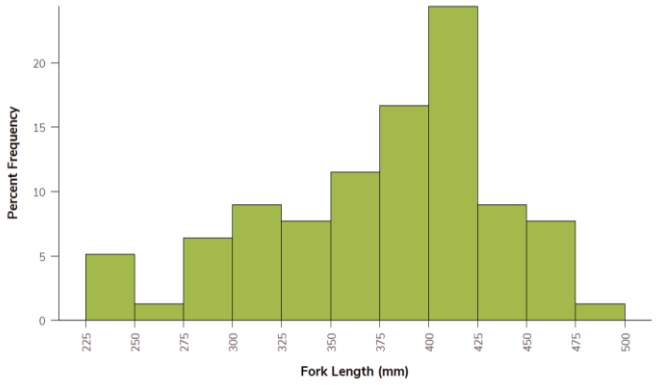

Figure 126. Length frequency distribution of lake whitefish, as sampled in Morely Lake (2018), n = 78.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles showed a sharp thermocline between 8 m and 9 m, followed by a gradual temperature decline throughout the water column. Dissolved oxygen remained relatively constant. Optimal lake trout habitat existed from 9 m to lake bottom.

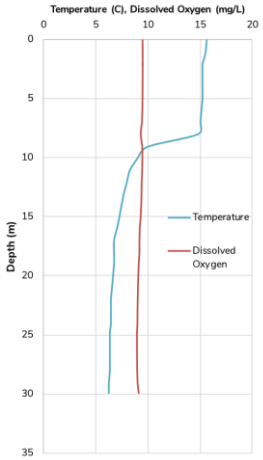

Figure 127. Temperature (C) and dissolved oxygen (mg/L) as measured in Morely Lake on July 9, 2018.

Quiet Lake 2012

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	E
SURFACE AREA	**ELEVATION**
5,441 ha	787 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
170 m	56.8 m
SURFACE TEMP	**REGULATIONS**
11.4^{O}C	Conservation Waters
SAMPLING DATES	**NET SETS**
July 16-20	102

Location

Quiet Lake is located approximately 60 km north of Johnsons Crossing in the south-central Yukon, along the South Canol Highway. Quiet Lake is within the Traditional Territory of the Teslin Tlingit First Nation and the Kaska Dena Nation (northern section of the lake).

Access and Use

Access to Quiet Lake is via the South Canol Road, which is only open to vehicles in the summer season and not maintained in the winter. There are two government campgrounds along the lake with two available boat launches.

Overall Status

Lake Trout

The lake trout population in Quiet Lake appears healthy. The 2012 survey results indicate that this large-bodied lake trout population is stable. This lake recieves minimal angler effort.

Lake Whitefish

The lake whitefish population in Quiet Lake was lower in number when compared to similarly sized Yukon lakes. This may be related to commercial fishing operations which occurred from 1961 - 1989, which included a yearly quota of 2,722kg of lake whitefish.

Recommendation

The recommendation from the 2012 survey is to slightly increase the number of net sets and collection of aging structures, if this lake is sampled in the future. This will improve the accuracy of the population estimate.

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Lake Trout

During the survey, a total of 162 lake trout were captured.

Population Estimate and Density

The lake trout population within Quiet Lake was estimated to be **17,865** (estimate range: 8,951 – 27,071). This equates to a density of 3.3 lake trout per hectare.

Length and Weight

Sampled lake trout ranged from 231 mm to 949 mm in fork length. They had an average length of 519 mm and an average weight of 1,852 g.

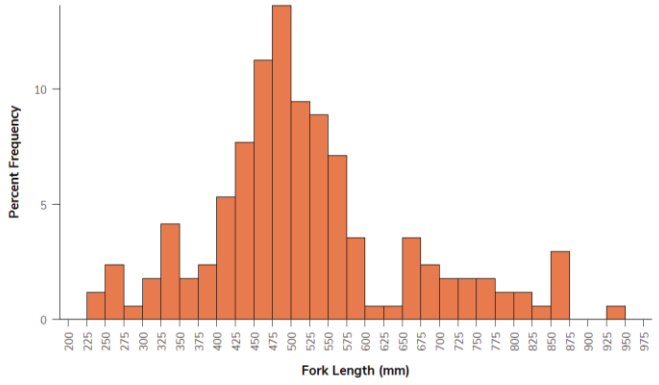

Figure 128. Length frequency distribution of sampled lake trout in Quiet Lake (2012), n = 162.

Age and Growth

Age structures were obtained from 37 lake trout during the 2012 survey. Ages ranged from 8 to 32 years.

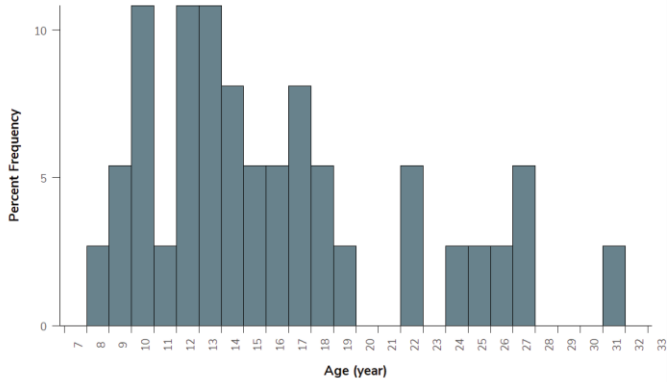

Figure 129. Age frequency distribution of age-analyzed lake trout as sampled in Quiet Lake (2012), n = 37.

Lake Whitefish

Overview

A total of 42 lake whitefish were captured during this survey, ranging from 352 mm to 544 mm in fork length, with an average length of 454 mm and average weight of 1,270 g. Age structures were analyzed from 4 lake whitefish. Ages ranged from 7 to 31 years.

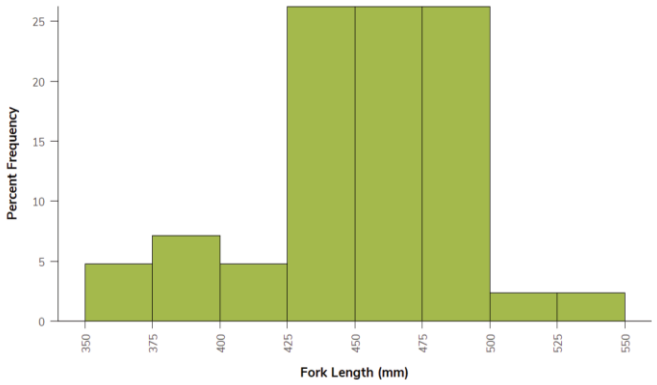

Figure 130. Length frequency distribution of lake whitefish in Quiet Lake (2012), n = 42.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken near the middle of Fish Lake on July 17, 2012. The lake was not stratified in temperature. Dissolved oxygen levels declined between 9 and 17 m.

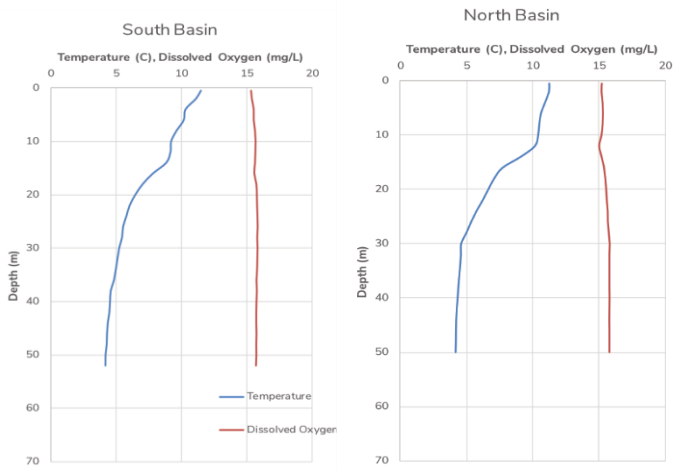

Figure 131. Temperature (C) and dissolved oxygen (mg/L) as measured in the South and North basins of Quiet Lake on July 17, 2018.

