2017 INUVIK LANDFILL GRIZZLY BEAR SURVEY

FAYE D'EON-EGGERTSON AND STEVEN BARYLUK

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ABSTRACT

Unsecured municipal landfills can attract bears and pose a public safety concern for nearby communities. This report details a study conducted in the summer of 2017 to estimate the numbers and fates of grizzly bears at the Inuvik landfill using genetic identification from hair-snags. Hair-snagging stations collected 134 samples and identified 20 individual bears, which is likely an underestimate of the number of bears that frequent the landfill. Eight of these bears were genetically identified at least once outside of this study, although only 20% of the study bears were re-identified at the landfill in subsequent years. This study provides a baseline for future monitoring and management efforts, which will be relevant going forward as there are plans to secure the Inuvik landfill with an electrified fence.

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INTRODUCTION

Unsecured municipal landfills are often a major attractant for all species of bears in North America. This is a public safety concern particularly in the Northwest Territories (NWT), as landfills are often located near municipal centres and food-habituated bears present a risk of human-bear conflict. In Inuvik, NWT, the municipal landfill is most often frequented by grizzly bears (Figure 1), and large numbers of grizzly bears visit this landfill during the summer months. Landfills in neighbouring communities are more often visited by black bears (e.g. Clarkson 1993), and local residents report that the Inuvik landfill used to be frequented by black bears, but that they were displaced by grizzly bears in the early 2000s. In Inuvik, Renewable Resource Officers respond to many calls every summer from concerned local residents regarding grizzly bears in and near the community. In some of these cases, the bear ends up getting dispatched in the interest of public safety. As grizzly bears are a charismatic species, there have also been issues with tourists and residents intentionally going to the landfill to view the bears, including by-passing a locked gate to access the landfill when it is closed. To prevent potential safety issues, signs have been put up and municipal ordinances have been issued prohibiting scavenging and after-hours trespassing at the landfill during bear season.

In the summer of 2017, concerns about the number of grizzly bears at the Inuvik landfill prompted a small research study with the objective of estimating how many bears were present. Related questions were 1) whether the same bears remain at the dump or whether different bears come and go, and 2) what are the fates of bears that frequent the landfill and are they more likely to become problem bears.

Figure 1. Grizzly bear at the Inuvik Landfill in 2017.

METHODS

Hair-snags

This study used the same hair-snag design as in Boulanger and Branigan (2020). Hair-snag tripods were constructed using six 2"x4" pieces of lumber 5'3" in length and secured at the corners with aircraft cable. Each upright 2"x4" leg was wrapped with double-stranded 15 1/2 gauge four-point high-tensile barbed wire to trap grizzly bear hair.

Five hair-snag tripod stations were set up at the Inuvik landfill and baited with various lures, such as beluga whale blubber and bubble bath liquid found on location. These stations were placed at the entry/exit of apparent trails and were moved onto fresh piles of garbage to maximize their chances of being encountered by a bear. The stations were deployed from July 17, 2017 until August 21, 2017, for a total deployment of five weeks or 35 days. They were checked for hair daily (excluding weekends) for the first three weeks and then once a week for the remainder of the study (six, eight and three days apart), resulting in the stations being checked a total of 17 times over the course of the study.

At each check, hair samples were removed with forceps, placed in coin envelopes, and labeled with identifying information about the tripod and date. A propane torch was used to remove any remaining hair. Hair samples were dried each night and stored cool and dry. All samples were sent to Wildlife Genetics International (WGI; Nelson, BC) for microsatellite genotyping. Individuals were identified using nine genetic markers, including eight microsatellites and a gender marker. A quality threshold of a minimum of two guard hair roots or 20 underfur hairs were used. The genotyping procedures are described further in published studies from WGI (e.g. Paetkau 2004).

A similar study was conducted at the Aklavik landfill by the local Renewable Resource Officer around the same time but was unsuccessful in obtaining any hair samples. While the Aklavik landfill is also visited by grizzly bears, it is at a lower scale than the Inuvik landfill.

