
Estimating the population size of Grizzly and Black bears in Yukon using a non-invasive DNA-based method.

Project Activities:

Our project, called OURS (Operation Ursus Research using Scat), aims at updating and providing a scientifically reliable estimate of the population size of Grizzly and Black bears in specific areas in Yukon by using a non-invasive DNA-based method relying on fecal samples. This community-based participatory research project began in April 2020 and is still ongoing.

The first year of the project, ending at the end of March 2021, consists of a pilot study aiming at assessing the efficiency of our sampling technique and testing the new sequencing technology on our samples. Between May 2020 and mid October 2020, we mainly focused on sampling bear scat. We collected 62 samples within the Southern Lakes region including Mount Lorne, Golden Horn, Marsh Lake and Tagish. Only 22 samples (35%) have been collected by Dr. Lucile Fressigné, the lead researcher on the project. Among these 22 samples, 15 of them have been found primarily by citizens who then contacted Lucile to share the location of the scat. The other 40 samples (65%) have been collected by citizens. In total, 24 different persons got involved with our project by collecting samples themselves or sharing the location of a scat they encountered. This is a very positive and promising value that shows that our advertising campaign was successful and that many citizens are interested in participating in a scientific project studying bears. In conclusion, 89% of the samples collected involved the help of citizens. Considering that it was the first year implementing this type of community-based research in Yukon and that due to COVID-19, we started advertising the project late, this value is really encouraging for the next sampling season that is coming up. We are certain that citizen science-based research projects are the way to proceed in conservation studies in Yukon as Yukoners care about their environment.

We developed a collaboration with Dr Stephen Lougheed from Queen's University, Kingston, Ontario, who developed a new technology called Genotyping in Thousands by sequencing (GT-seq). In October 2020, we sent 10 of our samples to Kingston to evaluate the process of shipping frozen bear scat samples by plane. We did not send them all at once to avoid any risk of losing all the samples at once due to plane issues or a break in the cold chain. It also allowed Dr. Lougheed and his team to adjust their protocol to our samples. As of today, Dr. Lougheed and his team have extracted and quantified DNA from these 10 samples. They are still working on the sequencing analysis.

During this first year, we also worked on building partnerships with different organizations and First Nations. As of today, we have a strong relationship with the Kwanlin Dün First Nation as well as the White River First Nation. We will be working with both this coming year to sample bear scat on their respective traditional territories. We will be expanding our relationships to the Carcross Tagish First Nation who are already interested to work with us on our project, and we

plan on including other Yukon First Nations as interest grows. We also built productive relationships with Wildwise Yukon and CPAWS Yukon who are distributing sampling kits for us and helping us teach safety precautions to our participants.

COVID-19 negatively impacted our work plan, especially the sampling part of our research project. First, we had to exclude Carcross from the study area as we had to limit our travels to other communities which reduced our study area. Then, the Kwanlin Dün First Nation, who we partnered with to study the bear population around Fish Lake, had to reorganize their activities due to COVID-19 and did less field trips than they expected. Therefore, they focused more on their own projects. This explains why we did not collect any samples from Fish Lake. Also, we partnered with different tourism associations to help with the collection of bear scat but due to the pandemic and associated travel restrictions, the tourism industry has been almost non-existent. So, considering all the unexpected issues related to COVID-19, this pilot study has been a success regarding the involvement of citizens and First Nations, and the number of samples collected.

We already made some observations from all the samples we collected. One alarming point is that 2020 was a year marked by low sightings of Grizzly bears in Mount Lorne, Marsh Lake, Golden Horn, Tagish and Fish Lake. This observation has been made by our Dr. Fressigné and has been reported to us by many different citizens as well as a representant of the Kwanlin Dün First Nation. The reason why is still unknown. Also, from our 62 samples, we looked at the content of the scat to determine the diet of the bears. All 62 samples were only containing plant substances such as grass, roots, seed, and berries. None of them were containing fur showing that the bears, in this study area, mainly forage on plants. Regarding the temporal distribution of bears, we began collecting bear scat at the beginning of May and collected our last sample around mid October. In May, we collected 9.7% of the samples, in June 35.5%, in July 19.3%, in August 8%, in September 16% and in October 11.3%. We collected more than a third of our samples in June. This can be explained by the fact that, from mid April to mid May, bears started to come out of hibernation and then migrated to lower elevations to access food (close to roads and houses where most of the samples have been collected) because the snow no longer covers the ground. Then by the end of July, they start moving back to higher elevation where the snow had melted, which explains why we sampled less bear scat in August/early September. Then, bears came back to lower elevations in the middle of September to feed on berries before hibernating.

Our main objective for this first year was to evaluate the feasibility of this project, evaluate the interest from citizens and First Nations, and determine the most efficient sampling technique. This successful pilot study proved that there is a high interest from citizens and First Nations to be involved in bear research studies and demonstrated that our sampling technique allowed us to obtain enough DNA to do the sequencing analysis. We will use the lessons learned coming from this pilot study to better develop this coming year. We will start advertising the project earlier, start contacting different tourism companies earlier and develop a more rigorous work plan to survey specific areas within the study areas.

Communications:

We created a Facebook page called Operation Ursus Research using Scat (<https://www.facebook.com/OURS.lf>). This page allows us to keep the participants and other interested people up to date with where we are at, to share pictures, to recognize and thank the participation of citizens, and to advertise events. It is also a convenient way for participants to reach out to us via Facebook messenger to ask questions.

