

**APPENDIX F**

**Meliadine Project Caribou Behaviour Study, 2023**



# Meliadine Mine

## Caribou Behaviour Study, 2023

PREPARED FOR



**AGNICO EAGLE**

Agnico Eagle Mines Limited

DATE  
March 2024

REFERENCE  
0689548-02



## ACKNOWLEDGEMENTS

# Meliadine Mine

## Caribou Behaviour Study, 2023

March 2024

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## ACRONYMS AND ABBREVIATIONS

Agnico Eagle	Agnico Eagle Mines Limited
AIC	Akaike information criterion
ATV	All-terrain vehicle
AWAR	Meliadine Mine All-Weather Access Road
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
BQCMB	Beverly Qamanirjuaq Caribou Management Board
ERM	ERM Consultants Canada Ltd.
GLMMs	Generalized linear mixed-effects models
GN	Government of Nunavut
GNWT ENR	Government of Northwest Territories Department of Environment and Natural Resources
IOL	Inuit Owned Land
IQ	Inuit Qaujimajatuqangit
KivIA	Kivalliq Inuit Association
km	Kilometre
km/h	Speed expressed as kilometres per hour
m	Metre
the Mine	The Meliadine Mine
NIRB	Nunavut Impact Review Board
NWT	Northwest Territories
TAG	Terrestrial Advisory Group
T&C	Terms and Conditions
TEMMP	Terrestrial Environment Management and Monitoring Plan
TK	Traditional Knowledge

## EXECUTIVE SUMMARY

The Meliadine Mine (the Mine), owned and operated by Agnico Eagle Mines Limited (Agnico Eagle), is located on Inuit Owned Land (IOL) approximately 25 km directly north of Rankin Inlet, Nunavut. A 30 km All Weather Access Road (AWAR) connects the Mine to Rankin Inlet. Groups of caribou from the Qamanirjuaq herd are present in the Mine area during June and July each year, some crossing through the Mine site and the AWAR.

As part of the Nunavut Impact Review Board (NIRB) Project Certificate #006, Agnico Eagle is required to report on the effects of the Mine on caribou behaviour (Term and Condition 57, b.). To support fulfillment of this condition, the Agnico Eagle Terrestrial Environment Management and Monitoring Plan (TEMMP) includes a behaviour monitoring program to determine if there are changes to behaviour i) with distance to the Mine and ii) in response to disturbances such as passing vehicles.

Behaviour monitoring was conducted annually from 2020 to 2023. Agnico Eagle retained ERM Consultants Canada Ltd. (ERM) to update the field protocols used for behaviour monitoring in early 2020. ERM adapted standard methods for caribou behaviour monitoring developed by the Government of Northwest Territories Department of Environment and Natural Resources (GNWT ENR). Following the first year of data collection in 2020, the protocols were updated for the 2021 season to improve the quality of the data collected. Methods for behaviour monitoring during the 2022 and 2023 seasons were unchanged from 2021.

Following the discussion of the caribou behaviour survey results in 2020 and 2021, the Kivalliq Inuit Association (KivIA) suggested several improvements to the survey protocol and analysis methods. A Terrestrial Advisory Group (TAG) was formed in 2022 and formalized by establishing Terms of Reference in early 2023 as a collaborative forum to discuss Inuit Qaujimagatuqangit (IQ), Traditional Knowledge (TK) and western science applications to mitigation and monitoring programs related to the protection of terrestrial wildlife and wildlife habitat for the Meliadine Mine, including on caribou movement in the Mine area. Agnico Eagle has endeavored to incorporate the suggestions of the TAG into the 2023 analysis.

Field surveys were conducted during June and July 2023 by an ERM wildlife biologist and an Agnico Eagle environmental technician dedicated to behaviour monitoring. In addition, Agnico Eagle environmental technicians were trained to conduct behaviour surveys on an opportunistic basis while conducting other duties. Each survey lasted 30 minutes, with scan samples conducted every three minutes. Data was analyzed across years 2020-2023 for this report.

The behaviour monitoring program in 2020-2023 had several key results:

- Forty-two surveys were conducted in 2023 with peak caribou activity observed between June 17 and June 27. This aligned with the timing from 2022 and was slightly earlier than the peak in 2021 and 2020. The data from 2020 to 2023 were combined for a total of 213 surveys across four years.
- Small groups (<25 caribou) tended to have a higher proportion of response behaviours (running, alert) than larger groups, irrespective of disturbances. Groups within 300 m of the

road also tended to have a higher proportion of response behaviours than those further away. This was apparent in all four survey years (2020 to 2023).

- Caribou mostly exhibited the non-response behaviours of standing, laying, and feeding. Statistical analysis indicated a trend for caribou at greater distance from the road (> 300 m) to have a lower proportion of response behaviours. Distance to the road was also linked to walking behaviour when grouped with alert and trotting behaviours, suggesting potential for walking as a response to disturbance. Walking behaviour has previously been considered a non-response behaviour, and as such models presented in this report include versions with walking designated as a potential response behaviour, as well as models with walking designated as a non-response behaviour for comparison.
- These results together suggest that within approximately 300 m of the road caribou are more alert and active.
- Approximately half of the surveys included a disturbance event, typically from essential Mine vehicles, mostly pickups and all-terrain vehicles (ATVs) used by community members on the Awaracuk Road (AWAR) for travel. The AWAR was closed to Mine vehicles (with the exception of approved convoys and the survey vehicle) when caribou were near the road and all Mine vehicles are required to stop when caribou are on the road. Note that surveys were conducted specifically to record responses to disturbances, so the proportion of surveys with disturbances is higher than the actual proportion of caribou exposed to disturbances.
- In 2023, the AWAR was closed near Rankin Inlet by the GN Conservation Officer and Kangiqliniq Hunters and Trappers Organization to all traffic (including local hunters) during periods of increased caribou sensitivity.
- Following a disturbance event, the proportion of response behaviours in a group of caribou rose, but typically returned to baseline behaviours within two sampling periods (six minutes). Caribou were statistically more likely to be walking, alert, or running in sampling periods where a disturbance occurred (i.e., a passing vehicle).

The survey protocols incorporate feedback from previous years of data and analysis, which were helpful in improving the overall quality and accuracy of the data. Interestingly, even with these changes, the trends in the results were highly consistent among the four years of data. This increases the confidence that trends are repeatable year to year. Overall, the results of the statistical analysis provided support for the key hypothesis that caribou tend to respond to disturbances, particularly when they are close to the road. However, the analysis also found that the effects of disturbances are likely short lived, with caribou returning to non-response behaviours within a short period of six or less minutes.

## 1. PROJECT OVERVIEW

The Meliadine Mine (the Mine), owned and operated by Agnico Eagle Mines Limited (Agnico Eagle), is located on Inuit Owned Land (IOL) approximately 25 km directly north of Rankin Inlet, Nunavut. A 30 km all weather access road (AWAR) connects the Mine to Rankin Inlet. The Rankin Inlet By-pass Road was constructed to the west and south of Rankin Inlet to allow mine traffic to circumvent the hamlet of Rankin Inlet when traveling from the AWAR to Itivia Harbour (i.e., Melvin Bay) southwest of Rankin Inlet (Figure 1-1).

The Meliadine Mine was approved by the Nunavut Impact Review Board (NIRB) in 2015 (Project Certificate #006) with a life of mine plan that includes production from five ore bodies. The mine plan includes open pits, underground mining and associated ore processing, waste management and ancillary infrastructure. Construction of the AWAR, camp, ore processing facilities and ancillary infrastructure began in 2017, and production began in Q2 2019. In 2019, the Meliadine Mine NIRB Project Certificate (#006 No. 001) was amended to include discharge of treated saline effluent to the marine environment via diffuser at Itivia Harbour and to convey via truck treated saline effluent along the AWAR to Itivia Harbour. In 2022, the Project Certificate (#006 No. 002) was further amended to allow for the construction of a 34 km waterline, which consists of two 16-inch diameter waterlines needed to convey treated saline effluent from the Mine to Itivia Harbour.

Caribou behaviour studies were conducted in June and July 2020, 2021, 2022, and 2023 at the Meliadine Mine and along the AWAR in support of existing NIRB conditions as outlined in Project Certificate #006 and the associated amendments.

### 1.1 TERRESTRIAL ENVIRONMENT MANAGEMENT AND MONITORING PLAN

The 2015 Project Certificate and 2019 and 2022 Project Certificate Amendments from the NIRB, Term and Condition 57 requires the Mine to report in its annual NIRB report:

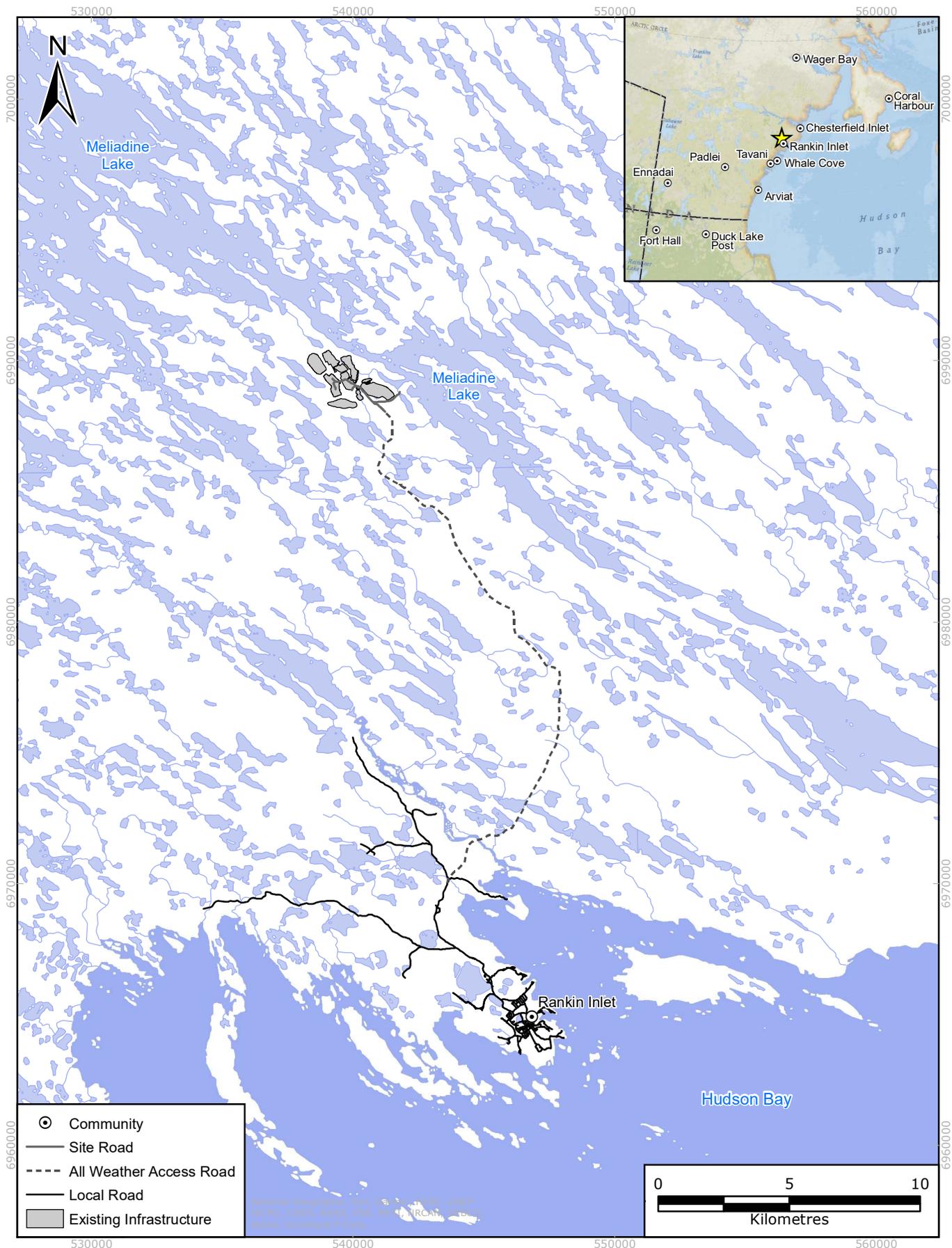
(T&C 57, b.) A detailed analysis of wildlife responses to operations with emphasis on wildlife behaviour, mortalities and displacements (if any), responses to operations of the all-weather access road and associated access roads/trails, and the waterlines;

The Meliadine Mine Terrestrial Environment Management and Monitoring Plan (TEMMP; Agnico Eagle 2022) is designed to meet this condition, with a behaviour monitoring program (Section 4.5) that has two objectives:

- "To determine if caribou activity budgets change with distance from the mine, and to document caribou response to stressors.
- To determine if caribou distribution changes with proximity to the mine (i.e., do caribou avoid the mine)."

The behaviour monitoring program described in this report is designed to address the first of these objectives, while the second objective is met via broader scale location-based GPS collar analyses. The TEMMP also specifies mitigation measures for traffic on the AWAR when caribou are in the area, namely that the AWAR must be closed to non-essential mine traffic when 50 or more caribou are within 100 m of the road.

FIGURE 1-1 MELIADINE GOLD MINE LOCATION



## 2. STUDY OBJECTIVES

The overall objective of the caribou behaviour monitoring program as stated in the TEMMP is:

- To determine if caribou activity budgets change with distance from the mine, and to document caribou response to stressor.

Per the Project Certificate (T&C 57, b), a detailed analysis of caribou responses to operations of the AWAR is required at the Mine. This report serves to summarize this analysis, investigating patterns both within years and across multiple years of collected data. The intent of the 2023 study was:

1. To conduct a study using behaviour survey methodology at the Mine site to estimate how the AWAR and Mine infrastructure may contribute to the effects of the Mine on caribou.
2. To use information from the surveys (combined across four years of data collection) to determine which factors predict caribou behaviour near the Mine site, specifically looking at distance, group size, and vehicle disturbances.

The primary hypothesis of this study was that caribou closer to the road would demonstrate a stronger response to vehicle disturbances.

## 3. BACKGROUND

### 3.1 QAMANIRJUAQ HERD

The Qamanirjuaq caribou subpopulation is a large barren-ground caribou herd numbering approximately 288,000 animals in 2017, down from over 348,000 animals reported in 2008 (Boulanger et al. 2018) but consistent with the population size in the 1980s (COSEWIC 2016).

The Beverly and Qamanirjuaq Caribou Management Board (BQCMB) rated the Qamanirjuaq herd as having “Medium” vulnerability in 2014 due to population declines since 2008 (BQCMB 2014) and upgraded this rating to “Medium-High” in 2016, a status that remains unchanged (BQCMB 2021).

Spring migration brings the caribou north along the coast of Hudson Bay, past the communities of Arviat, Whale Cove and Rankin Inlet to a broad calving ground generally centered on Qamanirjuaq Lake (BQCMB 2023).

Following calving, the caribou form into large groups of hundreds to thousands and radiate out from the calving grounds, including east towards the coast. During June and July, groups of animals from this herd migrate in proximity to the hamlet of Rankin Inlet, the Meliadine Mine and the AWAR connecting the two.

During summer and fall, the caribou generally move south and inland, gradually returning south towards their wintering areas by early December. Maps of the caribou range and movement are available on the BQCMB website (<https://arctic-caribou.com/resources/>).

### 3.2 TERRESTRIAL ADVISORY GROUP

A Terrestrial Advisory Group (TAG) was formed in 2022 and formalized via creation of the Terms of Reference in 2023 as a collaborative forum to discuss the application of Inuit Qaujimajatuqangit (IQ), Traditional Knowledge (TK) and western science to mitigation and monitoring programs for caribou movement in the Mine area. Members of the group include the local, regional, territorial, and federal governments, as well as Indigenous groups.

Wherever sample size allowed, suggestions made by the TAG have been added into the 2023 analysis. It was also suggested by the TAG that in future years, a variable for caribou movement direction relative to the road should be added and additional information collected on the speed of passing vehicles. Agnico Eagle has endeavored to incorporate the suggestions of the TAG into the 2023 analyses presented in this report.

## 4. STUDY AREA

The study area for behaviour monitoring included the existing Mine footprint, or the Meliadine Mine site and the AWAR (see Figure 1-1). Surveys were conducted on any caribou that could be visually observed from Mine infrastructure (including the AWAR) up to 3 km away with the aid of binoculars or a spotting scope.

The dominant terrain in the Mine area comprises glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and lakes. A series of low relief ridges are composed of glacial deposits, oriented in a northwest-southeast direction, which control the regional surface drainage patterns. The Mine area is approximately 60 metres above sea level in low-lying topography with numerous lakes (Final Environmental Impact Statement; Agnico Eagle 2015).

## 5. METHODS

### 5.1 FIELD SURVEYS

Survey methods followed protocols for monitoring caribou behaviour developed by the GNWT ENR (2017). In 2020, ERM refined these methods for Agnico Eagle's Nunavut mine operations. The updated methods focus on scan samples, *in lieu* of both scan and focal samples. Given time and personnel constraints, this was determined to be a more efficient use of time and produce better quality data that is suitable for statistical analysis. The updated methods also include an initial survey step to randomize which group of caribou to monitor when multiple groups are available. In 2021 these methods were further refined to reflect lessons learned in 2020. The 2021 updates included using a rangefinder to measure distance and recording additional information such as whether the caribou occurred on the east or west side of the road. The methodology used in 2022 and 2023 included the 2021 updates but was otherwise unchanged. Detailed protocols are attached in Appendix A.

Prior to the arrival of caribou in June, a wildlife biologist from ERM conducted a classroom and practical training program for Agnico Eagle environmental technicians from the Mine. The ERM wildlife biologist with an assistant was tasked with conducting behaviour observations as a primary role during July, while Meliadine technicians conducted behaviour observations opportunistically during other fieldwork in alignment with the TEMMP.

The overall method for the field surveys was to identify caribou groups visible from the mine site and AWAR, to select some groups for observation and to record the behaviour of individuals in groups of different sizes including their responses without any disturbance and in response to mine-related activities and natural factors. Surveys were conducted in late June and early July during the post-calving and early summer periods, when caribou pass through the Mine area in large numbers.

Field methods included the recording of site information at the location of each survey, including GPS coordinates, weather conditions, road structure, and location of the caribou group in relation to the surveyors and the road. Individuals in the observed -group were categorized when the survey started and every three minutes (referred to here as a "time interval") until 30 minutes had elapsed.

Behaviour categories and their definitions were standardized following GNWT ENR (2017) classifications. The behaviour categories were feeding, lying down, standing, alert, walking, and trotting or running.

At each three-minute interval, surveyors recorded the numbers of individuals in the group exhibiting each behaviour at that time. If the group was too large to be counted in each interval (>100 individuals), an identifiable subset of the group was surveyed during each interval and the total group size was recorded on the datasheet. In the case that a disturbance event occurred during the survey, the time and type of disturbance was recorded. A disturbance is defined as any human-caused loud noise, low-flying aircraft, or vehicle travelling on the road.