Snafu Lake (lower) 2010

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
248 ha	759 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
25 m	6.3 m
SURFACE TEMP	**REGULATIONS**
n/a	Special Management
SAMPLING DATES	**NET SETS**
July 05 – 06	22

Location

Snafu Lake (lower) is located approximately 25 km southeast of Jakes Corner along the Atlin Road. The lake belongs to a chain of lakes collectively referred to as Snafu Lakes. The lakes are within the Traditional Territory of the Carcross/Tagish First Nation.

Access and Use

Access to Snafu Lake (lower) is from the Atlin Road. This lake has a popular government campground and an accessible boat ramp.

Overall Status

Lake Trout

No lake trout were sampled during the survey of Snafu Lake. This indicates the lake trout population may have collapsed. Historically, constant fishing pressure from commercial and recreational angling may have led to this decline.

Lake Whitefish

Snafu Lake was found to contain a healthy population of lake whitefish. They likely form the primary diet of northern pike in this lake. Other sampled fish included: broad whitefish, arctic grayling, least cisco and northern pike.

Recommendation

The recommendation from the 2010 survey is to present a regulation change to prohibit retention of lake trout on this lake. This lake cannot sustain lake trout harvest at this time.

Lake Trout

Overview

No lake trout were sampled during this survey. The lack of lake trout captured indicates a collapsed population in this lake. This information agrees with results from Angler Harvest Surveys, which documented small numbers of lake trout in the catch composition.

Population Estimate and Density

As no lake trout were captured, population estimates can not be derived.

Lake Whitefish

Overview

During this survey, 96 lake whitefish were captured, ranging in fork length size from 220 mm to 470 m in length. Aging structures for lake whitefish were not obtained in 2010. However, given the large number sampled, it is believed that this population is healthy.

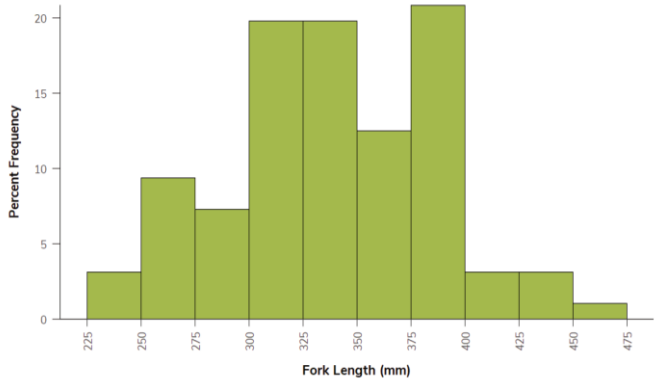

Figure 132. Length frequency distribution of lake whitefish sampled in Snafu Lake (2010), n = 96.

Temperature and Dissolved Oxygen

Temperature and oxygen profiles were not assessed during the 2010 survey as this equipment was not available at the time.

Snafu Lake (gazetted) 2018

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
475 ha	878 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
35 m	14.7 m
SURFACE TEMP	**REGULATIONS**
14 - 17^{O}C	General Waters
SAMPLING DATES	**NET SETS**
July 06 – 11	47

Location

Gazetted Snafu is located in the Southern Lakes region and is within the Traditional Territories of the Teslin Tlingit Council and the Carcross/Tagish First Nation.

Access and Use

Gazetted Snafu is difficult to access and receives little to no recreational angling pressure.

Overall Status

Lake Trout

The results from this survey suggest that the lake trout population is healthy, although the population is not large. The lake trout population is likely healthy due to the inaccessibility of this lake.

Lake Whitefish

The population of lake whitefish within Gazetted Snafu Lake consists of a large number of smaller whitefish. This population is currently healthy.

Recommendation

No change in current regulation. Due to the inaccessibility of this lake, this lake is a good candidate lake to be used as a control when studying lakes such as Snafu Lake and Tarfu Lake.

Lake Trout

Overview

There were 48 lake trout sampled during the survey.

Population Estimate and Density

The lake trout population estimate was approximately **1,560** (estimate range: 781 – 2364). The estimated density of lake trout is 3.3 per hectare.

Length and Weight

Sampled lake trout ranged from 400 mm to 815 mm in length (as measured to the fork).

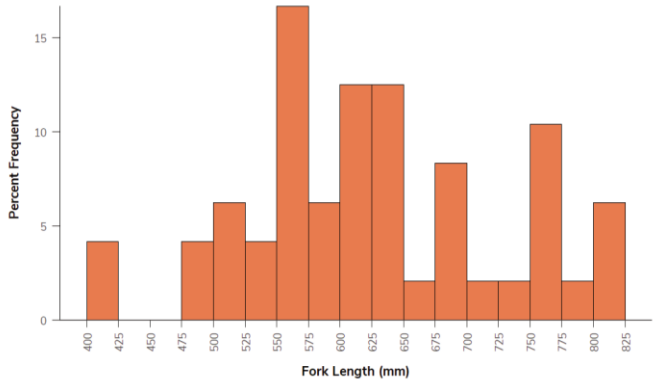

Figure 133. Length frequency distribution of lake trout as sampled in Snafu Lake (2019), n = 48.

Age and Growth

Seventeen were sampled for age. Ages ranged from 7 to 28 years.

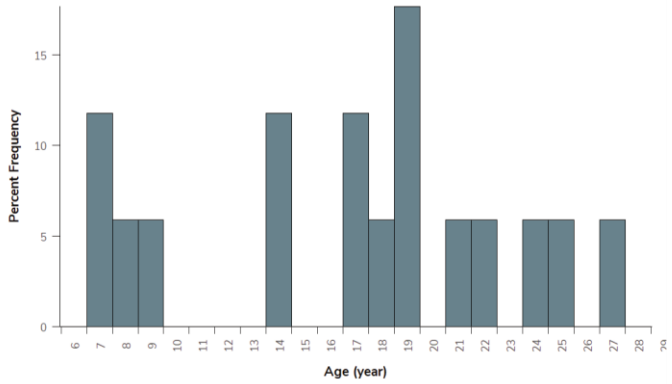

Figure 134. Age frequency distribution of age-analyzed lake trout in Snafu Lake (2018), n = 17.

Lake Whitefish

Overview

There were 262 lake whitefish captured during the survey, ranging from 200 mm to 474 mm in length (as measured to the fork). Fifty three were sampled for age. Ages ranged from 3 to 37 years.

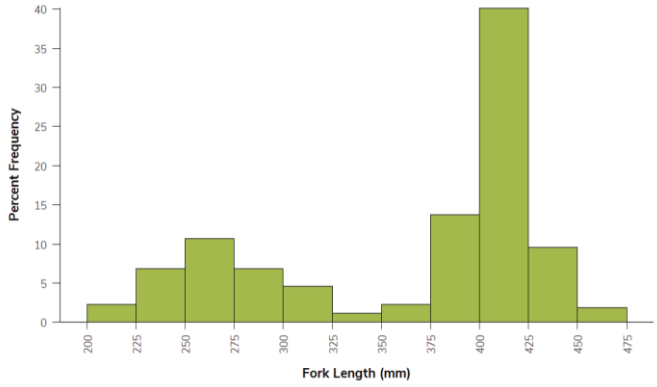

Figure 135. Length frequency distribution of lake whitefish as sampled in Snafu Lake (2018), n = 262.

