# FALL 2023 COMPOSITION SURVEYS OF BATHURST AND BLUENOSE-EAST BARREN-GROUND CARIBOU HERDS

J. ADAMCZEWSKI[1], J. WILLIAMS[1], J. BOULANGER[2] AND C. MODESTE-BURGIN[1]

[1] ENVIRONMENT AND CLIMATE CHANGE, [2] INTEGRATED ECOLOGICAL RESEARCH

2024

MANUSCRIPT NUMBER 328



Government of Northwest Territories

# ABSTRACT

This report describes the results of helicopter-based fall composition surveys of the Bathurst and Bluenose-East barren-ground caribou herds conducted in October 2023 near the peak of the rut. The main purpose of these surveys was to estimate the sex ratio in the herds during the breeding season, and to estimate the proportion of females in the herd that were accompanied by a calf, as an index of calf survival in the first four-and-a-half months of age.

The surveys were conducted October 20-26, 2023. There were in total 36.3 hours flown (13.4 hours ferry; 11.5 hours Bathurst survey; 11.4 hours Bluenose-East survey). Bases for flying were Wekweètì and the Tundra Ecological Research Station at Daring Lake. Temperatures varied between about 0˚C and -10˚C, strong winds prevailed throughout the survey period, and snow cover was mostly thin and patchy and increased though the survey period.

Survey planning was focused on flying to locations of collared female and male caribou from the Bathurst and Bluenose-East herds. Caribou were classified as cows, calves, young bulls and prime bulls using motion-stabilized binoculars from the front seat of the helicopter. Observations were recorded on tablet computers.

For the Bluenose-East herd, 2,144 caribou were classified, including calves, and the calf: cow ratio for fall 2023 was estimated at 51.4 calves: 100 cows (95%CI 48.8-54.4). The calf: cow ratios in 2022 (52.3), 2021 (49.6) and 2020 (51.7) were very similar and were the highest of the survey values 2009-2023. The bull: cow ratio estimated in October 2023 (58.2 bulls: 100 cows, 95%CI 53.1-64.6) was slightly lower than the ratios for 2022 (64.8), 2021 (68.7) and 2020 (63.3). The 2023 results suggested that healthy demographic indicators documented in this herd 2018-2022 had continued through 2023.

For the Bathurst herd, 2,373 caribou were classified. A ratio of 36.8 calves: 100 cows (95%CI 32.7-40.6) was estimated in these areas for fall 2023 and was similar to the fall estimates for this herd in 2022 (38.4) and 2020 (39.1). A ratio of 110.1 bulls: 100 cows (91.7-129.6) was estimated for the Bathurst herd, similar to the 105.6 bulls: 100 cows estimated in fall 2022 and higher than the ratio found in fall 2020 (64.1). We consider possible explanations for the unusually high October 2022 and 2023 Bathurst bull: cow ratios, including potentially differential rates of movement of bulls and cows between the Bathurst and Beverly herds.

# TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# INTRODUCTION

The Bathurst, Bluenose-East and Beverly[1] caribou herds all have calving grounds in Nunavut (NU) (Figure 1). The Bathurst calving ground is west of Bathurst Inlet, the Bluenose-East calving ground is west of Kugluktuk, and the Beverly calving ground is in the Queen Maud Gulf lowlands.

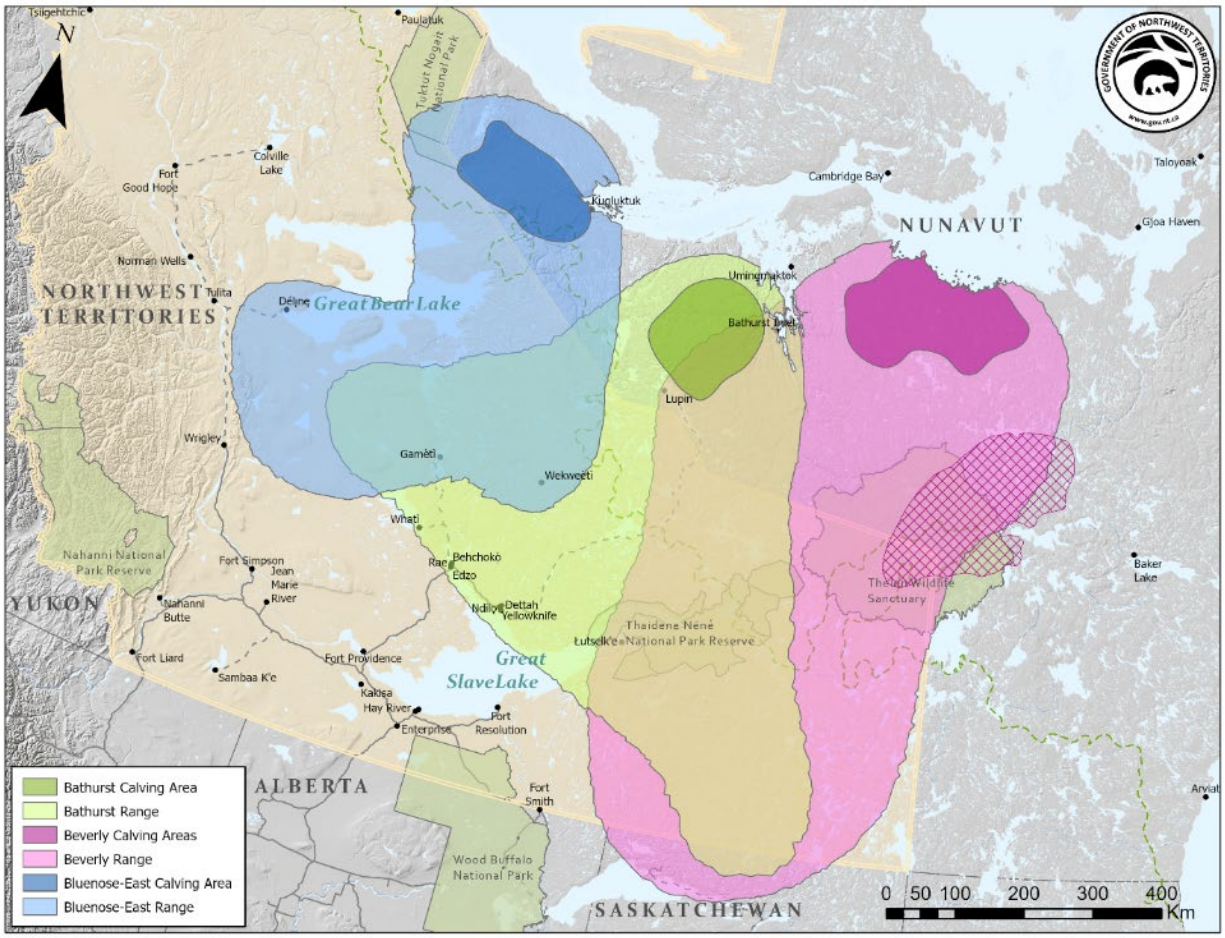



**Figure 1.** Annual ranges and calving grounds of the Bluenose-East, Bathurst, and Beverly herds, based on accumulated radio collar locations of cows (based on Nagy et al. 2011). Other herd ranges west and east of these four herds were omitted for simplicity.

Portions of the summer ranges for all three herds are in NU and the remainder of the ranges are in the Northwest Territories (NWT) (Figure 1). In previous years, ranges of the Bathurst and Beverly herds have occasionally extended as far south as northern Saskatchewan.

[1] The Beverly herd described in this report is the herd defined by the Government of Nunavut (GN) as calving in the central and western Queen Maud Gulf (Campbell et al. 2019). This herd may not correspond exactly to the Beverly herd defined prior to 2009 with an inland calving ground south of Garry Lakes (Adamczewski et al. 2015).

Fall composition surveys of barren-ground caribou herds have normally been carried out in late October near the peak of the fall breeding season. At the peak of the breeding season, all sex and age classes of caribou are mixed in rutting aggregations, some which can number hundreds or thousands. Sampling across the herd's distribution at this time of year can provide an estimate of the herd-wide sex ratio (bulls: 100 cows). This is needed to generate an overall herd estimate from the estimated numbers of females on the calving grounds in June (e.g. Boulanger et al. 2022, Adamczewski et al. 2022a). In addition, a calf: cow ratio can be estimated which gives an index of calf survival in the first four and a half months after birth, although it is also affected by initial calf productivity in June.

Population estimates for the Bathurst herd in 2018 (Adamczewski et al. 2019) and the Bluenose-East herd in 2018 (Boulanger et al. 2019) showed large declines from the previous estimates in 2015. In joint management proposals from the and the Department of Environment and Natural Resources (ENR) [2] and the Tłı̨chǫ Government (TG) to the Wek'èezhìı Renewable Resources Board (WRRB) in early 2019, increased monitoring proposed for the two herds included annual composition surveys of both herds in June, late October, and March/April (ENR and TG 2019a and b). The WRRB approved this monitoring (WRRB 2019a and b). In keeping with these monitoring plans, composition surveys of the Bathurst and Bluenose-East herds were planned for late October 2023.

The most recent population estimate for the Beverly herd in 2018 of about 103,000 caribou indicated that the herd was still relatively large (Campbell et al. 2019). A calving ground population survey of this herd was flown in June 2023 by the GN but results were not available at the time of writing this report. Monitoring of this herd has been less intensive than for the Bathurst and Bluenose-East herds but has included March composition surveys to monitor calf: cow ratios at about nine and a half months of age in most recent years. Composition surveys in the fall have been infrequent for the Beverly herd, in part because the herd has been widely dispersed (based on collar locations), and often portions of the herd have been in remote areas. A survey of this herd was flown in October/November 2022 (Adamczewski et al. 2024). A fall 2023 survey of this herd was not flown as much of the herd was in areas far from communities and out of flying range.

[2] The GNWT Department Environment and Natural Resources was re-named Environment and Climate Change (ECC) in 2023. The earlier departmental name has been retained when noting documents prior to the name change.

# METHODS

## Collared Caribou

Locations of collared Bathurst (27F, 11M), Bluenose-East (51F, 14M) and Beverly (49F, 37M) caribou were monitored through the survey period of October 20-26, 2023. Survey flying was focused on flying to the Bathurst and Bluenose-East collared caribou and classifying caribou nearby, as well as other groups encountered between collared caribou.

## Classification Methods

Daily flying routes were planned around locations of collared caribou, with consideration of fuel and flying time remaining, as well as proximity to fuel caches. Caribou were classified from the front of the helicopter using motion-stabilized binoculars. Caribou were identified as calves (based on small body size), cows (based on presence of a vulva patch), prime bulls (based on large body size and large antlers and absence of vulva patch) and young bulls (based on absence of vulva patch, smaller body size and smaller antlers). Identification of young bulls and prime bulls was somewhat subjective; the largest prime bulls and the smallest bulls were unmistakable but intermediate-sized bulls required a judgement call. Trimble Yuma 2 tablet computers were used to record observations with a GPS waypoint taken for each observation. Garmin GPS model 276CX units were used to plan flights and record flight lines. In addition to caribou, we also recorded observations and locations of other large mammals and birds.

# RESULTS

## Daily Flying and Survey Crew

A daily summary of flying hours and tasks for each day is shown in Table 1. The survey period began October 18 when the helicopter flew to Wekweètì and ended October 27 when the helicopter returned to Yellowknife.

**Table 1.** Daily flying carried out during October 2023 fall composition surveys of Bluenose-East and Bathurst caribou herds.

| Date | Flying Hours and Tasks |
|---|---|
| October 18 | Yellowknife to Wekweètì; 2.0 hours ferry, marginal weather. |
| October 19 | No flying; poor weather, low cloud, snowfall. |
| October 20 | Survey Bluenose-East caribou; 3.1 hours survey, 1.7 hours ferry. |
| October 21 | Survey Bathurst caribou 3.3 hours, 1.8 hours ferry. |
| October 22 | Attempted survey cut short due to poor weather; 0.4 hours ferry. |
| October 23 | Survey Bluenose-East caribou 2.0 hours; cut short due to poor weather; 1.6 hours ferry. |
| October 24 | Survey Bluenose-East caribou 4.5 hours, 1.2 hours Bathurst survey, 1.3 hours ferry. End day at Daring Lake station. |
| October 25 | 3.2 hours survey Bathurst caribou, 0.4 hours ferry. |
| October 26 | 3.8 hours survey Bathurst, 1.8 hours survey Bluenose-East caribou, 4.0 hours ferry. |
| October 27 | Return to Yellowknife; 1.8 hours ferry. |
| Totals | 11.5 hours survey Bathurst caribou; 11.4 hours Bluenose-East caribou survey; 13.4 hours ferry; 36.3 hours total. |

Acasta Heliflight A-Star helicopter C-GTVH was used for the October 2023 caribou surveys (Figure 2) and the pilot was John Buckland. Survey participants as observers and recorders were Judy Williams and Colin-Modeste-Burgin (Figure 3), and Jan Adamczewski. Mathieu Dumond, a videographer from Kugluktuk, flew with the survey crew on October 20 and 21 to record video clips to be used in an educational video on composition surveys. Two bases were used for the fall 2023 surveys because the satellite collars on the Bluenose-East and Bathurst herds were distributed over a wide area. The initial flying between October 20 and 24 was based at Wekweètì, and the helicopter was then based at the GNWT Tundra Ecological Research Station at Daring Lake between October 25 and 26. The last day of flying was October 26 and the helicopter returned to Yellowknife that day.


**Figure 2**. Helicopter used during fall 2023 caribou composition surveys: A-Star B2 C-GTVH with pilot John Buckland, at fuel cache at Little Crapeau Lake.

**Figure 3.** Fall 2023 caribou composition survey participants left to right John Buckland (pilot), Judy Williams and Colin Modeste-Burgin (observers/recorders) with the survey helicopter.

## Survey Conditions

Poor weather constrained the flying on several days; this included low cloud, snowfall and on some occasions freezing drizzle. Strong winds occurred throughout the survey period, sometimes gusting to 40-45 knots/hour. Temperatures were initially near freezing, then grew progressively colder to about -10˚C on the last day. The larger lakes had nearly all open water, with only a few bays with ice. Snow cover was generally thin and patchy (Figure 4),

which sometimes made caribou difficult to see. Snow cover gradually increased over the survey period.

**Figure 4.** Snow conditions during fall composition surveys in October 2023. View of Lupin mine at bottom right. Snow cover was light and patchy initially and increased somewhat during the survey period. Most lakes had primarily open water with some bays and smaller ponds frozen over. Photos J. Adamczewski, GNWT.

