FISH OF THE DEMPSTER COUNTRY PROJECT

--2018 RESULTS REPORT--

YFWET PROJECT 2018-19-23

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Prepared for:

Tr'ondëk Hwëch'in & Yukon Fish and Wildlife Enhancement Trust

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HÄN NATION

Yukon Fish & Wildlife
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The Fish of the Dempster Country Project

Would like to thank the following funding and supporting partners:

Fisheries and Oceans Canada | Pêches et Océans Canada

Special thanks to TH Fish and Wildlife Department staff and the YG Environment staff, including Kai Breithaupt and the Y2C2 Green Team for all your help in the field!

Photo credits: Jessica Sears

Background:

The Fish of the Dempster Country Project (FODC) has investigated fish occurrence in the North Klondike and Blackstone River regions of the Dempster Highway over a six field season period. The framework of the project arose, as interest into identifying and documenting fish species and their respective habitat(s) in an area with little development and information available on fisheries values.

Increased pressures from road traffic, anglings pressures from the ease of access along the Highway Cooridor and climate change triggered the need for monitoring these drainages.

The project framework also is geared towards involving youth with on the ground field work experience, gaining an understanding of what is required for future management of the environment. This will help establish our next guardians into the fish and wildlife resources within Dempster Country and Tr'ondëk Hwëch'in Traditional Territory.

The research and data collected to date has contributed to baseline data available for the region, along with identifying critical fish habitat areas in Dempster Country. Information has also been collected on fish passage through the highway via culvert and/or bridge and if issues exist. Issues have been documented and proper agencies such as YG Highways have been notified. Sites which require remediation or reclamation may occur as regular maintenance and/or development work on the highway in the future.

Arctic grayling (*Thymallus arcticus)* represent a majority of fish captures and occupancy from the six years field work and sampling, within the study areas of the North Klondike and Blackstone Rivers. Data collected at sites specific to Arctic grayling habitat were utilized in the 2018 FODC project in examining grayling populations in each life history stage within the Blackstone River drainage. Results from field work specializing in defining specific population dynamics, will assist in the overall understanding of health and status of grayling stocks in the Blackstone Basin and may be forwarded into other systems (such as the North Klondike) in future years.

Introduction:

In 2018 Fish of the Dempster Project continued efforts collecting baseline fisheries data at important and/or popular angling sites within Blackstone River, accessible via the Dempster Highway. Additionally DNA data was collected and recorded on Arctic Grayling in all life stage forms throughout the various sites documented in previous project years. Maintaining a baseline will help develop an index for the Blackstone drainage and the DNA analysis will assist in developing an understanding of Arctic grayling population structures within the system.

Inevitably, this information will assist in identify the current health and status of these stocks and guide in managing these resources for the future.

Project Methodologies:

In 2018, Fish of the Dempster Project sampled live fish in order to collect and record data on Arctic Grayling occurring at various sites in Dempster Country, within the Blackstone River Drainage. Information was collected, including species ID, weight, length, sex (mature fish only). Fish where sampled live, adhering to DFO sampling protocols (outlined in the DFO Scientific Collectors Licence) using low impact collection and release methods.

DNA Sampling:

Under guidance from Yukon Government, Fisheries Branch and Dalhousie University (YG partner), Fish of the Dempster Country project utilized standard DNA tissue sampling techniques at each study site to gain information specific to population dynamics amongst the stock. This will assist in determining if each of these locations contain unique grayling populations (genetically different) or part of a single larger population.

Each captured Grayling (yoy-adult) species where retained for sampling. An adipose fin clip was taken and placed into a labeled vial, preserved in ethanol. In the case were YOY fish were captured, the entire specimen was retained and placed into the vial containing ethanol. Scales and/or an Otolith sample were also retained, when possible for aging purposes.