Temperature and Dissolved Oxygen

Temperature at the lake surface was close to 15^{O}C, declining slowly over 8 m, with a thermocline noted between 6 m and 10 m. An oxygen profile was not conducted due to equipment malfunction.

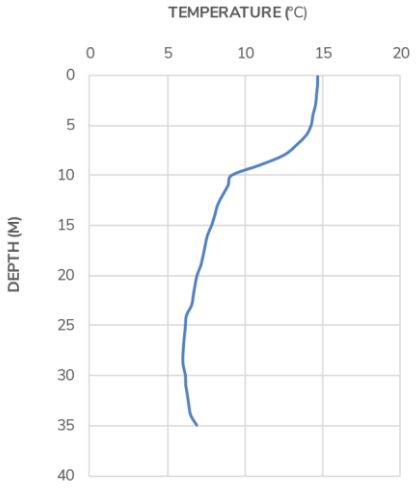

Figure 136. Temperature (C) as measured in the South and North basins of Snafu Lake on July 8, 2018.

Tagish Lake 2015

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	F
SURFACE AREA	**ELEVATION**
35,458 ha	662 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
307 m	12.8 m
SURFACE TEMP	**REGULATIONS**
14.2°C	Conservation Waters
SAMPLING DATES	**NET SETS**
August 8-14	140

Location

Tagish Lake is a large lake with multiple basins (Windy Arm, Taku Arm, Nares, Graham Inlet, Moose Arm), located in the southern Yukon. This is a transboundary lake with British Columbia and is within the Traditional Territory of the Carcross/Tagish First Nation and the Taku River Tlingit First Nation.

Access and Use

Tagish Lake is accessed via the South Klondike Highway and Tagish Road. Main access points are at Carcross and Tagish. There are two government campgrounds and multiple boat ramps on this lake. There are multiple private residences found along this lake.

Overall Status

Lake Trout

Tagish Lake is one of the largest lakes in the Yukon and the lakes multiple basins and depth make it difficult to effectively sample lake trout populations using the SPIN program. The lake trout population in Tagish Lake appears healthy. It has a large-bodied population. Numbers are similar to lakes of comparable size (Kluane, Atlin).

Lake Whitefish

The 2015 Tagish Lake survey results indicate a healthy population of lake whitefish. There is significant available habitat for this species. This population had similar catch rates as other Yukon lakes of this size.

Recommendation

The recommendation for future surveys is to perform an Angler Harvest Survey on the southern lakes system to gauge angling pressure.

fisheries@yukon.ca

Lake Trout

Population Estimate and Density

The population estimate for lake trout in Tagish Lake was **162,460** (estimate range: 100,263 – 227,310). This equates to a density of 4.6 lake trout per hectare. Given the wide range of our population estimate, we believe the strength of this estimate can be improved.

Length and Weight

These lake trout ranged in size (fork length) from 243 mm to 805 mm. Sampled fish had an average length of 480 mm and an average weight of 1,438 g.

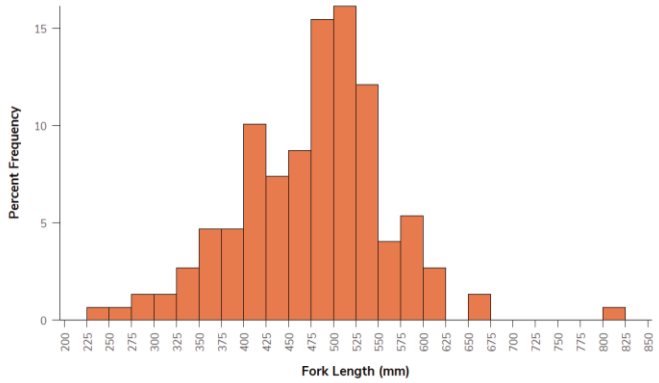

Figure 137. Length frequency distribution of lake trout in Tagish Lake (2015), n = 149.

Ageand Growth

Age Structures were obtained from 37 lake trout. Ages ranged from 5 to 25 years.

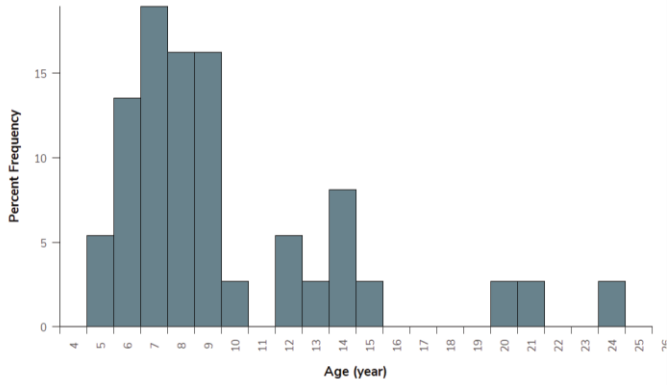

Figure 138. Age frequency distribution of age-analyzed lake trout in Tagish Lake (2015), n = 37.

Lake Whitefish

Overview

A total of 41 lake whitefish were captured during the 2015 survey. They ranged in size from 200 mm to 510 mm in fork length, with an average length of 419 mm and an average weight of 1,036 g. Age structures were only obtained from 4 lake whitefish. Ages ranged from 8 to 19 years.

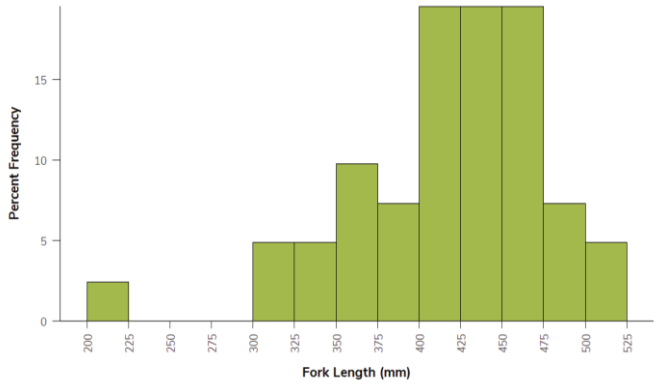

Figure 139. Length frequency distribution of lake whitefish in Tagish Lake (2015), n = 41.

Temperature and Dissolved Oxygen

Profiles in the Main basin indicated a strong thermocline, which weakened progressively at Graham and subsequently Engineer basins, however, overall Tagish Lake was suitable for lake trout.

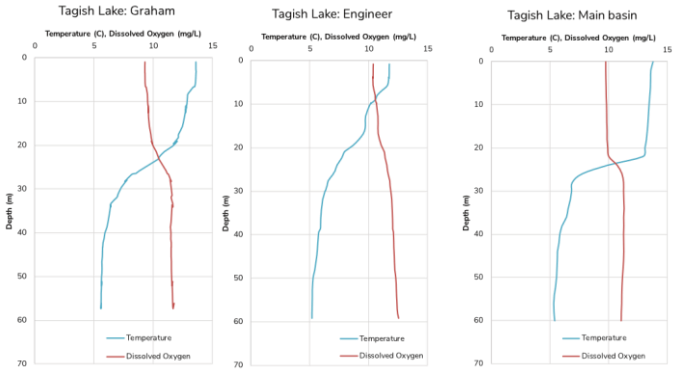

Figure 140. Temperature (C) and dissolved oxygen (mg/L) as measured at Graham, Engineer and the Main basins of Tagish Lake during the August 2015 survey.