## Caribou Group Sizes, Composition and Rutting Behaviour

We saw many cases of prime bulls closely following cows, and we saw a number of cases of prime bulls fighting and smaller bulls fighting. Groups of caribou showed a mix of cows, calves, prime bulls and young bulls and some groups were substantial in number (hundreds and occasionally thousands). These observations suggested that our surveys were timed close to the peak of the breeding season.

## Collared Caribou Movements and Daily Survey Flights

While the October 20-26 survey appeared to occur at peak of breeding, it also coincided with continuing migration of both herds. The general movement was southward but east-west movements also occurred. At times this created challenges in finding the caribou. Survey flying was planned around the most recent collared caribou locations, but we found on a number of occasions that we were flying in areas that had been used recently but no longer had caribou or had very few. In some instances, we were able to obtain more recent collar locations during the day and adjust flying, and in a few instances, we were able to discern the direction of caribou movement from tracks in the snow and find caribou in this manner.

The overall distribution of collared Bathurst, Bluenose-East and Beverly caribou can be seen in Figure 5 which shows collared caribou locations on October 23, about mid-way through the survey flying. Most of the Bluenose-East collared females and males were north of Wekweètì, with some east of Great Bear Lake and several north of Point Lake. Most of the Bathurst collared caribou were between Point Lake and Contwoyto Lake, with a limited area of overlap with the Bluenose-East collared caribou. Nearly all the Beverly collars were in NU, with a few north and east of Contwoyto Lake and the bulk of the collars further east. A few Bathurst collars were near Lac de Gras and one Bathurst bull collar was mixed among much larger numbers of Beverly collars, but there were no Beverly collars among the main Bathurst and Bluenose-East collar distributions.

Further maps show each day's flight lines with collared caribou locations and locations of groups classified for that day. Flying on October 20 targeted primarily the northern end of the Bluenose-East distribution (Figure 6). Flying on October 21 included most of the Bathurst collars between Point Lake and Contwoyto Lake (Figure 7). Flying on October 23 included a central portion of the Bluenose-East distribution (Figure 8). Flying on October 24 included the southern portion of the Bluenose-East distribution and the western portion of the Bathurst caribou distribution (Figure 9); on this day the survey crew began in Wekweètì and ended at the Daring Lake research station. Flying on October 25 included the eastern end of the Bathurst distribution (Figure 10). The last day of survey flying on October 26 included a portion of the Bluenose-East collar distribution and most of the Bathurst collar distribution (Figure 11). All the October 2023 flight lines are shown in Figure 12 along with incidental observations of other large mammals and birds.

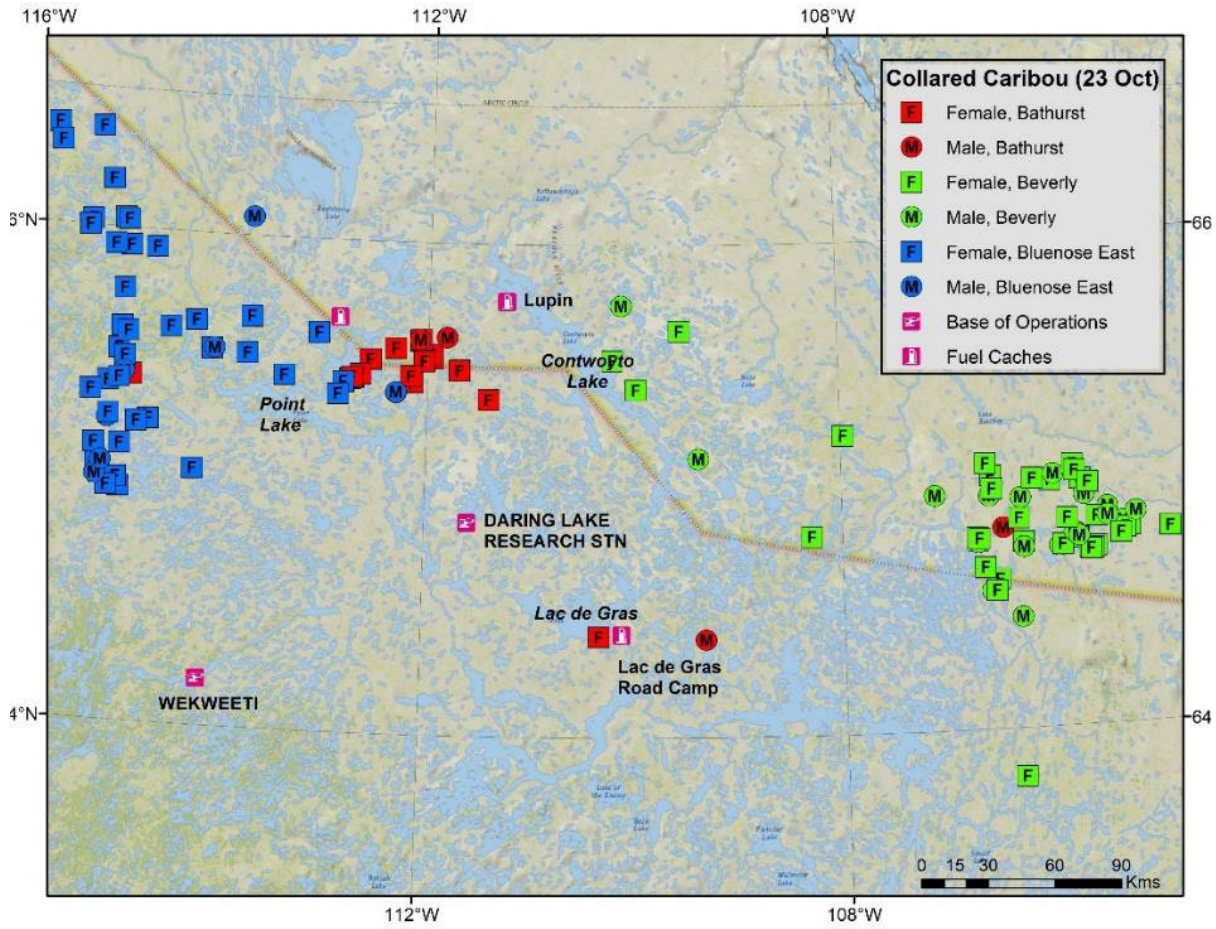



**Figure 5.** Locations of collared Bathurst, Bluenose-East and Beverly caribou on October 23, 2023, midway through the survey period.

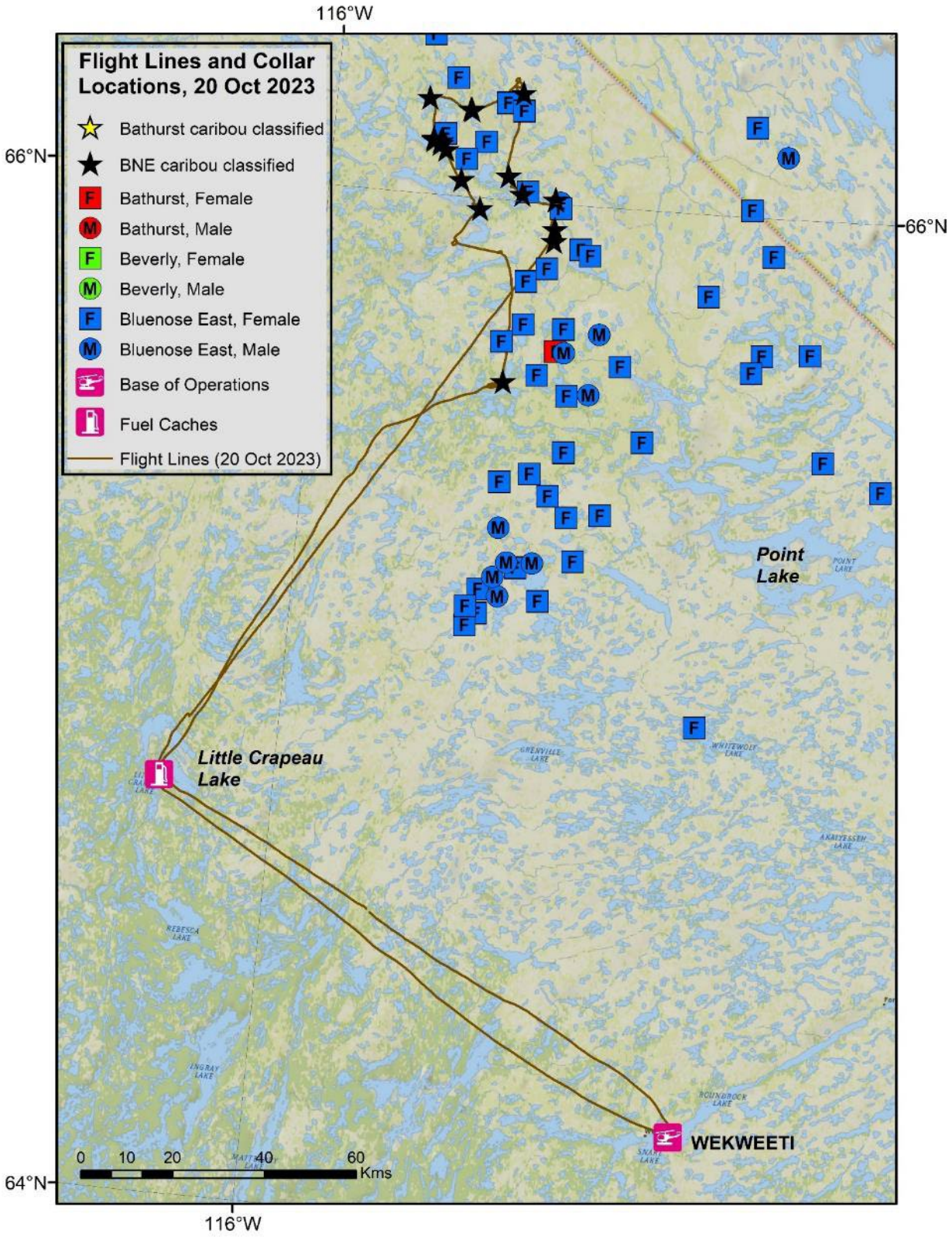



**Figure 6.** Flight lines, collared caribou and caribou groups classified October 20, 2023. Black stars identify groups classified as Bluenose-East caribou.

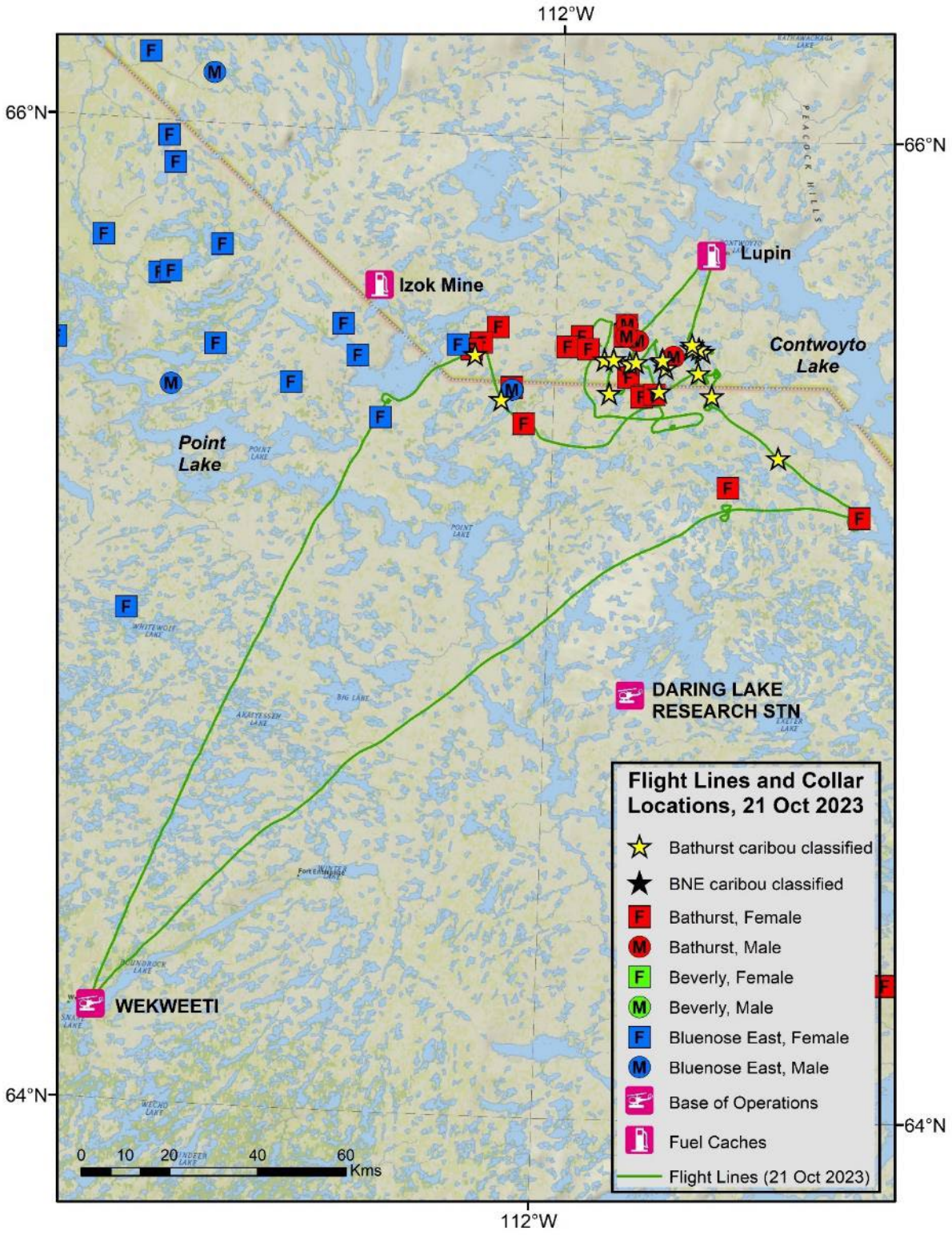



**Figure 7.** Flight lines, collared caribou and caribou groups classified October 21, 2023. Gold stars identify caribou groups classified as part of the Bathurst survey.