Alert behaviour and trotting or running were considered disturbance “response behaviours” and were grouped together in the subsequent data analysis. In this report, alert and running behaviours are referred to collectively as response behaviours, but it is important to note that this is irrespective of whether there were disturbances recorded. Caribou may exhibit these behaviours without a disturbance occurring. Walking was also assessed as a response behaviour in some analyses, which are specifically noted in the results.

## 5.2 DATA ANALYSIS

The objective of the data analysis was to quantify trends in the survey data, and determine whether factors such as distance to infrastructure, group size, or disturbances could be used to explain caribou behavior. The primary hypothesis was that caribou closer to the road would demonstrate a stronger response to disturbances. An initial exploratory analysis was conducted to visualize the data and determine the appropriate method for analyzing the data.

A regression analysis was conducted to test for statistically significant trends in the data. To increase the statistical power to detect changes in caribou behaviour, the behaviour categories were grouped for analysis into “response” behaviours (alert and running) and non-response behaviours (feeding, lying down, standing, and walking).

Following the 2021 analysis there was a suggestion from the TAG to explore whether the proportion of walking caribou changed as a response to disturbance. This was done to see if walking would be better categorized as a response behaviour or a non-response behaviour. To test this, a model that included walking, running, and alert behaviours was conducted in addition to the original model with just running and alert behaviours.

Generalized linear mixed-effects models (GLMMs) were used to assess the differences in the proportion of response behaviours in surveyed animals as a function of various controlling variables, including the occurrence of disturbances. Proportions were modelled using a binomial distribution. Because small groups naturally have greater variability in values (i.e., more likely that “all” or “none” of caribou are alarmed when there are only two caribou) an offset was included for the total number of caribou with tallied behaviour. This regression framework provides a means to control for environmental variables, repeated measurements, and spatial correlation. Random effects were included for survey ID, and Year to control for spatial and temporal autocorrelation.

Statistical analyses were conducted using R Statistical Software version 4.3.1 (R Core Development Team 2023). Two dependent variables were tested:

1. The first dependent variable tested was the proportion of response behaviours (alert and running) in each 3-minute interval in each survey.
2. The second dependent variable tested was the proportion of walking plus response behaviours in each 3-minute interval in each survey.

The two dependent variables were each modelled against a suite of potentially important variables to determine if there was any statistical relationship with response behaviour. Based on an initial assessment of which variables were most statistically relevant, the variables included in this

analysis were group size, distance to road, wind speed, and a binary variable identifying whether a disturbance occurred during each 3-minute interval.

For each dependent variable, GLMMs were constructed and tested for model fit, as evidenced by the Akaike Information Criterion (AIC). AIC is a number that is helpful for comparing models as it includes measures of both how well the model fits the data and how complex the model is (simpler is usually better). The top models were identified as having a low AIC and were within a 2-unit difference in AIC ( $\Delta AIC \leq 2$ ) of the top-ranked model (i.e., the model with the lowest AIC; Burnham & Anderson 2004). This is the industry standard for identifying models that are essentially 'equally good' at explaining the data. Models with a difference in AIC ( $\Delta AIC$ ) of 2 to 4 from the top model are generally considered to have 'limited support' (Burnham & Anderson 2004).

## 6. RESULTS AND DISCUSSION

### 6.1 CARIBOU DISTRIBUTION RELATIVE TO THE MINE

During late June and early July in the four years surveyed (2020-2023), caribou GPS collar locations were provided to the Mine through a data sharing agreement by the Government of Nunavut (GN). These data indicated when caribou were approaching the Mine site. In the field, confirmation of caribou presence using height of land and road surveys were conducted three times per day by Agnico Eagle environment technicians to trigger management actions (as per the TEMMP; Agnico Eagle 2022). These data informed the decision to begin behaviour surveys for caribou as they approached the site.

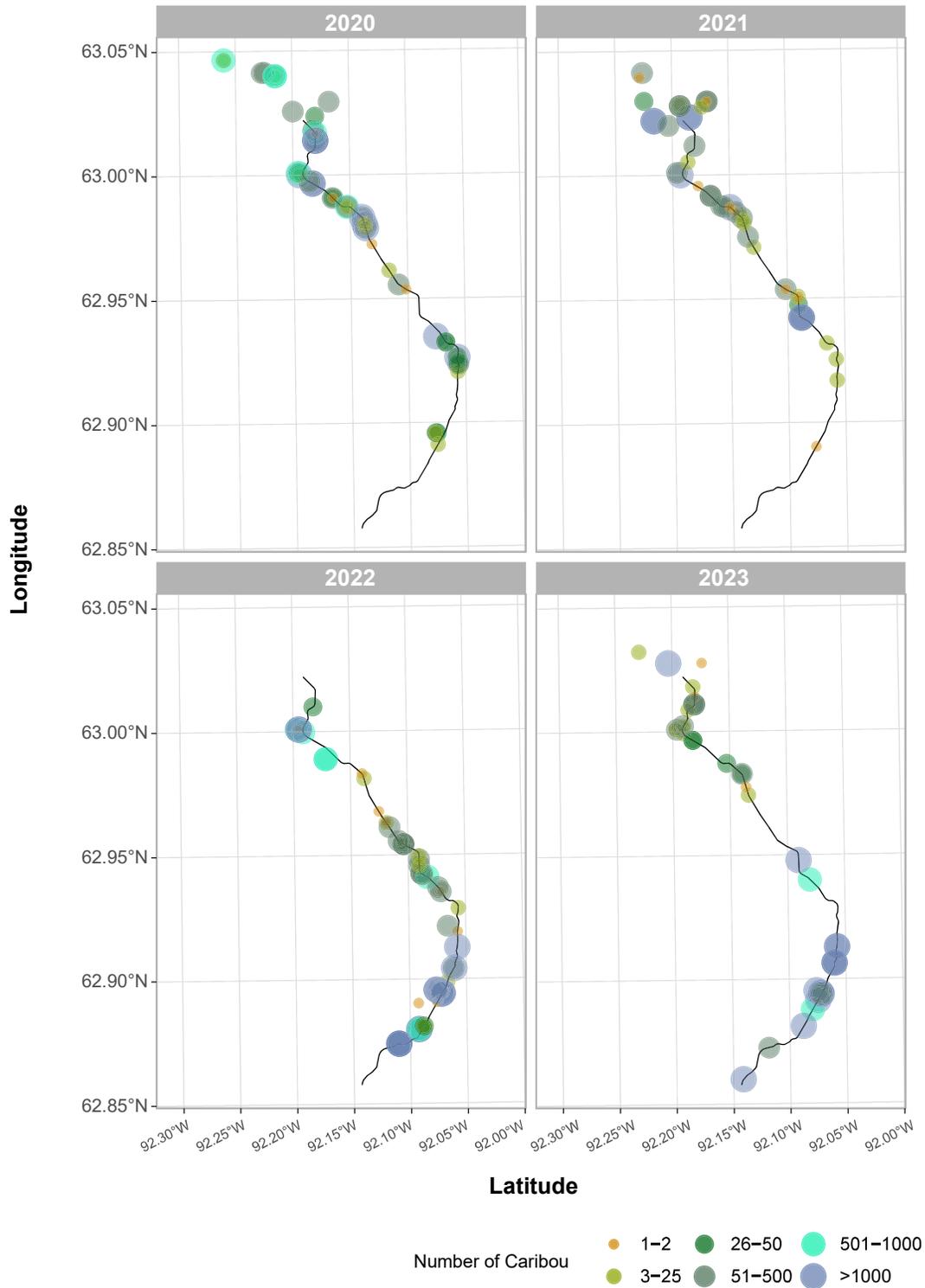
Survey locations by date are presented in Figure 6.1-1. From June 17 to July 9, 2023, groups of caribou from the Qamanirjuaq herd were surveyed passing through or near the study area, with numbers peaking around June 25. This was slightly earlier than the peak in 2022, 2021 and at least one week earlier than the peak in 2020. The length of time during which caribou could be seen from the AWAR increased from 16 days in 2020, to 18 days in 2021, to 23 days in both 2022 and 2023. In 2020 and 2021 most surveys were conducted from the northern portion of the AWAR, but in 2022 most surveys were conducted from the mid to southern portion of the AWAR representing areas where caribou were most commonly observed. Surveys in 2023 were distributed relatively evenly between the north and south ends of the AWAR, and around the mine site.

### 6.2 FIELD SURVEYS COMPLETED

In total, 42 behaviour surveys were conducted in 2023 during the period (June 17 to July 17) when groups of caribou were near the Mine. This is compared to the 56, 46, and 69 surveys completed in 2020, 2021, and 2022, respectively (Table 6.2-1). Surveys were conducted opportunistically whenever caribou were encountered during daily reconnaissance drives, primarily along the AWAR but also around the mine site when the opportunity arose. These numbers represent the upper limit of what could be achieved in each year given the logistical challenges of: 1) the caribou being on-site for a short period; and 2) the safety risk of vehicles being stopped by caribou on the road, leaving surveyors stranded for long periods of time.

In general, during the post-calving and early summer periods (June-July), barren-ground caribou aggregate into large groups (COSEWIC 2016; Russell and Gunn 2019). There were several days where only a single group of more than 1,000 individuals and up to 50,000 individuals was encountered. To diminish the risk of pseudo-replication, surveyors targeted different subsets of large groups when repeating surveys of that group. This should be considered when assessing the robustness of subsequent statistical analyses. A logistical constraint on sample size will likely also have to be considered for future behaviour surveys at Meliadine, which will always occur during the high-density post-calving season.

Overall, the survey methodology worked well for the Mine location and circumstances, and the survey results were generally consistent between all years 2020 to 2023. All reported results use the combined data from 2020, 2021, 2022, and 2023, unless otherwise stated.



Notes: Colour and size indicate group size, and the location of the All-Weather Access Road is indicated by the black line.

**Figure 6.1-1: Locations of Behaviour Surveys by Date**

TABLE 6.2-1 MELIADINE CARIBOU BEHAVIOUR SURVEYS DATA SUMMARY

Year	Type of Survey	Caribou Group Size						Total
		Small Group			Large Group			
		1-2	3-25	26-50	51-500	501-1,000	>1,000	
2020	Total # of surveys	5	11	9	14	6	11	<b>56</b>
	Surveys with disturbances	4	2	3	11	3	6	<b>29</b>
	Surveys with observed road crossings	2	2	0	1	1	0	<b>6</b>
2021	Total # of surveys	8	11	2	16	0	9	<b>46</b>
	Surveys with disturbances	5	7	0	8	0	7	<b>27</b>
	Surveys with observed road crossings	0	3	0	6	0	3	<b>12</b>
2022	Total # of surveys	11	9	3	18	8	20	<b>69</b>
	Surveys with disturbances	9	7	1	15	4	17	<b>53</b>
	Surveys with observed road crossings	3	4	0	6	0	2	<b>15</b>
2023	Total # of surveys	3	11	4	8	2	14	<b>42</b>
	Surveys with disturbances	2	1	1	3	0	5	<b>12</b>
	Surveys with observed road crossings	0	1	4	1	0	6	<b>12</b>

General observations on survey methodology and results included:

- Surveys were well distributed across a range of group sizes (Table 6.2-1). Surveyors reported that the addition of a reconnaissance survey and random selection of which group to survey assisted with a relatively even distribution of survey intensity across group sizes. In 2023, all group sizes were sampled at least twice, but most groups were in the categories of 3-25 caribou, or more than 1,000 caribou.
- Of the 213 surveys completed across four years, more than half recorded at least one disturbance during the survey (Table 6.2-1). In 2023, 29% of surveys recorded a disturbance. Mine traffic was suspended during periods when groups of caribou were near the road, which coincided with the timing of nearly all behaviour surveys. An exception was made for approved convoys of mine vehicles that occurred approximately three times per week for crew change and exchange of essential goods. Note that surveys were conducted specifically to record responses to disturbances, so the proportion of surveys with disturbances is higher than the actual proportion of caribou exposed to disturbances.
- The road was not closed to ATV traffic from Rankin Inlet while caribou were present from 2020 to 2022. In 2023, the AWAR was closed near Rankin Inlet by the GN Conservation Officer and Kangiqliq Hunters and Trappers Organization to all traffic (including local hunters) during

periods of increased caribou sensitivity. Despite this closure, ATVs were still able to access the AWAR via existing side trails. In total, 28% of disturbances were from ATV traffic, 56% were from light trucks (pickups), and 5% were from convoys. Light trucks included trucks from community groups conducting monitoring, the Kangiqliniq Hunters and Trappers Organization and KivIA, the GN wildlife officers, the pickup used for caribou surveys, or other Mine environment pickups. A disturbance caused by the survey vehicle stopping at the start of the survey was unavoidable in some cases and accounted for 5% of disturbances.

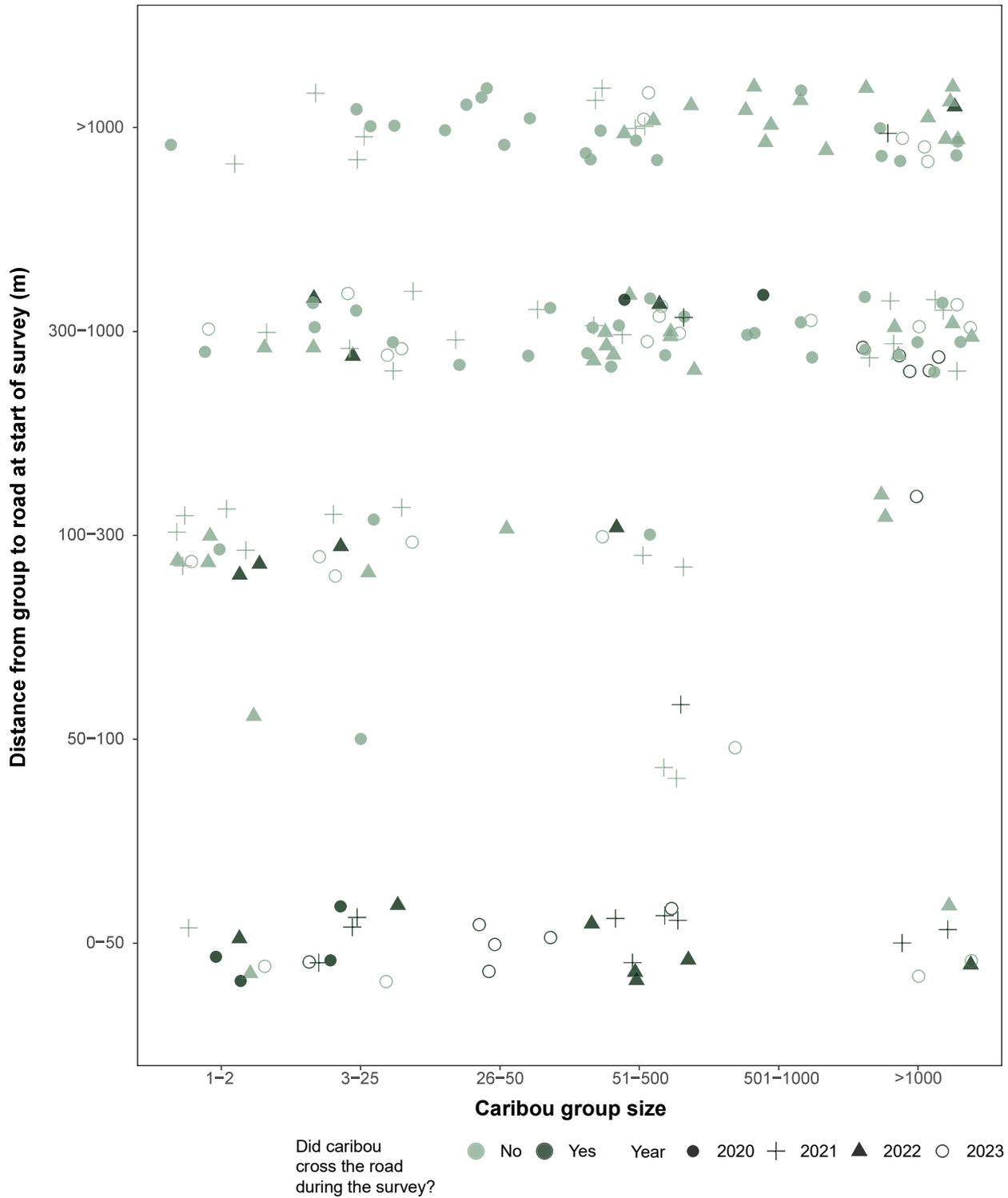
- The AWAR was closed to mine traffic as a mitigation measure during many of the surveys, leaving a small number of essential vehicles on the road, generally pickup trucks. It is expected that the ratio of ATVs to total traffic would therefore be higher during road closures because total traffic is much reduced.
- Caribou surveys were considered an essential activity by the Mine, allowing the survey pickup truck to be used on the AWAR even when the road was closed to normal mine traffic. However, vehicles stopped following guidance in the TEMMP when caribou were on or near the road.
- The methodology allowed for the estimation of baseline behaviour, response to disturbance, and return to baseline behaviour. Few surveys (6%) ended before caribou returned to baseline behaviour. Thus, 30 minutes appears to be an appropriate survey length.
- Most caribou behaviours were calm, generally foraging, and not moving quickly (non-response). The one exception was smaller groups who moved more than larger groups, exhibiting more walking and trotting.
- Caribou were observed crossing the road in 28% of surveys in 2023, 22% of surveys in 2022, 25% of surveys in 2021, and 10% of surveys in 2020, primarily in small groups of less than 25 individuals. Large groups of caribou were also observed crossing the road in each year, including groups of over 10,000 caribou.
- In 2020, distance was inconsistently estimated. Hence, distance was categorized into blocks of 0 to 50 m, 50 to 100 m, etc. Though distance was estimated with a rangefinder from 2021 to 2023, the data were still binned into distance intervals to allow the four years of data to be analyzed together with an adequate sample size.

## 6.3 EXPLORATORY ANALYSIS RESULTS

The exploratory analysis was conducted to determine if there were any trends or interactions in the following variables: road crossing, group size, distance to the infrastructure (AWAR/mine), weather and timing, side of the road (east or west), number of disturbances, and response time following disturbances. All results use the combined data from 2020 to 2023, unless otherwise stated. Exploratory analyses are focused on exploring potential trends in the data, with results being a qualitative interpretation of the patterns observed. Statistical analyses are presented in Section 6.4.

### 6.3.1 ROAD CROSSING

Results of the exploratory analysis indicated that groups closer to the road at the start of the survey were more likely to cross the road during the survey (Figure 6.3-1). This trend was seen in all survey years.



Notes: Distance from surveyors to the caribou is considered equivalent to distance from the road in this report.

**Figure 6.3-1: Caribou Group Size Versus Distance from the Caribou to the Road at the Start of the Survey**

### 6.3.2 GROUP SIZE AND DISTANCE TO INFRASTRUCTURE

Plotting the caribou group size against the distance of caribou groups to the road at the start of the survey revealed that small groups (less than 50 individuals) were observed in equal proportions across all distances, regardless of year (Figure 6.3-1). Large groups tended to be observed further from the road at the start of the survey, and smaller groups closer to the road when data are combined across years.