Tarfu Lake 2010

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
404 ha	773 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
33 m	11.6 m
SURFACE TEMP	**REGULATIONS**
n/a	Special Management
SAMPLING DATES	**NET SETS**
July 07 – 08	23

Location

Tarfu Lake is a small lake located approximately 35 km southeast of Jakes Corner, along the Atlin Road. Tarfu Lake is within the Traditional Territory of the Carcross/Tagish First Nation and Taku River Tlingit First Nation.

Access and Use

Access to Tarfu Lake is from the Atlin Road. This lake has a popular government campground and accessible boat ramp.

Overall Status

Lake Trout

The results from this survey suggest that this productive, small lake has a smaller density of lake trout. This agrees with findings from historic angler harvest surveys, which show low catch rates for lake trout. Given the small population of lake trout, and in combination with the lakes popularity as a fishing destination, we suggest that the lake trout population could be at risk of collapse.

Lake Whitefish

There were no lake whitefish captured during this survey. , However round whitefish were captured in this survey. The population of round whitefish appeared healthy. Additional species sampled included: arctic grayling and northern pike.

Recommendation

We recommend a regulation change to prohibit lake trout retention for this lake.

Lake Trout

A total of 8 lake trout were sampled during the 2010 survey.

Population Estimate and Density

The lake trout population estimate for Tarfu Lake was **680** (estimate range 52 – 1,319). This equates to a density of 1.7 lake trout per hectare, which is less than predicted for a small productive lake. There is uncertainty in this population estimate due to the small number of lake trout sampled.

Length and Weight

Sampled lake trout ranged from 440 mm to 824 mm in fork length.

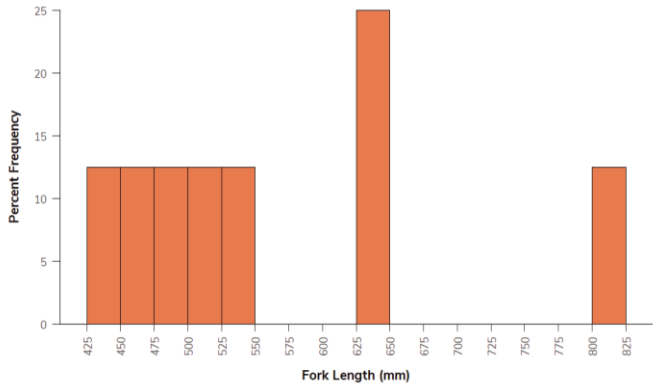

Figure 141. Length frequency distribution of sampled lake trout in Tarfu Lake (2010), n = 8.

Age and Growth

Age structures were taken from four lake trout. Ages ranged from 11 to 45 years.

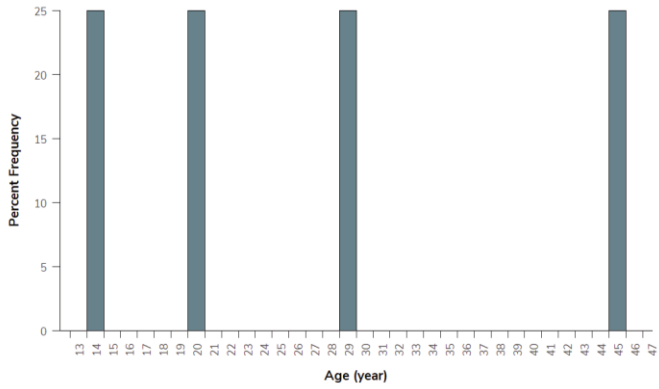

Figure 142. Age frequency distribution of age-analyzed lake trout as sampled in Tarfu Lake (2010), n = 4.

Round Whitefish

Overview

During this survey, 68 round whitefish were sampled. They ranged in fork length size from 287 mm to 420 m. Age structures for lake whitefish were not obtained in 2010. However, given the numbers sampled and their size, we suspect that this population is healthy.

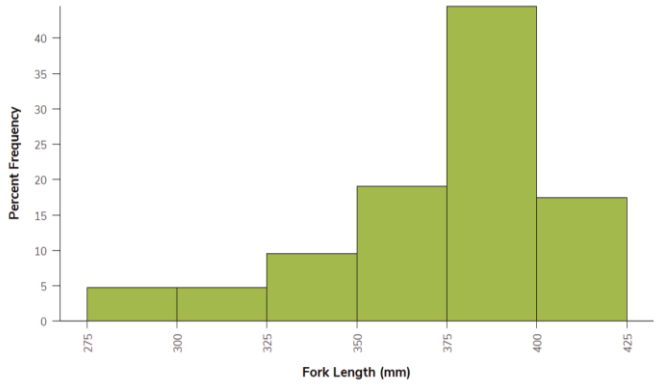

Figure 143. Length frequency distribution of sampled round whitefish in Tarfu Lake (2010), n = 68.

Temperature and Dissolved Oxygen

Temperature and oxygen profiles were not assessed during the 2010 survey as this equipment was not available.

Ta'tla Mun 2011

Lake Information

WATERSHED	LAKE CLASS
Pelly	D
SURFACE AREA	**ELEVATION**
3,141 ha	525 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
48 m	27 m
SURFACE TEMP	**REGULATIONS**
16.5°C	Special Management
SAMPLING DATES	**NET SETS**
July 05 – 08	63

Location

Ta'tla Mun is located approximately 30 km southeast of Pelly Crossing. The lake is within the Traditional Territory of the Selkirk First Nation. This lake is of historical and cultural significance and as such, has been designated as a **Special Management Area.**

Access and Use

There is no road access to the lake, however there is a well-defined trail from Pelly Crossing, accessible by off-road vehicles

Overall Status

Lake Trout

Ta'tla Mun was found to have a healthy population of large-bodied lake trout, as evidenced by the large numbers of lake trout sampled during our survey. This finding agrees with our past (1991) survey which also reported a healthy lake trout population.

Lake Whitefish

The lake whitefish population was found to be healthy. Additional species sampled included: burbot and northern pike.

Recommendation

The recommendation resulting from the 2011 survey is to use this data to guide the Ta'tla Mun Special Management Area plan. If this lake is to be resampled, we recommend increasing the number of net set and age structures obtained, which will aid our confidence in the population number and provide adequate information on population structure.

Lake Trout

Overview

A total of 65 lake trout were captured during the 2011 survey.

Population Estimate and Density

The lake trout population estimate within Ta'tla Mun was **12,937** (estimate range: 7,570 – 18,515). This equates to a density of 4.1 lake trout per hectare.

Length and Weight

Sampled lake trout ranged from 320 mm to 870 mm in fork length. Sampled fish had an average fork length of 671 mm and average weight of 4,250 g.