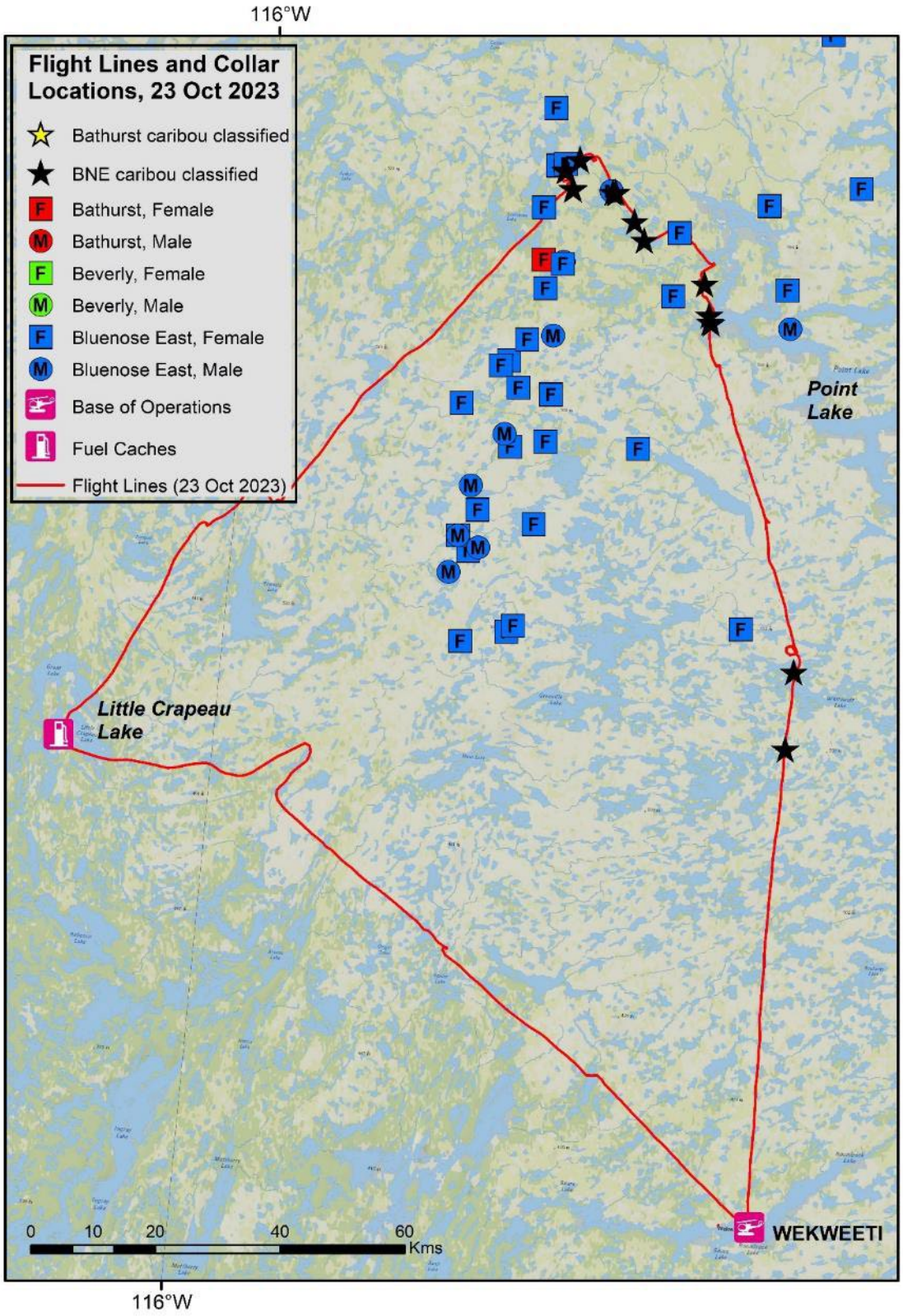



**Figure 8.** Flight lines, collared caribou and caribou groups classified October 23, 2023. Black stars identify caribou groups classified as part of the Bluenose-East survey.

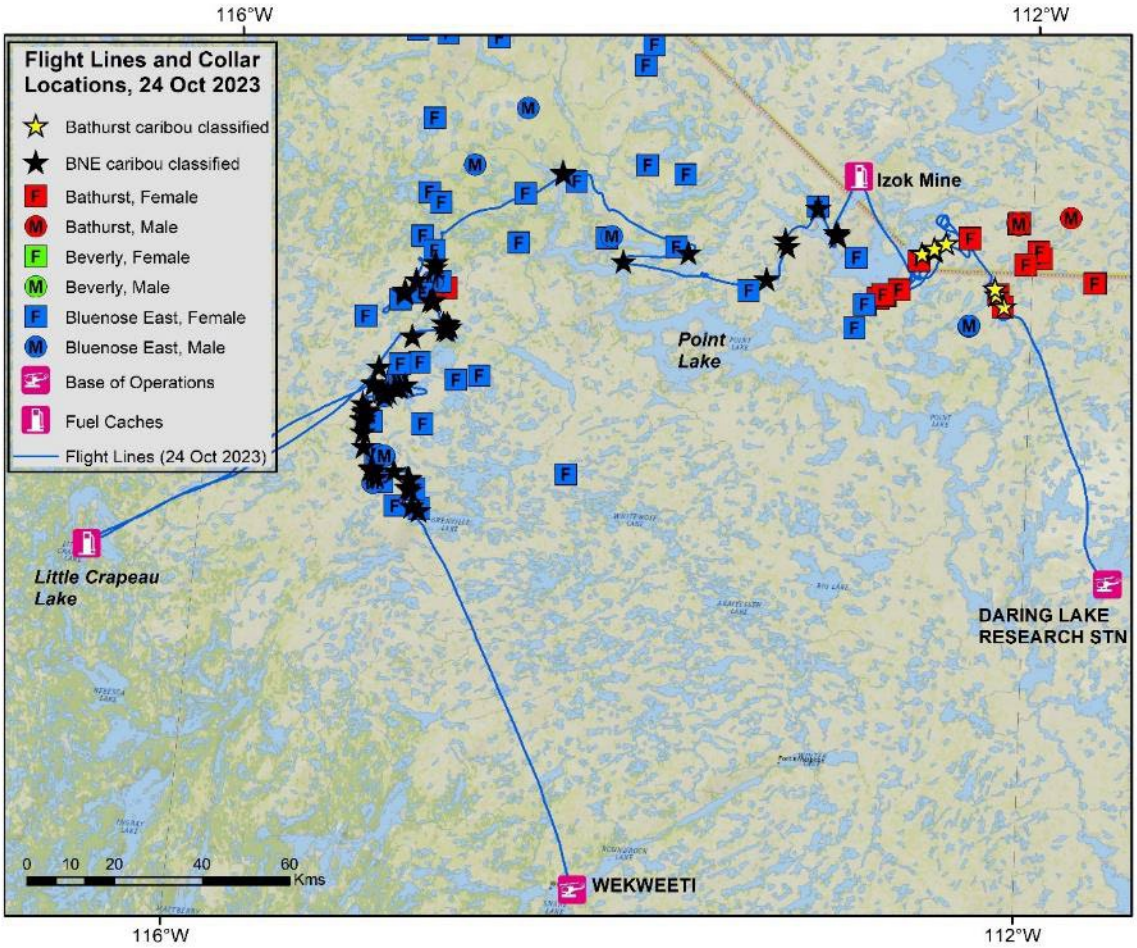



**Figure 9.** Flight lines, collared caribou and caribou groups classified October 24, 2023. Black stars identify caribou groups identified as part of the Bluenose-East survey and gold stars identify groups classified as Bathurst caribou.

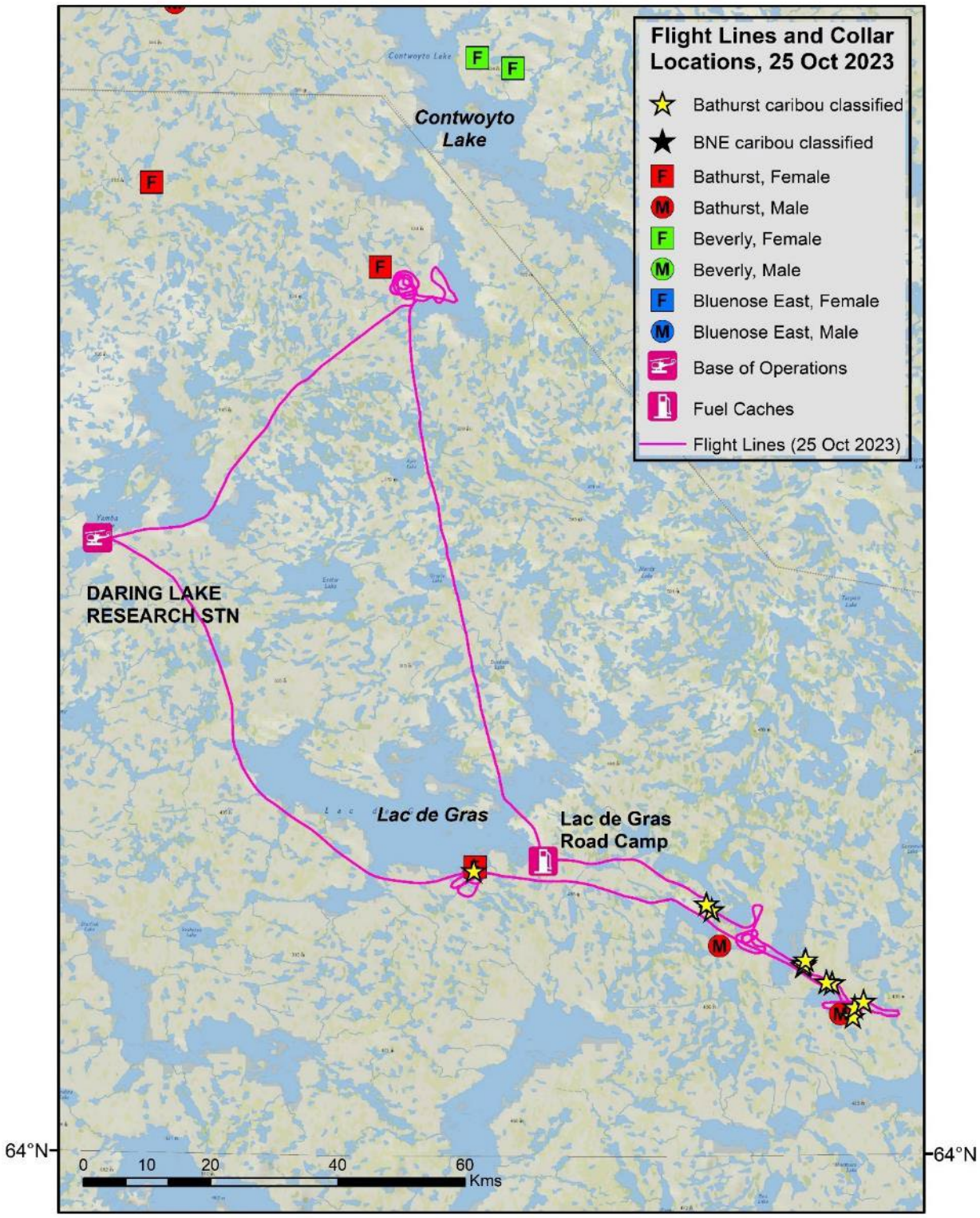



**Figure 10.** Flight lines, collared caribou and caribou groups classified October 25, 2023. Gold stars identify caribou groups classified as part of the Bathurst survey.

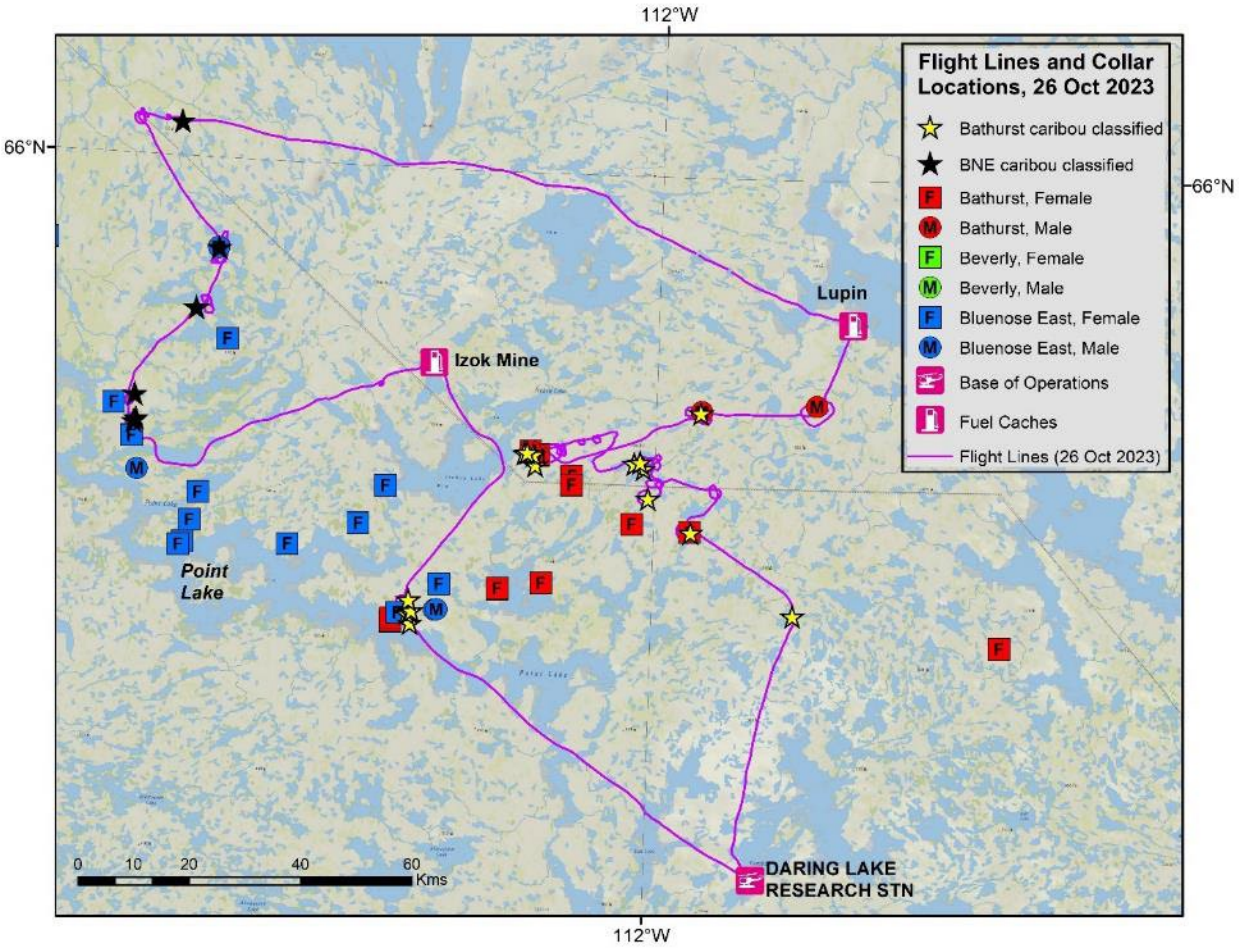



**Figure 11.** Flight lines, collared caribou and caribou groups classified October 26, 2023. Return flight from Daring Lake to Yellowknife is not shown. Black stars identify caribou groups classified as part of the Bluenose-East survey and gold stars identify groups classified as part of the Bathurst survey.

