Travaillant Lake Ecology Monitoring 2010

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Travaillant Lake in the foreground, looking north at the north Travaillant River

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1. Introduction

1.1 Background

The area of concern is the Travaillant Lake area east of the Hamlet of Tsiigehtchic in the Northwest Territories. This area has been used by the Gwichya Gwich'in people for thousands of years and is still a very important harvesting site today. Travaillant Lake was identified as an area of special concern by the community of Tsiigehtchic because of its proximity to proposed developments, its cultural and historical significance to the Gwichya Gwich'in and the lack of baseline data about the area's ecosystem.

1.2 Fisheries resources

The Mackenzie Valley Gas pipeline and the Mackenzie Valley highway are both proposed development projects that are routed to pass near to the Travaillant Lake area. Both projects are large scale construction projects that have the ability to have a negative impact on the Travaillant Lake watershed and its fisheries resource.

In previous years, the fisheries resources were studied by Fisheries and Oceans Canada (DFO) and the Gwich'in Renewable Resources Board (GRRB). Results of past work can be found online at (www.grrb.nt.ca/fisheries_research.htm). The results of these works gave valuable insight into the fisheries resources of Travaillant Lake and helped to establish a baseline data set from which to compare future work. Fisheries research at Travaillant Lake in 2010 was modelled on GRRB unpublished 2007 & 2008 reports as the most recent methodology was the most desirable for the objectives we wished to determine and the timing window we had to work in.

The community of Tsiigehtchic also indicated that they wished to understand more about the oxygen levels of the lake and were concerned that the oxygen levels in the lake were depleted.

1.3 Forest and fire ecology

Recently, an increasing amount of attention has been placed on the fire regime on barren-ground caribou (*Rangifer tarandus groenlandicus*) winter foraging areas. The increased energy requirements associated with fire induced range expansion is recognized as a factor regulating the size of caribou herds. Furthermore, fire affects caribou populations by reducing or by completely destroying lichen biomass, the main source of food available for caribou during winter. Changes in food availability due to fire are also believed to regulate caribou populations.

Understanding what happens after a fire event is integral to the maintenance of traditional harvesting practices, and there have been several fires in the Travaillant Lake area within the past fifty years. Understanding this fire-lichen-caribou interaction is also necessary in order to develop management policies and forest prescriptions to protect and enhance the barren-ground caribou population in this area.

1.4 Objectives

This study was designed to investigate further into the re-vegetation potential of the area after disturbance, as well as to re-assess the fisheries resources of the lake after a three-year absence. The following objectives were outlined:

1) To gather baseline vegetation conditions and compare them with fire influenced areas of the lake to assess re-vegetation rates, specifically lichen.
2) Re-assess the fisheries resources of the lake.

2. Methods

2.1 Fisheries

The fisheries field crew flew in to Travaillant Lake on August 3rd, 2010. Camp was erected on the south-western shore of the lake and sampling began the following day.

The field crew set multi-mesh gillnets with mesh sizes measuring 1, 2, 3, 4, 5 and 5.5 inches. Each mesh panel was separated from the other meshes by a 2m gap which allowed each panel to fish independently. Each panel was 6m in length and 2m in depth. Four nets were used simultaneously and were sunk for either six or twelve hours at a time. Over eight sampling days, this resulted in 348 total hours of soak time. Nets were set randomly around the lake with the majority of net sets occurring on the southwest shore of the lake. The field team found it difficult to manage ten to fifteen minute travel times between nets in the small zodiac and thus we were limited in the number of sets we could make 4km and greater from camp. Effort was made to sample these areas but the majority of sampling occurred within 4km of camp.

When fish were captured, a fin was clipped to mark the panel they were removed from and they were then placed in plastic totes for transport back to the field camp. At field camp, fish were sampled for fork length, weight, sex, maturity and stomach contents. Otoliths and fin rays were taken from most samples to determine age and a flesh sample was preserved in ethanol. When not too badly damaged, Ciscoes were left intact and frozen whole for later sampling by Fisheries and Oceans staff as per their request.