### 6.3.3 BEHAVIOUR TYPE, GROUP SIZE AND DISTANCE TO INFRASTRUCTURE

Average proportions of each behaviour type by group size and by distance to road are presented in Figure 6.3-2. When analyzed by group size (panel a), the results suggest that the proportion of response behaviours "Alert" and "Trotting" are inconsistent across group sizes and years.

When analyzed by distance to road (Figure 6.3-2, panel b), the results suggest that the proportion of response behaviours was higher closer to the road than further away from 2020 to 2022, though this pattern was not observed in 2023 where qualitative exploratory analysis suggests no clear trend in response to distance to road.

The level of response behaviours by small groups (<25) was higher than large groups (>1,000) in all years surveyed. This was especially true near the road (i.e., within 50 m when the survey started). In 2021, 2022, and 2023 distance to road and distance to observer were collected separately, therefore distance to road was used except for 2020 where distance to observer was used as a proxy.

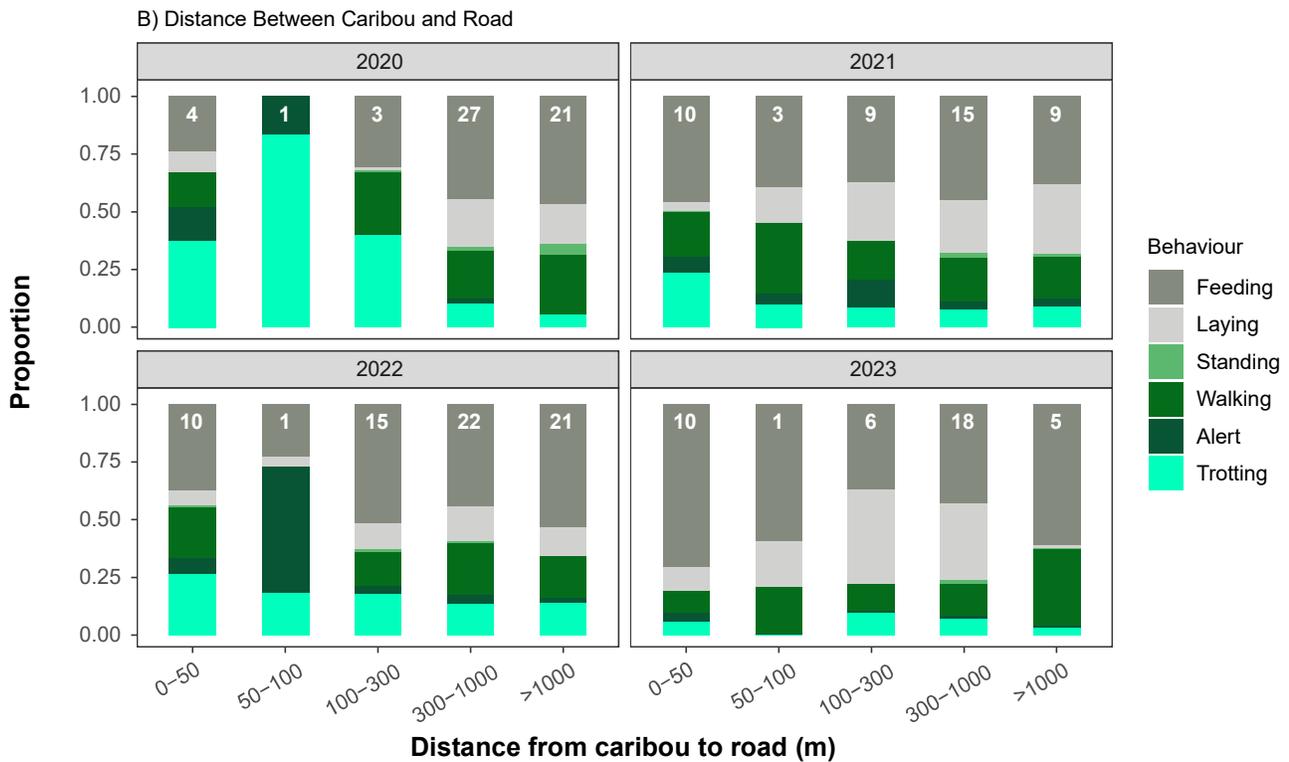
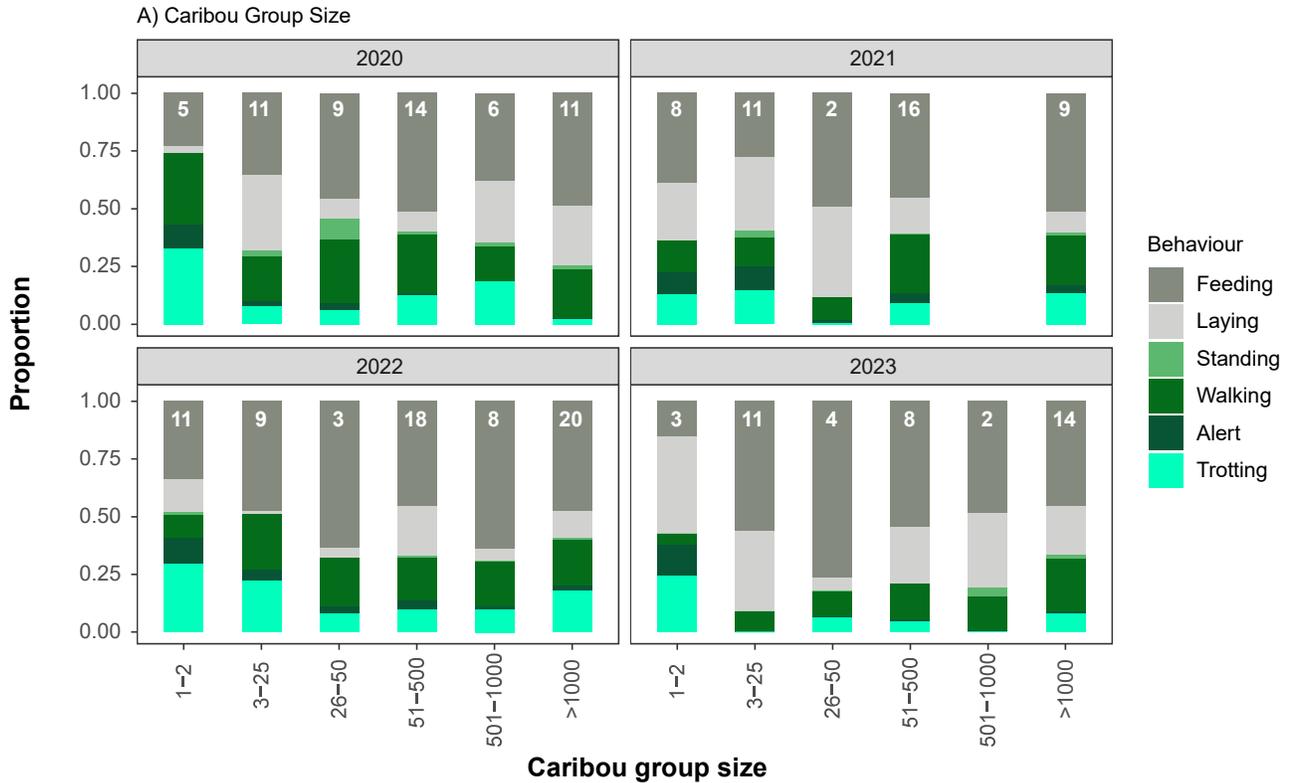
### 6.3.4 BEHAVIOUR TYPE AND ENVIRONMENTAL VARIABLES

Figure 6.3-3 shows the relationship between: 1) the proportion of response behaviours and 2) environmental variables temperature, wind speed, and date. This comparison was included to explore the possibility that environmental factors such as heat or high winds were influencing caribou behaviour during the survey. No trend is visible in the data and trend lines fit to the abiotic environmental data are nearly flat with wide confidence intervals, suggesting that environmental factors do not have a substantial effect on behaviour relative to other factors. Date was also included to explore the hypothesis that caribou behaviour may change as the season transitions from the more sensitive post-calving season into summer; however, the results indicated that date was not associated with caribou behaviour.

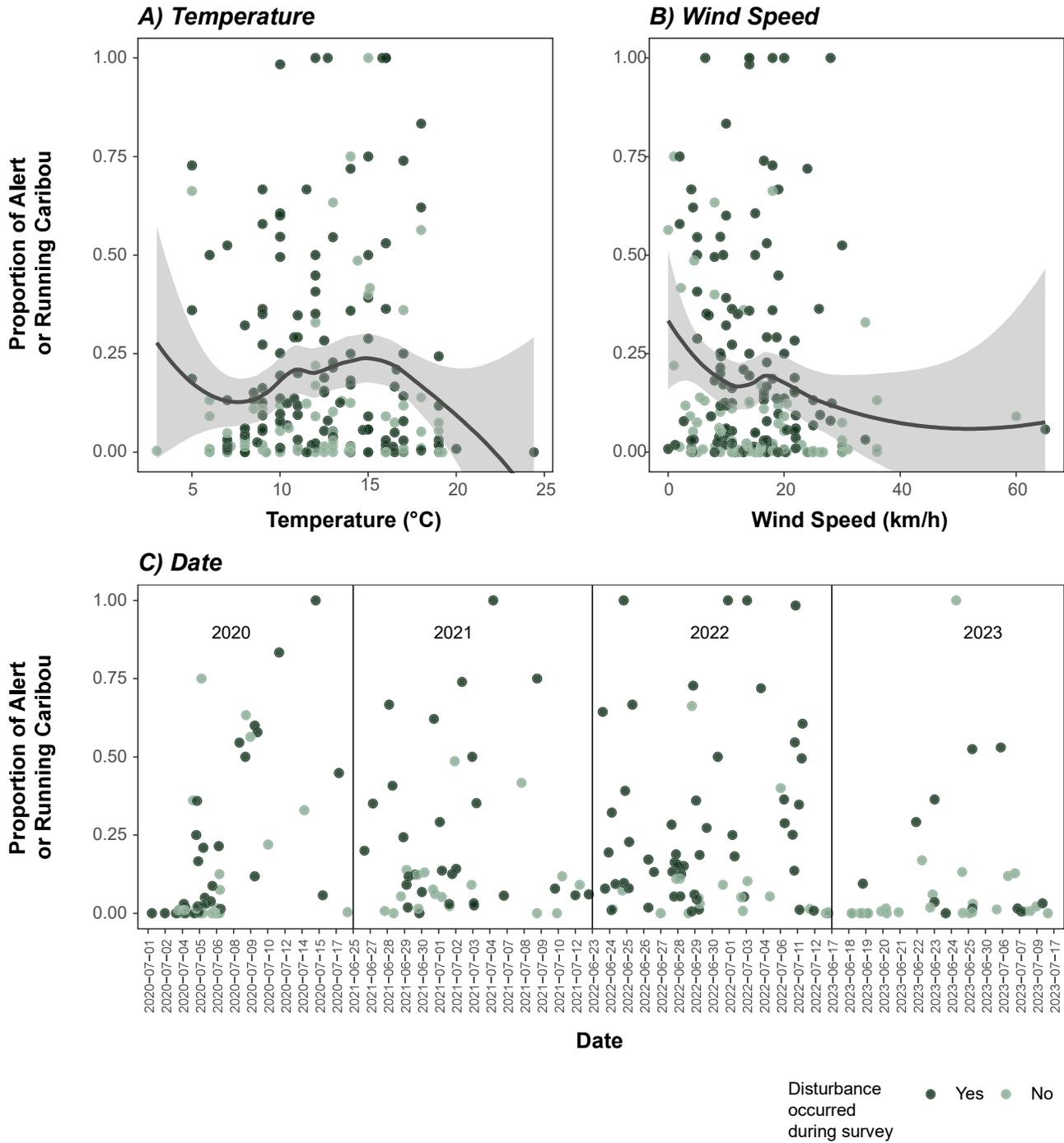
No relationship was observed between wind speed and caribou behavior. However, observations were largely collected in June, with a smaller proportion in early July, generally before the majority of mosquitos emerge, and therefore there is less likely to be an effect of insects and wind relief from insects at this time of year.

### 6.3.5 UPSTREAM OR DOWNSTREAM OBSERVATIONS

The movement pattern for caribou in the Mine area is variable. In some years, caribou primarily cross the road travelling east to west, and in other years it is the opposite. In all four years of data collection, most of the observed caribou were travelling northwest to southeast from their calving grounds, around the west side of Meliadine Lake and on to the coast to feed.



**Figure 6.3-2: Average Proportion of Each Behaviour Type Observed at the Start of the Survey**



Notes: Colour indicates whether or not a disturbance occurred during the survey.  
 In the top two panels, an exploratory loess smooth fit is shown in grey with the 95% confidence intervals shaded in light grey.

**Figure 6.3-3: Proportion of Alert or Running Caribou by Temperature, Wind Speed and Date**

This aligns with observations from community members in Rankin Inlet and the KivIA, i.e., “*The majority of collared caribou going Northward when the lake is frozen. Some come through the South end then cross at KM 25-27 then go East*” (Jeff Tulugak, KivIA, personal communication). Because of this, it is hypothesised that behaviour may vary depending on whether the caribou had crossed the road already (East, or the “downstream” side) or whether they were anticipating doing so (West, or the “upstream” side).

One hypothesis is that caribou may be hesitant to cross the road, but that once they cross the road they move away quickly. If this were the case, the prediction would be that groups of caribou would be observed close to the road on the upstream side with fewer groups or groups further away on the downstream side. This predicted distribution was not observed. Instead, groups of caribou were observed near the road on both sides of the road, and frequently crossed in both directions. Figure 6.3-4 compares the distance to the road at the start of the survey with the location relative to the road (East or West). More surveys occurred on caribou further from the road, but this was independent of which side of the road the caribou were on.

When proportion of each behaviour type was compared between surveys on the East and West (Figure 6.3-4), the two subsets were almost identical in 2020 and 2021, and more response behaviours were observed on the East (downstream) side of the road in 2022 and 2023.

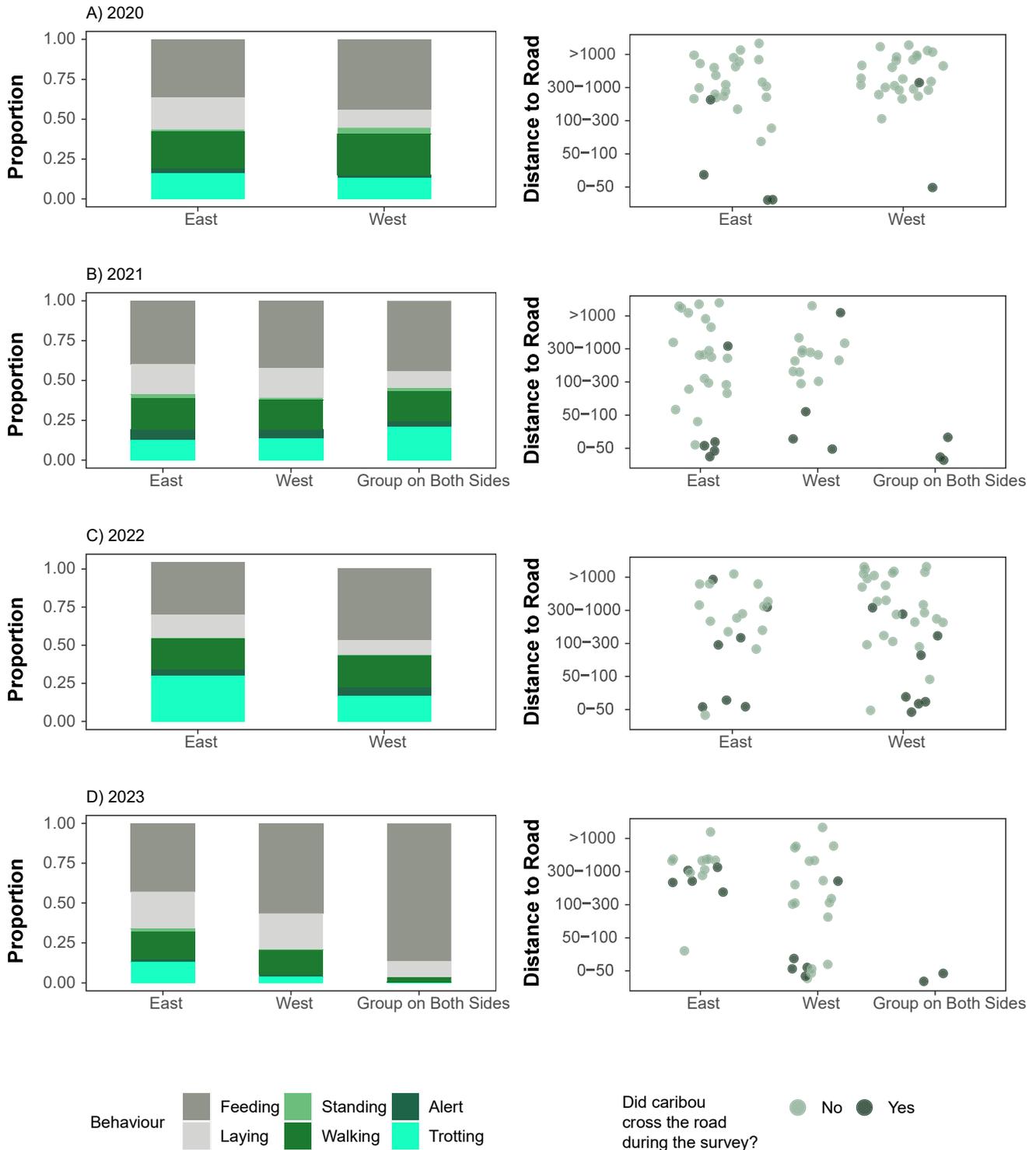
### 6.3.6 NUMBER OF DISTURBANCES

When duration of response (i.e., time taken for caribou to return to a baseline condition following a disturbance) is compared with the proportion of response behaviours, surveys with a higher proportion of caribou responding to the disturbance tend to take longer to recover to a baseline condition (Figure 6.3-5 panel a). Interestingly, it appears that surveys with multiple disturbances don't consistently produce a larger response or a longer one. Although the long-lasting full-group responses are in surveys with multiple disturbances, there are surveys with multiple disturbances that don't have large reactions or longer-lasting (>15 minute) response durations.