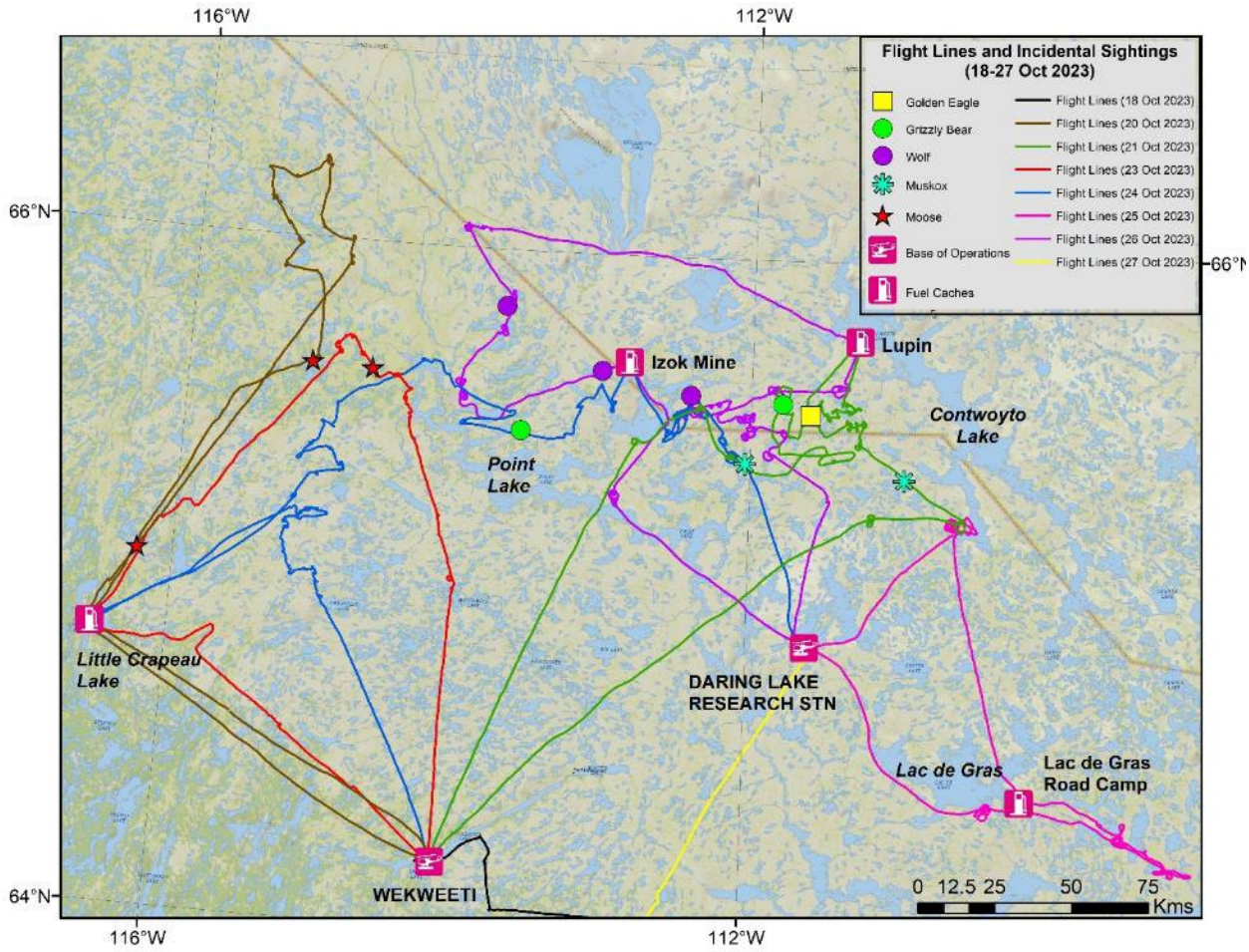



**Figure 12.** Flight lines and incidental sightings October 20-27, 2023 on fall composition surveys.

## Survey Results for Bluenose-East Herd

Numbers of caribou classified, calf: cow ratios and bull: cow ratios for the Bluenose-East herd in October 2023 are shown in Table 2, including results for each day of flying and for the overall survey. In total 2,144 caribou, including calves, were classified. Of this total, 1,730 (80.7%) were classified on October 24, thus the overall estimates of calf-cow and bull-cow ratios primarily reflect the results for that day.

**Table 2.** Results for October 2023 Bluenose-East fall composition survey, by survey day and overall. SE = Standard Error; CIU = 95% Confidence Interval Upper; CIL = 95% Confidence Interval Lower. Ratios were not calculated for October 26 due to very low sample size.

| Measurement | October 20 | October 23 | October 24 | October 26 | Overall |
|---|---|---|---|---|---|
| # Caribou | 254 | 131 | 1,730 | 29 | 2,144 |
| # Cows | 127 | 65 | 826 | 5 | 1,023 |
| # Calves | 56 | 31 | 435 | 4 | 526 |
| # Young Bulls | 31 | 16 | 212 | 1 | 260 |
| # Prime Bulls | 40 | 19 | 257 | 19 | 335 |
| # All Bulls | 71 | 35 | 469 | 20 | 595 |
| # Groups | 18 | 17 | 61 | 6 | 102 |
| Mean Group Size | 11.0 | 5.9 | 21.2 | 4.2 | 15.9 |
| Calves:100 Cows | 44.1 | 47.7 | 52.7 | - | 51.4 |
| SE Calves:100 Cows | 5.1 | 6.1 | 1.6 | - | 1.5 |
| CIL & CIU Calf:Cow | 35.2, 55.3 | 40.2, 64.4 | 49.8, 56.3 | - | 48.8, 54.4 |
| Bulls:100 Cows | 55.9 | 53.8 | 56.8 | - | 58.2 |
| SE Bulls:100 Cows | 7.8 | 12.8 | 3.0 | - | 3.0 |
| CIU & CIL Bull:Cow | 45.3, 75.7 | 34.2, 83.4 | 51.8, 62.9 | - | 53.1, 64.6 |

The overall estimate of 51.4 calves: 100 cows (95%CI 48.8-54.4) was similar to the 52.7 found on October 24 and somewhat higher than estimates on October 20 (44.1) and October 23 (47.7). The overall estimate of 58.2 bulls: 100 cows (53.1-64.6) was similar to the value of 56.8 on October 24 and slightly higher than the values for October 20 (55.9) and October 23 (53.8).

Of the 51 female Bluenose-East collared caribou and 14 male Bluenose-East collared caribou available at the time of the survey, 43 females and 12 males (84.6%) were in or near the groups classified (Table 3). The only other collar mixed in with the Bluenose-East collared caribou sampled was one female Bathurst collar. Given the most recent herd estimates for the Bluenose-East herd of about 39,500 in 2023 (Boulanger et al. 2024) and about 6,800 for the Bathurst herd in 2022 (Adamczewski et al. 2023), the Bluenose-East herd out-numbered the Bathurst by about 5.8:1, thus this one Bathurst collar likely represents a very small proportion of the caribou surveyed as Bluenose-East in October 2023. Based on these collar numbers, the October 2023 fall survey should be strongly representative of the Bluenose-East herd.

**Table 3.** Numbers of Bluenose-East collared females and males in the October 2023 fall survey areas and overall numbers of collared caribou in the herd.

| | Female Bluenose-East | Male Bluenose-East | Total Bluenose-East | Other Collars in Surveyed Area |
|---|---|---|---|---|
| Collars on Herd | 51 | 14 | 65 | |
| Collars in Area Flown October 20 | 12 | 1 | 13 | 0 |
| Collars in Area flown October 23 | 5 | 1 | 6 | 0 |
| Collars in Area flown October 25 | 23 | 8 | 31 | 1 BATH F |
| Collars in Area flown October 26 | 3 | 2 | 5 | 0 |
| Total Collars in Areas Flown | 43 | 12 | 55 | 1 BATH F |

We note however, that on October 20 (254 caribou), October 23 (131 caribou) and October 26 (29 caribou), numbers of Bluenose-East caribou classified were low and below the numbers we expected to see based on collar numbers and the herd's estimated herd size in 2023. We suspect that on these days, we may have missed some larger groups of caribou, most likely due to continuing migratory movement throughout the survey period. The patchy snow conditions made caribou more difficult to see and the sometimes marginal weather (low ceilings, snowfall and fog) also limited our ability to sight caribou groups. The fall 2022 survey of this herd resulted in 2,884 caribou classified (Adamczewski et al. 2024) and the fall 2021 survey of this herd resulted in 4,049 caribou classified (Adamczewski et al. 2022c) with generally similar survey effort. These considerations suggest some caution in interpreting the results of this survey.

Although our helicopter-based survey did not allow for prolonged observation of individual caribou, the caribou we saw on the Bluenose-East survey appeared to be in very good condition, there were many large bulls with large antlers, and some of the calves appeared large and had substantial spike antlers. We observed a number of cases of cows accompanied by two calves and no other caribou nearby, which suggested there may be some cases of twins. It was impossible to assign an overall percentage of twins, however.

## Survey Results for Bathurst Herd

Numbers of caribou classified, calf: cow ratios and bull: cow ratios for the Bathurst herd in October 2023 are shown in Table 4, including results for each day of flying and for the overall survey. In total 2,373 caribou, including calves were classified. Of this total, 1,382 (58.2%) were classified on October 26, thus the overall estimates of calf-cow and bull-cow ratios most strongly reflect the results for that day.

**Table 4.** Results for October 2023 Bathurst fall composition survey, by survey day and overall. SE = Standard Error; CIU = 95% Confidence Interval Upper; CIL = 95% Confidence Interval Lower.

| Measurement | October 21 | October 24 | October 25 | October 26 | Overall |
|---|---|---|---|---|---|
| # Caribou | 295 | 505 | 191 | 1,382 | 2,373 |
| # Cows | 117 | 232 | 71 | 541 | 961 |
| # Calves | 34 | 83 | 25 | 212 | 354 |
| # Young Bulls | 37 | 72 | 38 | 253 | 400 |
| # Prime Bulls | 107 | 118 | 57 | 376 | 658 |
| # All Bulls | 144 | 190 | 95 | 629 | 1,058 |
| # Groups | 18 | 8 | 11 | 16 | 53 |
| Mean Group Size | 14.5 | 52.8 | 15.1 | 73.1 | 38.1 |
| Calves:100 Cows | 29.1 | 35.8 | 35.2 | 39.2 | 36.8 |
| SE Calves:100 Cows | 7.9 | 6.2 | 5.1 | 3.6 | 2.1 |
| CIL & CIU Calf:Cow | 18.3-47.1 | 27.0-42.9 | 24.4-44.8 | 31.9-46.3 | 32.7-40.6 |
| Bulls:100 Cows | 123.1 | 81.9 | 133.8 | 116.3 | 110.1 |
| SE Bulls:100 Cows | 18.6 | 110.7 | 24.4 | 13.4 | 9.9 |
| CIU & CIL Bull:Cow | 100.0-173.9 | 71.3-240.1 | 88.2-183.1 | 86.6-138.7 | 91.7-129.6 |

We attempted to survey areas with most of the Bathurst collars on October 21 (Figure 7) but classified just 295 caribou. It appeared this, in large part, was due to not finding most of the larger groups, which in turn resulted mainly from continuing collared caribou movements. On October 24 we attempted to survey about half the Bathurst collars (Figure 9) and classified 505 caribou, however on that day we also likely missed some of the larger groups for the same reasons. On October 26 we had much better success finding larger groups of Bathurst caribou, including one group that appeared to have at least 2,000 caribou. We estimated there were about 3,000 caribou overall in the areas surveyed that day, likely representing a large proportion of the Bathurst herd. Between October 21 and 26, there was some re-shuffling of the collared Bathurst caribou, and it is likely that caribou groups classified on October 26 included some Bathurst caribou previously surveyed. However, the Bathurst calf: cow ratios and bull: cow ratios were generally consistent across the survey period. We believe the ratios from October 26 were representative of the herd, and those ratios were very similar to the ones that include results from all the Bathurst survey flights.

The overall Bathurst estimate of 36.8 calves: 100 cows (95%CI 32.7-40.6) was similar to the 39.2 found on October 26 with limited variation on the other days of the survey; the ratios were 29.1 on October 21, 35.8 on October 24 and 35.2 on October 25. The overall estimate

of 110.1 bulls: 100 cows (91.7-129.6) was similar to the value of 116.1 on October 26, with values of 123.1 on October 21, 81.9 on October 24, and 133.8 on October 25.

Of the 27 female Bathurst collared caribou and 11 male Bathurst collared caribou available at the time of the survey, only one male collar was not in areas surveyed in October (Figure 5); this male was further east and mixed with multiple Beverly collars. There were no collared caribou from other herds among the nine Bathurst collared caribou surveyed October 24 and 25 (Table 5). The largest portion of the Bathurst caribou surveyed was on October 26. On this day there were 28 Bathurst collared caribou in the areas surveyed and one Bluenose-East female collared caribou. Assuming caribou classified were in proportion to collar representation and relative herd sizes, this would have been about 89% Bathurst caribou and 11% Bluenose-East caribou[3]. On October 21, the caribou classified as Bathurst would have been about 76% Bathurst and 24% Bluenose-East[4]; however, just 295 caribou were classified that day (12% of Bathurst survey). Overall, we estimate that less than 10% of the caribou surveyed as Bathurst had Bluenose-East caribou mixed in, thus the overall Bathurst results should be a strong representation of the herd.