The field team attempted to assess water quality variables such as temperature, oxygen concentration and pH but unfortunately the YSI probes had been damaged and the team was not able to collect any of these variables.

2.2 Vegetation sampling

The field crew flew in to Travaillant Lake on August 20th, 2010. Camp was erected on the south-western shore of the lake and sampling began the following day.

The field crew had identified four sites in which to assess. Each site was randomly assigned inside the known burn area (sites one, two & three). Site four was located outside the burn area to serve as a control. In each site eight plots were identified by dropping a 1 square meter frame randomly inside the site. This resulted in a total of 32 plots being assessed.

Each plot was photographed and the team attempted to determine the plant species present. In some cases a small sample was taken in the event that the field team could not identify the plant species they found. Soil profiles were photographed and recorded as well.

If trees were present in the vicinity of the plot, the field team measured height, circumference (DBH) and took a core. Cores were collected from dominant trees within the site. Spruce trees were used due to their serotinous or semi-serotinous nature.

3. Results

3.1 Fisheries

Results are still being analyzed and only preliminary figures have been generated. Because of this, this report will be limited to a simple discussion of the results and will not go into great detail.

3.1.1 Composition

Species composition in Travaillant Lake has not changed appreciably in any of the years data has been collected on this lake. Species collected in 2010 include lake whitefish (known locally as ‘crookedback’) (*Coregonus clupeaformis*), broad whitefish (*Coregonus nasus*), northern pike (*Esox lucius*), cisco (*Coregonus sp*), lake trout (*Salvelinus namaycush*) and longnose sucker (*Catostomus catostomus*). Arctic grayling (*Thymallus arcticus*) and ninespine stickleback (*Pungitius pungitius*) were observed in tributary streams near camp.

Two species of cisco are known to inhabit the lake (arctic and least cisco) but field determination between the two species is difficult and these fish are currently being processed by DFO staff in Winnipeg.

In all sampling years, lake whitefish and broad whitefish typically dominate the catch with other species such as cisco and northern pike making up the larger portion of the other species. Below is the 2010 catch composition found in Travaillant Lake. This represents a typical catch composition for any of the assessment years.