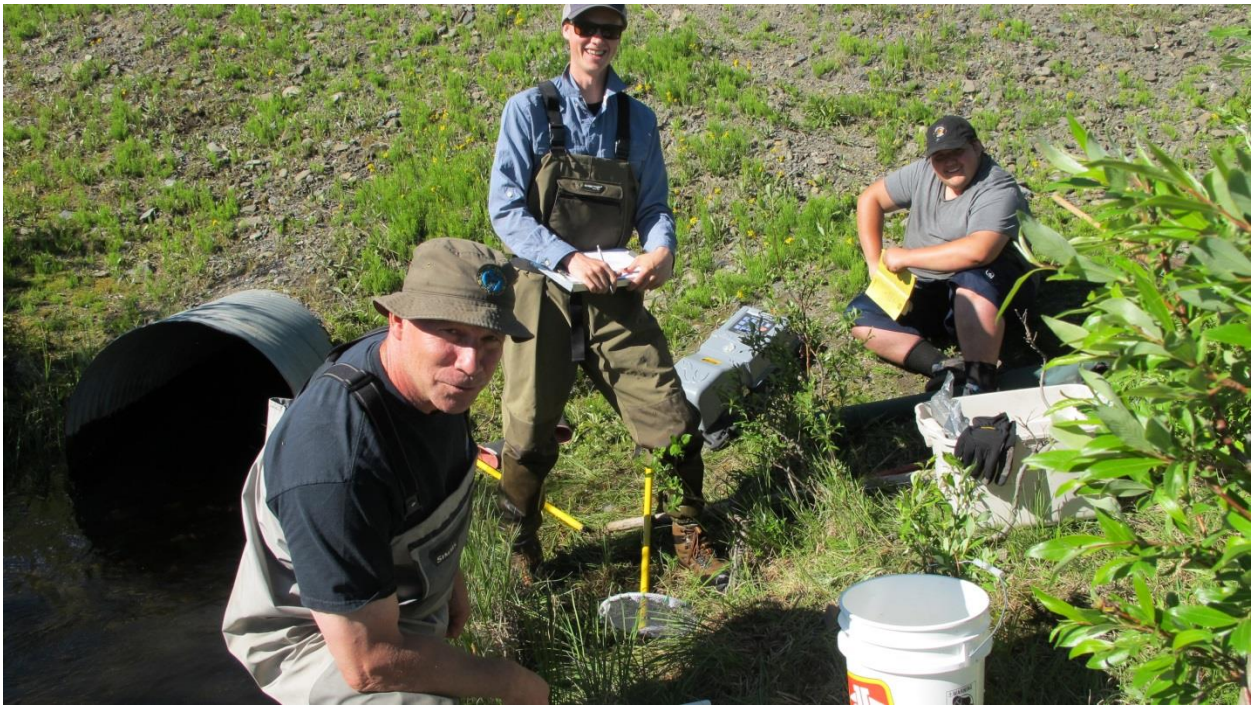
Various sampling equipment and capture techniques were utilized during the field work in order to best represent fish and fish habitat characteristics for each site. Different life stages specific to Arctic grayling including, site characteristics and time/month of sampling all contributed to the effect of which sampling equipment was utilized for each sample site location.

Sampling methods and equipment included:

- Gee-Minnow traps:
- Electro-Fisher:
- Minnow seine net:
- Minnow dip nets (YOY fish)
- Rod and Reel (angling):
- Visual Observations:

All sampling occurred within a hundred (100) meters of either side of the highway corridor. Sampling efforts at sites with highway crossings such as culverts and bridges were targeted up

and down stream of the highway in attempt to document fish passage and/or issues affecting fish passage at the time of sampling.