We also created posters that we posted in all the neighborhoods within the study area to advertise our research project. We added the logo of the YFWET at the bottom of the poster to recognize the Enhancement Trust.

We hosted three information sessions during the sampling season: one in Mt Lorne, another one in Marsh Lake and the third one downtown Whitehorse. Each information session was well attended, and we received positive feedback. During these information sessions, we used a PowerPoint to present our research project and the last slide was showing the YFWET logo to acknowledge the Enhancement Trust.

Between May 2020 and September 2020, we have been interviewed four different times in both English and French. Our research project appeared in four different newspapers, one radio station and one television news station. The first interview was done by Radio Canada in French but did not mention who funded our project: https://ici.radio-canada.ca/premiere/emissions/phare-ouest/episodes/463879/ratrapage-du-vendredi-22-mai-2020/4?fbclid=IwAR3f8B_qxV_4LZy5NfnUskvCHo9tKu2u0vrSigPL6l1WXRI2zwhFJeIEWB0. A newspaper article has also been written from the same interview and has been published by Radio Canada, ICI Grand Nord: https://ici.radio-canada.ca/nouvelle/1705562/yukon-etude-participative-ours-excrement-biologie-recensement?fbclid=IwAR2_6WXb_Wnnnw37ol38tPuvzzSJ6DwOkC3VFXKWgchOAm-ObtRF0FGc0qQ. The second interview, done by CBC in English, made the news on May 28, 2020 on CBC Northbeat and an article was also published by CBC North: https://www.cbc.ca/news/canada/north/yukon-bear-scat-population-project-1.5586059?fbclid=IwAR0hR6KEkiFuUlrmrVMzjOxZCLic38VcQicW-1lm5vL1rGLa_5xv7OdkYM. This article recognizes the Enhancement Trust as one of our funders. The third interview was done by Yukon News in English and the Enhancement Trust was recognized as one of the funders: https://www.yukon-news.com/news/stoop-and-scoop-yukoners-asked-to-collect-scat-samples-to-help-update-bear-research/?fbclid=IwAR0hR6KEkiFuUlrmrVMzjOxZCLic38VcQicW-1lm5vL1rGLa_5xv7OdkYM. The last interview was done in French by L'aurore Boréale but did not mention who funded our project: http://aureoboreale.ca/des-excrements-dours-qui-contribuent-a-la-conservation-de-lespece/?fbclid=IwAR2KbzwowQ8nCd_0p9WCtD2EV-z038CCzpGTGtBrcU7bmikciUaA3SMvAa4.

We are maintaining an open discussion with our First Nation partners on the advancement of our project and are starting to plan this coming sampling season together. In

August 2020, we also presented our project to biologists from the Yukon Government to receive feedback and start a partnership.

Financial Reports:

Our project received \$10,000 from the Enhancement Trust. The YFWET was crucial for the launch of this research project as it was our main funder.

We used \$755.97 to buy a freezer where we keep all the bear scat samples. We originally planned to also spend some money towards the use and maintenance of lab equipment to analyze all the samples. Originally, Dr. Fressigné had plan to travel to Kingston to analyze all the samples with the help of Dr. Lougheed and his team in the fall/winter 2020. So, lab equipment was supposed to be used and this was planned in our budget. But due to the COVID-19 travel restrictions, Dr. Fressigné was not able to travel to Kingston and did not use Dr. Lougheed's equipment. Regarding the 10 samples that have been sent to our collaborator in Kingston, Dr Lougheed mentioned to us that he will not facture us anything for these samples as they are considered test samples to calibrate their equipment and protocol.

We spent \$380.76 to buy all the necessary items needed to build sampling kits that were distributed to citizens and First Nations. This includes vials + caps, wooden sticks, silica beads, ziplock bags, markers, label paper, 2 boxes of medical gloves, two ammunition boxes, and two locks. The ammunition boxes were displayed at the Mt Lorne Community Center and contained sampling kits for citizens to use. Citizens that wanted to have access to sampling kits had to ask for the combination lock to be able to grab a kit from the ammunition box. This amount also includes the price of an ice pack and the shipping cost to send 10 frozen samples from Whitehorse to Ottawa via Air North Cargo. We expected to spend \$3,500 in the materials and supplies category because we planned on analyzing all the samples in the lab by the end of the pilot study. But COVID-19 modified our plans and delayed the analysis of the samples. So, we did not have to purchase any reactants or solutions for the extraction of DNA and did not have to pay for the sequencing analysis. We plan on sending the rest of the samples to Kingston for analysis after we receive the results from the first 10 samples. Unfortunately, due to the COVID-19 travel restrictions, Dr. Fressigné will probably not be able to go to Kingston before the summer.

For the travel expenses category, we originally planned to spend around \$2,000 for Dr. Fressigné to travel to Kingston with all the samples in order to analyze them. But due to the COVID-19 travel restrictions, Dr. Fressigné was not able to travel to Kingston. This explains why we did not use any money for this category.

We spent the rest of the fund (\$8,863.27) towards the salary of Dr. Fressigné who charges \$40/hour of work. From May 2020 until September 2020, she worked 24 hours a week on this project. Then, from October 2020 until February 2021, she worked 10 hours a week on this project. In total, her salary should be \$29,240. The Enhancement Trust was able to cover a big part of Dr. Fressigne's salary.