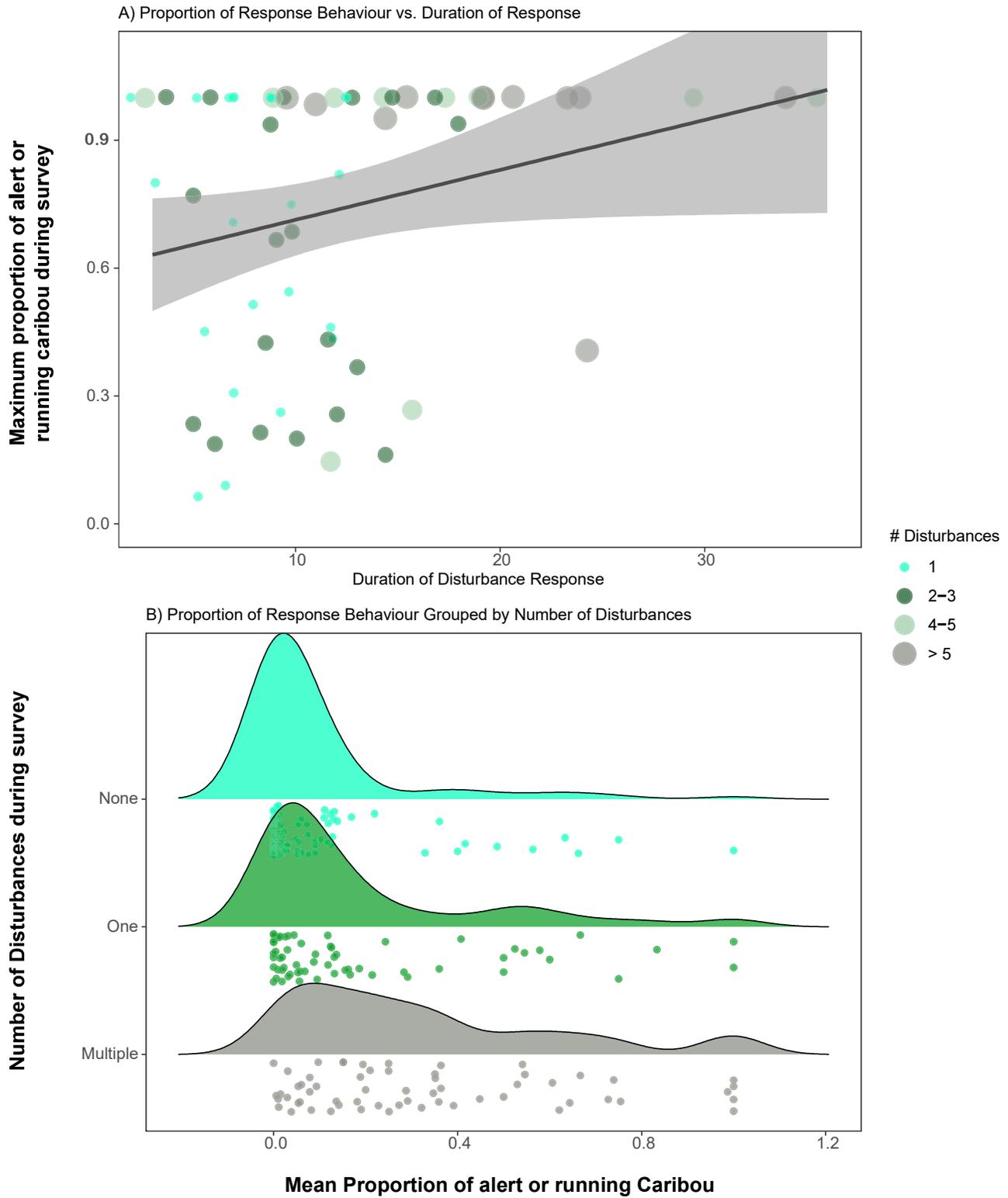
Figure 6.3-5 (panel b) shows a density plot for the proportion of response behaviours in three subsets of surveys: those with no disturbances, those with one disturbance, and those with multiple disturbances. The results suggest a slightly higher proportion of alert or running caribou in surveys when one or more disturbances occurred. Surveys with multiple disturbances do not appear to have a greater overall response than surveys with one disturbance. It should be noted that this figure is an average proportion of response behaviours across the entire 30-minute survey, so in some instances the proportion of response behaviours may have been obscured by the large number of intervals with no response behaviour.

### 6.3.7 RESPONSE TO DISTURBANCES

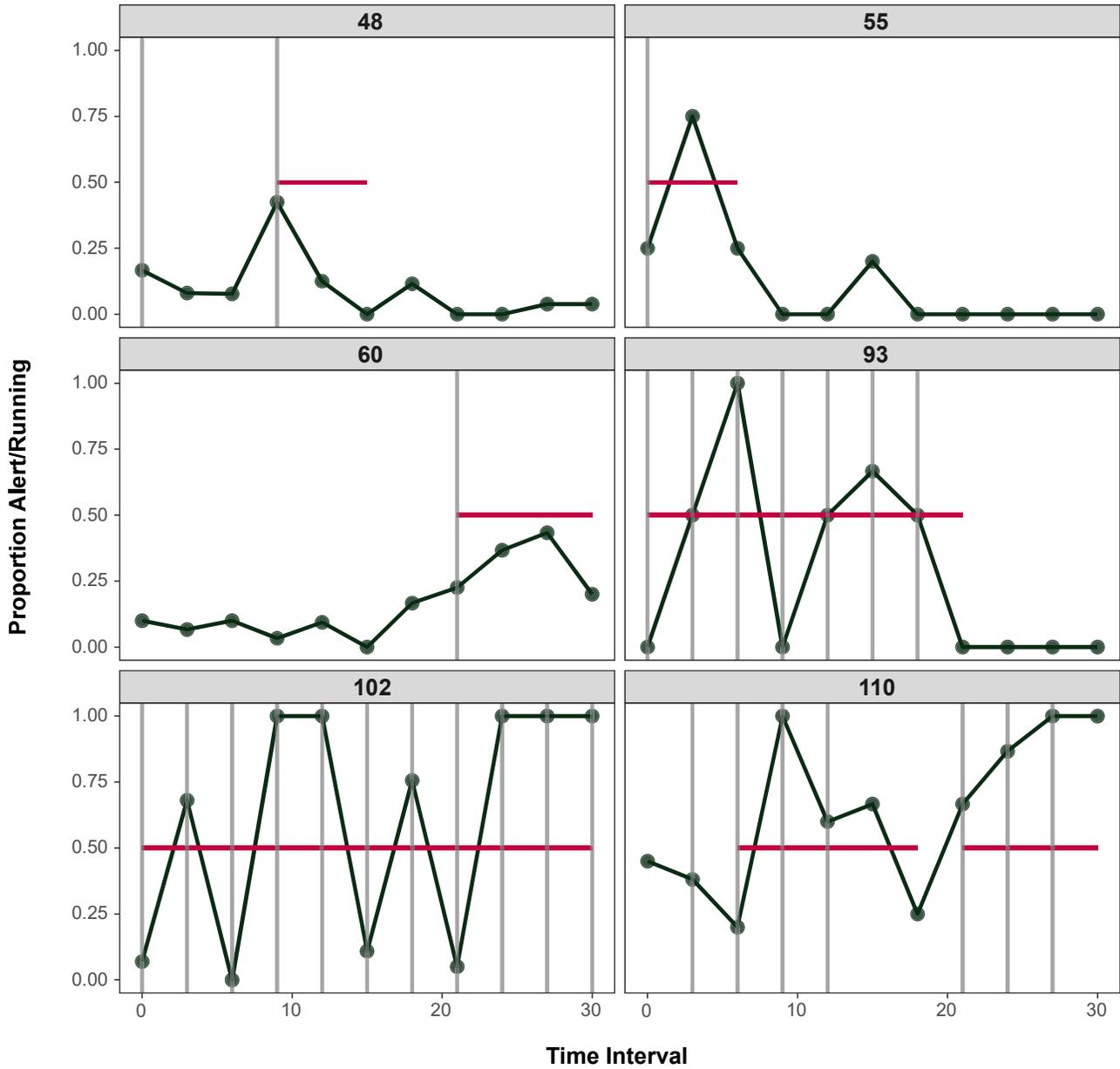
Summarizing data over the entire 30-minute survey is useful for broad comparisons but has the disadvantage that response behaviour can be washed out in a relatively uneventful survey. To examine the response to disturbances within a survey, the proportion of response behaviours was plotted by three-minute interval for each survey, as shown for a subset of surveys in Figure 6.3-6 (see Appendix C for plots of all surveys).



**Figure 6.3-4: Average Proportion of Each Behaviour Type Observed on East and West Side of Road**



**Figure 6.3-5: Comparison of Response Behaviours by Number of Disturbances**



Notes: See Appendix C for all surveys from 2020, 2021, 2022, and 2023.

**Figure 6.3-6: Proportion of Response Behaviour during Each Survey – Example Subset**

In Figure 6.3-6, the response behaviours of “alert” and “trotting or running” are combined to create the total proportion of responding caribou in any given time interval and plotted over time within the 30-minute survey. Disturbances are denoted with a vertical bar. A spike in response behaviours in the interval during a disturbance or immediately following a disturbance, suggests that the caribou are responding to the disturbance. Disturbance response time is denoted with a horizontal red bar, with the end of the bar representing either a lower proportion of response behaviours than prior to the disturbance, or a 40% reduction in response behaviours from the peak following disturbance.

The results show that even in the absence of disturbances, an average of 0-10% of caribou typically exhibit response behaviours at any given time. Figure 6.3-6 and Appendix C suggest that following a disturbance event, there was commonly a spike in the proportion of caribou with response behaviours increasing from 0-10% up to 60-90% of the group. The proportion of caribou with response behaviours returned to a pre-disturbance level quickly, often within two intervals (less than 6 minutes). For example, when a vehicle passed, most caribou would look up (which is classified as a response behaviour) then return to feeding or standing (pre-disturbance behaviour).

There was some variability in the proportion of response behaviours. During some surveys, there was a spike in response behaviours when no vehicle or other obvious disturbance was observed. There are several things that may account for this, including a disturbance that could not be detected by surveyors, insect harassment, or gregarious behaviour (i.e., one caribou reacting triggers a chain reaction). In some surveys of varying group sizes and distances to the road (approximately 16% of surveys from 2020 to 2023) a vehicle passed by (which would be considered as a disturbance), but there was no increase in response behaviours observed in the caribou group during the subsequent time period.

## 6.4 STATISTICAL ANALYSIS RESULTS

As group size and distance to road were identified as being potentially correlated during the exploratory analysis, a Chi-square test was conducted between the two variables to determine if they were too closely related to be included in a model together. A Chi-square ( $\chi^2$ ) statistic can be used to test for the correlation between two categorical variables. The resulting Chi-square statistic was significant ( $p = 0.0002$ ), indicating that group size is associated with distance to road. To prevent overfitting the models, two separate models were run that included group size as an independent variable and distance to road as an independent variable, respectively. To bolster the sample size for statistical analyses, all analyses in this section were conducted on the pooled dataset of 2020 to 2023 data with Year as a random effect.

The final models had many parameters, and it was difficult to attain model convergence. As a result, model variables that had little or no explanatory power and were not variables of interest (such as Temperature) were dropped from the final model sets. Three response (dependent) variables were tested in three separate model sets as described in the methods: proportion of response behaviour (alert or running), proportion of walking and response behaviour, and duration of response following disturbance.

The estimates and significance levels for the best-fitting models (one each with group size or distance to road) that used response behaviour as the dependent variable are presented in

Tables 6.4-1A and 6.4-1B, for the best-fitting model that used walking and response behaviour as the dependent variable in Tables 6.4-2A and 6.4-2B, and for the best-fitting model that used duration of response in the time to event model in Table 6.4-3.

**TABLE 6.4-1A SUMMARY OF MODEL COEFFICIENTS AND SIGNIFICANCE LEVELS FOR RESPONSE BEHAVIOUR MODEL WITH DISTANCE TO ROAD (N = 208)**

Effect Type	Group	Variable	Estimate	Standard Error	P-value
Fixed	-	(Intercept)	0.02	0.014	-
		Distance to road:	-	-	< 0.001 ***
		• 0-50 m	Reference	Reference	-
		• 50-100 m	1.828	2.29	-
		• 100-300 m	1.499	1.041	-
		• 300-1,000 m	0.152	0.088	-
		• >1,000 m	0.04	0.025	-
		Disturbance during interval	4.162	0.21	< 0.001 ***
	Wind speed (km/h)	0.961	0.022	0.09 •	
Random	Survey ID	SD for random effect	2.659	-	-
	Year	SD for random effect	0.825	-	-

Note: Statistically significant p-values <0.05 are indicated with a single asterisk. Highly significant values (p<0.001) are indicated with three asterisks. P-values <0.10 and >0.05 are indicated with a dot.

**TABLE 6.4-1B SUMMARY OF MODEL COEFFICIENTS AND SIGNIFICANCE LEVELS FOR RESPONSE BEHAVIOUR MODEL WITH CARIBOU GROUP SIZE (N = 208)**

Effect Type	Group	Variable	Estimate	Standard Error	P-value
Fixed	-	(Intercept)	0.508	0.345	-
		Caribou group size:	-	-	< 0.001 ***
		• 1-3	Reference	Reference	-
		• 3-25	0.018	0.011	-
		• 26-50	0.003	0.002	-
		• 51-500	0.003	0.002	-
		• 501-1,000	0.003	0.002	-
		• >1,000	0.003	0.002	-
		Disturbance during interval	4.175	0.21	< 0.001 ***
	Wind speed (km/h)	0.968	0.018	0.08 •	
Random	Survey ID	SD for random effect	2.21		
	Year	SD for random effect	0.743		

Note: Statistically significant p-values <0.05 are indicated with a single asterisk. Highly significant values (p<0.001) are indicated with three asterisks. P-values <0.10 and >0.05 are indicated with a dot.

**TABLE 6.4-2A SUMMARY OF MODEL COEFFICIENTS AND SIGNIFICANCE LEVELS FOR WALKING AND RESPONSE BEHAVIOUR MODEL WITH DISTANCE TO ROAD (N = 208)**

Effect Type	Group	Variable	Estimate	Standard Error	P-value
Fixed	-	(Intercept)	0.101	0.054	-
		Distance to road:	-	-	<0.001 ***
		• 0-50 m	Reference	Reference	-
		• 50-100 m	2.248	2.359	-
		• 100-300 m	1.59	0.921	-
		• 300-1,000 m	0.247	0.12	-
		• >1,000 m	0.215	0.112	-
		Disturbance during interval	2.086	0.088	< 0.001 ***
		Wind speed (km/h)	0.964	0.019	0.09 *
Random	Survey ID	SD for random effect	2.226	-	-
	Year	SD for random effect	0.483	-	-

Note: Statistically significant p-values <0.05 are indicated with a single asterisk. Highly significant values (p<0.001) are indicated with three asterisks. P-values <0.10 and >0.05 are indicated with a dot.

**TABLE 6.4-2B SUMMARY OF MODEL COEFFICIENTS AND SIGNIFICANCE LEVELS FOR WALKING AND RESPONSE BEHAVIOUR MODEL WITH CARIBOU GROUP SIZE (N = 208)**

Effect Type	Group	Variable	Estimate	Standard Error	P-value
Fixed	-	(Intercept)	1.7	0.895	-
		Caribou group size:	-	-	< 0.001 ***
		• 1-3	Reference	Reference	-
		• 3-25	0.051	0.026	-
		• 26-50	0.011	0.007	-
		• 51-500	0.012	0.006	-
		• 501-1,000	0.008	0.005	-
		• >1,000	0.012	0.006	-
		Disturbance during interval	2.091	0.089	< 0.001 ***
Wind speed (km/h)	0.964	0.015	0.08 *		
Random	Survey ID	SD for random effect	1.879	-	-
	Year	SD for random effect	0.348	-	-

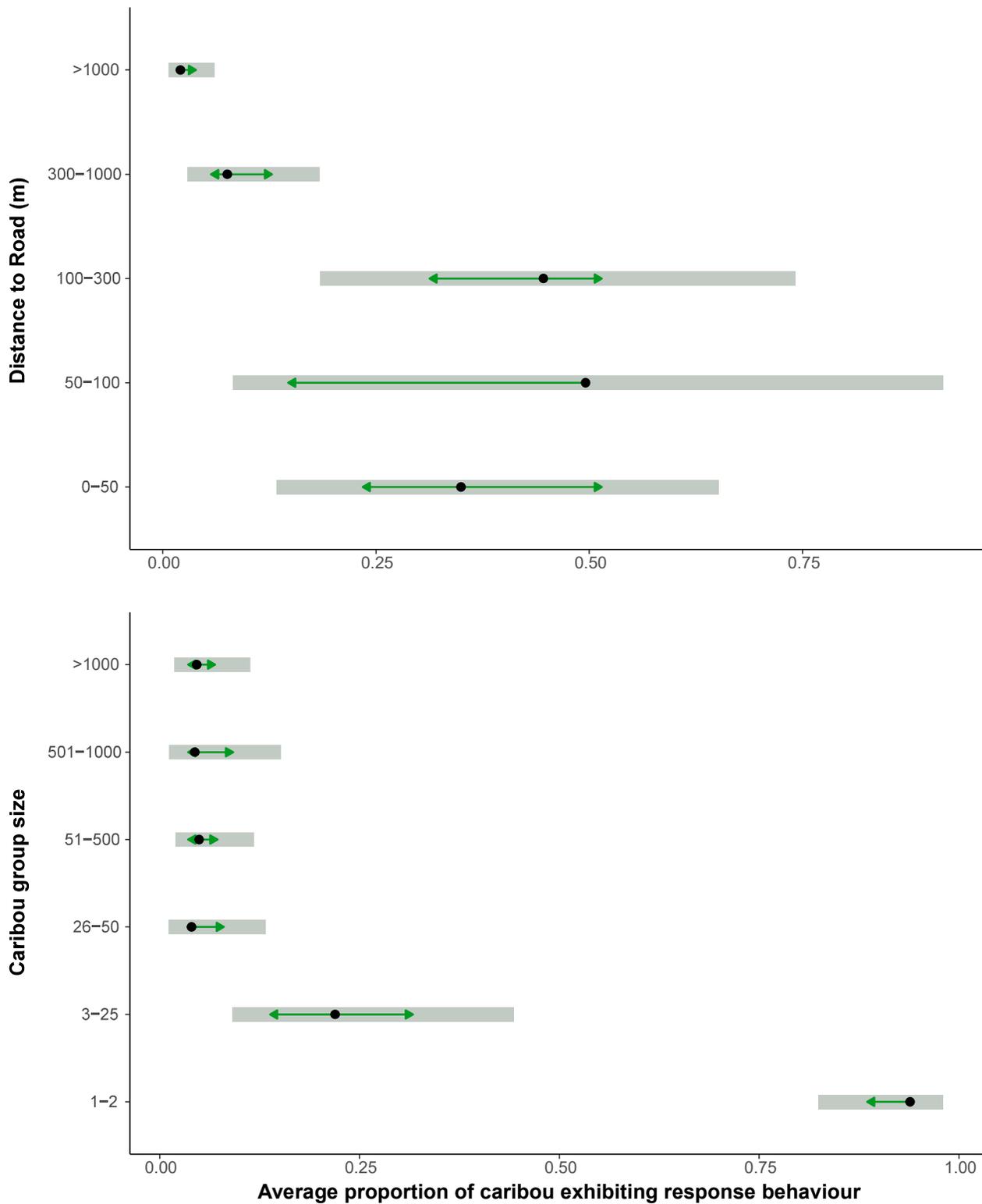
Note: Statistically significant p-values <0.05 are indicated with a single asterisk. Highly significant values (p<0.001) are indicated with three asterisks. P-values <0.10 and >0.05 are indicated with a dot.