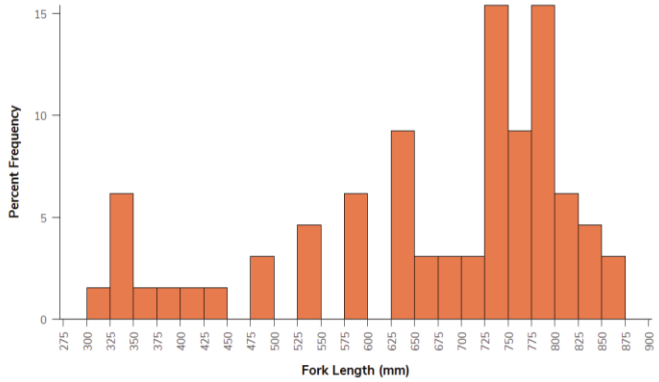

Figure 144. Length frequency distribution of sampled lake trout in Ta'tla Mun (2011), n = 65.

Age and Growth

Age structures were obtained from 15 lake trout. Ages ranged from 12 to 34 years.

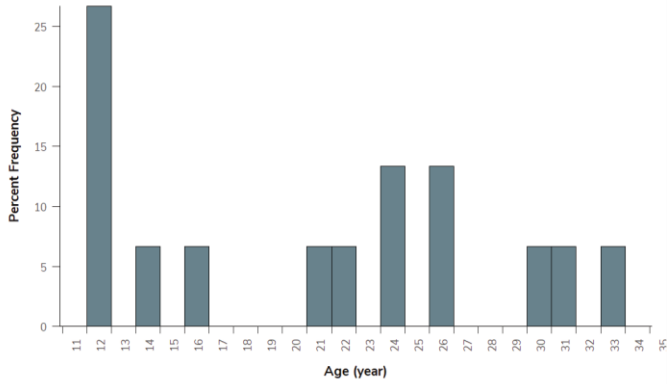

Figure 145. Age frequency distribution of age-analyzed lake trout sampled in Ta'tla Mun (2011), n = 15.

Lake Whitefish

Overview

A total of 632 lake whitefish were sampled during the 2011 survey. Sampled lake whitefish fork length ranged from 220 mm to 560 mm, with an average length of 335 mm and an average weight of 538 g. Age structures were taken from 6 fish. Ages ranged from 7 to 20 years.

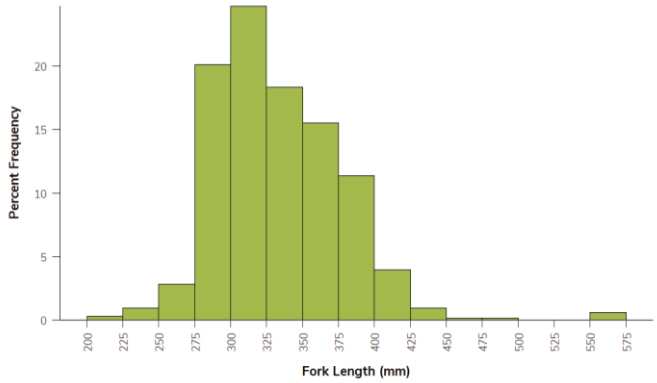

Figure 146. Length frequency distribution of lake whitefish as sampled in Ta'tla Mun (2011), n = 632.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken in the deepest part of the lake. The lake was thermally stratified with the thermocline extending from the surface to about 13 m. Below this the temperature remained at 4°C to the bottom.

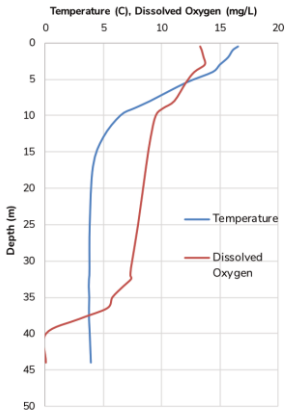

Figure 147. Temperature (C) and dissolved oxygen (mg/L) as measured in Ta'tla Mun during the July 2011 survey.

Ten Mile Lake 2016

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
326 ha	808 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
48 m	23 m
SURFACE TEMP	**REGULATIONS**
16.0^{O}C	Conservation Waters
SAMPLING DATES	**NET SETS**
June 27 – 29	26

Location

Ten Mile Lake is located approximately 110 km north of Whitehorse, along the North Klondike Highway. This lake is within the Traditional Territories of the Ta'an Kwäch'än Council, Kwanlin Dün First Nation and the Little Salmon/Carmacks First Nation.

Access and Use

Ten Mile lake is accessed by float plane or a 15km 4x4 access trail. There is a wilderness outfitter operating on this lake.

Overall Status

Lake Trout

Survey results indicate that the lake trout population in Ten Mile Lake is small, and is vulnerable to collapse. However, our confidence in the population estimate is weak. The lake trout population is composed of the large-bodied type.

Lake Whitefish

The population of lake whitefish in Ten Mile Lake also appears small in number.

Recommendation

The recommendation for future surveys of the Ten Mile Lake is to increase the number of net sets, while attempting to minimize mortalities. Increasing the number of sets will improve the precision of our population estimate. Angler Harvest surveys and collaboration with the outfitter will assist in determining recreational angling pressure and success.

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Lake Trout

Overview

A total of 26 lake trout were sampled during this survey.

Population Estimate and Density

The population estimate for lake trout in Ten Mile Lake was **522** (estimate range: 1 -1,117). Given the variability associated with this population estimate, there is little confidence in this number.

Length and Weight

These large-bodied lake trout ranged in fork length from 424 mm to 597 mm. They had an average length of 503 mm with an average weight of 1,610 g.

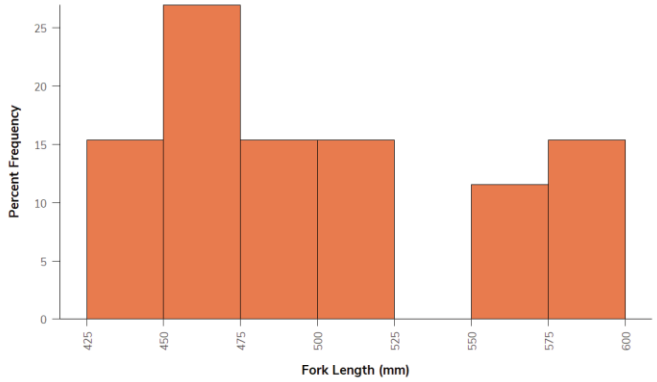

Figure 148. Length frequency distribution of sampled lake trout in Ten Mile Lake (2016), n =26.

Age and Growth

Age structures were obtained from nine lake trout. Ages ranged from 9 to 19 years.

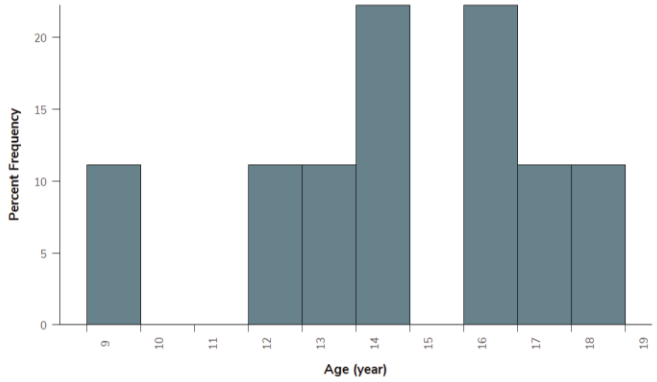

Figure 149. Age frequency distribution of age-analyzed lake trout as sampled in Ten Mile Lake (2016), n = 9.

Lake Whitefish

Overview

During the 2016 survey, a total of 23 lake whitefish were sampled. The size of these fish ranged from 397 mm to 515 mm, with an average fork length of 475 mm and an average weight of 1,522 g. Age structures were obtained from 12 lake whitefish. Ages ranged from 5 to 28 years.