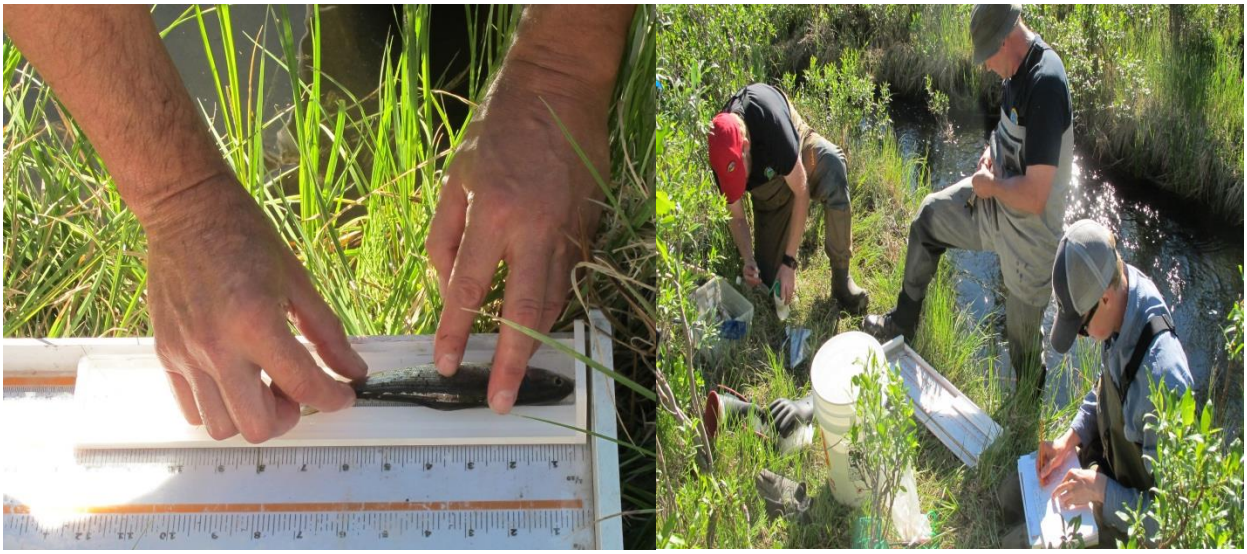


Photo: sampling Arctic grayling at Km 92 Rake Ck

A habitat assessment was completed on each site as an approach to index fish habitat suitability for the region. In 2018 Arctic Grayling habitat suitability was prioritized in establishing sites for sampling as a means for collecting the DNA tissue data.

Measurements such as depth and stream width were recorded at uniform stations (marked with flagging) each month sampled in order to represent change and/or similarities (i.e H2O level), which may or may not affect fish presence/absence, throughout the summer. A standardized "habitat assessment" form was created for the project based on water quality/quantity parameters and specific habitat characteristics.

The following parameters were collected:

- Water Quantity: Temp, Ave depth (cm), width (50 m tape)
- Site Characteristics: such as bed material/water form & stage/vegetation present
- Site Characteristics: suitability of fish habitat (specific to AG), including summer rearing, spawning and migration routes and/or critical habitats
- GPS: lat/long coordinate and elevation
- Date/Time &Weather Conditions
- Notes: any notable features, including fish health, environmental changes in area and notes of interest to the project

Temperature was collected at each site with a standardized handheld thermometer

Sample sites selected for the 2018 Fish of the Dempster Project included:

Blackstone River-Km86
Foxy Creek-Jenson's Camp -Km 91
Rake Creek-Km 92
Blackstone River-Km 100
Blackstone River: Rest Area-Km107.5
Blackstone Braids-Km 116
Cache Creek-Km 130
Blackstone River-Km 145

*pls note only sites with capture rates over 30 (samples) were submitted, being the lowest threshold for DNA analysis

Results:

In 2018 Fish of the Dempster Country Project (FODC) completed its 6th field season sampling and recording baseline data within the Blackstone River Basin area of the Dempster Highway Cooridor.

In 2018 the FODC Project focused on Arctic Grayling stocks within the Blackstone River (part of the Mackenzie-Peel River Drainage) and began collecting DNA tissue samples to define population dynamics within the stock. Yukon Government Fisheries Branch and Dalhousie University provided guidance regarding a standard DNA tissue sampling program for each study site, to help determine if each of these sample sites contains unique populations. The results

will assist in determining if these stocks are genetically different or part of a single larger population.