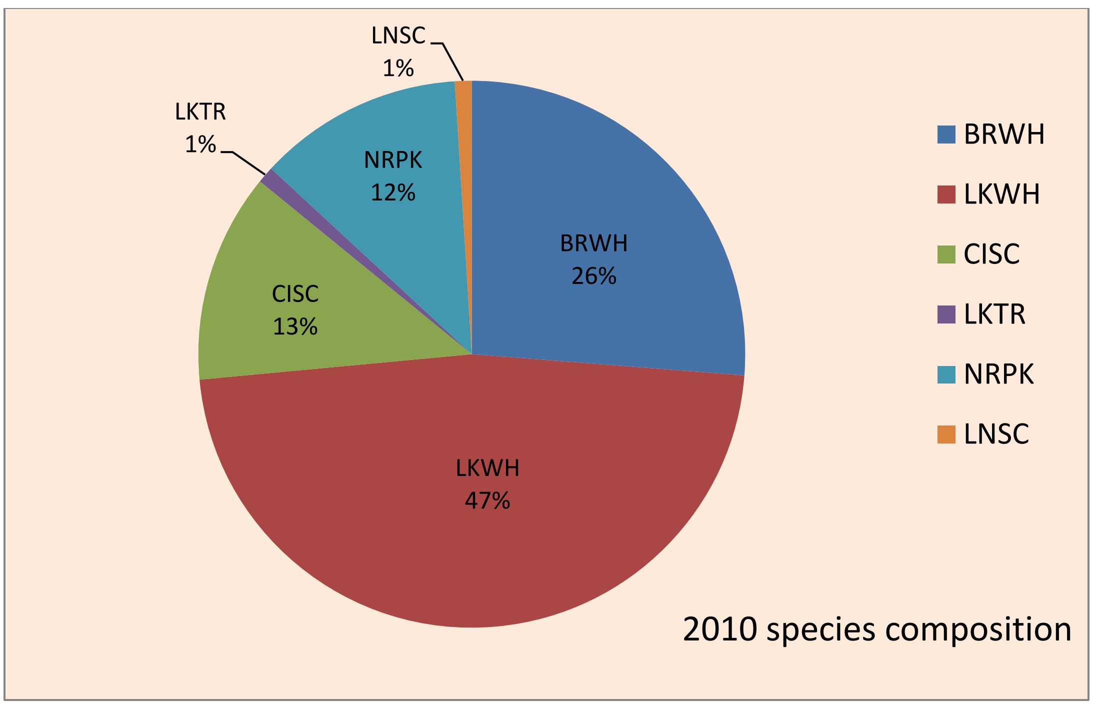

Figure 1. 2010 species composition of fishes sampled from Travaillant Lake. BRWH = Broad Whitefish; LKWH = Lake Whitefish; CISC = Cisco; LKTR = Lake Trout; NRPK = Northern Pike; LNSC = Longnose Sucker.

3.1.2 CPUE

A total of 348 hours of soak time were recorded during the field sampling. This resulted in a total catch of 405 fish which equals a total of 1.16 fish per net hour. Lake whitefish CPUE was 0.55 followed by broad whitefish at 0.30, cisco and northern pike at 0.14 and lake trout and longnose sucker at 0.01 fish per net hour.

3.1.3 Lake Whitefish (Crookedback)

Preliminary 2010 results indicate that the average length, average weight, body condition, length at age, age class composition and overall abundance of lake whitefish have not changed throughout the various sample years. Lake whitefish average length was 307mm (12 inches) with three distinguishable size classes present. Average weight was 618g (1.4 lb). Due to funding constraints, juvenile (>200mm) lake whitefish were not aged, which skews the average age in favour of older fish. Because lake whitefish separate into length classes so well, it was not necessary to age fish less than 200mm as it was apparent based on past sampling that lake whitefish in the 100-200mm range were between the ages of 1-3 years old. Average age of lake whitefish greater than 200mm was 11.4 years.

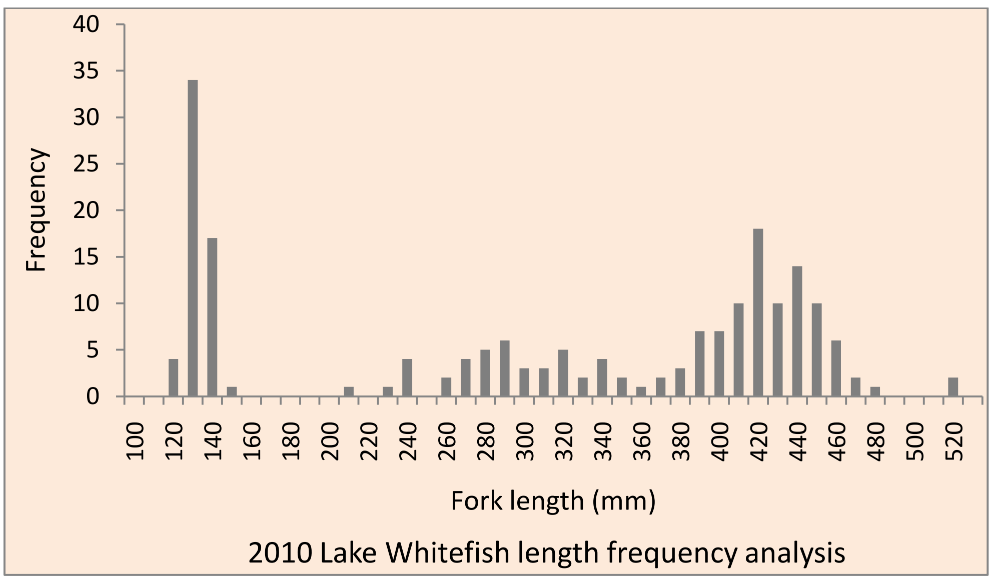

Figure 2. Travaillant Lake 2010 lake whitefish (*C. clupeaformis*) length frequency analysis. Three distinct size classes can be distinguished.