In Tables 6.4-1 and 6.4-2, the statistics presented include the type of term in the model (fixed versus random effects), and variable estimate (Odds Ratio), which can be interpreted as the expected effect on the dependent variable as the independent variable increases. For example, in Table 6.41 the  $<1$  estimate for windspeed indicates that as the wind speed increases, the proportion of caribou with response behaviours decreases. However, estimates should always be considered in tandem with the standard error; if the standard error is larger than the estimate, the estimate has little precision. For random effects, the estimate indicates the standard deviation of the random term. The p-value statistic indicates whether there is a relationship between the variable and the response, taking into account the other variables in the model. Significant p-values ( $<0.05$ ) for variables with more than two categories were followed up with pairwise posthoc tests to determine which groups were different. A p-value of less than 0.05 suggests that the variable is an important determinant of the response, as it indicates there was less than 5% probability that we would see an association as strong as we did if there was no relationship.

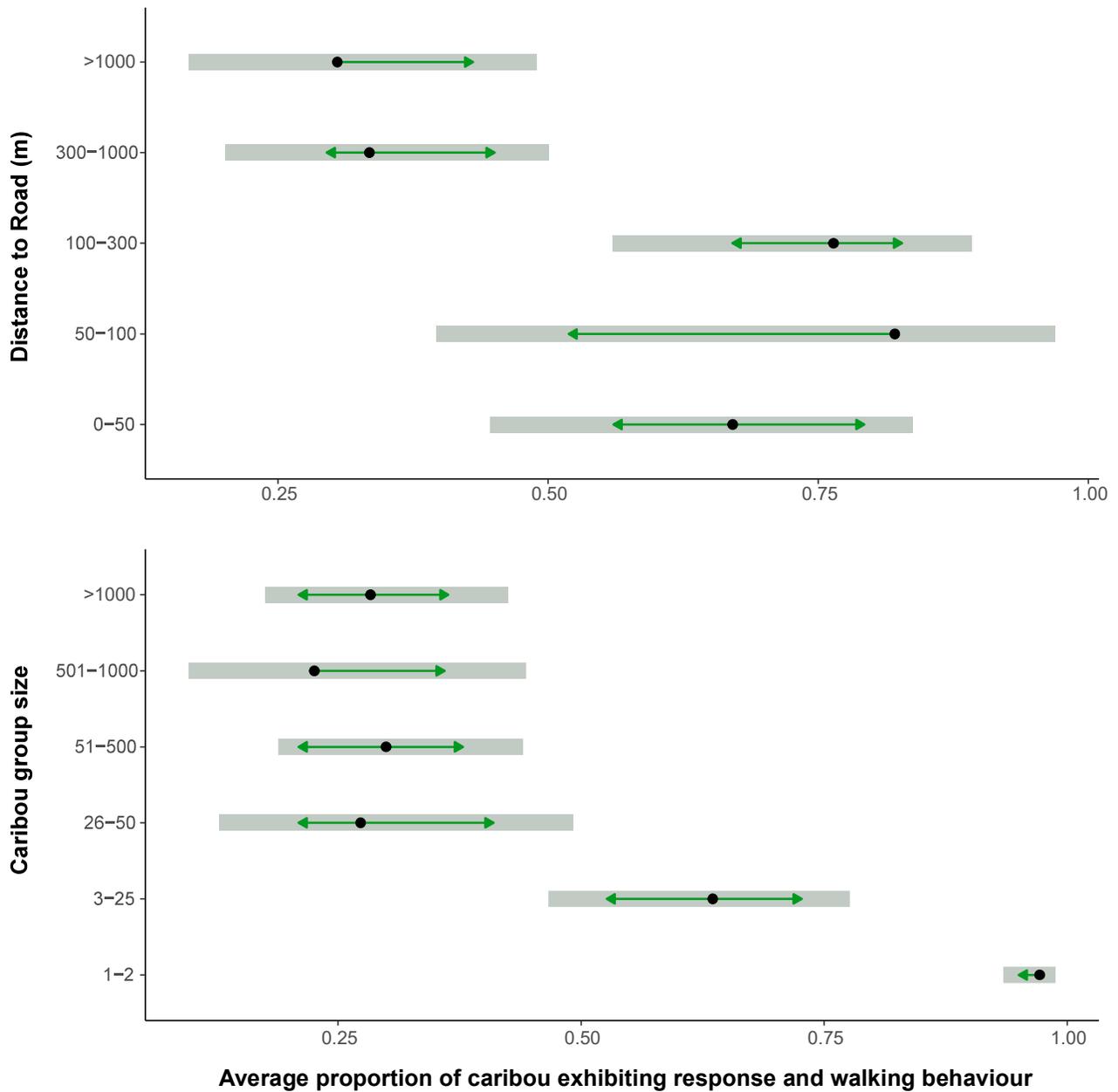
Tables 6.4-1 and 6.4-2 suggest that in both models, whether a disturbance occurred during an interval was a significant predictor of the proportion of animals exhibiting response behaviour during that interval. In both models for response alone, the Odds Ratio is approximately 4, suggesting that there is a 4 times higher odds of response behaviour in intervals containing a disturbance averaged across group size or distance to road. In the models with walking behaviour included, there is approximately 2 times higher odds of exhibiting this behaviour in intervals where a disturbance occurred.

The models also suggest that both distance to road and caribou group size are significantly associated with the proportion of caribou exhibiting response behaviour. Post-hoc pairwise test results are illustrated in Figures 6.4-1 and 6.4-2. The shaded grey bars indicate the 95% confidence intervals around the estimates of average proportion of caribou exhibiting response behaviour. The points indicate the means (averaged over whether a disturbance occurred), and the green arrows the pairwise comparisons among groups. Where these arrows do not overlap suggests a significantly different response between the groups.

For the response models, there is no difference in proportion of disturbed caribou up to 300 m distance from the road, similarly, there is no strong evidence for a difference between the largest distance bins. This suggests a change in behaviour that occurs at approximately 300 m distance from the road, with those closest exhibiting a higher proportion of response behaviour. Similarly, the smallest group size had the largest proportion of response behaviour and this was different from all other group sizes. The next largest size bin (3-26 animals) also showed a significantly higher proportion of response compared to the larger group sizes which were all similar to each other. Taken together, these results suggest that small groups of caribou near the road are more likely to have a higher response to disturbance compared to larger groups further from the road. The response and walking models had the same pattern of results.



**Figure 6.4-1: Pairwise Comparisons of Average Proportion of Caribou Exhibiting Response Behaviour among Categories of Distance to Road and Caribou Group Size**



**Figure 6.4-2: Pairwise Comparisons of Average Proportion of Caribou Exhibiting Response and Walking Behaviour among Categories of Distance to Road and Caribou Group Size**

### 6.4.1 RESULTS SUMMARY

The results of the statistical analysis provided support for the key hypothesis that caribou tend to respond to disturbances, particularly when they are close to the road or in smaller groups. Additional analyses focused on convoys in future years may provide additional information on responses directly to multi-vehicle convoys vs. singular vehicles, as done at the Meadowbank Mine showing returns to baseline behaviours approximately 15 minutes after a convoy (ERM 2023).

The proportion of caribou walking was also linked to disturbances, leading to inclusion in post-hoc models as a response behaviour, which was not possible due to data sparsity in previous years. Pairwise comparisons showed that increased proportions of response behaviours were observed for both groups of 25 or less caribou, as well as groups within 300 m of roads.

These results are consistent with other surveys recorded on barren-ground caribou during the post-calving and early summer periods, which suggest that caribou behavioural responses to all-season haul roads tend to taper off beyond approximately 500 m (Curatolo et al. 1987; Johnson and Lawhead 1989; Dyer et al. 2001). However, zone of influence estimates are highly variable in the literature and this method of data collection is not designed to estimate it. In addition, responses to roads and infrastructure have previously been linked to increased harvest from roadways (Plante et al. 2018; Russell and Gunn 2019), a factor which was not included in this analysis.

## 7. SUMMARY

The behaviour monitoring data from 2023 were combined with data from 2020, 2021, and 2022, to determine if caribou activity budgets change with distance from the mine, and to document caribou response to stressors. All results outlined in this report use all three years, unless otherwise stated. The program and combined data resulted in several key findings:

- The monitoring protocols adapted from the GNWT ENR worked well at the Mine site.
- Forty-two surveys were conducted in 2023 with peak caribou activity observed around June 25. This aligned with the timing observed in 2022 and was slightly earlier than the peak in 2020 and 2021. The data from 2020 to 2023 were combined for a total of 213 surveys across four years.
- Caribou mostly exhibited the non-response behaviours of standing, laying, feeding, and the variable walking which may be considered both a response or non-response behaviour.
- Observations were well distributed across a range of caribou group sizes from 1 to 2 individuals to >1,000.
- Small groups tended to have a higher proportion of response behaviours (running, alert) than larger groups, irrespective of disturbances. Groups within 300 m of the road also tended to have a higher proportion of response behaviours than those further away. This was apparent in 2020, 2021, 2022, and 2023.
- Groups of caribou were observed near the road in equal proportions on both the upstream and downstream sides of the road. Increased response behaviours were observed on the downstream (East) side of the road in 2022 and 2023.
- Statistical analysis indicated a trend for caribou at greater distance from the road (>300 m) to have a lower proportion of response behaviours.
- Groups of 25 or less caribou showed increased proportions of response behaviours as compared to larger groups.
- Following a disturbance event, the proportion of response behaviours in a group of caribou rose, but typically returned to baseline behaviours within two sampling periods (less than six minutes). Caribou were statistically more likely to be walking (a potential response or non-response variable), alert, or running within survey intervals where there was a disturbance (i.e., vehicle traffic).
- The use of convoys to consolidate multiple essential vehicles into a single disturbance event is an effective mitigation measure for reducing disturbance to caribou.
- The proportion of caribou with response behaviours in a group was unrelated to measured environmental variables including temperature and wind speed.
- Approximately half of the surveys included a disturbance event, typically from essential Mine vehicles, mostly pickups, and all-terrain vehicles (ATVs) used by community members on the AWAR for travel and harvesting. The AWAR was closed to Mine vehicles (with the exception of approved convoys or the survey vehicle) when caribou were near the road. All Mine vehicles are required to stop when caribou are on the road.

Analyses summarized here provide support for the key hypothesis that caribou tend to respond to disturbances, particularly when they are close to the road or in smaller groups. Statistical results suggest different reactions based on the number of disturbances experienced, with more disturbances resulting in increased time until caribou return to baseline behaviours.

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# APPENDIX A DETAILED METHODS FOR CARIBOU BEHAVIOUR SURVEYS



## Meadowbank Gold Mine

### Caribou Behaviour Monitoring

September 15, 2021

Project No.: 0597635

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### APPENDIX A MEADOWBANK GOLD MINE: CARIBOU BEHAVIOUR MONITORING DATA SHEET

## 1. INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) would like to determine whether caribou behaviour changes in response to mine activities. The purpose of caribou behaviour surveys is to provide information to characterize the effects of the physical road and mine-related activities on caribou behaviour, including the All Weather Access Road (AWAR) and Haul Road.

The planned monitoring program is designed to collect data on caribou behaviour using standardized, scientifically-defensible methods. The data will be used to monitor Project effects.

### 1.1 Objectives

Following discussions with the Kivalliq Inuit Association and Government of Nunavut during the spring of 2021, the objectives of the behaviour monitoring program for caribou have been updated to the following:

- Evaluate the baseline behaviour of caribou (behaviour in the absence of disturbance);
- Evaluate the response of caribou to disturbances;
- Compare the behaviour of caribou between the following categories, if there is sufficient data:
  - 1) in large vs. small groups,
  - 2) near vs. far from the road,
  - 3) when the road is open vs. closed,
  - 4) east vs. west of the road, (upstream and downstream), and
  - 5) spring migration vs. summer and fall periods.

## 2. STUDY AREA

The study area for behaviour monitoring is anywhere that caribou may interact with the mine, including the All Weather Access Road (AWAR), the Meadowbank Mine site, Whale Tail site and the Haul Road connecting Meadowbank to Whale Tail.

### 3. STANDARD OPERATING PROCEDURES

The purpose of caribou behaviour surveys is to provide information to characterize the effects of the physical road and mine-related activities on caribou behaviour, including the All Weather Access Road (AWAR) and Haul Road. The overall method for the surveys is to identify caribou groups visible from the road, to select some groups for observation, and to record the behaviour of individuals in groups of different sizes including their behaviour without any disturbance and responses to both mine-related activities and natural factors.

Notes to guide the work include:

- Systematic surveys will be conducted along all Project roads during spring, summer and fall periods.
- The survey team will consist of a driver/observer and a second observer when available.

Surveys should be performed:

- During spring, summer and fall when caribou may be in the Project area,
- Of caribou at various distances from the road and group sizes, and
- If surveying effects of a convoy, conduct two surveys, one at least an hour before convoy deployment so that a pre-disturbance measurement can be made, and a second survey during the convoy passing by caribou.

#### 3.1 General Field Data

For each survey day, the appropriate general field data will be recorded onto field data sheets supplied in Appendix A and B. A new data sheet will be used for each survey, including additional sheets as necessary to record all observations. General information includes:

- Survey date and start and end times.
- Field personnel (full names on the data sheet header and initials thereafter).
- Weather conditions during and prior to sampling (e.g., snow in the last 24 hours, current wind conditions).
- Site description: provide location and description (GPS coordinates, road name and distance marker).
- Photographs or video (if possible):
  - Take a photo of the caribou every time an observation is recorded so that the observations can be verified by a biologist.
  - For any photographs taken, record the picture IDs in the comments field on the field data sheet.
  - Write descriptions of any photos taken for specific reasons.
- General observations/notes of the environment/sampling procedures.
- Any deviation from the SOPs outlined below.

*Note: When in doubt take pictures and make field notes explaining the situation, your response or consequent changes in methods. It is better to have more data/notes than not enough when interpreting the results later on.*

## 3.2 General Equipment List

- A GPS unit with waypoints of road km markings.
- Field data sheets (Appendix A and B), clipboard, pencils, or iPad with data form.
- A timer capable of alarm setting for repeat time intervals (i.e., can be set to go off every three minutes, like a smart phone).
- Binoculars or spotting scope.
- Compass (or use compass function on GPS unit).
- Portable weather station (temperature and wind speed).
- Camera.
- Rangefinder.

## 3.3 Field Methods

### 3.3.1 Group Selection

The survey day will begin with a reconnaissance survey to determine how many caribou groups are present near the road, how large they are, and where they are. This will be accomplished by driving from the mine site along the road and noting relevant information about the groups and their sizes along the way (using the standard, tablet-based road survey form). Observers will preferentially choose groups to survey to across group sizes and distances from the road. Ideally, caribou would be sampled in an even distribution across these variables and along the AWAR and Haul Road. However, the nature of caribou and field sampling mean that observers may need to survey what caribou are available, rather than what is “ideal”.

Allow approximately one hour to survey each group. If the length of the survey day permits all groups to be surveyed then they should all be surveyed. If there are more groups to survey than the time in the day, then do the following:

1. Look at how many of each group size (bullet list below) have been surveyed to date. If one of them is under-represented and there is a group of that size on the road, then go survey that group. If there is more than one group of that size, choose it randomly using the procedure in step 4.
  - 1 or 2 caribou
  - 3 to 25 caribou
  - 26 to 50 caribou
  - >50 caribou
2. During 2020, few groups of caribou within 300 m of the road were observed or sampled. Preferentially choose groups of caribou within 300 m of the road, with a soft target of approximately 1/3 of samples in this area.
3. If any Project-tolerant caribou are observed (e.g., caribou observed near the road or mine site for more than 72 hours in summer and 48 hours in other seasons; TEMP 2020), then select these animals for sampling. In Appendix A data sheet, record that the group is Project tolerant in the notes field.
4. If there are multiple groups available, choose groups to fill in an even distribution of group sizes and distances from roads.

Record all caribou groups observed during the reconnaissance survey in the standard, tablet-based survey form and submit that data along with the results of behaviour monitoring.

### 3.3.2 Selection of an Observation Site

Find a safe parking location and follow site safety protocols. The observation location may be the vehicle itself or a safe location off the road. If observers exit the vehicle, the observation location should be chosen where observer activity is not likely to influence caribou behaviour and where the observer can remain comfortable for a period of approximately 45 minutes without needing to move. Ideally, the vehicle should be stopped a minimum of ~250-300 m from the caribou – adapt this distance as needed. If the animals are staring at the truck or moving away, then the truck is too close.

### 3.3.3 Data Recording

Allow 15 minutes between arrival and the time at which behavioural observations begin. This is to allow animals to return to behaviour that may have been interrupted by the arrival of observers. In the time before recording behaviour, fill in the top portion of the form with location, weather, and group size information.

After 15 minutes, begin recording data in the form in Appendix A. The start time to record is the time that observations begin.

#### 3.3.3.1 Location

**Location:** Collect a waypoint of the location from which the observations will be made. Note the waypoint number and the UTM coordinates on the data sheet.

**Road Condition:** If observing caribou on a road, record whether the AWAR or Haul Road are open or closed.

**Distance:** Estimate the distance to the group using a laser rangefinder and, using a compass or the GPS unit compass feature, record the bearing (0° to 360°) to the group being observed. If the group of caribou is large and spread over a considerable distance from the road, estimate the distance to nearby caribou and the caribou furthest away that will be sampled. If some caribou in the group are too far away to sample, then do not include them in the distance estimate.

**Behaviour:** At each time interval during the survey, observers should record the number of individuals in the group exhibiting behaviour in each category. For clarity, observers should record zero values for behaviours not observed.

**East vs. West:** Note if the group is on the east or west side of the road. At the end of the 30 minute observation period return to the top of the form and record (Y or N) if the group crossed the road during the survey period. If monitoring at the mine site or Whale Tail, leave this section blank.

**Sex:** Note the sex of the group. This can be difficult in large groups, so record in the following categories: mostly males, mostly females, mostly females with calves, juveniles, or mixed group.

#### 3.3.3.2 Weather Conditions

Use the portable weather station to record:

- Air temperature;
- Wind speed;
- Wind direction;
- Precipitation; and
- Humidity (if the weather station has this function).

### 3.3.3.3 Road Structure

At the location of the caribou group, record the road characteristics:

- Height of the road above the tundra (m);
- Slope of the road side (with of the slope in m);
- Approximate height of snow bank (m); and
- Any structures, such as bridges, present.

### 3.3.3.4 Caribou Behaviour

Individuals in the group being observed will be categorized when the survey starts and at three minute intervals. Standardized behaviour categories will be used (Section 3.3.4). The standardization of behaviour is necessary for clarity and data analysis. If the observed behaviour does not fit within any of the categories then observers have the option of noting other behaviour in the comments field. However, this should be used only rarely as most behaviour should fit in the primary categories listed below. If noting a new/different behaviour, please take a photo or video of the caribou.