**Table 5.** Numbers of Bathurst collared females and males in the October 2023 fall survey areas and overall numbers of collared caribou in the herd. As noted in text, some Bathurst surveyed October 21 were likely among the caribou surveyed October 26.

| | **Female Bathurst** | **Male Bathurst** | **Total Bathurst** | **Other Collars in Surveyed Area** |
|---|---|---|---|---|
| Collars on Herd | 27 | 11 | 38 | |
| Collars in Area Flown October 21 | 25 | 8 | 33 | 2 BNE F, 1BNE M |
| Collars in Area flown October 24 | 5 | 0 | 5 | 0 |
| Collars in Area flown October 25 | 2 | 2 | 4 | 0 |
| Collars in Area flown October 26 | 20 | 8 | 28 | 1 BNE F |
| Total Collars in Areas Flown | 52 | 18 | 70 | 3 F BNE, 1 M BNE |

As with the Bluenose-East herd, the caribou we saw on the Bathurst survey appeared to be in very good condition, there were many large bulls with large antlers, and some of the calves appeared large and had substantial spike antlers.

[3] 28/38 Bathurst collars x herd size of 6,800 = 5,010 Bathurst caribou present; 1/65 BNE collars x herd size 39,500 = 607 BNE caribou present; 5,010/5,617 caribou = 89% Bathurst caribou present; 11% BNE caribou present.

[4] 33/38 Bathurst collars x herd size of 6,800 = 5,905 Bathurst caribou present; 3/65 BNE collars x herd size of 39,500 = 1,823 BNE caribou present; 5,905/7,728 = 76% Bathurst present; 24% BNE caribou present.

## Incidental Sightings of Other Large Mammals

Incidental sightings of other large mammals and birds during Bluenose-East and Bathurst fall composition surveys in 2023 are listed in Table 6. One grizzly bear was seen on each survey along with seven wolves on the Bluenose-East survey and four wolves on the Bathurst survey.

**Table 6.** Incidental sightings of large mammals and birds on the Bathurst and Bluenose-East October 2023 composition surveys. Numbers in parentheses are group sizes.

| Species | Bathurst | Bluenose-East |
|---|---|---|
| Wolf | 4 (4) | 7 (1,6) |
| Grizzly Bear | 1 | 1 |
| Muskox | 29 (4,25) | 0 |
| Moose | 0 | 6 (1,2,3) |
| Golden Eagle | 1 | 0 |
| Snowy Owl | 1 | 0 |
| Red Fox | 1 | 0 |

# DISCUSSION

## Bluenose-East Survey

To provide context for the 2023 Bluenose-East fall composition survey, fall calf: cow and bull: cow ratios for the herd from 2009-2023 are shown in Figure 13. The calf: cow ratios in October 2020 (51.7), 2021 (49.6), 2022 (52.3) and 2023 (51.4) were very similar and were the highest of the 11 surveys conducted over these years.

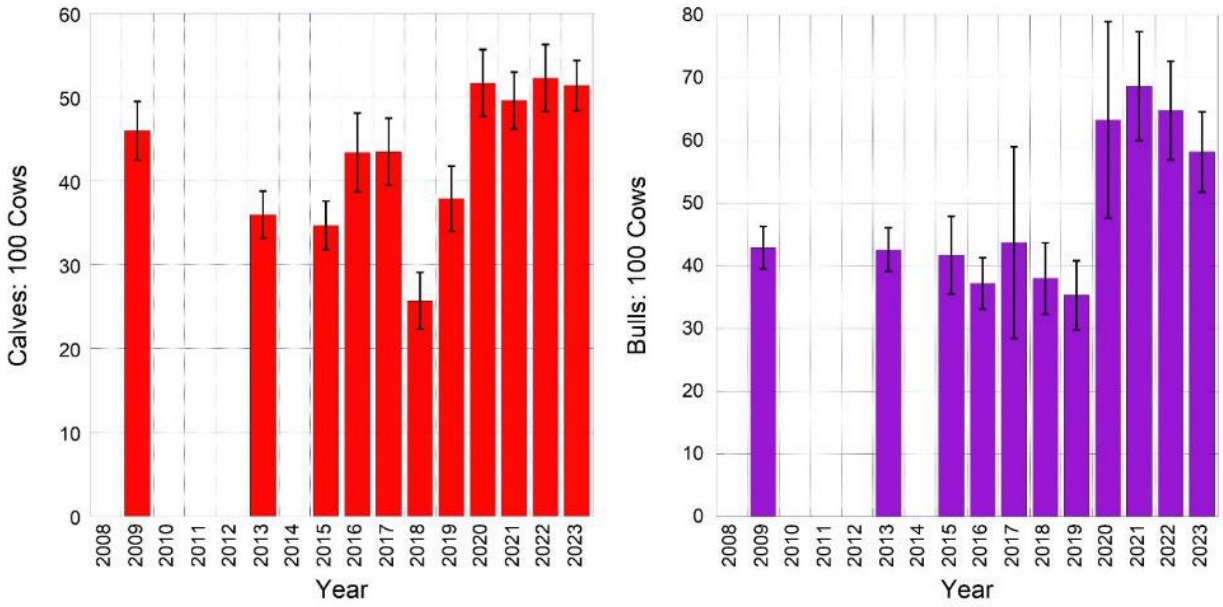



**Figure 13.** Fall calf: cow ratios (left) and bull: cow ratios (right) for the Bluenose-East herd 2009-2023. Means are shown with 95% Upper Confidence Intervals.

Bull: cow ratios between 2009 and 2019 were variable with no clear trend. The bull: cow ratios recorded in October 2020 (63.3), 2021 (68.7) and 2022 (64.8) were similar (Adamczewski et al. 2022b, 2022c; 2024) and were the three highest values estimated in this herd 2009-2023. The estimate for October 2023 (58.2) was slightly lower. This may in part reflect a limited sample size during this survey. We suspect we missed several of the larger rutting groups because of the continuing migration during the survey period. The last period of widespread growth in NWT mainland barren-ground caribou herds was in the early 1980s. The average bull: cow ratio recorded during six fall composition surveys during this period was 66 bulls: 100 cows (in Gunn et al. 1997, p. 35), similar to the Bluenose-East ratios for 2020, 2021 and 2022. Overall, the results of the fall 2023 Bluenose-East survey suggest that the healthy indicators in the herd from 2018-2022 have continued through 2023.

## Comparison with Ekwǫ̀ Nàxoèdee K'è Caribou Monitoring of Bluenose-East Caribou (Sahti Ekwǫ̀) in 2023

The Tłı̨chǫ Government carried out ground-based monitoring of Bluenose-East caribou in fall (September 15 – October 4) of 2023 in the Point Lake (Deèzàatì) area. A summary of observations (courtesy of P. Jacobsen, Tłı̨chǫ Government) is included here to compare with our October 2023 survey of the Bluenose-East herd. A selection of slides presented at a meeting in November 2023 of the Advisory Committee on Cooperation for Wildlife Management (ACCWM – a group of co-management boards in NWT and NU) on Bluenose-East caribou is included as Appendix 1. This appendix also includes slides on Bathurst caribou presented to a December 2023 meeting of the Bathurst Caribou Advisory Committee (BCAC).

The Tłı̨chǫ observers saw a total of 238 caribou in 32 groups in the Point Lake area and interpreted their results as likely not representative of the herd due to low sample numbers. They noted a calf: cow ratio of 60 calves: 100 cows among the caribou they saw. Calves born that June appeared to be growing well and were healthy. Some of the calves they saw had grown large bodies and long antlers, making it challenging to identify them as calves or yearlings. As in 2022, there were high proportions of young bulls and young cows among the caribou seen. Overall, most caribou were healthy and in good or fat condition. This included 25 bulls, all of which (100%) were fat; 27 cows, of which 89% were fat, 7% in good condition, and one skinny; 16 calves, of which 44% were fat and 56% in good condition. Although based on a limited sample, these observations are consistent with Bluenose-East caribou in 2023 being in very good condition.

## Summary of Bluenose-East caribou observations from Kugluktuk Angoniatit Association

A summary of Bluenose-East caribou observations from the Kugluktuk Angoniatit Association (KHTA) was presented to a meeting of the ACCWM in November 2023 and is included as Appendix 2. In brief, the KHTA noted that in 2023, the summer season was very hot and dry, there were a lot of horseflies and small biting insects, but the mosquito season was short. They had good rain in the fall so the vegetation was very healthy. Berries were abundant and bigger than normal. The winds in the past few summers also kept insect harassment to a minimum. Most of the caribou harvests were very healthy, even caribou harvested in June and July. Animals had good amounts of fat.

Trends toward lower summer temperatures and a reduced oestrid (warble fly) index based on the MERRA climate database for the summer range of the Bluenose-East herd were noted by Boulanger et al. (2022), demonstrating a parallel trend between local ground-based observations of environmental trends and metrics based on satellite-based results.

## Bathurst Survey

The ratio of 36.8 calves: 100 cows estimated for the Bathurst herd in October 2023 was similar to the ratios estimated in October 2022 (38.4) and October 2020 (39.1) (Figure 14). These moderate Bathurst calf: cow ratios have consistently been lower than fall ratios in the Bluenose-East herd (mean 51.2 2020-2023, see above). At least in some years, the June composition survey results suggest that early calf mortality may be higher on the Bathurst calving ground than on the Bluenose-East calving ground. In June 2023, a ratio of 86.3 calves: 100 cows in breeding females was estimated for the Bluenose-East herd just before a ratio of 67.1 calves: 100 cows was estimated for the Bathurst herd (Boulanger et al. 2024). A total of 15 grizzly bears were noted during the June 2023 Bluenose-East composition survey and 19 grizzly bears were noted during the June 2023 Bathurst composition survey (Boulanger et al. 2024). If early calf mortality is higher on the Bathurst caving ground than the Bluenose-East, then a lower fall calf: cow ratio should be expected in the Bathurst herd.

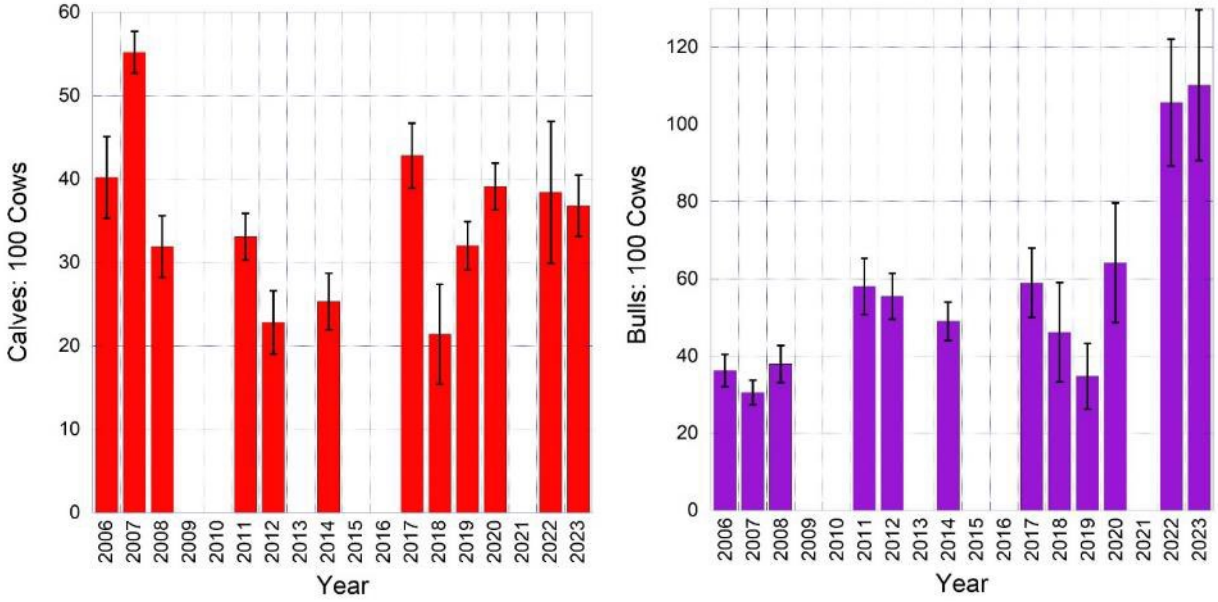



**Figure 14.** Fall calf: cow ratios (left) and bull: cow ratios (right) for the Bathurst herd 2006-2023. Means are shown with 95% Upper Confidence Intervals.

The October 2023 Bathurst ratio of 110.1 bulls: 100 cows was similar to the ratio estimated in October 2022 (105.6; Adamczewski et al. 2024) and substantially higher than the ratio of 64.1 estimated in October 2020 (Adamczewski et al. 2022b). A sex ratio of more bulls than cows is highly unusual in caribou, given that a bull: cow ratio of 50: 100 is common in various kinds of caribou (Bergerud 2000). The fall 2022 estimates for the Bathurst herd were observed in areas having only Bathurst collared cows and bulls present. At the time the very high bull: cow ratio seemed implausible, and we wondered whether this ratio could have resulted from the presence of Beverly caribou that did not have a collar associated with them.

In October 2022, there were 34 collared Beverly caribou (19F, 15M) in a herd estimated at 103,000 in 2018 (Campbell et al. 2019), and we had repeatedly found groups of caribou numbering hundreds or thousands with no collar nearby during October and March composition surveys. A few Beverly collared caribou were not far away from some of the Bathurst collars in October 2022. In October 2023, however, there were 84 Beverly collared caribou (49F, 36M), thus the herd's distribution was much better represented than a year earlier. None of the Beverly collars were mixed with Bathurst collared caribou during the October 2023 surveys, and just one Bathurst collared male was mixed with the Beverly collars (Figure 5).

The very high bull: cow ratios estimated in the Bathurst herd in October 2022 and 2023 may have another explanation: if female caribou were emigrating from the Bathurst calving range to the Beverly calving range, as observed in June 2018, 2019, 2021 and 2023 based on collared cows, but males were not emigrating at the same rate, then the sex ratio could increase due to these differing movement rates. We carried out an initial analysis of fidelity of collared bulls to their summer ranges in July (Boulanger et al. unpublished). Collared bulls are normally assigned to a herd based on their locations in July, because bulls are usually most clearly spatially separate at that time. We looked for directional movements of collared bulls from one year to the next, using known bull collars in the Bathurst, Bluenose-East and Beverly herds. This was analogous to looking for fidelity or switching of collared cows in June. Collared bulls in the three herds showed strong fidelity to their summer ranges in July. Sample numbers of collared bulls were much lower than for collared cows. This initial analysis suggested that emigration of Bathurst cows to the Beverly range was not matched by emigration of Bathurst bulls. Differential emigration could over a number of years result in an elevated bull: cow ratio in the Bathurst herd. Integrated Population Model analyses carried out as part of the June 2023 calving ground surveys of the Bluenose-East and Bathurst herds composition (Boulanger et al. 2024) suggested that the recent increase in the Bathurst bull: cow ratio was likely due to a combination of higher bull survival rates, moderate productivity as well as potential differential emigration of bulls and cows to the Beverly herd.