3.1.4 Broad Whitefish

Preliminary 2010 results indicate that the average length, average weight, body condition, length at age, age class composition and overall abundance of broad whitefish have not changed throughout the various sample years. Broad whitefish average length was 298mm (11.5 inches) with at least three distinguishable size classes present. Average weight was 539g (1.2 lb). Due to funding constraints, juvenile (>200mm) broad whitefish were not aged, which skews the average age in favour of older fish. Because broad whitefish separate into length classes so well, it was not necessary to age fish less than 200mm as it was apparent based on past sampling that broad whitefish in the 100-200mm range were between the ages of 1-3 years old. Average age of broad whitefish greater than 200mm was 9.1 years.

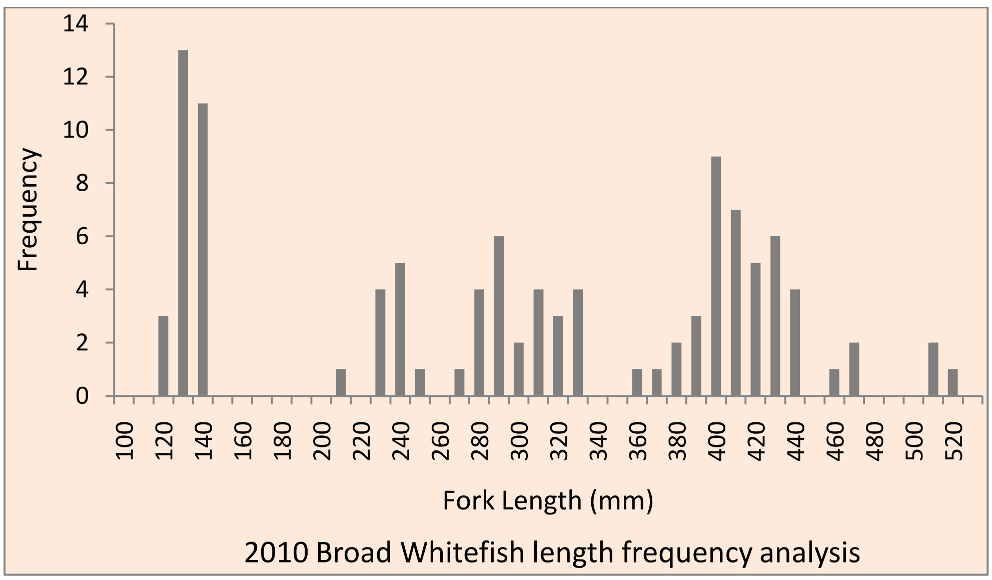

Figure 2. Travaillant Lake 2010 broad whitefish (*C. nasus*) length frequency analysis. Four distinct size classes of broad whitefish can be distinguished.

3.1.5 Lake Trout

Only four lake trout were captured during the sampling. Only two of these were dead sampled as all lake trout were captured late in the trip and as a result the field team decided that there would be no point to dead sampling the two fish capable of survival as they would not add any value to the dataset. Because of the low number of lake trout caught, no significant analyses can be done for the lake trout population. The lake trout captured in 2010 were quite small (average length 427mm; 16.8 inches) compared to previous years and it bears noting that one of the lake trout which was dead sampled was a sexually mature male at only 470mm (18.5 inches).


Typical lake trout (*S. Namaycush*) sampled at Travaillant Lake 2010.

3.2 Vegetation

Results are still being compiled by ENR staff with GRRB assistance. Due to unexpected circumstances and a lack of experience on the field team, the data that was collected will need to be worked over carefully in order to bring worthwhile results to bear. General observations are possible with the data collected such as tree re-growth and shrub species composition. Data is lacking in the lichen and moss species identification.

