Interim Project Report 2019

1. **NWRT Project Number**: **2-18-12, 2-19-01**

2. **Project title**: **Kitikmeot wolverine monitoring – non-invasive and community-based initiative**

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Note: This draft project report provides a brief preliminary summary of the 2018 and 2019 field work results. After 2019, DNA results will be pooled for population analysis and presented in a final project report in 2020.

Summary:

This summary presents preliminary results for a wolverine (*Gulo gulo*) DNA mark-recapture study conducted near Napaktulik Lake, Kitikmeot region, Nunavut, to establish baseline population abundance and density estimates for long term regional monitoring. Wolverine is an important cultural and economic resource traditionally harvested by Inuit.

We used genetic analysis to identify individual wolverines and their sex from hair samples collected non-invasively by a science-driven study design and logistics facilitated by local hunters. From early March through late April 2018 and 2019, the field team sampled a grid of 154 posts baited with caribou (*Rangifer tarandus groenlandicus*) and muskox (*Ovibos moschatus)* legs and scent lures for three 10-day sessions. The posts were spaced in 5 x 5 km (25 km^2) cells. We detected 22 individual wolverines (11F:11M) in 2018. Seven of 22 individuals were detected in all three sessions. In the 2019 sampling season, a total of 220 hair samples were collected at the posts and subsequently submitted to a genetics lab for analysis.

We will use spatially explicit capture-recapture (SECR) methods to estimate density and average number of wolverines on the sampling grid. After the results of the 2019 hair samples, both years (2018 and 2019) data will be combined for population analysis and will be presented in a final project report in 2020.

Wolverines in the region exist at low densities and are being exposed to increasing levels of human activity through mining and subsistence harvest. This collaborative research project with the Kugluktuk Hunters and Trappers Organization (HTO) has provided training, employment and technical skills transfer to HTO members. By involving local hunters, DNA based surveys offer a practical and cost-effective method to monitor wolverine populations in tundra situations.

4. Project Objectives:

Our primary objective was to estimate wolverine population size and density utilizing Inuit hunter's relevant skills and capacities to develop a community-based monitoring protocol through a combination of culturally acceptable (non-invasive) scientific methods and hunter knowledge. We intended this project to be the basis for long-term monitoring of the species in Nunavut.

The specific objectives are:

- Identification of key wolverine habitat by interviewing active wolverine hunters and elders;
- Estimate wolverine density within the Napaktulik Lake study area;
- Establish baseline wolverine population data which can be used for long-term regional population monitoring; and
- Provide skills transfer and employment to HTO members and increase collaboration between government and resource users.

5. Materials and Methods:

Study Area

We used two approaches to establish a long term DNA sample plot to monitor representative wolverine densities over the long-term. First, we interviewed 10 wolverine hunters and elders from Kugluktuk to identify wolverine habitat and distribution and hunter harvest pattern, as well as caribou and muskox distribution. Second, we considered future mineral resource development, potential linear developments, and long term patterns of wolverine harvest in the Kitikmeot region. The selected study site comprised ~4,000 km^2 area in the vicinity of Napaktulik (Takijuq) Lake (66° 29′. 21N, 113° 28′.45W: Fig. 1) in the Kitikmeot region of Nunavut, approximately 180 km southeast of the community of Kugluktuk. The study area has numerous small lakes with elevations ranging from 400 to 600 m. The study area lies in the Takijuq Lake Upland Ecoregion of the Southern Arctic Ecozone.

The ecoregion is characterized by cool summers and very cold winters. Mean summer and winter temperatures are 6°C and -26.5°C, respectively, and mean annual precipitation ranges from 200 to 300 mm. The ecoregion is classified as having a low Arctic eco-climate, with massive Archean rocks that form broad, sloping uplands, plateaus, and lowlands. The ecoregion has high mineral development potential and substantial exploration activity has taken place. The (Ecological Framework of Canada 2019) vegetation is characterized as shrub tundra, consisting of dwarf birch, willow, northern Labrador tea, Dryas spp., and Vaccinium spp., a ground cover of mosses and lichens with scattered stands of spruce along the southern boundary (Ecological Framework of Canada 2019).

The study area overlaps with the summer range of the Bluenose-east caribou herd (Boulanger et al. 2016) in the west, with the Dolphin and Union caribou herd winter range in the east (Environment and Climate Change Canada 2018), and within the annual range of Bathurst caribou herd (Virgl et al. 2017, Wolf Feasibility Assessment Technical Working Group 2017), with light activity of hunting and trapping. The study area is also part of a traditional travel route from the Kugluktuk to the Contwoyto Lake.