Considering the Blackstone Drainages northern location in the Taiga Cordillera eco-region, (identified as arctic tundra, consisting of treeless landscapes underlined by permafrost), the river still supports an abundance of Arctic grayling.

Access provided via the Dempster Highway, which would otherwise be an isolated and remote area to sample, makes the Blackstone Basin an ideal candidate for sampling north Yukon grayling stocks, including relatively inexpensive transportation by vehicle(s).

DNA Results:

Genetic analyses of the grayling DNA tissue samples/data are underway, with released results expected throughout the summer of 2019. DNA leads (former YG S/fisheries biologist) Robert Perry and Dalhousie Universities, Dr. Daniel Ruzzante will further explain and analyze the results as data becomes available. These results will help define population structures within the Blackstone grayling stocks. These results will ultimately assist in the better management of these specific stock and their respective habitats, occurring near the Dempster Cooridor.

Arctic Grayling Capture Results:

In 2018, capture results for Arctic Grayling *Thymallus arcticus* included a specimen from each life stage form, including Young of Year fish through to mature adult fish, at each site. Several sites supported various all life history stages, such as tributaries to the Blackstone with fast and slower moving water in one unique habitat area. Other sites were more suitable to one specific life stage forms, such as the main Blackstone River, supporting mostly larger adult fish. These results indicate the Blackstone River provides all the necessary habitat requirements for Arctic grayling spawning, juvenile and adult summer rearing areas. It is still unclear where Arctic grayling over-winter in the Blackstone, however it is possible adults utilize deeper pools and juveniles utilize ground water estuaries.

During 6 years of sampling, capture results have highlighted several areas, which support unique and critical habitat characteristics for grayling. Habitat such as braided channels, small inlet lake formations and plunge pools, such as those dug out by highway culverts all support healthy population(s) of Arctic grayling. These unique habitats and relationships to grayling are consistent throughout the Blackstone and apparently critical for survival throughout their northern latitude range.

Braided channels, such as those found near Km116 of the Dempster Cooridor is a unique habitat complex, found throughout the Blackstone and other arctic environments. A memorandum released (Finster, DFO 2008), in relation to the 2008 results of the Yukon Government Dempster Fisheries Assessment-Km 116 Blackstone study, define the characteristics of braided channel complex(s) as:

- as having multiple channels and gravel bars
- extend the entire width of the valley
- have a low degree of lateral channel stability and complexity,
- have a coarse substrate and a riparian plant community limited to some grassed islands and scattered shrubs.
- Aufesis is also present in these areas throughout winter and in cooler summers.

Observations noted (in the memo), while conducting the field work investigations provides additional site (or habitat) characteristic information on the braided channel complexes include:

- Multiple ground water discharge areas
- Algal growth, near the discharge areas
- Seep mosses growing in some of the discharge areas, implying discharge throughout the year
- Re-charge zones, whereby flows disappeared into the river bottom or the volume of flow visibly reduced as it descended downstream

Braid Channel Complex of the Blackstone river, Km 116 Dempster Highway

Within the scope of FODC field work and research it is evident the braided channels at KM 116 provide the necessary habitat requirements for grayling spawning and Young of the Year rearing locations and could be defined as “Critical rearing habitat”.

Habitat assessments and capture results have also identified critical summer rearing sites for adults at several sites, including Km 91 and 92 Dempster Highway. These areas act as rearing grounds during summer for larger fish and support large numbers within the stock. Results from the DNA tissue sampling, which included an adipose fin clip revealed no re-captures during the entire summer, with over 40 fish captures at each of sites. This information indicates grayling specimens captured at tributaries within the Blackstone are not necessarily unique and may originate from a greater population within the Blackstone stock.

Above: FODC Coordinator speaks to locals fishing at a popular grayling hole. On an average day, this location Often receives pressures from up to 10 anglers, often all catching at least one grayling.