The data to record at each three-minute interval are the numbers of individuals in the group exhibiting each behaviour at that time. Do not attempt to characterize the behaviour that occurred during the interval. If the group is too large to be counted in each interval, choose an identifiable subset of the group, count the individuals exhibiting each behaviour at each time interval, and add a comment that a subset of the group was sampled.

Indicate the total group size at the top of the data form, not the size of the subset whose behaviour was recorded. Count the number of caribou up to 100 animals, and then record group size in categories above 100; 100-200 animals, etc. (see Appendix A).

Practically, the easiest way to do this is to have the observer scan across the group of caribou from Left to Right, calling out the behaviour of each animal, while the recorder adds tick marks to the data sheet. When complete, count up the tick marks.

### 3.3.3.5 Disturbance Events

Caribou behaviour is expected to vary in response to some disturbance events. The bottom of the data form should be used to record any potential disturbance events evident to the observer regardless of whether caribou respond to them. The main categories of events are included in the data sheet:

- Light truck;
- Haul truck;
- Road maintenance vehicle (e.g., grader);
- ATV or skidoo;
- Aircraft; and
- Predator (note species).

Record the number and approximate speed of the vehicle (regular driving speed, or moving slowly, ~10 km/h, past caribou).

Record the time of the disturbance event (0:00 to 30:00 of the survey), indicate which type of disturbance was observed in the appropriate column. Record any additional comments and records of photographs taken in the final column.

Record whether the vehicle stopped when approaching caribou or continued to drive slowly. If possible, coordinate with passing vehicles on the road to have some vehicles stop for 10 minutes, and others drive by slowly.

### 3.3.4 Behaviour Classification

With the exception of Alert behaviour, the primary behaviour categories and their definitions follow classifications from the Government of Northwest Territories (GNWT 2017). The categories appear as columns on the data form, with descriptions on the form. The behaviour categories are:

- **Feeding** – standing or walking posture, with the muzzle touching or nearly touching the ground; can be ingesting food or not; head down or moving from side to side.
- **Lying down** – bedded on the ground, either upright or lying on its side, in a resting or ruminating position.
- **Standing** – stationary in an upright, standing posture with head elevated above the ground, and usually above the knees; if cow is nursing, if possible record the time spend nursing.
- **Alert** – head up scanning horizon or focused on a source of disturbance (e.g., vehicle, predator, human).
- **Walking** – similar to standing posture but moving at a slow gait (<5 km/h).
- **Trotting/running** – similar to standing posture but moving rapidly in symmetrical or asymmetrical gait.

Other behaviours that may be observed (record in comments field on form) are:

- **Nursing** – calf is suckling cow.
- **Sparring** – two males in contact.
- **Insect response behavior** – twitching, stamping, tossing head.

In the comments, record if any animals are moving towards the road, parallel or away from the road.

## 4. DATA MANAGEMENT

Please scan all data sheets at the end of the day. Data from behaviour surveys should be entered into Excel. Data from group selection surveys (standard tablet data form) and behaviour surveys should be delivered at the end of each month to ERM for QA/QC.

## 5. CLOSURE

This SOP has been produced for Agnico Eagle Meadowbank Division by ERM Canada. Please contact the authors with any questions.

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## 6. REFERENCES

GNWT-ENR. 2017. *Caribou behaviour monitoring field protocols*. Government of the Northwest Territories Environment and Natural Resources, 10 page unpublished document. Yellowknife, NT.

TEMP. 2020. Meadowbank Division. *Terrestrial Ecosystem Management Plan*. Version 8, April 2020.

**APPENDIX A      MEADOWBANK GOLD MINE: CARIBOU BEHAVIOUR  
MONITORING DATA SHEET**



## Categories and Definitions of Behaviour<sup>1</sup>:

- **Feeding** – standing or walking posture, with the muzzle touching or nearly touching the ground; can be ingesting food or not; head down or moving from side to side.
- **Lying down** – bedded on the ground, either upright or lying on its side, in a resting or ruminating position.
- **Standing** – stationary in an upright, standing posture with head elevated above the ground, and usually above the knees; if cow is nursing, if possible record the time spend nursing.
- **Alert** – head up scanning horizon or focused on a source of disturbance (e.g., vehicle, predator, human).
- **Walking** – similar to standing posture but moving at a slow gait (<5 km/h).
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Other behaviours that may be observed (record in comments field on form) are:

- **Nursing** – calf is suckling cow.
- **Sparring** – two males in contact.
- **Insect response behavior** – twitching, stamping, tossing head.

<sup>1</sup> Primary source: GNWT-ENR 2017 caribou behaviour monitoring field protocols, courtesy of GNWT Yellowknife, NT.

# APPENDIX B DATA FROM CARIBOU BEHAVIOUR SURVEYS

APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Observers	UTM_E	UTM_N	Road Name and Distance Marker	Distance from Caribou to Observer Location (m)	Distance from Caribou to Road	Bearing to Caribou Group	Is group east or west of survey?	Did the group cross the road during the survey?	Caribou Group Size	Temperature (°C)	Wind Speed (km/h)	Wind Direction	Days since Last Snow or Wind Event
1	17-Jun-23	DM, MM	540996	6986104	AWAR 27	100-300	NA	235	West	No	4	8	24	312.3	0
2		DM, MM	540999	6985761	AWAR 27	100-300	NA	NA	West	No	4	8	24	312.3	0
3		DI, IL	542936	6984430	AWAR 24.5	300-1000	0	NA	West	Yes	50-100	11	13.8	223.7	0
4		IL, DI	543914	6983012	AWAR 22.5	10-300	NA	NA	NA	No	18	8	15.9	206.2	0
5	18-Jun-23	AT, IL	541417	6987855	AWAR 29.5	300-1000	NA	NA	East	No	3	14	17.1	42.2	1
6		IL, AT	540982	6986068	AWAR 27.5	300-1000	NA	NA	West	No	9	15	20.3	12.5	1
7	19-Jun-23	DI, IL	540679	6985948	AWAR Esker KM 27	0-50	NA	90	West	No	6	7	26.2	344.1	2
8		IL, DI	540674	6985953	AWAR Esker KM 27	NA	NA	315	West	No	3	7	26.7	337.3	2
9		IL, DI	540738	6985955	AWAR Esker KM 27	51-100	NA	NA	West	No	9-Aug	7	26.6	341.4	2
10		IL, AT	540905	6985896	AWAR 27.25	100-300	NA	180	West	No	11-Jul	9.2	26.2	345.3	2
11		IL, AT	541429	6985458	AWAR 26	NA	0	NA	E-W	Yes	50-100	9.2	26.2	345.2	2
12		IL, AT	541420	6985458	AWAR 25	1000	0	270	West	Yes	50-100	11	26.2	345.3	2
13	20-Jun-23	IL, AT	538997	6989402	AWAR 30	51-100	0	90	West	Yes	6	7.2	8.1	129.2	3
14		IL, AT	541481	6987076	AWAR 28	100-300	0	90	E-W	Yes	201-500	6	8.5	164.3	3
15		AT, IL	541213	6986826	AWAR 28	300-1000	NA	NA	West	No	11	6	5.1	98.7	3
16	21-Jun-23	IL, AT	540709	6985933	AWAR 27	1000	NA	90	West	No	201-500	13.9	12.8	219.9	4
17	22-Jun-23	NM, IL	543615	6983959	AWAR KM 23	>1000m	30	180	West	Yes	40	12	16	180	NA
18		NM, IL	543615	6983959	AWAR KM 23	300-1000m	500	180	East	No	300	11	17	90	NA
19	23-Jun-23	NM, JC	541489	6987063	AWAR KM 27	300-1000m	400	180	East	No	150	8	20	270	NA
20		NM, JC	541489	6987063	AWAR KM 26	300-1000m	NA	180	East	No	150	8	22	270	NA
21		NM, JC, IL	540980	6986096	AWAR KM 27	100-300m	300	270	West	No	101-200	9	23	230	NA
22		NM, AT, SG	543802	6983375	AWAR KM 23	0-50m	20	270	West	No	1	8	26	200	NA
23	24-Jun-23	IL, HB	541509	6987406	AWAR 29	100-300	NA	NA	West	No	1	8	20.2	330.9	0
24		NM, SG	541815	6988926	EXPLO KM 0	300-1000m	NA	360	East	No	1	15	14	220	NA
25	25-Jun-23	NM JC	540320	6988907	AWAR KM 14	300-1000m	NA	90	East	No	>1000	6	36	320	0
26		NM, JC	547876	6976232	AWAR KM 14	300-1000m	500	90	East	No	>1000	6	36	320	NA
27		NM, JC	547876	6976232	AWAR KM 14	>1000m	1000	90	West	Yes	>1000	6	36	320	0
28		NM JC	547770	6975506	AWAR KM 13	300-1000m	NA	180	West	No	>1000	7	30	320	0
29		NM, JC	547770	6975506	AWAR KM 13	300-1000m	50	180	West	No	>1000	7	30	320	0
30		NM, JC	547770	6975506	AWAR KM 13	>1000m	800	200	West	No	>1000	7	30	320	0
31		JC, NM	547036	6973832	AWAR KM 12	300-1000m	0	90	West	No	>1000	7	30	320	0
32		NM, JC	546801	6973418	AWAR KM 11	300-1000m	100	180	East	No	501-1000	10	25	320	0
33	6-Jul-23	MF, MM	546961	6974262	AWAR KM 12	300-1000m	NA	170	East	Yes	>1000	10	19	130	NA
34		MF, MM	547163	6974163	AWAR KM 12	>1000m	NA	250	West	No	>1000	11	16	110	NA
35		MF, SS	543699	6970277	AWAR KM 7	100-300m	NA	330	East	Yes	>1000	16	17	155	NA
36	7-Jul-23	MF, MM	547184	6974118	AWAR KM 12	300-1000m	NA	220	East	Yes	>1000	9	14	90	NA
37		MF, MM	547181	6974115	AWAR KM 11	300-1000m	NA	203	East	Yes	>1000	9	12	95	NA
38		MF, SS	546391	6972670	AWAR KM 10	>1000m	NA	320	West	No	>1000	14	18	140	NA
39		MF, SS	544844	6971696	AWAR KM 8	300-1000m	NA	88	West	No	201-500	16	20	95	NA
40	9-Jul-23	MF, MM	547185	6974113	AWAR KM 10	>1000m	NA	190	East	No	201-500	8	18	NA	NA
41		MF, MM	546660	6979228	AWAR KM 19	300-1000m	NA	12	East	No	501-1000	7	31	202	NA
42		MF, MM	546156	6980093	AWAR KM 20	300-1000m	NA	324	East	Yes	>1000	7	34	270	NA
43	17-Jul-23	DM, IL	546172	6979871	AWAR 19	300-1000	NA	NA	West	No	2000+	10	20.4	299.4	0

APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Weather Observations	Road Height (cm)	Road Side Width (cm)	Structures Present	Feeding 0	Laying 0	Standing 0	Walking 0	Alert 0	Trotting 0	Comments 0
1	17-Jun-23	Cloudy-sunny	NA	NA	AWAR	4	0	0	0	0	0	NA
2		Cloudy-sunny	NA	NA	AWAR	3	0	0	1	0	0	NA
3		Cloudy	NA	NA	AWAR	40	5	0	5	0	0	NA
4		Cloudy-sunny	NA	NA	AWAR	11	7	0	0	0	0	NA
5	18-Jun-23	Cloudy	NA	NA	AWAR	3	0	0	0	0	0	NA
6		Cloudy	NA	NA	AWAR	2	7	0	0	0	0	NA
7	19-Jun-23	Sunny	NA	NA	AWAR	3	0	0	3	0	0	NA
8		Sunny	NA	NA	AWAR	3	0	0	0	0	0	NA
9		Sunny	NA	NA	AWAR	5	2	0	1	0	0	The one walking cross the road
10		Sunny	NA	NA	AWAR	2	5	0	0	0	0	NA
11		Sunny	NA	NA	AWAR	49	1	0	0	0	0	NA
12		Sunny	NA	NA	AWAR	40	10	0	0	0	0	NA
13	20-Jun-23	Partly sunny	NA	NA	AWAR	6	0	0	0	0	0	Cross AWAR W to E
14		Partly sunny	NA	NA	AWAR	20	10	0	0	0	0	They are on both side AWAR mostly east
15		Partly sunny	NA	NA	AWAR	3	8	0	0	0	0	NA
16	21-Jun-23	Partly sunny	NA	NA	AWAR	23	5	0	2	0	0	NA
17	22-Jun-23	Clear	100	100	30m from road	10	0	0	10	0	3	NA
18		Clear	100	100	500m from road	40	15	0	0	0	0	Convoy coming
19	23-Jun-23	Clear	100	100	400m from road	20	0	0	0	0	3	Convoy playing
20		Cloudy, started to rain at 24 minutes	100	100	NA	4	20	0	0	9	0	NA
21		Rain passed, sun coming out	100	100	300m from road	27	3	0	0	0	0	NA
22		Clear	100	100	20m from road	0	0	0	0	1	0	NA
23	24-Jun-23	Cloudy/rain	NA	NA	AWAR	0	1	0	0	0	0	NA
24		Clear, sunny, good visibility	100	100	About 100m from WRSF3	0	0	0	0	0	1	Zigzagging
25	25-Jun-23	Overcast	100	100	500m from the road	23	27	0	1	0	0	NA
26		Overcast	100	100	500m from road	2	61	0	0	0	0	NA
27		Overcast, windy, no bugs	100	100	1000m from road	21	0	0	3	1	7	NA
28		Wind 30 gusting 50	100	100	0M from road	28	0	0	3	0	0	NA
29		Overcast, wind gusting at 50 km/h	100	100	50m from road	30	15	1	0	0	0	NA
30		Cloudy, windy	100	100	800m from road	19	25	0	0	0	0	Hunter approaching
31		Partly cloudy	100	100	0m to road	10	0	0	8	2	13	NA
32		Partly cloudy	100	100	100 m from road	22	5	1	2	0	0	One nursing
33	6-Jul-23	Overcast, cool; buggy	100	150	Bridge	10	0	0	25	0	0	Crossing road. Drinking in lake
34		Buggy; clear	100	200	NA	30	0	0	0	0	0	NA
35		NA	50	250	NA	25	0	0	5	0	0	NA
36	7-Jul-23	Overcast, few bugs	100	250	Bridge	24	0	0	4	0	0	NA
37		Drizzling	100	200	Bridge	3	18	2	8	0	0	NA
38		Clear, broken clouds	150	300	NA	32	0	0	0	0	0	NA
39		Clear, broken clouds	150	180	Tentcity cabins	30	0	0	0	0	0	NA
40	9-Jul-23	Overcast, breezy	100	150	NA	28	5	0	2	0	0	NA
41		Breezy, overcast	90	200	NA	26	0	0	8	0	0	NA
42		Windy, overcast	80	300	Excavators, new quarry	12	0	3	15	0	0	NA
43	17-Jul-23	Cloudy-sunny	NA	NA	AWAR	10	0	1	0	0	0	NA

APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Feeding 3	Laying 3	Standing 3	Walking 3	Alert 3	Trotting 3	Comments 3	Feeding 6	Laying 6	Standing 6	Walking 6	Alert 6	Trotting 6	Comments 6
1	17-Jun-23	2	0	0	0	0	0	NA	0	0	0	2	0	0	180 m away from observers
2		1	0	0	3	0	0	NA	3	0	0	1	0	0	NA
3		45	0	0	5	0	0	NA	45	5	0	0	0	0	NA
4		8	10	0	0	0	0	NA	8	10	0	0	0	0	NA
5	18-Jun-23	2	0	0	1	0	0	NA	2	0	0	1	0	0	NA
6		2	7	0	0	0	0	NA	3	6	0	0	0	0	NA
7	19-Jun-23	3	0	0	3	0	0	NA	6	0	0	0	0	0	NA
8		2	0	0	1	0	0	NA	3	0	0	0	0	0	NA
9		4	3	0	0	0	0	Lost the one that cross	3	4	0	2	0	0	Gain one more
10		0	0	0	7	0	0	NA	10	0	0	1	0	0	Gain 4 more
11		47	0	0	3	0	0	Crossing the road back and forth	47	0	0	3	0	0	NA
12		25	25	0	0	0	0	NA	25	25	0	0	0	0	NA
13	20-Jun-23	6	0	0	0	0	0	NA	6	0	0	0	0	0	NA
14		24	6	0	0	0	0	NA	20	5	0	5	0	0	More cross on east side
15		0	11	0	0	0	0	NA	0	11	0	0	0	0	NA
16	21-Jun-23	24	0	0	6	0	0	Starting to move	24	0	0	6	0	0	NA
17	22-Jun-23	25	0	0	6	0	0	NA	20	0	0	8	2	0	Crossing the road
18		40	15	0	5	0	0	Convoy 2 km away, stopping	30	10	0	7	2	0	Convoy 2km away and stopped
19	23-Jun-23	12	0	0	8	0	4	Moving towards road	10	0	0	10	2	2	NA
20		5	24	0	0	4	0	Truck stopped	5	28	0	0	0	0	NA
21		26	3	0	0	1	0	NA	25	5	0	0	0	0	NA
22		1	0	0	0	0	0	NA	1	0	0	0	0	0	NA
23	24-Jun-23	0	1	0	0	0	0	NA	0	1	0	0	0	0	NA
24		0	0	0	0	0	1	NA	0	0	0	0	0	1	Switched directions, hesitant about the waterline
25	25-Jun-23	30	56	0	0	0	0	NA	27	59	0	0	0	0	NA
26		1	58	2	0	1	0	One nursing	2	57	0	0	1	0	NA
27		23	4	0	2	0	4	NA	20	0	0	9	0	1	NA
28		24	0	0	3	0	0	NA	22	8	0	4	0	0	Laying beside road
29		19	14	0	0	0	0	NA	28	12	0	0	0	0	NA
30		19	26	0	0	0	0	Hunter stationary nearby	14	28	0	0	0	0	NA
31		6	0	0	0	7	20	NA	12	0	0	7	0	17	NA
32		24	5	0	1	0	0	NA	20	5	0	7	0	0	NA
33	6-Jul-23	33	0	0	0	2	2	NA	30	0	0	3	0	1	NA
34		15	0	0	15	0	0	NA	15	10	0	5	0	0	NA
35		30	0	0	0	0	0	NA	0	0	0	20	2	10	Moving fast atv
36	7-Jul-23	30	0	0	0	0	0	NA	28	0	1	1	0	0	NA
37		3	15	1	10	1	0	NA	2	15	4	12	0	0	NA
38		10	0	0	20	0	0	NA	0	0	2	28	1	0	NA
39		25	5	1	3	0	0	NA	25	4	0	3	0	0	NA
40	9-Jul-23	28	0	0	3	0	0	NA	30	0	1	2	0	1	Slowly moving while feeding
41		38	0	0	0	0	1	NA	21	9	4	1	2	0	NA
42		0	4	0	10	0	2	NA	3	4	5	14	0	2	NA
43	17-Jul-23	11	0	0	0	0	0	NA	11	0	0	0	0	0	NA

APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Feeding 9	Laying 9	Standing 9	Walking 9	Alert 9	Trotting 9	Comments 9	Feeding 12	Laying 12	Standing 12	Walking 12	Alert 12	Trotting 12	Comments 12
1	17-Jun-23	0	0	0	0	0	0	Out of sight	NA	NA	NA	NA	NA	NA	NA
2		2	1	0	1	0	0	NA	2	2	0	0	0	0	NA
3		48	0	0	0	0	2	NA	48	2	0	0	0	0	NA
4		7	11	0	0	0	0	NA	5	13	0	0	0	0	NA
5	18-Jun-23	3	0	0	0	0	0	NA	3	0	0	0	0	0	NA
6		3	6	0	0	0	0	NA	3	6	0	0	0	0	NA
7	19-Jun-23	6	0	0	0	0	0	NA	6	0	0	0	0	0	NA
8		3	0	0	0	0	0	NA	1	0	0	0	0	0	Lost 2 behind hill
9		5	4	0	0	0	0	NA	5	4	0	0	0	0	NA
10		11	0	0	0	0	0	NA	6	0	0	0	0	0	NA
11		50	0	0	0	0	0	NA	50	0	0	0	0	0	Lost 4 behind a hill
12		20	30	0	0	0	0	NA	33	0	0	15	2	0	NA
13	20-Jun-23	6	0	0	0	0	0	NA	4	0	0	1	1	0	NA
14		21	5	0	4	0	0	NA	24	3	0	3	0	0	NA
15		0	11	0	0	0	0	NA	0	11	0	0	0	0	NA
16	21-Jun-23	23	0	0	6	0	1	NA	12	0	0	18	0	0	NA
17	22-Jun-23	10	0	0	10	2	4	ATV approaching, 50% on each side of road now	0	0	0	20	2	8	NA
18		30	0	0	10	3	0	Convoy moving again	30	0	0	0	2	0	Convoy
19	23-Jun-23	25	0	2	2	0	2	NA	25	0	0	0	0	2	NA
20		5	28	0	0	0	0	NA	3	30	0	0	0	0	NA
21		20	8	0	0	1	0	NA	14	14	0	0	2	0	NA
22		1	0	0	0	0	0	NA	0	0	0	0	1	0	NA
23	24-Jun-23	0	1	0	0	0	0	Stand up/alert	0	1	0	0	0	0	NA
24		0	0	0	0	0	1	Going back in the direction it came from	0	0	0	0	1	0	NA
25	25-Jun-23	24	64	0	2	1	0	NA	33	60	0	1	0	0	NA
26		4	58	0	0	0	0	NA	5	57	0	0	0	0	NA
27		26	0	0	1	0	3	NA	21	0	0	9	0	0	NA
28		23	10	0	2	0	0	Light rain started	13	8	0	11	0	7	NA
29		28	13	0	0	0	0	NA	25	18	0	0	0	0	NA
30		14	17	0	4	0	1	Hunter out of sight, moving slowly	15	15	NA	2	0	0	NA
31		11	0	0	0	1	5	NA	0	0	0	0	0	0	NA
32		20	4	0	6	0	0	NA	19	8	0	3	0	0	NA
33	6-Jul-23	0	0	0	35	0	0	Moving west	0	0	0	20	0	15	NA
34		20	0	3	7	0	0	NA	25	0	0	5	0	0	NA
35		0	0	0	30	0	0	NA	0	0	0	20	6	7	NA
36	7-Jul-23	29	0	0	0	0	1	NA	25	0	0	0	1	4	NA
37		0	3	20	6	1	0	Standing on road	4	0	24	3	0	0	NA
38		28	2	0	0	0	0	NA	26	0	0	4	0	0	NA
39		15	20	1	0	0	0	NA	10	20	0	0	0	0	NA
40	9-Jul-23	30	0	0	0	2	0	NA	24	0	0	5	0	1	NA
41		13	28	1	2	0	0	NA	9	24	2	1	0	0	NA
42		0	3	0	28	0	0	NA	0	0	0	30	0	0	NA
43	17-Jul-23	11	0	0	0	0	0	NA	10	1	0	0	0	0	NA

APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Feeding 15	Laying 15	Standing 15	Walking 15	Alert 15	Trotting 15	Comments 15	Feeding 18	Laying 18	Standing 18	Walking 18	Alert 18	Trotting 18	Comments 18
1	17-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2		1	3	0	0	0	0	NA	0	4	0	0	0	0	200m away from observer
3		48	2	0	0	0	0	NA	48	0	0	2	0	0	NA
4		3	15	0	0	0	0	NA	5	13	0	0	0	0	NA
5	18-Jun-23	3	0	0	0	0	0	NA	3	0	0	0	0	0	NA
6		2	7	0	0	0	0	NA	2	7	0	0	0	0	NA
7	19-Jun-23	6	0	0	0	0	0	NA	6	0	0	0	0	0	NA
8		3	0	0	0	0	0	NA	3	0	0	0	0	0	NA
9		4	5	0	0	0	0	NA	3	6	0	0	0	0	NA
10		0	0	0	7	0	0	All went behind a hill	NA	NA	NA	NA	NA	NA	NA
11		50	0	0	0	0	0	NA	48	0	0	2	0	0	NA
12		0	0	0	0	0	50	Most were alert and started to run	10	0	0	0	0	0	90% are gone
13	20-Jun-23	6	0	0	0	0	0	NA	6	0	0	0	0	0	NA
14		23	5	0	0	0	2	NA	24	6	0	0	0	0	NA
15		0	11	0	0	0	0	NA	0	11	0	0	0	0	NA
16	21-Jun-23	12	0	0	18	0	0	NA	14	0	0	16	0	0	NA
17	22-Jun-23	0	0	0	20	0	14	Most cross road. ATV did not approach	10	0	0	10	0	8	All crossed
18		0	0	0	0	0	60	All trotting	0	0	0	30	2	30	Convoy passed
19	23-Jun-23	25	8	0	0	0	2	NA	17	4	0	0	0	0	NA
20		5	28	0	0	0	0	NA	4	29	0	0	0	0	NA
21		13	13	0	0	0	1	NA	13	16	0	1	0	0	NA
22		1	0	0	0	0	0	NA	1	0	0	0	0	0	NA
23	24-Jun-23	0	1	0	0	0	0	NA	0	1	0	0	0	0	NA
24		0	0	0	0	0	1	NA	0	0	0	0	0	1	NA
25	25-Jun-23	23	77	0	3	0	0	NA	25	77	0	0	0	0	NA
26		8	45	0	1	0	0	NA	14	55	0	0	0	1	NA
27		19	0	0	4	0	7	NA	19	0	0	4	0	7	NA
28		25	5	0	7	0	0	NA	20	5	0	8	0	1	NA
29		29	16	0	0	0	0	NA	22	19	0	0	0	0	NA
30		23	12	0	5	0	0	NA	16	10	1	0	0	0	One nursing
31		0	0	0	0	0	0	NA	0	0	0	0	0	0	NA
32		17	6	0	10	0	0	NA	14	4	0	13	0	0	NA
33	6-Jul-23	5	0	0	25	0	5	NA	10	0	0	20	0	5	NA
34		28	0	0	2	0	0	NA	10	0	0	20	0	0	NA
35		0	0	0	0	0	30	NA	0	0	0	0	0	30	NA
36	7-Jul-23	28	0	0	1	0	1	NA	22	0	0	8	0	0	NA
37		25	0	0	5	0	0	Crossed road	20	0	3	8	0	0	NA
38		29	0	0	0	0	1	NA	25	0	0	2	0	3	NA
39		28	0	0	1	1	0	NA	30	0	0	0	0	0	NA
40	9-Jul-23	22	0	0	14	0	0	NA	14	0	0	20	1	0	NA
41		4	23	8	0	0	0	NA	2	21	9	6	0	0	NA
42		4	0	2	28	0	2	NA	4	0	0	25	0	0	NA
43	17-Jul-23	9	2	0	0	0	0	NA	9	2	0	0	0	0	NA

APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Feeding 21	Laying 21	Standing 21	Walking 21	Alert 21	Trotting 21	Comments 21	Feeding 24	Laying 24	Standing 24	Walking 24	Alert 24	Trotting 24	Comments 24
1	17-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2		4	0	0	0	0	0	NA	4	0	0	0	0	0	NA
3		48	0	0	2	0	0	NA	43	0	0	7	0	0	NA
4		6	12	0	0	0	0	NA	5	13	0	0	0	0	NA
5	18-Jun-23	3	0	0	0	0	0	NA	2	1	0	0	0	0	NA
6		3	6	0	0	0	0	NA	3	6	0	0	0	0	NA
7	19-Jun-23	0	0	0	0	0	0	All gone, went on other side of esker	NA	NA	NA	NA	NA	NA	NA
8		3	0	0	0	0	0	NA	1	0	0	2	0	0	NA
9		3	6	0	0	0	0	NA	0	9	0	0	0	0	NA
10		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11		47	0	0	3	0	0	0	48	2	0	0	0	0	NA
12		5	0	0	5	0	0	90% gone	5	0	0	0	0	0	95% gone
13	20-Jun-23	4	0	0	2	0	0	Cross AWAR E to W	1	0	0	5	0	0	NA
14		23	4	0	0	0	0	NA	26	4	0	0	0	0	NA
15		0	9	0	2	0	0	NA	0	9	0	2	0	0	NA
16	21-Jun-23	5	0	0	15	0	0	Losing sight of caribou	2	0	0	20	0	0	NA
17	22-Jun-23	30	0	0	10	0	3	More appearing over ridge	20	0	0	1	1	7	More joining, main group 300m off road
18		0	0	0	50	0	30	NA	0	0	0	0	0	60	NA
19	23-Jun-23	16	10	0	0	0	0	NA	13	14	0	0	0	0	NA
20		4	28	0	1	0	0	NA	2	31	0	0	0	0	NA
21		14	18	0	0	1	0	NA	8	22	0	0	0	0	NA
22		0	0	0	0	1	0	NA	0	0	0	0	0	1	NA
23	24-Jun-23	0	1	0	0	0	0	NA	0	1	0	0	0	0	NA
24		0	0	0	0	0	0	Out of sight	0	0	0	0	0	1	NA
25	25-Jun-23	11	92	0	0	0	0	NA	9	93	0	0	0	0	NA
26		12	31	0	8	0	0	NA	18	39	0	0	1	0	NA
27		25	0	0	4	0	1	NA	24	0	0	4	0	2	NA
28		20	8	0	6	0	0	NA	8	3	0	3	0	2	NA
29		21	19	0	0	0	0	NA	22	20	0	0	0	0	NA
30		16	8	1	3	0	0	One nursing	11	8	0	6	1	0	NA
31		0	0	0	0	0	0	NA	0	0	0	0	0	0	NA
32		20	6	0	10	0	0	NA	15	7	0	8	0	0	NA
33	6-Jul-23	30	0	0	4	0	1	NA	0	0	0	35	0	0	NA
34		22	2	0	6	0	0	NA	6	0	0	20	2	2	NA
35		0	0	0	0	0	30	NA	0	0	0	0	0	30	NA
36	7-Jul-23	15	0	0	5	0	10	NA	22	0	2	1	2	2	1 crossed
37		0	0	0	30	0	0	Started raining	5	0	0	25	0	0	NA
38		16	0	0	15	0	0	NA	5	0	0	25	0	0	NA
39		35	0	0	0	0	0	NA	30	0	0	0	0	0	NA
40	9-Jul-23	0	0	0	5	0	0	Rest out of sight	10	0	1	22	0	2	NA
41		5	19	2	9	0	0	NA	12	15	0	0	0	0	NA
42		25	0	0	5	0	1	NA	20	0	0	15	0	0	NA
43	17-Jul-23	9	2	0	0	0	0	NA	9	2	0	0	0	0	NA

APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Feeding 27	Laying 27	Standing 27	Walking 27	Alert 27	Trotting 27	Comments 27	Feeding 30	Laying 30	Standing 30	Walking 30	Alert 30	Trotting 30	Comments 30
1	17-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2		4	0	0	0	0	0	NA	4	0	0	0	0	0	NA
3		43	0	7	0	0	0	NA	45	0	0	5	0	0	Start crossing road
4		3	15	0	0	0	0	NA	3	15	0	0	0	0	NA
5	18-Jun-23	2	1	0	0	0	0	NA	2	1	0	0	0	0	NA
6		3	6	0	0	0	0	NA	3	6	0	0	0	0	NA
7	19-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8		3	0	0	0	0	0	NA	3	0	0	0	0	0	NA
9		0	9	0	0	0	0	NA	9	0	0	0	0	0	NA
10		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11		45	5	0	0	0	0	NA	45	5	0	0	0	0	NA
12		5	0	0	0	0	0	95% gone	5	0	0	0	0	0	95% gone
13	20-Jun-23	6	0	0	0	0	0	Cross AWAR W to E	5	0	0	1	0	0	NA
14		26	4	0	0	0	0	NA	24	6	0	0	0	0	NA
15		2	9	0	0	0	0	NA	0	9	0	0	0	0	Lost 2 down the hill
16	21-Jun-23	4	0	0	4	0	0	lost 90% caribou	4	0	0	0	0	0	Lost 95% caribou
17	22-Jun-23	40	1	0	2	0	0	NA	30	3	0	0	0	2	NA
18		0	0	0	60	0	10	NA	0	0	0	60	0	0	NA
19	23-Jun-23	13	14	0	0	0	0	NA	15	15	0	0	0	0	NA
20		3	30	0	0	0	0	NA	3	30	0	0	0	0	NA
21		7	28	0	0	0	0	NA	3	30	0	0	0	0	NA
22		0	0	0	1	0	0	NA	0	1	0	0	0	0	NA
23	24-Jun-23	0	1	0	0	0	0	NA	0	1	0	0	0	0	NA
24		0	0	0	0	0	0	Out of sight	0	0	0	0	0	0	Out of sight
25	25-Jun-23	9	93	0	0	0	0	NA	10	93	0	1	0	0	NA
26		27	37	0	0	1	1	NA	29	30	0	2	0	0	NA
27		28	0	0	1	0	1	NA	18	0	0	2	0	10	NA
28		12	6	0	1	0	0	Some are moving out of sight	12	6	0	5	0	0	NA
29		12	22	0	0	0	0	NA	13	19	0	0	0	0	NA
30		22	13	0	5	2	2	NA	31	5	0	0	0	0	NA
31		0	0	0	0	0	0	NA	0	0	0	0	0	0	NA
32		16	9	0	6	0	0	NA	16	9	0	4	0	1	NA
33	6-Jul-23	5	0	0	15	0	15	No disturbance seen	30	0	0	5	0	0	NA
34		5	0	0	25	0	0	NA	2	0	2	26	0	0	NA
35		0	0	0	0	0	0	Out of sight	0	0	0	0	0	0	Out of sight
36	7-Jul-23	25	0	1	1	2	0	NA	11	0	0	0	0	19	Bugs
37		0	0	0	30	0	0	NA	28	0	0	2	0	0	NA
38		15	0	1	14	0	0	NA	15	0	0	20	0	0	NA
39		32	3	0	0	0	0	NA	28	5	0	1	1	0	NA
40	9-Jul-23	6	0	0	27	0	1	NA	32	0	0	3	0	0	NA
41		9	17	4	4	0	0	NA	10	22	0	6	0	0	NA
42		5	0	0	24	2	0	NA	30	0	0	2	0	0	NA
43	17-Jul-23	9	2	0	0	0	0	NA	9	2	0	0	0	0	NA

APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Disturbance 0	Disturbance Comments 0	Disturbance 3	Disturbance Comments 3	Disturbance 6	Disturbance Comments 6	Disturbance 9	Disturbance Comments 9
1	17-Jun-23	3 ATV	2:10, 3 ATV caribou running away from road	NA	NA	NA	NA	NA	NA
2		NA	NA	NA	NA	NA	NA	NA	NA
3		NA	NA	NA	NA	NA	NA	NA	NA
4		NA	NA	NA	NA	NA	NA	NA	NA
5	18-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA
6		NA	NA	NA	NA	NA	NA	NA	NA
7	19-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA
8		NA	NA	NA	NA	NA	NA	NA	NA
9		NA	NA	NA	NA	NA	NA	NA	NA
10		NA	NA	NA	NA	NA	NA	NA	NA
11		NA	NA	NA	NA	NA	NA	NA	NA
12		NA	NA	NA	NA	NA	NA	NA	NA
13	20-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA
14		NA	NA	NA	NA	NA	NA	NA	NA
15		NA	NA	NA	NA	NA	NA	NA	NA
16	21-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA
17	22-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA
18		NA	NA	NA	NA	NA	NA	NA	NA
19	23-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA
20		Light truck	Caribou monitoring truck travelling very slow. All laying before	NA	NA	NA	NA	NA	NA
21		NA	NA	NA	NA	NA	NA	NA	NA
22		Light truck	Own vehicle	NA	NA	NA	NA	NA	NA
23	24-Jun-23	NA	NA	NA	NA	NA	NA	ATV	9 min open pit blast second before 1 ATV went by, video taken
24		NA	NA	NA	NA	NA	NA	NA	NA
25	25-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA
26		NA	NA	NA	NA	NA	NA	NA	NA
27		NA	NA	NA	NA	NA	NA	NA	NA
28		NA	NA	NA	NA	NA	NA	NA	NA
29		NA	NA	NA	NA	NA	NA	NA	NA
30		NA	NA	NA	NA	NA	NA	NA	NA
31		ATV	Slow	NA	NA	NA	NA	NA	NA
32		NA	NA	NA	NA	NA	NA	NA	NA
33	6-Jul-23	NA	NA	NA	NA	NA	NA	NA	NA
34		NA	NA	NA	NA	NA	NA	NA	NA
35		ATV	NA	NA	NA	ATV	NA	NA	NA
36	7-Jul-23	NA	NA	NA	NA	NA	NA	NA	NA
37		NA	NA	NA	NA	NA	NA	NA	NA
38		NA	NA	NA	NA	NA	NA	NA	NA
39		ATV	NA	ATV	Side by side	NA	NA	NA	NA
40	9-Jul-23	NA	NA	NA	NA	NA	NA	NA	NA
41		NA	NA	NA	NA	NA	NA	NA	NA
42		NA	NA	NA	NA	NA	NA	NA	NA
43	17-Jul-23	NA	NA	NA	NA	NA	NA	NA	NA