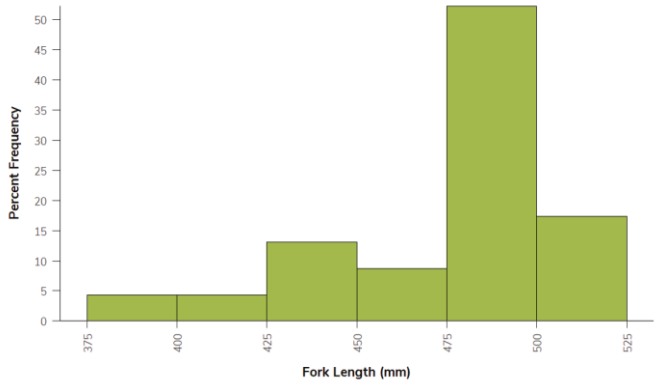

Figure 150. Length frequency distribution of sampled lake whitefish in Ten Mile Lake (2016), n = 23.

Temperature and Dissolved Oxygen

The temperature profile shows a steep thermocline from 5 m to 10 m, followed by a gradual decline through the remaining water column. Dissolved oxygen displayed an increase in concentration from 5 m to 10 m, followed by a gradual decline. Overall, optimum habitat for lake trout existed between 8 m and lake bottom.

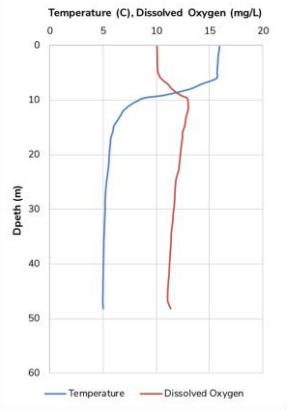

Figure 151. Temperature (C) and dissolved oxygen (mg/L) as measured in Ten Mile Lake on July 27, 2016 survey.

Teslin Lake 2016

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	F
SURFACE AREA	**ELEVATION**
37,720 ha	684 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
232 m	54 m
SURFACE TEMP	**REGULATIONS**
15.9^{0}C	Special Management
SAMPLING DATES	**NET SETS**
July 18 – 22	135

Location

Teslin Lake is a transboundary lake with British Columbia, located in the southern Yukon, approximately 125 km east of Whitehorse. The community of Teslin, sits on the eastern shore, along the Alaska Highway. This lake is within the Traditional Territories of the Taku River Tlingit First Nation and the Teslin Tlingit Council.

Access and Use

Teslin is accessed from numerous locations, within the community of Teslin and the government campground, both have accessible boat ramps. There are also a number of private residences along the lake.

Overall Status

Lake Trout

Survey results suggest that the lake trout population in Teslin Lake is small. Concerns over the health of this stock have been ongoing. Our survey results indicated that this population is still recovering, however there is a large uncertainty with our population estimate, which makes definitive judgements about this population difficult.

Lake Whitefish

Based on our low catch rates, the population of lake whitefish in Teslin lake appears small. Additional species sampled included: arctic grayling, northern pike, lease cisco, slimy sculpin, chinook salmon and chum salmon.

Recommendation

The recommendation for future surveys of Teslin Lake, is to slightly increase the number of net sets as well as increase the number of aging structures collected for analysis. Lakes of this size can be difficult to establish precise population estimates. Increased analysis of age structures will allow improved information on the population structure of lake trout within this lake.

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Lake Trout

During the 2016 survey of Teslin Lake, a total of 59 lake trout were sampled.

Population Estimate and Density

The population estimate for lake trout in Teslin Lake was **63,759** (estimate range: 7,558 -121,001). The survey results were uncertain, as evident by the wide range in the population estimate. This estimate equates to an average density of 1.8 lake trout per hectare.

Length and Weight

These large-bodied fish, ranged from 261 mm to 793 mm in fork length. They had an average length of 500 mm and an average weight of 1,764 g.

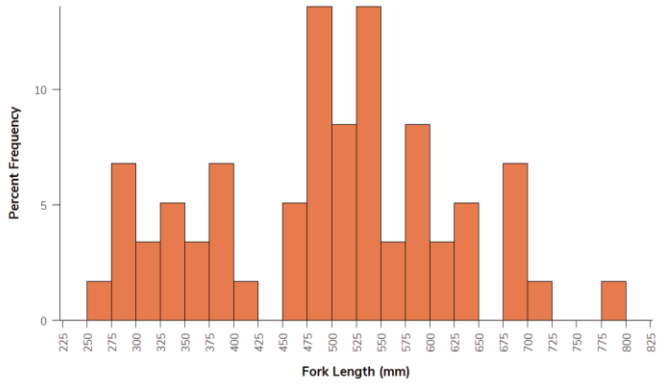

Figure 152. Length frequency distribution of sampled lake trout in Teslin Lake (2016), n = 59.

Age and Growth

Age structures were obtained from 11 lake trout. Ages ranged from 3 to 40 years.

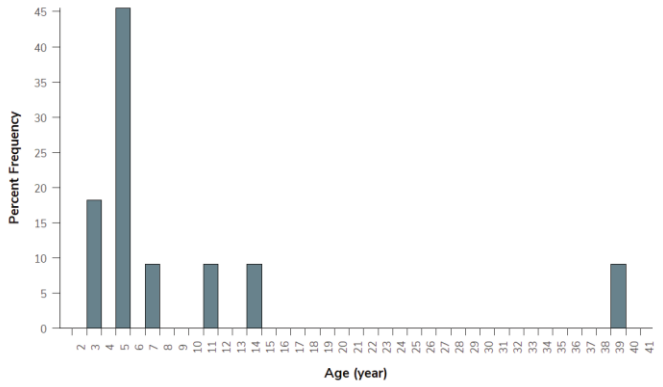

Figure 153. Age frequency distribution of age-analyzed lake trout in Teslin Lake (20160, n = 11.

Lake Whitefish

Overview

During 2016 a total of 87 lake whitefish were captured. The lake whitefish sampled had an average fork length of 440 mm and an average weight of 1,204 g.

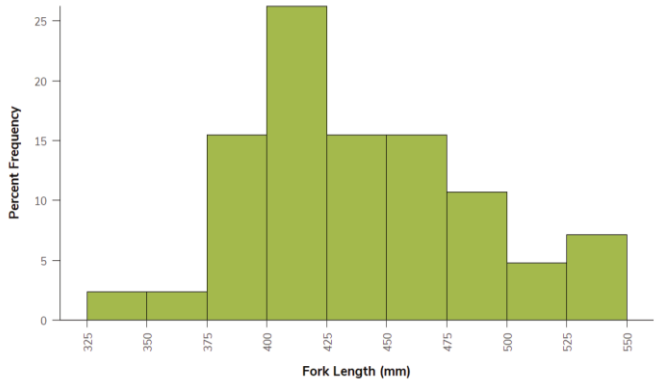

Figure 154. Length frequency distribution of lake whitefish sampled in Teslin Lake (2016), n = 87.

Temperature and Dissolved Oxygen

The temperature profile displays a strong thermocline between 5 m and 10 m, followed by a gradual decline throughout the rest of the water column. Overall, habitat was suitable for lake trout from 10 m to 50 m.