Drone

Renewable Resource Officers flew a drone at the Inuvik landfill to determine how many bears were at the landfill at a given time, and to observe their behaviour. The drone was flown on two occasions, at different times of the day: once at midnight and once at 5:00 a.m.

RESULTS

Drone Footage

Drone footage taken by the Renewable Resource Officers showed up to 13 bears at one time, providing a minimum count of the number of bears at the landfill (Figure 2; 13th bear is out of frame). The drone footage showed a difference in demographics and behaviour, with the 5:00 a.m. video showing smaller, likely younger bears (up to 13 bears at one time) that scattered immediately when the drone approached, and the midnight video showing larger, likely older bears (up to nine bears at one time) that barely moved even when approached by the drone (within 10 m).

Figure 2. Drone photo showing 12 grizzly bears in one frame.

Hair-snags

A total of 134 hair samples were collected from hair-snag stations during this study and sent for analysis. Four of these samples were not from bears, and an additional 24 samples were inadequate for analysis. Forty-eight of the remaining 106 samples (45%) failed during the genotyping analysis. The remaining 58 samples were successfully genotyped, resulting in the identification of 20 individual bears (15 male and five female). Bears were identified from DNA on one to four separate sampling sessions (mean: 2), with an average of ten days

between when they were first and last detected at the landfill (range: 0-30 days). These results are summarized in Table 1.

Table 1. Summary of grizzly bears identified during the Inuvik landfill hair-snag survey.

Bear ID	B255	B487	B732	B744	B745	B746	B750	B756	B761	B785
Sex	F	M	M	M	F	M	M	M	F	M
# Sessions	1	2	4	3	2	3	1	2	4	2
Days Apart	0	14	30	13	20	28	0	25	25	4
Bear ID	B795	B797	B804	B808	B820	B833	B839	B848	G10-4-1-1a	G1043
Sex	F	F	M	M	M	M	M	M	M	M
# Sessions	3	1	1	1	3	1	1	1	3	3
Days Apart	7	0	0	0	10	0	0	0	8	12

Previously and Subsequently Identified Bears

All grizzly bears killed near Inuvik (either in defense of life and property (DLP) or as part of regular subsistence harvesting) have samples submitted which can be used to genetically identify them. Four of the bears in this study had previously been genetically identified during other studies, and seven bears from this study were killed in the five years following this study, for a total of eight bears genetically identified at least once outside of this study. These bears are highlighted in Table 1, with details provided below.

- Bear G1043 was previously captured as a five-year-old bear 35 km away from the landfill in 2003, recaptured 70 km away in 2004, and was darted again in 2008. This bear was harvested 90 km from the landfill as part of regular subsistence harvesting in 2019. The hunter noted that the bear was "very fat and in good shape".
- Bear B255 was previously identified when a local resident submitted a hair sample following a bear breaking into their cabin (located about 3 km from the landfill) in 2006. This bear was killed by Renewable Resource Officers in 2019 in DLP at the landfill.
- Bear B487 was previously identified 85 km from the landfill during a 2008 biopsy darting survey. This bear was harvested 85 km from the landfill as part of regular subsistence harvesting in 2020. The harvester did not note anything unusual about this bear.
- Bear G10-4-1-1a was previously identified 45 km away from the Inuvik landfill in 2013 during the Inuvik-Tuktoyaktuk Highway hair-snag survey (Boulanger and Branigan 2020). It has not been subsequently identified.
- Bear 756 was harvested 15 km from the landfill as part of subsistence harvesting in 2018. The hunter noted that the bear was in "excellent shape".
- Bears B795, B797 and B833 were killed by Renewable Resource Officers on different dates in 2019 in DLP at or near the landfill.

The remaining 12 bears have not been genetically identified since 2017.

DISCUSSION

Tripod Placement

Baiting tripods are not very effective in landfills as there are already many bear attractants in the surrounding area. The highest number of hair samples were retrieved when tripods were placed directly onto piles of fresh garbage, which the bears were most attracted to. Immediately after being dumped, these piles of garbage could be up to 2 m high and would be flattened within a day by the bears. The barbed wire on the tripods also collected a lot of garbage.