Fish captured during the FOD 2018 field investigations are as follows:

- Dolly Varden — Salvelinus malma
- Arctic Grayling — Thymallus arcticus
- Burbot — Lota lota
- Slimy Sculpin — Cottus cognatus
- Chinook salmon — Oncorhynchus tshawytscha

Project Activities:

The following objectives were completed in the FOD-2018 Project:

- Continued to collect and record baseline data for fish occurrence and fish habitat suitability at chosen sites, identified through past project field work and research.
- Collected and recorded DNA tissue samples from Arctic grayling captured at select locations in order to determine the structure and dynamics of the Blackstone Drainage population. This included a better understanding weather these stocks are part of unique grayling populations (genetically different) or part of a single larger population.
- Worked directly with TH Fish and Wildlife staff and summer students, including project concepts, design and assistance while working in the field. Students were able to gain hands on experience with fisheries assessment work in Dempster Country.
- Traditional and local Knowledge implemented into the project where possible

Our activities contributed to the goals and objectives of the FODC 2018 Project, through the project research and field work. Working with THFN Fish and Wildlife Department Staff, including summer students provided the capacity needed to capture fish for sampling, collect DNA tissue samples, record data and gain insight into Traditional and Local Knowledge.

Upon submission of the original work plan to the YFWET, the FODC 2018 was to continue to collect and record baseline fisheries data on sites within the Blackstone and North Klondike River Drainages, monitored through previous years. Artic grayling were also to be an under lying focus for the project as an important and abundant fish species found throughout both drainages.
After partnering with Yukon Government Fisheries Branch the DNA tissue sampling work was introduced and prioritized. FODC project work plan was adjusted to accommodate this work. The following changes were made in order to complete the new objectives:

- specifically targeted Arctic grayling for DNA tissue samples
- Only examine Arctic grayling within the Blackstone Basin in order to maintain quality over quantity, along with acquiring the required sample minimum threshold for analysis.
- Data was submitted specific to the DNA work. Baseline fisheries data was collected as time and conditions permitted
- Sites were originally proposed to be sampled 3 times over June, July and August. In order to collect all the samples, certain sites were visited frequently throughout the summer.

The results from the Arctic grayling DNA data will assist in defining characteristics regarding population structures from the Blackstone River stocks. This will assist in the enhancement of knowledge into the current status and health of the population. It will also help determine and define sites of *critical summer rearing and spawning* habitat. Sites such as those defined through FODC field investigations have been highlighted as critical and in need of protection.

In completing the project again, with similar objectives, including collecting substantial sample thresholds the best way to improve results is increasing sampling efforts. This would be accomplished through increased field crew capacity and sampling time and efforts at each site

Communications:

Results from the FODC 2018 project were shared through a presentation at the Tombstone Interpretive Centre, Dempster Highway by coordinator Matthew McHugh. The presentation in July of 2018 introduced project concepts and past results. Yukon Government-Senior Fisheries Biologist, Robert Perry also presented on concepts specific to the DNA work YG is completing on grayling stocks through the Yukon Territory.

Credit to the YFWET was listed in the presentation, results report and local communications of project scope. YFWET is credited during any conversation regarding the projects details as the main funder for the work completed to data.

Thank you and we look forward to continue working with you into the future!

FODC-2018 crew relaxing after another day in the field!

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VON FINSTER, A. 2008. Memo: Potential for High altitude/latitude braided channel complexes to be important nursery areas for young-of-year Arctic grayling.

Traditional and Local Knowledge:

Percy Henry Interview, in person by Matthew McHugh. Feb 2012.

Robert Alexie Interview, over the phone by Matthew McHugh. Jan 2013.

Percy Henry THFN: Black City TK Project June 23rd 2004-notes taken from transcripts pg 1-5

Personal Communication:

Clint Collins, conversation regarding Dolly Varden in west Blackstone River In person at the Tombstone Outfitters base camp, Km 90 Dempster Highway. August 2016

Clint Collins, conversation in person at Tombstone Outfitters base camp,regarding Arctic grayling in the west Blackstone headwaters. July 2017

Joe Bishop. Conversation in person regarding his observations of high densities of Arctic grayling in the west Blackstone River. August 2017.