In 2018, we observed no caribou or tracks of caribou in the study area during the sampling period. However, during the 2019 sampling period we encountered caribou and caribou tracks daily. Hunters from Kugluktuk harvested caribou around Napaktolik area all winter. Caribou scattered gut piles from this hunting activity provided local food supply to wolverines but also likely contributed to increased harvesting pressure on them as well. The reported annual average wolverine harvest from the study area from 2014 through 2018 was 3. However, the reported wolverine harvest from the study area shows that 12 wolverine were harvested from the study area prior and during the 2019 sampling period.

The average annual reported wolverine harvest for Kugluktuk (2011-2017) was 48, but the bulk of the wolverine harvest by Kugluktuk hunters occurs north and northwest of the study area, while subsistence hunting for caribou.

Low densities of muskoxen (*Ovibos moschatus*) live year round in the area and may be a food source for wolverine through the winter. Smaller prey species include Arctic hare (*Lepus arcticus*), Arctic ground squirrels (*Spermophilus parryii*), voles and lemmings (Muridae), ptarmigan (*Lagopus* spp.) and migratory bird species (Mulders 2000, Samelius et al. 2002, Dalerum et al. 2009, Awan et al. 2012). Other carnivores in the area included Arctic fox (*Vulpes lagopus*), red fox (*V. vulpes*), wolf (*Canis lupus*), and grizzly bear.

Field methods

We conducted DNA sampling during early spring in 2018 and 2019 following the non-invasive procedure developed by Mulders et al. (2007). This study was designed to involve local hunters in the collection of samples, with 3 Kugluktuk HTO members hired as part of the field research team. The DNA grid (Fig. 1) was sampled from 08 March to 20 April, 2018 and 09 March to 22 April, 2019.

Low snow depth in 2018 resulted in the dropping of 17 of 160 bait posts proposed for sampling in the original design, and 6 bait posts in 2019 were dropped due to lack of access. We sampled, 143 bait posts in 2018 and 154 in 2019 in a systematic sampling grid within 5x5 km grid cells, each hosting a post in the cell centre. Each hair snare bait post was ~1.6 m long and 10 x 10 cm wide and wrapped with barb-wire and anchored in packed snow. We attached bait (~250g caribou or muskox leg bone) and a combination of commercial lures (Beaver Castor and Long Distance Call, O'Gorman Lures, Montana, USA) to the top of each post with haywire. We used frozen caribou/muskox leg bones, which we cut in chunks, drilled a hole in the bone, and wired the bone to the top of the post. We recorded the GPS position of each bait post. We used snowmobiles to visit each post 3 times at about 10-day intervals. At each visit, we collected all visible hairs and used a propane torch to remove any remaining hair. Each individual clump of hair was removed from the post and placed in a labeled individual coin envelope (post number, location on post and date) for storage. We installed a fresh set of bait and lures after every check. We recorded the number of muskoxen, and other prey species sighted or wildlife signs observed during the post set-up and while driving between posts.

We installed 12 motion triggered digital cameras (Reconyx PC-800 Hyperfire Professional IR, Holmen, WI) facing bait posts to capture wolverine activity. We programmed cameras at high sensitivity, 5 images per trigger, one second apart. The cameras documented wolverine sighting date and time of visits and time spent at the hair snagging post, in addition to capturing images of other animals visiting the post.

We sent hair samples to Wildlife Genetics International (WGI), Nelson, BC for individual wolverine identification. We analyzed two samples per collection event (post/session combination) when there was more than one sample of suitable quality available. If possible, we selected the two samples from different sides of the post and used an average of 5.3 guard hair roots per extraction — counting underfur as 0.2 guard hair roots. DNA was extracted using QIAGEN DNeasy Tissue kits, aiming to use 10 clipped guard hair roots, when available. We identified individual wolverines using a ZFX/ZFY gender marker and 7 microsatellite markers, which has been utilized in other wolverine projects in the tundra (Mulders et al. 2007, Dumond et al. 2012, Awan and Boulanger 2018).