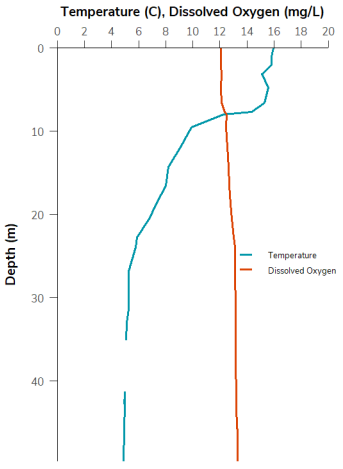

Figure 155. Temperature (C) and dissolved oxygen (mg/L) as measured in Teslin Lake on July 19, 2016.

Twin Lake (east) 2013

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	A
SURFACE AREA	**ELEVATION**
61 ha	630 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
34 m	14.6 m
SURFACE TEMP	**REGULATIONS**
21^{O}C	Special Management
SAMPLING DATES	**NET SETS**
June 26-27	24

Location

Twin Lake (east) lies along the North Klondike Highway, in the central Yukon. This lake is within the Traditional Territories of the Kwanlin Dün and Little Salmon/Carmacks First Nations.

Access and Use

Twin Lake (east) is accessed from the Klondike Highway, with a popular government campground across this lake at Twin (west). There is an accessible gravelled area that acts as a rough boat ramp.

Overall Status

Lake Trout

The lake trout population in Twin Lake East appears small. This may be due to a mix of available habitat, as well as recreational pressure.

Lake Whitefish

We did not sample any lake whitefish in Twin Lake East during this survey.

Recommendation

Although recreational angling effort on Twin Lake East was not formally at the time of this survey, prior surveys conducted on Twin Lake West, showed a moderate level of pressure. It can be inferred that due to the close proximity of this lake, the pressure may be the same.

Lake Trout

Overview

During the 2013 Twin Lake (east) survey, a total of 20 lake trout were sampled. Age structures were only obtained from two individuals, both of which were 15 years of age.

Population Estimate and Density

The population estimate of lake trout in Twin Lake (east) was **193** (estimate range: 94 – 296). This equates to a density of 3.2 lake trout per hectare. This density was slightly lower than expected.

Length and Weight

The sampled lake trout ranged in fork length size from 325 mm to 672 mm. They had an average length of 529 mm and an average weight of 2,017 g.

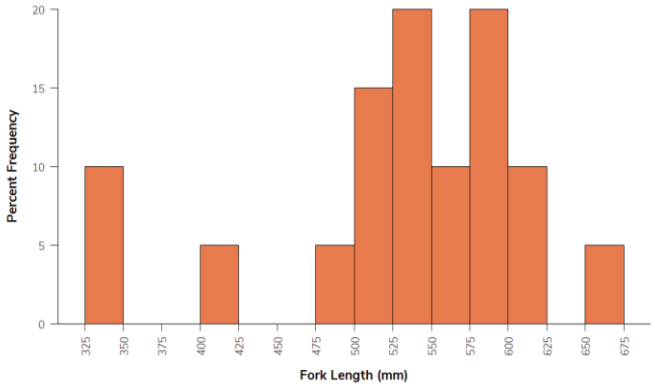

Figure 156. Length frequency distribution of lake trout, as sampled in Twin Lake (east) in 2013, n = 20.

Lake Whitefish

Overview

During this survey, no lake whitefish were captured in Twin Lake (east).

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles were taken on June 25, 2013, near the deepest section of Twin Lake (east). The lake was stratified with a thermocline between 4 m and 7 m. The dissolved oxygen was within suitable limits between the surface and 32 m. Overall habitat was suitable for lake trout between 4 m and 32 m.

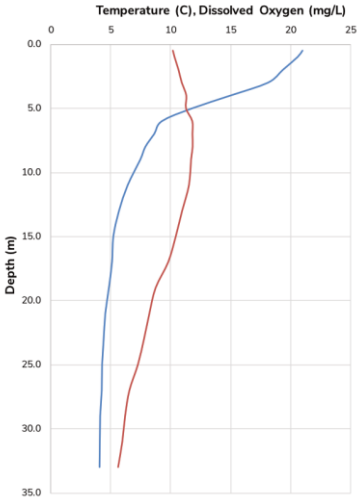

Figure 157. Temperature (C) and dissolved oxygen (mg/L) as measured in Twin Lake (east) on June 25, 2013.

Twin Lake (west) 2013

Lake Information

WATERSHED	**LAKE CLASS**
Yukon Headwaters	B
SURFACE AREA	**ELEVATION**
153 ha	630 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
43 m	16.1 m
SURFACE TEMP	**REGULATIONS**
$^{20.7O}$C	Special Management
SAMPLING DATES	**NET SETS**
June 25,26	26

Location

Twin Lake (west) lies along the North Klondike Highway, in the central Yukon. This lake is within the Traditional Territories of the Kwanlin Dün, Champagne/Aishihik and Little Salmon/Carmacks First Nations.

Access and Use

Twin Lake (west) is accessed from the Klondike Highway, with a popular government campground at the lake. There is an accessible boat ramp at this campground.

Overall Status

Lake Trout

The lake trout population in Twin Lake (west) appears to be in a depleted state, when compared to lake trout populations in other similarly sized Yukon lakes. Low catch numbers create a situation where it is difficult to estimate population numbers with precision. However the low catch rate may also indicate that the population is at risk of collapse.

Lake Whitefish

The lake whitefish population in Twin Lake (west) appears small and lower than predicted, when compared to other Yukon lakes of similar size.

Recommendation

Twin Lake (west) receives a high level of angling pressure and due to habitat limitations, appears to have a small lake trout population. In combination, this makes the population vulnerable to collapse. It is the recommended that a regulation is established that eliminates the catch and possession of lake trout. This will aide in allowing this population to naturally recover.

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Lake Trout

During the 2013 Twin Lake (west) survey, only seven lake trout were sampled.

Population Estimate and Density

The population estimate of lake trout in Twin Lake (west) was **234** (estimate range: 0 – 474). This equates to a density of 1.5 lake trout per hectare. Given the lack of precision associated with this estimate and the potential for collapse, a cautionary approach to management regulations is warranted.

Length and Weight

Lake trout ranged in fork length size from 230 mm to 618 mm. They had an average length of 432 mm and an average weight of 1,125 g.

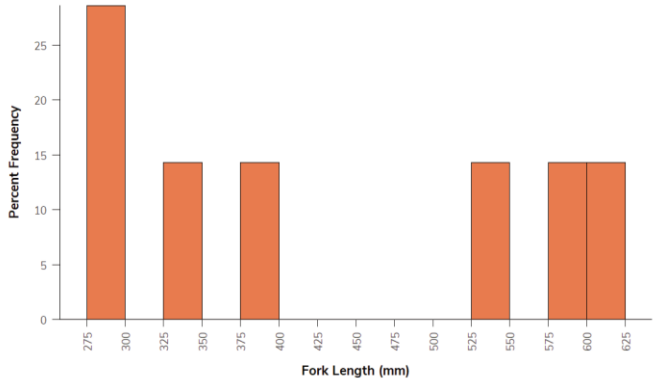

Figure 158. Length frequency distribution of sampled lake trout in Twin Lake (west) during the 2013 survey, n=7.

Age and Growth

Age structures were obtained from three individuals. The ages of these sampled fish were 7, 11 and 29.

Lake Whitefish

Overview

During this survey, 26 lake whitefish were sampled. The sampled lake whitefish ranged from 252 mm to 530 mm in fork length, with an average length of 432 mm and average weight 1,021 g. Age structures were obtained 13 lake whitefish. Ages ranged from 5 to 25 years. The low catch numbers create difficulty in making definitive conclusions about this population.