Counts of caribou observed on the Bathurst and Bluenose-East October 2023 surveys are included in Appendix 3.

### Comparison with Ekwǫ̀ Nàxoèdee K'è Caribou Monitoring of Bathurst Caribou (Kokètì Ekwǫ̀) in 2022

The Tłı̨chǫ Government carried out ground-based monitoring of Bathurst caribou (Kokètì Ekwǫ̀) in summer and fall 2016-2023 in the Kokètì (Contwoyto Lake) area, and in the Ek'atì (Lac de Gras) area in 2022. A summary of trends is included here (courtesy of P. Jacobsen, Tłı̨chǫ Government) to compare with survey-based information recorded by ECC biologists and summarized in this report. A selection of slides from P. Jacobsen on Bathurst caribou

presented at a BCAC meeting in December 2023 and on Bluenose-East caribou at an ACCWM meeting in November 2023 is included as Appendix 1. The 2023 summer and fall Tłı̨chǫ observation program was hampered by the exceptional fire season, including widespread smoke, tundra fires and fire evacuations.

Based on observations in July and August, a total of 253 Bathurst caribou in 72 groups were seen. Group sizes were small and mostly bulls (45.8%). In July and August, caribou were, overall, in healthy and good condition, and caribou were becoming fat in August. Out of 102 bulls in 32 groups, 51% were fat and 48 observed as good condition and 1 bull observed as thin. Of 35 cows in 18 groups, 23% were scored as fat, 74% as good condition and 1 skinny. Of 20 calves, 20% were fat and 80% in good condition, and no thin calves. A calf: cow ratio of 51.2 calves: 100 cows was estimated but this was based on just 23 cows and 13 calves, a limited sample not likely representative of the herd overall. Overall, recognizing the limited sample size, the Tłı̨chǫ observations suggest Bathurst caribou were in generally good condition in summer and fall 2023.

# ACKNOWLEDGEMENTS

We would like to thank John Buckland of Acasta HeliFlight Inc., who flew the A-Star helicopter skillfully and safely on these surveys and was a pleasure to work with.

A warm thank-you to Petter Jacobsen from the Tłı̨chǫ Government, who provided summaries of Ekwǫ̀ Nàxoèdee K'è caribou monitoring carried out by the Tłı̨chǫ Government based on observations of Bathurst and Bluenose-East caribou in summer and fall. Amanda Dumond, manager of the Kugluktuk Angoniatit Association, kindly provided the summary on Bluenose-East caribou observations presented to the Advisory Committee for Cooperation on Wildlife Management in November 2023.

Funding for these surveys was provided by the Government of the Northwest Territories.

# LITERATURE CITED


Adamczewski, J., A. Gunn, K.G. Poole, A. Hall, J. Nishi and J. Boulanger. 2015. What Happened to the Beverly Caribou Herd after 1994? Arctic 68: 407-421.

Adamczewski, J., J. Boulanger, H. Sayine-Crawford, J. Nishi, D. Cluff, J. Williams and L.M. LeClerc. 2019. Estimates of breeding females & adult herd size and analyses of demographics for the Bathurst herd of barren-ground caribou: 2018 calving ground photographic survey. Environment and Natural Resources, Government of the Northwest Territories. Manuscript Report 279.

Adamczewski, J., J. Boulanger, J. Williams, D. Cluff, K. Clark, J. Nishi, S. Goodman, K. Chan and R. Abernethy. 2022a. Estimates of breeding females & adult herd size and analyses of demographics for the Bathurst herd of barren-ground caribou: 2021 calving ground photographic survey. Environment and Natural Resources, Government of the Northwest Territories. Manuscript Report 326.

Adamczewski, J., D. Cluff, J. Williams and J. Boulanger. 2022b. October 2020 fall composition surveys of Bathurst and Bluenose-East barren-ground caribou herds. Environment and Natural Resources, Government of the Northwest Territories. Manuscript Report 298.

Adamczewski, J., J. Williams and J. Boulanger. 2022c. October 2021 fall composition survey of Bluenose-East barren-ground caribou herd. Environment and Natural Resources, Government of Northwest Territories. Manuscript Report 301.

Adamczewski, J., J. Boulanger, J. Williams, D. Cluff and K. Clark. 2023. June 2022 calving ground surveys: Bathurst and Bluenose-East barren-ground caribou herds. Environment and Natural Resources, Government of Northwest Territories. Manuscript Report 308.

Adamczewski, J., J. Williams, D. Cluff and C. Modeste-Burgin. 2024. Fall 2022 composition surveys of Bathurst, Bluenose-East, and Beverly barren-ground caribou herds. Environment and Climate Change, Government of Northwest Territories. Manuscript Report (In Prep.).

Bergerud, A.T. 2000. Chapter 31, Caribou. In S. Desmarais and p. R. Krausman (editors): Ecology and management of large mammals in North America. Prentice-Hall, NJ.

Boulanger, J., J. Adamczewski, J. Nishi, D. Cluff, J. Williams, H. Sayine-Crawford and L. M. LeClerc. 2019. Estimates of breeding females & adult herd size and analyses of demographics for the Bluenose-East herd of barren-ground caribou: 2018 calving ground photographic survey. Environment and Natural Resources, Government of the Northwest Territories. Manuscript Report 278.

Boulanger, J. J. Adamczewski, J. Williams, D. Cluff, K. Clark, S. Goodman, K. Chan and R. Abernethy. 2022. Estimates of breeding females & adult herd size and analyses of demographics for the Bluenose-East herd of barren-ground caribou: 2021 calving ground photographic survey. Environment and Natural Resources, Government of the Northwest Territories. Manuscript Report 325.

Boulanger, J., J. Adamczewski, J. Williams, S. Goodman, K. Clark, R. Abernethy and L.M. Leclerc. 2024. June 2023 calving ground surveys: Bluenose-East and Bathurst herds. Environment and Natural Resources, Government of the Northwest Territories. Manuscript Report (In Prep.)

Campbell, M., D.S. Lee and J. Boulanger. 2019. Abundance Trends of the Beverly Mainland Migratory Subpopulation of Barren-ground Caribou (*Rangifer tarandus groenlandicus*): June 2011-June 2018. Department of Environment, Government of Nunavut. Technical Report Series No: 01-2-18.

ENR and Tłı̨chǫ Government. 2019a. Government of the Northwest Territories and Tłı̨chǫ Government Joint Proposal on Management Actions for the Bathurst Ekwǫ̀ (Barren-ground caribou) Herd: 2019-2021. www.wrrb.ca/sites/default/files/TG%20ENR%20Joint%20Management%20Proposal%20for%20BATH%202019_0.pdf.

ENR and Tłı̨chǫ Government. 2019b. Government of the Northwest Territories and Tłı̨chǫ Government Joint Proposal on Management Actions for the Bluenose-East ʔekwǫ (Barren-ground caribou) Herd 2019-2021. www.wrrb.ca/sites/default/files/TG%20ENR%20Joint%20Management%20Proposal%20for%20BNE%202019.pdf.

Gunn, A., J. Dragon and J. Nishi. 1997. Bathurst Calving Ground Survey 1996. Resources, Wildlife and Economic Development, Government of Northwest Territories. File Report 119.

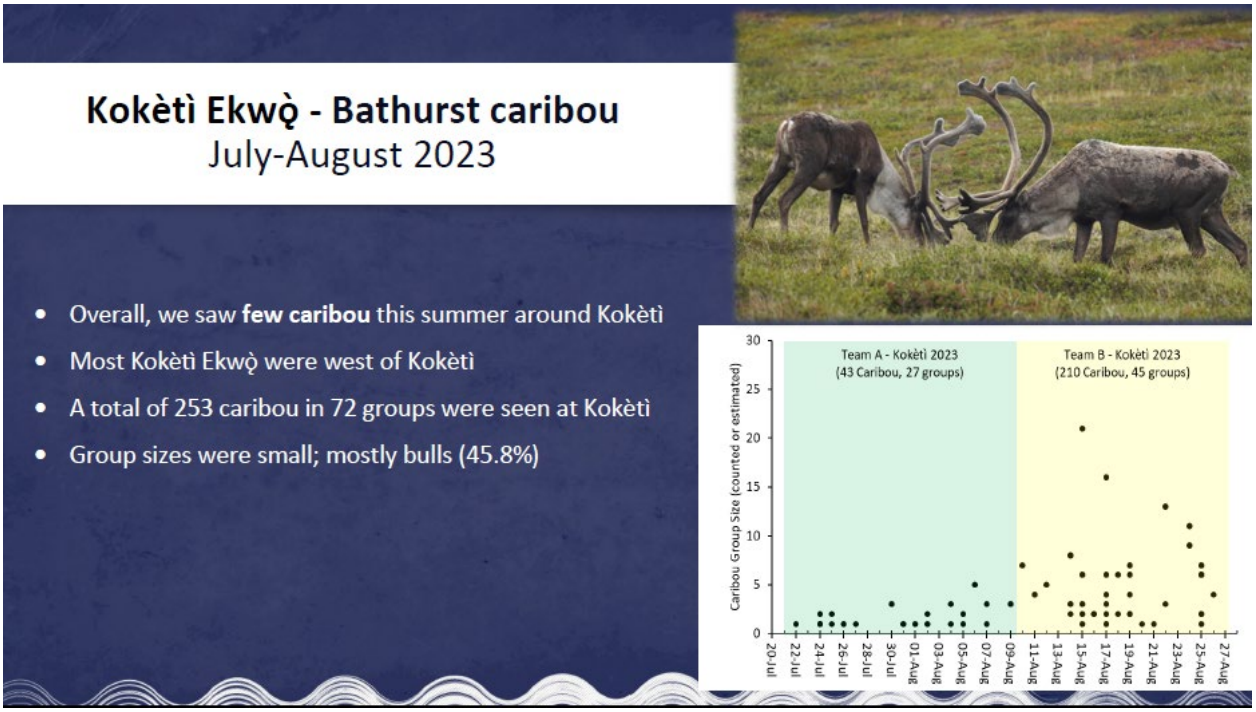
Nagy, J., D.L. Johnson, N.C. Larter, M. Campbell, A.E. Derocher, A. Kelly, M. Dumond, D. Allaire and B. Croft. 2011. Subpopulation structure of caribou (*Rangifer tarandus L.*) in Arctic and subarctic Canada. Ecological Applications 21: 2,334-2,348.

WRRB (Wek'èezhìı Renewable Resources Board). 2019a. Report on a Public Hearing held by the Wek'èezhìı Renewable Resources Board 9-11 April 2019 in Behchokǫ̀, NWT and Reasons for Decisions Related to a Joint Proposal for the Management of the Sahtú Ekwǫ̀ (Bluenose-East Caribou) Herd. June 18, 2019. www.wrrb.ca/public-information/archives?f%5B0%5D=field_proceeding%3A7599&f%5B1%5D=field_category%3A23.

WRRB (Wek'èezhìı Renewable Resources Board). 2019b. Reasons for Decisions Related to a Joint Proposal for the Management of the Kǫ̀kèetì ekwǫ̀ (Bathurst Caribou) Herd. October 4, 2019. www.wrrb.ca/public-information/public-registry?f%5B0%5D=field_proceeding%3A8290&f%5B1%5D=field_category%3A23.

# APPENDIX 1.

## OBSERVATIONS FROM EKWỌ̀ NÀXOÈDEE K'È CARIBOU MONITORING OF KOKÈTÌ EKWỌ (BATHURST CARIBOU) AND SAHTÌ EKWỌ (BLUENOSE-EAST CARIBOU) UPDATED TO 2023 (Courtesy P. Jacobsen, Tłı̨chǫ Government)



# Body Condition

In July and August; most caribou were in overall in healthy and good condition. In August; caribou were becoming fat

- Out of 102 bulls in 32 groups observed; 51% of bulls were fat and 48 % were good condition, 1 bull observed as thin.
- Of 35 cows in 18 groups; only 23% scored were fat, while 74% were in good condition, and 1 cow was skinny
- Of 20 calves: 20% were fat and 80% in good condition. No thin calves.