Genetic Analysis

The hair samples in this study had a very low success rate (55%) while undergoing genetics analysis. This is lower than in other similar hair-snag studies (e.g. 60-70% in Boulanger and Branigan 2020) despite other studies only checking their stations every two weeks (compared with an average of every two days in this study). It is unclear why the genotyping success rate was so low in this study, but in some cases the tripods were flipped, leaving the hair sitting in the garbage, which may have sped up DNA degradation in the samples. In addition, the weather was fairly wet and rainy during this study, which may have contributed to sample degradation.

Number and Demographics of Bears at the Landfill

From DNA results, we know that a minimum of 20 grizzly bears visited the Inuvik landfill in the summer of 2017. This is very likely an underestimate as hair samples were probably not obtained from every bear, and the study only ran for five weeks during July and August so would have missed bears that visited the landfill outside of that time window. Other studies have found that grizzly bears are more likely to frequent landfills in the fall (Wood and Ciarniello 2011, MacKay 1996), when natural food sources are more limited (Peirce and Van Daele 2006). Drone footage showed that at least 13 bears could be in the landfill at one time. This is not a precise estimate, but it gives some quantifiable insight and minimum counts as to the number of bears at the landfill.

Demographically, only 25% of the detected bears at the landfill were female, compared with 56% of the bears in the nearby Inuvik-Tuktoyaktuk Highway hair-snag study (Boulanger and d'Eon-Eggertson In Press). This could suggest that male bears are preferentially visiting the landfill, or that female bears are avoiding the landfill, either due to its proximity to humans or due to the presence of male bears. Large male bears are known to dominate high-resource areas – although, surprisingly, Peirce and Van Daele (2006) found that females with cubs were the most socially dominant bears at a landfill in Alaska – and smaller bears were observed being wary of large male bears in the landfill during this study. The age distribution

of bears detected in this study is unknown. No cubs were observed during this study, but cubs were observed at the landfill by Renewable Resource Officers at other times.

If further studies are conducted when the landfill is fenced, this baseline DNA data will help identify bears that visit the Inuvik landfill.

Managing Problem Bears

The town of Inuvik has plans to secure the landfill with an electrified fence in order to exclude bears from the landfill. Electric fences are the most effective way to protect assets from all types of bears (Khorozyan and Waltert 2020). Some community members are concerned that this could result in landfill-habituated bears coming into town, resulting in conflicts with humans. This study identified four bears (20% of the study bears) that were killed in subsequent years at the landfill, suggesting that they were regular landfill users. Three bears (15%) were harvested away from the landfill and are unlikely to be landfill-dependent bears, and along with the remaining 13 bears (65%), are not known to have not caused human-wildlife conflicts in the five years following this study. This suggests that a bear being present at the landfill does not necessarily mean that it will become a conflict bear in the future. This is consistent with other studies which found that a minority of grizzly bears that were heavier landfill users were more likely to become problem bears, while most bears were transient or infrequent users and were less likely to become problem bears (Peirce and Van Daele 2006, Craighead and Craighead 1971, Wood and Ciarniello 2011).

The effectiveness of electric fencing to deter bears depends on human behaviour in the vicinity of the landfill (Khorozyan and Waltert 2020). Some regions have had substantial bear problems in nearby communities following landfill closures (Craighead and Craighead 1971, MacKay 1996), while others have had minimal or no issues (Latour and Hagen 1993). The jurisdictions that faced issues have recommended bear-proofing garbage in town, public education, restricting public access to dump (MacKay 1996), and cleaning up other nearby sources of food before restricting access to landfills (Craighead and Craighead 1971). In some cases, there were no issues during the first summer after the electric fence was installed, but then bears became a problem in the fall when natural food sources were more limited (MacKay 1996). Several studies found that relocating garbage-conditioned bears from landfills was ineffective, with most relocated bears either returning or becoming a problem in a new area (MacKay 1996, Wood and Ciarniello 2011).

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