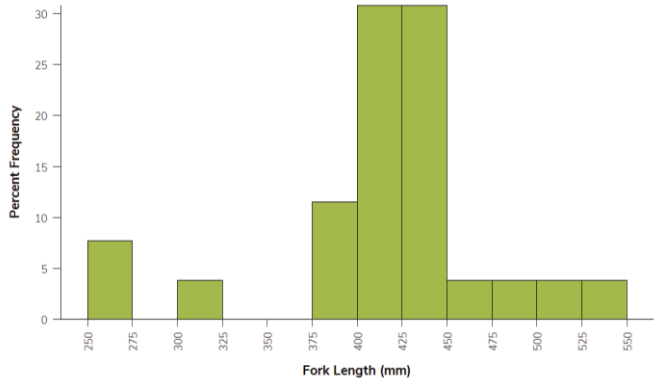

Figure 159. Length frequency distribution of lake whitefish in Twin Lake (west) as sampled in the 2013 survey, n = 26.

Temperature and Dissolved Oxygen

The lake was stratified with an observed thermocline between 4 and 7 m. The dissolved oxygen was within suitable limits between the surface to 32 m.

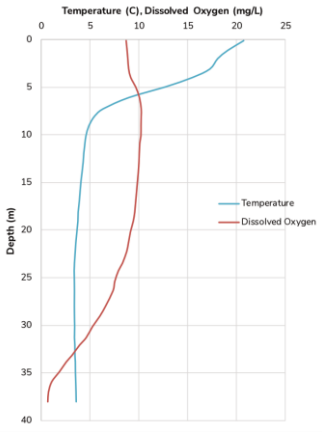

Figure 160. Temperature (C) and dissolved oxygen (mg/L) as measured in Twin Lake (west) on June 25, 2013.

Wolf Lake 2018

Lake Information

WATERSHED	LAKE CLASS
Yukon Headwaters	E
SURFACE AREA	**ELEVATION**
7,312 ha	986 m
MAXIMUM DEPTH	**AVERAGE DEPTH**
72 m	26.6 m
SURFACE TEMP	**REGULATIONS**
16^{O}C	Conservation waters
SAMPLING DATES	**NET SETS**
Aug 02 – 05	98

Location

Wolf Lake is located in the Southern Lakes region, approximately 70km northeast of Teslin, and is within the Traditional Territory of the Teslin Tlingit Council.

Access and Use

Wolf Lake is only accessible by plane and receives minimal fishing pressure. A fishing lodge has been established on the lake since 1978, and operates on a catch and release policy.

Overall Status

Lake Trout

In accordance with the 2018 survey results, the lake trout population in Wolf Lake appears healthy. This population is of the large-bodied form. The population estimate indicates a moderate density of lake trout when compared to similar sized Yukon lakes.

Lake Whitefish

The population of lake whitefish in Wolf Lake is low in density, as evidenced by the low catch-numbers.

Recommendation

The recommendation for future surveys of Wolf Lake is to slightly increase net sets and age structures, to improve our precision in the population estimate.

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Lake Trout

Overview

A total of 81 lake trout were sampled during the survey.

Population Estimate and Density

The population estimate for lake trout in Wolf Lake was **28,411** (estimate range: 16,103 - 41,243). This equates to a density of 3.9 lake trout per hectare.

Length and Weight

These large-bodied lake trout ranged in fork length from 262 mm to 860 mm. They had an average length of 547 mm with an average weight of 2,091g.

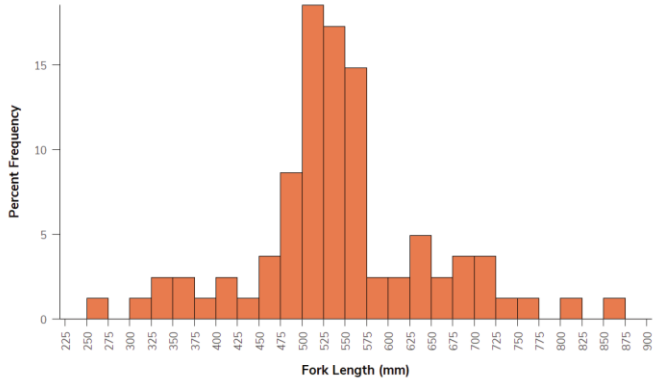

Figure 161. Length frequency distribution of sampled lake trout in Wolf Lake (2018), n = 81.

Age and Growth

Age structures were obtained from 35 lake trout. Ages ranged from 5 to 40 years.

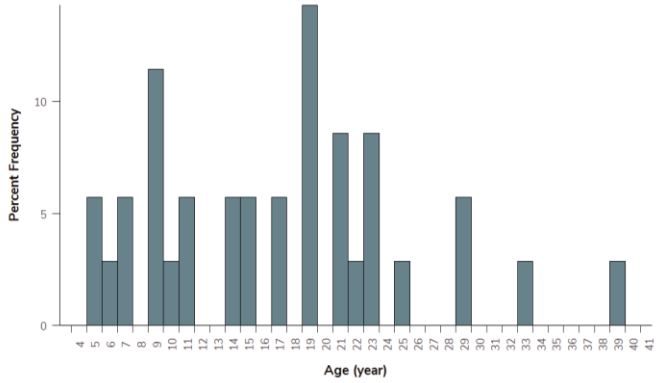

Figure 162. Age frequency distribution of age-analyzed lake trout in Wolf Lake (2018), n = 35.

Lake Whitefish

Overview

During the 2018 survey, a total of 13 lake whitefish were sampled. The fork length of these fish ranged from 515 mm to 575 mm. They had an average length of 548 mm and an average weight of 2,505 g. Age structures were taken from nine lake whitefish. Ages ranged from 12 to 40 years.

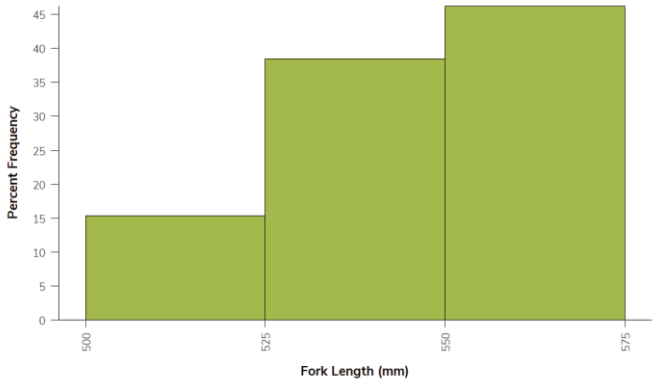

Figure 163. Length frequency distribution of sampled lake whitefish in Wolf Lake (2018), n = 13.

Temperature and Dissolved Oxygen

Temperature and dissolved oxygen profiles display a sharp thermocline between 5 m and 9 m. Overall, optimum lake trout habitat existed from 6 m to lake bottom.

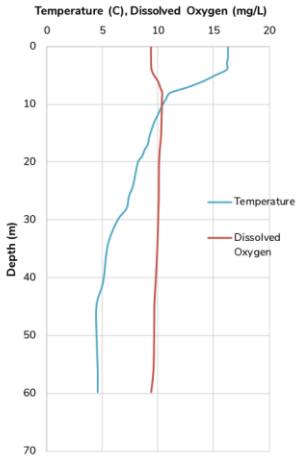

Figure 164. Temperature (C) and dissolved oxygen (mg/L) as measured in Wolf Lake during the 2018 survey.

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