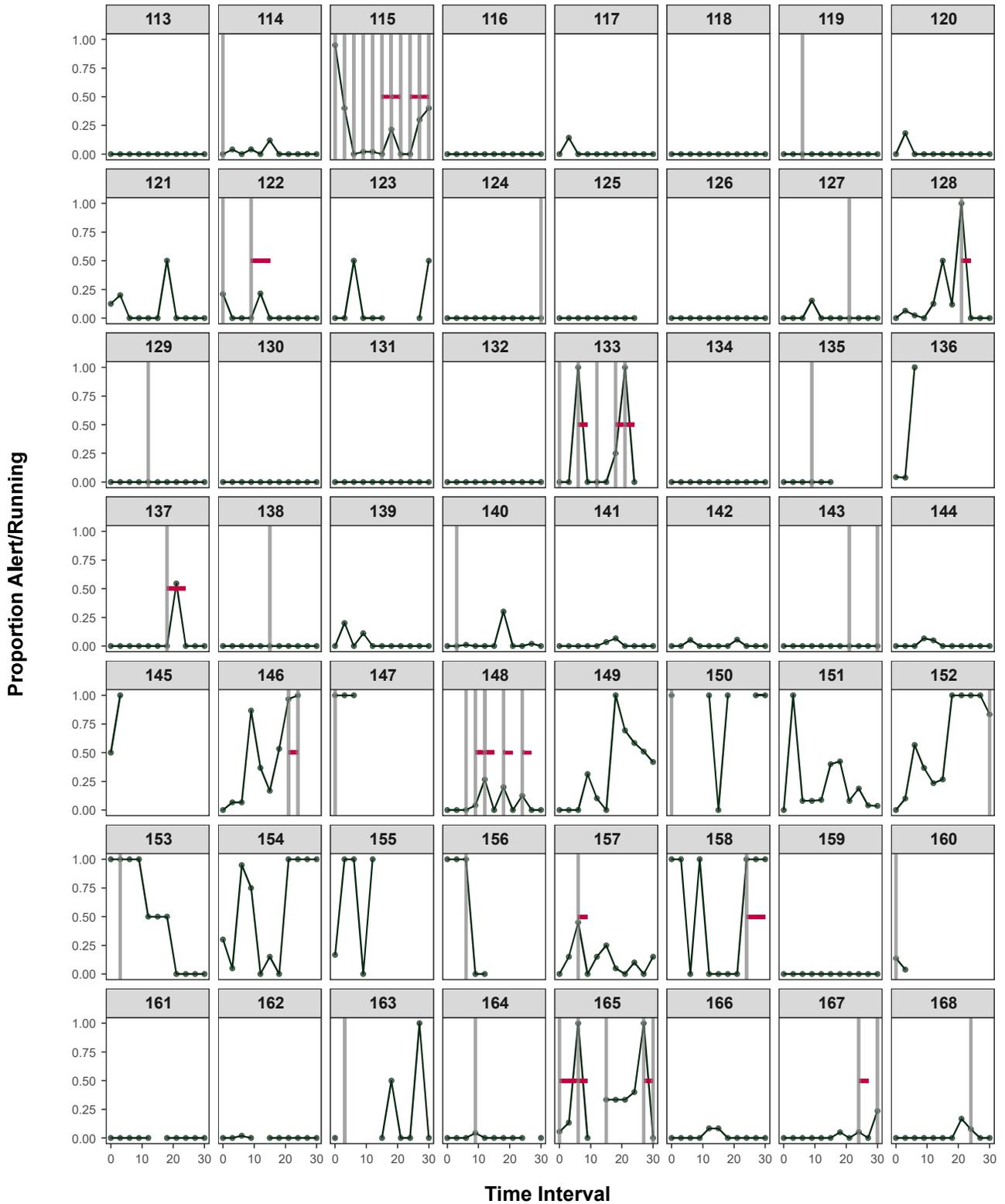
APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Disturbance 12	Disturbance Comments 12	Disturbance 15	Disturbance Comments 15	Disturbance 18	Disturbance Comments 18	Disturbance 21	Disturbance Comments 21	Disturbance 24	Disturbance Comments 24
1	17-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	18-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	19-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12		NA	NA	Ambulance	15:59 ambulance had to pass, caribou all went running back west	NA	NA	NA	NA	NA	NA
13	20-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	21-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17	22-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18		Light truck	10 haul trucks are busses, 4	NA	NA	NA	NA	NA	NA	ATV	NA
19	23-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
20		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
22		NA	NA	NA	NA	NA	NA	NA	NA	ATV	NA
23	24-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
24		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25	25-Jun-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
28		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
31		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
33	6-Jul-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
34		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
35		ATV	ATV herding herd	ATV	Herding	ATV	ATV herding	ATV	Driving fast	ATV	NA
36	7-Jul-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
37		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
38		NA	NA	NA	NA	NA	NA	NA	NA	Light truck	Slow
39		Light truck	Slow drive	Light truck	NA	NA	NA	NA	NA	Light truck	NA
40	9-Jul-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
41		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
42		NA	NA	NA	NA	Light truck	Slow crawl	NA	NA	NA	NA
43	17-Jul-23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

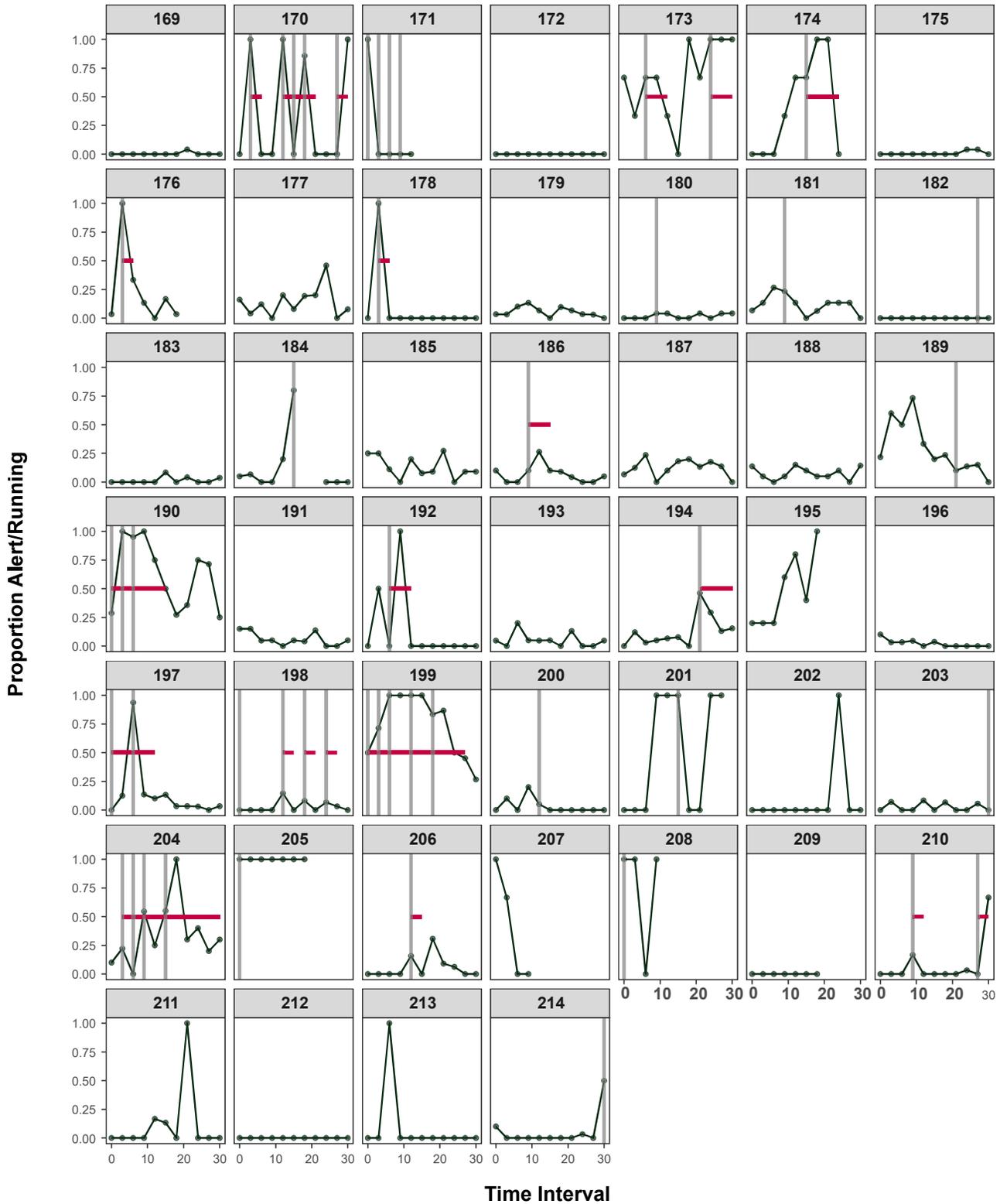
APPENDIX B: DATA FROM CARIBOU BEHAVIOUR SURVEYS

Survey ID	Date	Disturbance 27	Disturbance Comments 27	Disturbance 30	Disturbance Comments 30	General Comments
1	17-Jun-23	NA	NA	NA	NA	NA
2		NA	NA	NA	NA	NA
3		NA	NA	NA	NA	NA
4		NA	NA	NA	NA	NA
5	18-Jun-23	NA	NA	NA	NA	NA
6		NA	NA	NA	NA	NA
7	19-Jun-23	NA	NA	NA	NA	NA
8		NA	NA	NA	NA	NA
9		NA	NA	NA	NA	NA
10		NA	NA	NA	NA	NA
11		NA	NA	NA	NA	NA
12		NA	NA	NA	NA	NA
13	20-Jun-23	NA	NA	NA	NA	NA
14		NA	NA	NA	NA	NA
15		NA	NA	NA	NA	NA
16	21-Jun-23	NA	NA	NA	NA	NA
17	22-Jun-23	NA	NA	NA	NA	Group grew to 100 over survey. All cows and calves. 1 to 1 cows to calves
18		NA	NA	NA	NA	Cows and calves 1:1
19	23-Jun-23	NA	NA	NA	NA	Started to rain
20		NA	NA	NA	NA	Cows and calves 1:1
21		NA	NA	NA	NA	Very unaffected caribou
22		NA	NA	NA	NA	NA
23	24-Jun-23	NA	NA	NA	NA	Seemed stressed
24		NA	NA	NA	NA	Very large group spread from KM8 to KM14 and up to 8 km east of road
25	25-Jun-23	NA	NA	NA	NA	The group extends from KM8 to KM14
26		NA	NA	NA	NA	Group general moving to the north and east
27		NA	NA	NA	NA	Large group spread out over several square kilometers
28		NA	NA	NA	NA	Part of a larger huge group
29		NA	NA	NA	NA	Part of enormous group.
30		Hunter	Possible hunting out of sight, seeing some reaction	NA	NA	Ended early because we left
31		NA	NA	NA	NA	NA
32		NA	NA	NA	NA	NA
33	6-Jul-23	NA	NA	NA	NA	10,000+. Buggy day. Crossed road calmly
34		NA	NA	NA	NA	10,000+, moving west calmly
35		NA	NA	NA	NA	8,000
36	7-Jul-23	NA	NA	NA	NA	3,000
37		NA	NA	NA	NA	3,000
38		ATV	NA	NA	NA	3,000
39		NA	NA	Light truck	NA	NA
40	9-Jul-23	NA	NA	NA	NA	300+
41		NA	NA	NA	NA	Hiding from strong winds
42		NA	NA	NA	NA	15,000
43	17-Jul-23	NA	NA	NA	NA	NA

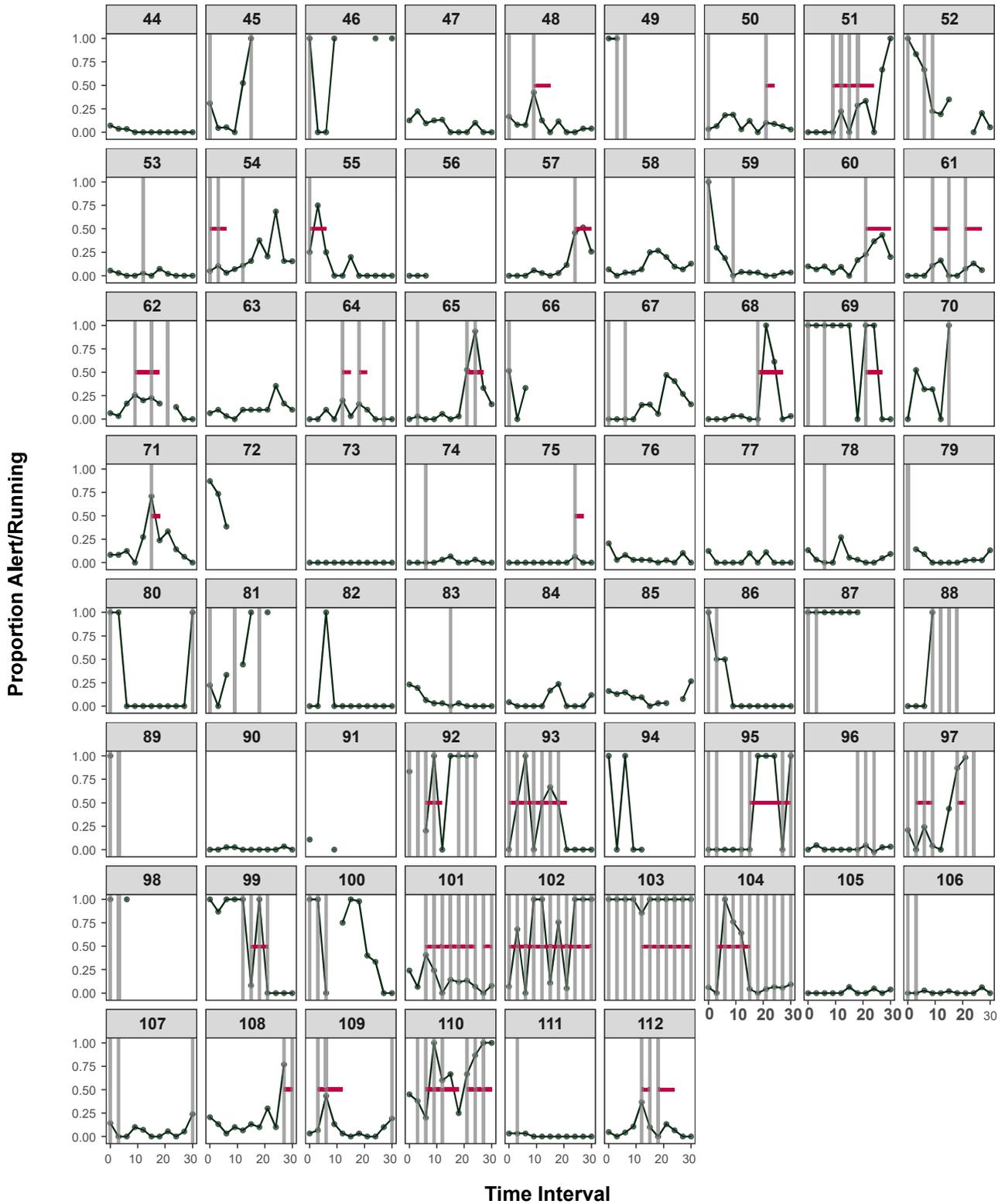
## APPENDIX C PROPORTION OF ALERT AND RUNNING CARIBOU IN EACH SURVEY



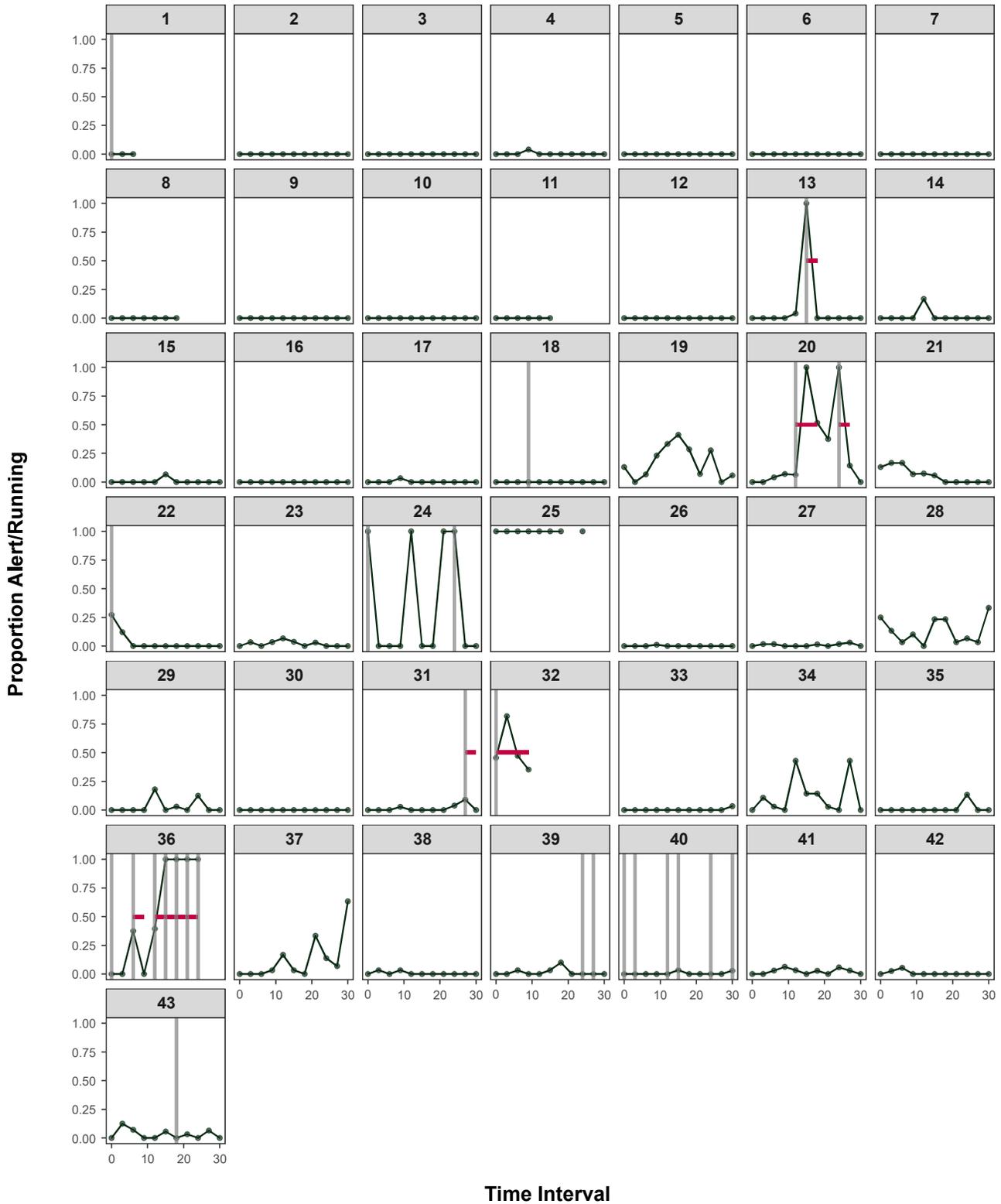
**Figure C-1: Proportion of Response Behaviour during Each Survey – 2020**



**Figure C-2: Proportion of Response Behaviour during Each Survey – 2021**



**Figure C-3: Proportion of Response Behaviour during Each Survey – 2022**



**Figure C-4: Proportion of Response Behaviour during Each Survey – 2023**



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