**Injuries:** out of 253 caribou seen in July and August, no lameness, limping or foot injuries were observed

**Bulls**

| Groups | Fat | Good | Thin | Total |
|---|---|---|---|---|
| 32 | 52 | 49 | 1 | 102 |
| | 51% | 48% | 1% | 100% |

**Cows**

| Groups | Fat | Good | Thin | Total |
|---|---|---|---|---|
| 18 | 8 | 26 | 1 | 35 |
| | 23% | 74% | 3% | 100% |

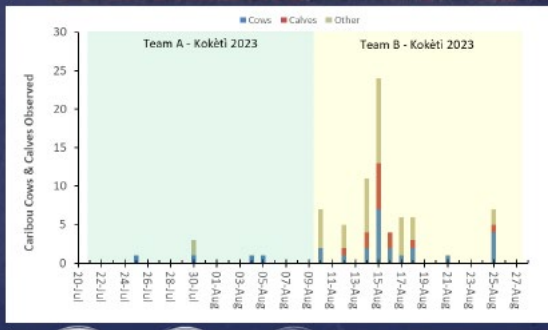
**Calves**

| Groups | Fat | Good | Thin | Total |
|---|---|---|---|---|
| 13 | 4 | 16 | 0 | 20 |
| | 20% | 80% | 0% | 100% |

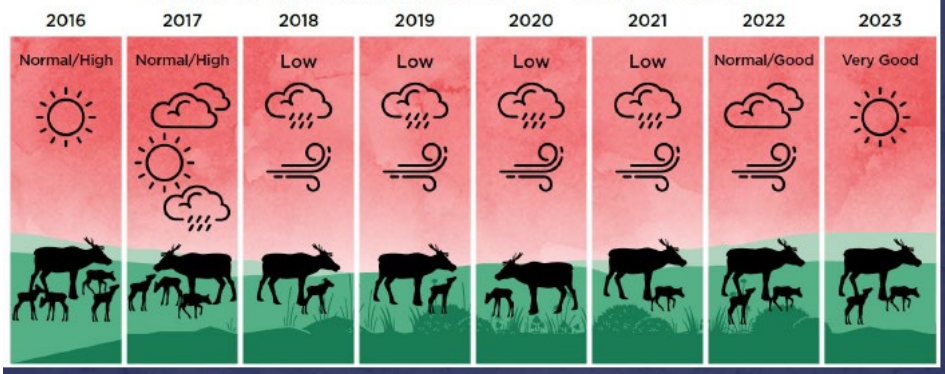
# Kokètì Ekwǫ̀ Cows and Calves

- Estimated **51.2 calves per 100 cows** (SE 13.2) based on 16 caribou groups (23 cows and 13 calves).
  - This ratio is **very good** for late summer: shows that many calves survive during spring & summer
- Estimate is likely **not representative** of the Bathurst herd due to **small sample size** and few animals observed
- On August 26, 2023 – saw a cow with 2 calves; possibly twins

*"In August; many of the cows and calf groups observed had a 1:1 ratio; indicating good population growth"*
-John F. Koadloak



# Calf Abundance Over Time




Tłı̨chǫ Ndek'àowo
Tłı̨chǫ Government

2019 – we observed 89 groups, and counted ***31 calves per 100 cows***

2020 – we observed 37 groups, and counted ***29 calves to 100 cows***

2021 – we observed 69 groups, and counted ***39 calves to 100 cows***

2022 – we observed 44 groups, and counted ***48 calves to 100 cows***

2023 – we observed 16 groups and counted ***51 calves to 100 cows***

- The good habitat (2018-21) and caribou health provides the necessary environmental conditions for the population to grow, but many groups had few calves until,
- Summer 2022 and 2023 we observed groups with more calves

Tłı̨chǫ Ndek'àowo
Tłı̨chǫ Government

# Sahtì Ekwǫ̀

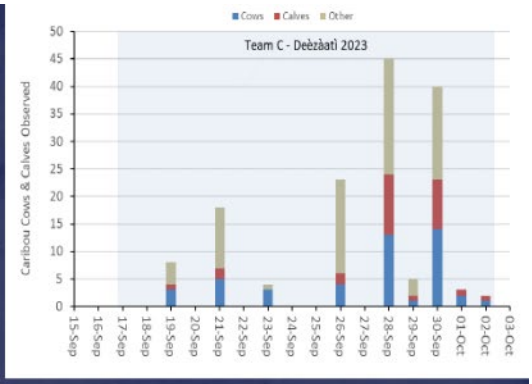
## Bluenose East Caribou

Deèzàatì – Point Lake
September & October 2023

# Sahtì Ekwǫ

One team at Deèzàatì (Point Lake) September 15 - October 4

Total of 238 caribou were observed in 32 groups. Most groups were small, no larger herds.




Estimated an average calf: cow ratio of **60 calves per 100 cows** (± 10 SE).

- This ratio suggests **high calf** survival through spring and summer.
- Often challenging to differentiate calf from yearling
- Calves born in June have been **growing well and are healthy**.

Likely not representative of the herd due to small sample of caribou groups: based on 46 cows and 28 calves.

**Tsıa (calves) –** grown large bodies and long antlers by September

## *Tsıdaa* and *Yagoa*

Tłı̨chǫ Ndek'àowo
Tłı̨chǫ Government

In 2022, we saw a **high proportion of *tsıdaa and yagoa*** (young bull & young cows).

In September 2023, we continued to see **many young caribou**

Good sign to see high proportion of young caribou: *yagoo and yagoa*. Indicate that most calves and yearlings survive overwinter

*"You can tell all caribou around here are young, because of the way they are moving. They are moving fast – bouncing & trotting"*
*-Joe Zoe*

In 2022 we saw many fat and healthy bulls; with big antlers and big bellies. In 2023, did not see any large bulls around Deèzàatì

## Body Condition & Health – September 2023

Overall, most caribou were healthy and in good & fat body condition.

- Of 25 bulls in 10 groups observed; all the bulls (100%) were fat, no skinny bulls
- Of 27 cows in 12 groups; 89% were fat, and 7% in good condition. 1 skinny cow was noted.
- Of 16 calves in 9 groups; 44% were fat, and 56% in good condition. No thin calves were seen.

## Injured BNE caribou at Deèzàatì - October 2023

- One cow had an injured back left hoot.
- She had taken refuge by the shoreline by herself. When we approached by boat, the cow was limping slowly and carefully only a few meters away, then stopped.
- The foot was very swollen, and she did not put any weight on the hoof.
- The animal had likely been injured for a long time; she was skinny, and her tail was down even though she was afraid of us.



# APPENDIX 2.

## 2023 SUMMARY OF BLUENOSE-EAST CARIBOU OBSERVATIONS FROM KUGLUKTUK ANGONIATIT ASSOCIATION

The following summary was provided in March 2024 by Amanda Dumond, Manager of the Kugluktuk Angoniatit Association in Kugluktuk, NU. It was presented to a meeting of the Advisory Committee for Cooperation on Wildlife Management (ACCWM) in November 2023 on status of Bluenose-East caribou and is included as written:

**Kugluktuk Angoniatit Association ●Hunters' & Trappers' Organization**
PO Box 309, Kugluktuk NU X0B 0E0 ● Phone: (867) 982-4908 ● Email: kugluktuk@krwb.ca

For the past number of years, Kugluktuk community members have seen an increase in the Bluenose East caribou. This includes more caribou overall but also a higher number of calves, with many cows with twins. Observations over the past few years have also shown many surviving yearlings and lots of young and adult bulls.

Smaller herds were observed, especially during the fall.

The grizzly bear population has been increasing for a number of years throughout the Bluenose East caribou range. Wolves continue to be a huge presence.

In prior years leading up to 2023, we had cool temperatures and dry vegetation due to little rain throughout the summer. This led to a shorter mosquito (and other insects) season. In 2023, the summer season was very hot and dry, there were a lot of horseflies and small biting insects, but the mosquito season was short. We had good rain in the fall so the vegetation was very healthy. Berries were abundant and bigger than normal. The winds in the past few summers also kept the insect harassment to a minimum.

Most of the caribou harvests were very healthy, even caribou harvested in June and July. Animals had good amounts of fat. The hides in the fall were very nice.

# APPENDIX 3A.

## OCTOBER 2023 BATHURST CARIBOU COMPOSITION SURVEY GROUP OBSERVATIONS

| Date & Time | Latitude | Longitude | Cows | Calves | Small Bulls | Prime Bulls | Bulls Total | All Caribou |
|---|---|---|---|---|---|---|---|---|
| 21/10/2023 1:03:21 PM | 65.551162 | -111.755126 | 25 | 14 | 7 | 17 | 24 | 63 |
| 21/10/2023 10:08:12 AM | 65.356973 | -110.893758 | 0 | 1 | 0 | 3 | 3 | 4 |
| 21/10/2023 10:22:53 AM | 65.481346 | -111.223996 | 1 | 0 | 0 | 6 | 6 | 7 |
| 21/10/2023 10:42:31 AM | 65.528013 | -111.292729 | 0 | 0 | 0 | 2 | 2 | 2 |
| 21/10/2023 10:50:28 AM | 65.489181 | -111.482401 | 1 | 0 | 0 | 2 | 2 | 3 |
| 21/10/2023 10:56:30 AM | 65.547775 | -111.599842 | 7 | 0 | 1 | 1 | 2 | 9 |
| 21/10/2023 11:08:13 AM | 65.550120 | -111.475449 | 44 | 9 | 18 | 37 | 55 | 108 |
| 21/10/2023 11:08:51 AM | 65.553083 | -111.468378 | 2 | 1 | 0 | 1 | 1 | 4 |
| 21/10/2023 11:11:07 AM | 65.537524 | -111.453153 | 2 | 1 | 0 | 1 | 1 | 4 |
| 21/10/2023 11:26:39 AM | 65.571170 | -111.273522 | 3 | 1 | 0 | 1 | 1 | 5 |
| 21/10/2023 11:27:43 AM | 65.577812 | -111.292360 | 0 | 0 | 0 | 1 | 1 | 1 |
| 21/10/2023 11:29:59 AM | 65.578479 | -111.324413 | 0 | 0 | 0 | 3 | 3 | 3 |
| 21/10/2023 11:32:16 AM | 65.586007 | -111.325879 | 1 | 0 | 1 | 4 | 5 | 6 |
| 21/10/2023 12:47:13 PM | 65.544217 | -111.630224 | 4 | 1 | 3 | 4 | 7 | 12 |
| 21/10/2023 12:52:21 PM | 65.483093 | -111.727168 | 2 | 1 | 0 | 2 | 2 | 5 |
| 21/10/2023 12:57:21 PM | 65.551994 | -111.709958 | 22 | 4 | 3 | 20 | 23 | 49 |
| 21/10/2023 2:02:04 PM | 65.463146 | -112.256798 | 3 | 1 | 2 | 1 | 3 | 7 |
| 21/10/2023 2:12:14 PM | 65.553701 | -112.392554 | 0 | 0 | 2 | 1 | 3 | 3 |
| 24/10/2023 4:09:30 PM | 65.543573 | -112.486213 | 138 | 49 | 45 | 49 | 94 | 281 |
| 24/10/2023 4:15:37 PM | 65.534573 | -112.549136 | 0 | 0 | 0 | 5 | 5 | 5 |
| 24/10/2023 4:22:54 PM | 65.557845 | -112.431570 | 64 | 22 | 14 | 33 | 47 | 133 |
| 24/10/2023 4:30:05 PM | 65.541657 | -112.489314 | 0 | 0 | 1 | 6 | 7 | 7 |
| 24/10/2023 4:30:55 PM | 65.546669 | -112.488440 | 0 | 0 | 0 | 5 | 5 | 5 |
| 24/10/2023 4:59:21 PM | 65.456375 | -112.174192 | 4 | 0 | 2 | 1 | 3 | 7 |
| 24/10/2023 5:02:14 PM | 65.468505 | -112.181982 | 25 | 11 | 10 | 19 | 29 | 65 |
| 24/10/2023 5:10:01 PM | 65.432139 | -112.134766 | 1 | 1 | 0 | 0 | 0 | 2 |
| 25/10/2023 1:00:17 PM | 64.244090 | -109.165431 | 7 | 2 | 5 | 10 | 15 | 24 |
| 25/10/2023 1:03:13 PM | 64.246018 | -109.183497 | 16 | 5 | 12 | 20 | 32 | 53 |
| 25/10/2023 1:07:19 PM | 64.277626 | -109.250559 | 4 | 3 | 6 | 4 | 10 | 17 |
| 25/10/2023 1:08:36 PM | 64.271976 | -109.256827 | 8 | 2 | 4 | 5 | 9 | 19 |
| 25/10/2023 1:09:09 PM | 64.269084 | -109.258862 | 5 | 0 | 0 | 1 | 1 | 6 |
| 25/10/2023 1:31:59 PM | 64.349168 | -109.555053 | 0 | 0 | 1 | 0 | 1 | 1 |
| 25/10/2023 1:33:25 PM | 64.357670 | -109.571859 | 0 | 0 | 2 | 0 | 2 | 2 |
| 25/10/2023 12:14:01 PM | 64.404829 | -110.332138 | 1 | 0 | 0 | 0 | 0 | 1 |
| 25/10/2023 12:35:09 PM | 64.209932 | -109.092553 | 5 | 2 | 0 | 4 | 4 | 11 |
| 25/10/2023 12:45:25 PM | 64.196835 | -109.099560 | 20 | 9 | 6 | 12 | 18 | 47 |

| Date & Time | Latitude | Longitude | Cows | Calves | Small Bulls | Prime Bulls | Bulls Total | All Caribou |
|---|---|---|---|---|---|---|---|---|
| 25/10/2023 12:50:09 PM | 64.217896 | -109.064199 | 5 | 2 | 2 | 1 | 3 | 10 |
| 26/10/2023 10:04:26 AM | 65.426693 | -111.854906 | 7 | 4 | 1 | 5 | 6 | 17 |
| 26/10/2023 10:25:51 AM | 65.480090 | -112.023769 | 16 | 10 | 14 | 25 | 39 | 65 |
| 26/10/2023 10:41:09 AM | 65.528234 | -112.044720 | 0 | 0 | 0 | 1 | 1 | 1 |
| 26/10/2023 10:44:32 AM | 65.538128 | -112.059031 | 0 | 0 | 0 | 4 | 4 | 4 |
| 26/10/2023 10:45:40 AM | 65.535696 | -112.081770 | 2 | 0 | 3 | 1 | 4 | 6 |
| 26/10/2023 11:25:44 AM | 65.547658 | -112.500222 | 118 | 45 | 67 | 101 | 168 | 331 |
| 26/10/2023 11:28:25 AM | 65.546464 | -112.510632 | 27 | 11 | 9 | 20 | 29 | 67 |
| 26/10/2023 11:36:02 AM | 65.527829 | -112.468011 | 88 | 24 | 26 | 49 | 75 | 187 |
| 26/10/2023 11:39:50 AM | 65.544504 | -112.476189 | 53 | 17 | 12 | 21 | 33 | 103 |
| 26/10/2023 11:56:04 AM | 65.620401 | -111.827174 | 0 | 0 | 0 | 7 | 7 | 7 |
| 26/10/2023 4:17:08 PM | 65.282574 | -112.931554 | 4 | 1 | 2 | 1 | 3 | 8 |
| 26/10/2023 4:19:28 PM | 65.279529 | -112.942013 | 17 | 14 | 6 | 12 | 18 | 49 |
| 26/10/2023 4:22:47 PM | 65.284442 | -112.924889 | 4 | 1 | 2 | 1 | 3 | 8 |
| 26/10/2023 4:25:51 PM | 65.301736 | -112.937754 | 0 | 0 | 1 | 0 | 1 | 1 |
| 26/10/2023 4:51:32 PM | 65.264137 | -112.928923 | 198 | 83 | 110 | 128 | 238 | 519 |
| 26/10/2023 9:48:50 AM | 65.295862 | -111.452707 | 7 | 2 | 0 | 0 | 0 | 9 |