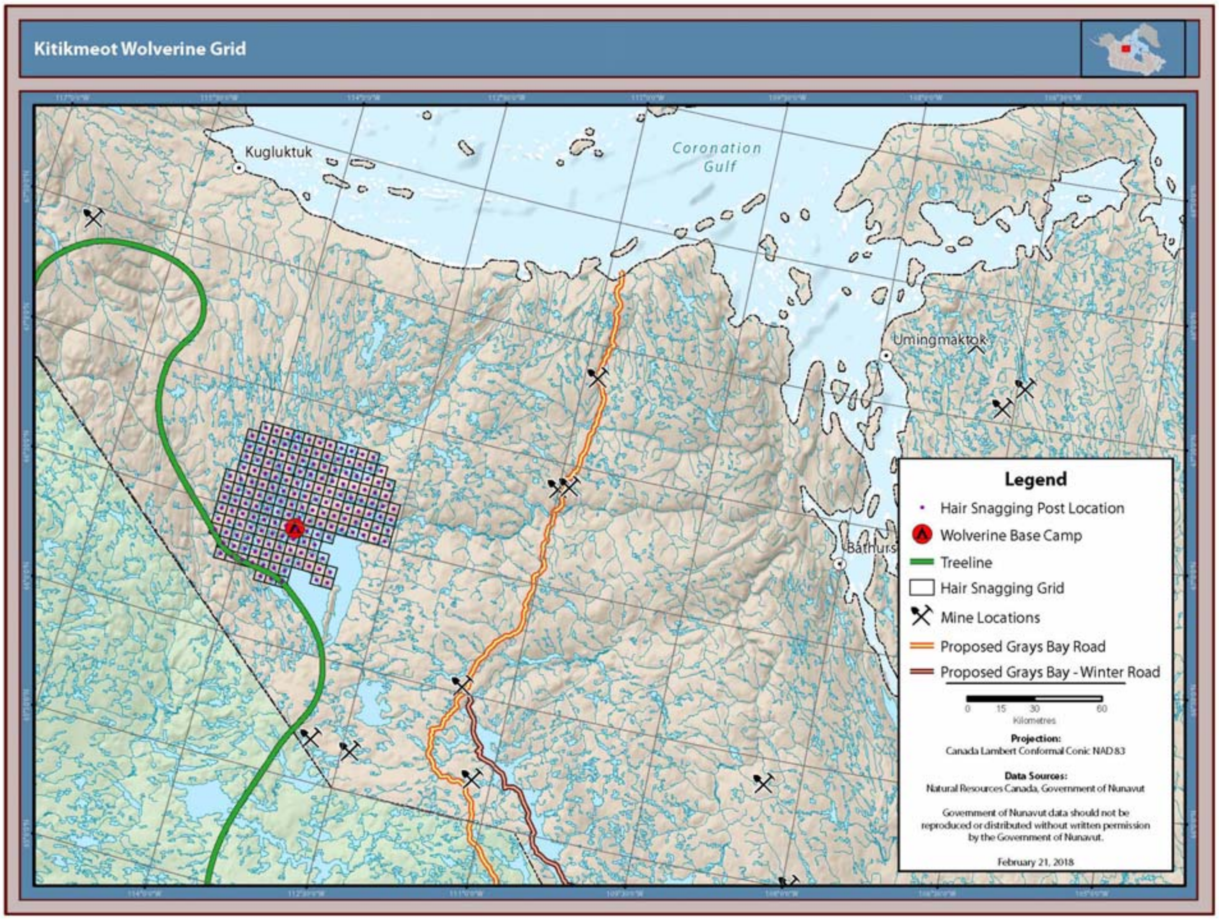

Fig. 1: Study area (DNA sampling grid), 5X5 km cells.

We will use spatially explicit capture-recapture (SECR) methods to estimate density and average number of wolverines on the sampling grid.

6. Project Schedule:

Considering the relatively low density of wolverines more than a single year of study was proposed to obtain estimates of suitable precision. To intensify the initial sampling effort we conducted multiple sampling sessions (3 sessions) in 2018 and 2019.

7. Preliminary results/discussion:

In 2018 field season, a total of 175 hair samples were collected at the posts and submitted to a genetics lab for analysis.

Hair sample Classes:
The 175 Napaktulik Lake samples were classified as follows:
Xinadequate (7%): 12 samples that lacked material suitable for analysis.
Xspecies (1%): 1 sample visually identified as non-wolverine.
Xsubselect (8%): 15 samples that weren't selected for analysis.
Xbomb (14%): 24 samples that failed during genotyping.
sample (70%): 123 wolverine samples that produced complete genotypes.

The 123 successful samples assigned to 22 individual wolverines (11M:11F).
Of the 22 individuals identified this year, 9 were detected in session 1, increasing to 14 and 19 in sessions 2 and 3. Seven of 22 individuals were detected in all 3 sessions. There were no matches to individuals from other study areas.

In the 2019 sampling season, a total of 220 hair samples were collected at the posts and submitted to a genetics lab for analysis. After the results of 2019 hair samples, both years (2018 and 2019) of data will be combined for population analysis and will be presented in a final project report in 2020.

8. Reporting to Communities/resource users:

Preliminary results of the study were presented in March 2019 to the Kugluktuk HTO.

Field Team:

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Orenthal James Bernhardt (2018)	Kugluktuk HTO member
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