4. Discussion & Recommendations

4.1.1 Fisheries

Due to the static nature of the Travaillant Lake fisheries resources, we do not recommend any further direct fisheries sampling. It is still recommended to assess the fish population in the lake for monitoring purposes about every five years. Monitoring frequency should increase if there are impacts from the development of the Mackenzie Gas Pipeline or Mackenzie Highway Project.

The main subsistence priorities of the Gwichya RRC are whitefish and lake trout. Because of this, only their assessment will be detailed here.

Lake whitefish are typically more prevalent in the southern portions of the lake and typically spawn in the south Travaillant River (outflow). Broad whitefish are typically more prevalent in the northern parts of the lake and typically only spawn in the north Travaillant River (inflow). This explains why sampling near the camp on the southwest shore of Travaillant Lake results in a higher CPUE for lake whitefish than broad whitefish. No large changes were observed in overall catch composition and CPUE during this year's sampling (both species of whitefish). Due to the low harvest levels and abundance of unaltered habitat, whitefish populations in Travaillant Lake remain stable as expected.

While no noticeable changes to species composition or catch rates were observed, it should be noted that lake trout CPUE is down from all years and this species may be less present in the lake due to a number of factors. This is an important fish to the Gwichya Gwich'in and Travaillant Lake is known traditionally as a 'trout lake.' Lower water levels and warmer summer temperatures may be forcing lake trout to migrate out of the lake in search of higher quality habitat. While never a large part of the sample size, large-size (>200mm) cisco were also absent from the catch, suggesting that low abundance of one of the main lake trout prey items may also be hampering their population numbers. Lastly, lower CPUE of lake trout may also be due in part to the scientific sampling of the lake. Higher CPUE of large size (>400mm) lake trout in the mid 2000s may have impacted the spawning population and subsequently reduced lake trout density.

4.1.2 Fish habitat

Because we were unable to obtain lake water chemistry characteristics, it is recommended that if any further forest ecology sampling takes place, a component of that work include water sampling. Even though the field team had difficulty with equipment, it was fairly obvious that Travaillant Lake should have sufficient oxygen supply throughout the course of the open water season. The lake is prone to high wind events and extremely large waves which creates a substantial amount of lake mixing. Photographic observations show that the lake level may be decreasing over the years, in the order of 1 - 1.5m. Because Travaillant Lake is relatively shallow (2010 max observed depth 7.5m), a loss of even 1m depth could have a negative impact on the carrying capacity of the lake and its ability to maintain enough oxygen to support fish survival. Many portions of the lake contain dense growths of aquatic vegetation which likely contributes to a drawdown effect on the oxygen concentration throughout the winter. The combination of lower water levels and dense vegetation growth is a cause for concern with respect to oxygen levels. It may be worthwhile to assess Travaillant Lake during the wintertime to develop oxygen and temperature profiles. This has its practical challenges as Travaillant Lake is not easily accessed in the wintertime.

In continuation with the aquatic monitoring priority laid out by the Gwichya RRC, we also recommend instituting a program like CABIN (Canadian Aquatic Bio-monitoring Network) to assess the Travaillant River and tributaries as well as tributaries flowing into the east side of the lake itself which may be impacted by the proposed developments. Developing these baseline conditions now is very important to future management of the area should the proposed developments impact the lake and its ecosystem.

4.2. Forest Ecology

As this was a pilot project, we went in with the expectation of learning what we would need to do to build this project into a long term assessment & monitoring tool to relate the effects of large landscape sized fires back to habitat growth and regeneration and from that information, assess the effects of fire on caribou habitat, migration and population density.

As stated in the above section, due to some technical challenges, we are still analyzing data at this time and do not have a significant amount to report on. We believe that the information as a whole that was returned from the project was beneficial to evaluating how we want to move forward with future versions of this work. This project was beneficial in training field staff, building capacity and creating renewed interest in ecology at the community level and we look forward to building on the 2010 foundation.