# APPENDIX 3B.

## OCTOBER 2023 BLUENOSE-EAST CARIBOU COMPOSITION SURVEY GROUP OBSERVATIONS

| Date & Time | Latitude | Longitude | Cows | Calves | Small Bulls | Prime Bulls | Bulls Total | All Caribou |
|---|---|---|---|---|---|---|---|---|
| 21/10/2023 1:03:21 PM | 65.551162 | -111.755126 | 25 | 14 | 7 | 17 | 24 | 63 |
| 20/10/2023 1:15:34 PM | 65.645786 | -115.090941 | 1 | 0 | 0 | 3 | 3 | 4 |
| 20/10/2023 1:43:19 PM | 65.979838 | -115.267005 | 7 | 3 | 1 | 4 | 5 | 15 |
| 20/10/2023 1:48:43 PM | 66.033487 | -115.367855 | 24 | 11 | 5 | 4 | 9 | 44 |
| 20/10/2023 1:53:09 PM | 66.089768 | -115.453158 | 14 | 5 | 3 | 4 | 7 | 26 |
| 20/10/2023 1:57:44 PM | 66.100236 | -115.482515 | 6 | 4 | 2 | 3 | 5 | 15 |
| 20/10/2023 1:58:47 PM | 66.105489 | -115.481908 | 10 | 3 | 0 | 5 | 5 | 18 |
| 20/10/2023 2:01:09 PM | 66.110293 | -115.516799 | 3 | 3 | 0 | 0 | 0 | 6 |
| 20/10/2023 2:02:33 PM | 66.107090 | -115.514028 | 2 | 2 | 2 | 1 | 3 | 7 |
| 20/10/2023 2:08:16 PM | 66.188911 | -115.551901 | 4 | 3 | 1 | 3 | 4 | 11 |
| 20/10/2023 2:13:46 PM | 66.171032 | -115.343427 | 6 | 3 | 1 | 0 | 1 | 10 |
| 20/10/2023 2:15:05 PM | 66.172698 | -115.349578 | 10 | 1 | 2 | 1 | 3 | 14 |
| 20/10/2023 2:24:51 PM | 66.212181 | -115.100438 | 13 | 4 | 2 | 2 | 4 | 21 |
| 20/10/2023 2:32:55 PM | 66.048210 | -115.142176 | 4 | 4 | 4 | 1 | 5 | 13 |
| 20/10/2023 2:34:18 PM | 66.014420 | -115.069471 | 3 | 3 | 1 | 1 | 2 | 8 |
| 20/10/2023 2:39:15 PM | 66.008453 | -114.907183 | 0 | 0 | 0 | 2 | 2 | 2 |
| 20/10/2023 2:41:50 PM | 66.008360 | -114.905504 | 0 | 0 | 1 | 1 | 2 | 2 |
| 20/10/2023 2:46:08 PM | 65.950793 | -114.900387 | 18 | 7 | 5 | 4 | 9 | 34 |
| 20/10/2023 2:49:08 PM | 65.926888 | -114.900520 | 2 | 0 | 1 | 1 | 2 | 4 |
| 23/10/2023 10:02:10 AM | 65.489367 | -114.411442 | 0 | 0 | 0 | 1 | 1 | 1 |
| 23/10/2023 10:03:16 AM | 65.500525 | -114.420737 | 1 | 1 | 0 | 0 | 0 | 2 |
| 23/10/2023 10:07:00 AM | 65.490983 | -114.415658 | 1 | 1 | 0 | 0 | 0 | 2 |
| 23/10/2023 10:08:28 AM | 65.545175 | -114.444065 | 0 | 0 | 0 | 1 | 1 | 1 |
| 23/10/2023 10:26:13 AM | 65.601998 | -114.664975 | 5 | 2 | 0 | 1 | 1 | 8 |
| 23/10/2023 10:36:57 AM | 65.627857 | -114.703654 | 20 | 7 | 6 | 2 | 8 | 35 |
| 23/10/2023 10:37:32 AM | 65.667412 | -114.786353 | 3 | 3 | 0 | 0 | 0 | 6 |
| 23/10/2023 10:37:56 AM | 65.667064 | -114.775851 | 0 | 0 | 0 | 1 | 1 | 1 |
| 23/10/2023 10:45:51 AM | 65.668009 | -114.777090 | 0 | 0 | 0 | 1 | 1 | 1 |
| 23/10/2023 10:46:43 AM | 65.710762 | -114.909256 | 8 | 5 | 0 | 1 | 1 | 14 |
| 23/10/2023 10:49:38 AM | 65.710844 | -114.910329 | 10 | 4 | 5 | 6 | 11 | 25 |
| 23/10/2023 10:51:14 AM | 65.693661 | -114.959115 | 7 | 3 | 2 | 2 | 4 | 14 |
| 23/10/2023 10:53:24 AM | 65.694697 | -114.953578 | 0 | 0 | 0 | 1 | 1 | 1 |
| 23/10/2023 10:55:16 AM | 65.667429 | -114.925605 | 4 | 2 | 1 | 1 | 2 | 8 |
| 23/10/2023 10:55:26 AM | 65.668322 | -114.928162 | 1 | 1 | 0 | 1 | 1 | 3 |
| 23/10/2023 9:26:56 AM | 64.883140 | -114.059489 | 2 | 1 | 1 | 0 | 1 | 4 |

| Date & Time | Latitude | Longitude | Cows | Calves | Small Bulls | Prime Bulls | Bulls Total | All Caribou |
|---|---|---|---|---|---|---|---|---|
| 23/10/2023 9:33:48 AM | 64.995145 | -114.048023 | 3 | 1 | 1 | 0 | 1 | 5 |
| 24/10/2023 1:02:46 PM | 65.302799 | -115.035491 | 39 | 22 | 12 | 7 | 19 | 80 |
| 24/10/2023 1:06:47 PM | 65.321663 | -114.882085 | 0 | 0 | 1 | 1 | 2 | 2 |
| 24/10/2023 1:08:00 PM | 65.320619 | -114.867261 | 1 | 1 | 1 | 0 | 1 | 3 |
| 24/10/2023 1:09:47 PM | 65.327658 | -114.855827 | 8 | 3 | 4 | 1 | 5 | 16 |
| 24/10/2023 1:11:50 PM | 65.333155 | -114.867628 | 14 | 8 | 2 | 5 | 7 | 29 |
| 24/10/2023 1:14:05 PM | 65.334278 | -114.869970 | 34 | 18 | 5 | 9 | 14 | 66 |
| 24/10/2023 1:16:28 PM | 65.334811 | -114.887071 | 2 | 2 | 0 | 1 | 1 | 5 |
| 24/10/2023 1:18:34 PM | 65.379134 | -114.943935 | 0 | 0 | 0 | 1 | 1 | 1 |
| 24/10/2023 1:18:51 PM | 65.380817 | -114.952509 | 1 | 1 | 0 | 0 | 0 | 2 |
| 24/10/2023 1:20:08 PM | 65.379124 | -114.962301 | 7 | 3 | 3 | 2 | 5 | 15 |
| 24/10/2023 1:29:21 PM | 65.390603 | -115.090028 | 4 | 2 | 1 | 1 | 2 | 8 |
| 24/10/2023 1:31:13 PM | 65.395621 | -115.088453 | 4 | 2 | 1 | 4 | 5 | 11 |
| 24/10/2023 1:32:51 PM | 65.419366 | -115.037284 | 0 | 0 | 0 | 1 | 1 | 1 |
| 24/10/2023 1:40:08 PM | 65.447052 | -114.951423 | 34 | 12 | 11 | 15 | 26 | 72 |
| 24/10/2023 1:40:37 PM | 65.457773 | -114.949203 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24/10/2023 1:55:10 PM | 65.659362 | -114.348979 | 3 | 2 | 0 | 0 | 0 | 5 |
| 24/10/2023 1:56:21 PM | 65.658362 | -114.348295 | 4 | 3 | 2 | 1 | 3 | 10 |
| 24/10/2023 1:56:39 PM | 65.660854 | -114.352047 | 4 | 1 | 1 | 0 | 1 | 6 |
| 24/10/2023 10:01:15 AM | 64.986947 | -114.986485 | 11 | 9 | 5 | 5 | 10 | 30 |
| 24/10/2023 10:02:03 AM | 64.991188 | -114.998703 | 4 | 4 | 0 | 0 | 0 | 8 |
| 24/10/2023 10:02:25 AM | 64.991896 | -114.996261 | 4 | 0 | 1 | 0 | 1 | 5 |
| 24/10/2023 10:02:45 AM | 64.992522 | -114.994797 | 3 | 0 | 0 | 0 | 0 | 3 |
| 24/10/2023 10:05:22 AM | 65.011303 | -115.002399 | 2 | 2 | 1 | 3 | 4 | 8 |
| 24/10/2023 10:05:36 AM | 65.009483 | -114.994340 | 3 | 1 | 1 | 0 | 1 | 5 |
| 24/10/2023 10:10:25 AM | 65.023896 | -115.073034 | 3 | 2 | 0 | 0 | 0 | 5 |
| 24/10/2023 10:15:24 AM | 65.008465 | -115.155546 | 32 | 19 | 11 | 9 | 20 | 71 |
| 24/10/2023 10:17:33 AM | 65.018677 | -115.171647 | 11 | 6 | 3 | 1 | 4 | 21 |
| 24/10/2023 10:19:03 AM | 65.026769 | -115.180151 | 7 | 5 | 2 | 2 | 4 | 16 |
| 24/10/2023 10:20:14 AM | 65.023633 | -115.184079 | 9 | 7 | 2 | 0 | 2 | 18 |
| 24/10/2023 10:20:38 AM | 65.025195 | -115.185498 | 1 | 1 | 1 | 0 | 1 | 3 |
| 24/10/2023 10:24:35 AM | 65.069011 | -115.229413 | 7 | 3 | 1 | 0 | 1 | 11 |
| 24/10/2023 10:27:16 AM | 65.098275 | -115.238761 | 2 | 2 | 0 | 0 | 0 | 4 |
| 24/10/2023 10:29:37 AM | 65.124014 | -115.246721 | 4 | 4 | 2 | 2 | 4 | 12 |
| 24/10/2023 10:30:25 AM | 65.126002 | -115.248408 | 5 | 2 | 1 | 1 | 2 | 9 |
| 24/10/2023 10:32:04 AM | 65.138063 | -115.243415 | 4 | 1 | 2 | 1 | 3 | 8 |
| 24/10/2023 10:35:17 AM | 65.139975 | -115.238930 | 24 | 13 | 4 | 10 | 14 | 51 |
| 24/10/2023 10:37:25 AM | 65.140907 | -115.223679 | 17 | 9 | 3 | 5 | 8 | 34 |
| 24/10/2023 10:39:01 AM | 65.141515 | -115.227511 | 10 | 6 | 3 | 2 | 5 | 21 |
| 24/10/2023 10:42:28 AM | 65.143296 | -115.236368 | 37 | 21 | 10 | 12 | 22 | 80 |

| Date & Time | Latitude | Longitude | Cows | Calves | Small Bulls | Prime Bulls | Bulls Total | All Caribou |
|---|---|---|---|---|---|---|---|---|
| 24/10/2023 10:46:29 AM | 65.156606 | -115.250722 | 8 | 4 | 0 | 2 | 2 | 14 |
| 24/10/2023 11:00:14 AM | 65.202438 | -115.048515 | 63 | 30 | 14 | 20 | 34 | 127 |
| 24/10/2023 11:08:55 AM | 65.195272 | -115.100852 | 114 | 58 | 27 | 33 | 60 | 232 |
| 24/10/2023 11:09:06 AM | 65.196089 | -115.077594 | 2 | 1 | 0 | 0 | 0 | 3 |
| 24/10/2023 11:17:03 AM | 65.183769 | -115.130598 | 110 | 52 | 27 | 32 | 59 | 221 |
| 24/10/2023 11:19:33 AM | 65.176402 | -115.148004 | 12 | 6 | 1 | 3 | 4 | 22 |
| 24/10/2023 11:20:55 AM | 65.179625 | -115.149821 | 20 | 11 | 3 | 4 | 7 | 38 |
| 24/10/2023 11:21:26 AM | 65.185878 | -115.163416 | 0 | 0 | 0 | 1 | 1 | 1 |
| 24/10/2023 11:24:02 AM | 65.198536 | -115.206026 | 8 | 4 | 2 | 1 | 3 | 15 |
| 24/10/2023 11:24:13 AM | 65.201043 | -115.206112 | 3 | 2 | 1 | 1 | 2 | 7 |
| 24/10/2023 12:54:15 PM | 65.234165 | -115.185598 | 4 | 2 | 1 | 2 | 3 | 9 |
| 24/10/2023 2:13:50 PM | 65.512636 | -113.704681 | 4 | 2 | 2 | 1 | 3 | 9 |
| 24/10/2023 2:21:14 PM | 65.486835 | -114.024606 | 9 | 7 | 3 | 4 | 7 | 23 |
| 24/10/2023 2:37:30 PM | 65.467289 | -113.311823 | 10 | 7 | 2 | 2 | 4 | 21 |
| 24/10/2023 2:42:34 PM | 65.536329 | -113.217799 | 0 | 0 | 1 | 1 | 2 | 2 |
| 24/10/2023 2:47:48 PM | 65.550114 | -113.228302 | 23 | 9 | 6 | 9 | 15 | 47 |
| 24/10/2023 2:53:37 PM | 65.618452 | -113.074096 | 3 | 2 | 1 | 2 | 3 | 8 |
| 24/10/2023 2:59:17 PM | 65.563416 | -112.972016 | 1 | 0 | 1 | 1 | 2 | 3 |
| 24/10/2023 3:01:40 PM | 65.566497 | -112.968824 | 9 | 4 | 1 | 8 | 9 | 22 |
| 24/10/2023 3:02:04 PM | 65.569723 | -112.978060 | 2 | 2 | 0 | 0 | 0 | 4 |
| 24/10/2023 9:55:53 AM | 64.946443 | -114.938395 | 58 | 33 | 21 | 28 | 49 | 140 |
| 24/10/2023 9:56:49 AM | 64.954268 | -114.973444 | 4 | 2 | 1 | 0 | 1 | 7 |
| 26/10/2023 1:49:33 PM | 66.055512 | -113.922203 | 0 | 0 | 0 | 13 | 13 | 13 |
| 26/10/2023 2:26:49 PM | 65.855295 | -113.745868 | 1 | 1 | 0 | 1 | 1 | 3 |
| 26/10/2023 2:49:41 PM | 65.611074 | -114.044206 | 2 | 1 | 0 | 2 | 2 | 5 |
| 26/10/2023 2:57:28 PM | 65.567651 | -114.042782 | 2 | 2 | 0 | 2 | 2 | 6 |
| 26/10/2023 2:58:47 PM | 65.572092 | -114.033749 | 0 | 0 | 1 | 1 | 2 | 2 |