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Dall's Sheep Survey of Liard and Nahanni Ranges Mackenzie Mountains, August 2018

Danny G. Allaire, Nicholas C. Larter, Julian Sabourin and Steve Gooderham

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ABSTRACT

We conducted an aerial survey for Dall's sheep (*Ovis dalli dalli*) in the Liard and Nahanni Ranges of the Mackenzie Mountains on 15 August 2018 to document sheep distribution and the lamb crop. We attempted to survey the same area with the same flight lines as the previous survey in August 2011. Unfortunately, low cloud and fog prevented us from duplicating the effort in 2011; only 50% of the Liard and 40% of the Nahanni was surveyed. Sheep were classified from the air into four sex/age classes: lambs, yearlings, ewes, and rams. We used digital photographs to verify sex/age classifications of large groups. We used a handheld global positioning system to track the survey flight path and record the locations of all wildlife seen. We classified 88 Dall's sheep in 20 groups on the Liard Range and 15 Dall's sheep in four groups on the Nahanni Range. The estimated 47.3 lambs/100 ewes (pooled across ranges) were similar to that reported for 2003 and 2011 surveys. Other wildlife observed during the survey included seven moose (*Alces americanus*), 18 bison (*Bison bison athabascae*), one wolf (*Canis lupus*) and three pairs of trumpeter swans with goslings (*Cygnus buccinator*).

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INTRODUCTION

Dall's sheep in the Mackenzie Mountains is a relatively unstudied wildlife species of the Northwest Territories (NWT), with the most extensive research being conducted in the 1960s and 1970s (Simmons 1982, Simmons et al. 1984). In the 1980s, sporadic aerial surveys were conducted to document numbers and distribution, and provide estimates of productivity (Ferguson et al. 1985, Case 1989). Ground-based classification surveys have been conducted on an almost annual basis from 1997-2017 in two study areas west of Norman Wells (Heather Sayine-Crawford personal communication). Observations of non-resident hunters have been collected on a voluntary basis from 1995-2018. The number of lambs and rams per 100 ewes pooled over the entire Mackenzie Mountains is reported in annual harvest reports (e.g. Larter and Allaire 2017). Recently, stable and radioactive elements and stable isotopes were reported in Dall's sheep and other sympatric ungulates in the 2010s, (Larter et al. 2016), and the Department of Environment and Natural Resources (ENR) initiated a study looking at the health of Dall's sheep (Heather Sayine-Crawford, personal communication).

The opportunity to conduct aerial Dall's sheep surveys in the Mackenzie Mountains is rare, because it requires the availability of rotary-winged aircraft, and the local weather can change rapidly. Costs for rotary-winged aircraft are high, and their availability is limited in summer because of forest fire operations requirements. Fortunately, in some years when the fire season has been slow, aircraft contracted to ENR fire operations become available for wildlife field studies. This was the case for previous surveys in 2003 and 2011, and was the case in August 2018. We took this opportunity to conduct an aerial survey of the Nahanni and Liard Ranges to document numbers and distribution and provide estimates of productivity. We report the current distribution and sex and age composition of Dall's sheep in the Nahanni and Liard Ranges and compare with survey results from the same area in the Mackenzie Mountains.

STUDY AREA

The survey area is located in the southeast portion of the Mackenzie Mountains falling in the boreal cordillera ecological region; the Nahanni Range in the high boreal and the Liard Range in the mid-boreal (Ecosystem Classification Group 2010). Because of the complexity of geological formations and wide variations in altitude and soil conditions, the area contains a wide variety of habitat types (Simmons 1982, Ecosystem Classification Group 2010).

The Nahanni Range features a long narrow limestone ridge with steep escarpments and subalpine coniferous forest and provides good Dall's sheep habitat. Its limestone geology has resulted in an abundance of caves, some very large and deep. Case (1989) describes a cave that extended 40-45m inside from the mouth. Sheep often use these caves for both shelter and protection from predators (Clay Lancaster personal communication); their use of caves makes it challenging for aerial surveyors. The Nahanni Range ravines are more irregularly spaced than those of the Liard. Two large deep lakes bisect the range at its northern end. Sheep are rarely found north of Little Doctor Lake, the southernmost lake. The Liard Range is a long sinuous jagged shale, sandstone and limestone ridge which runs adjacent to the Liard River. The terrain drops off rapidly to the east. To the west less steep terrain slopes to the Kotaneelee Valley. Deep ravines occur throughout the length of the range. Mixed-wood deciduous and coniferous forests are found in the valley floors, with lodgepole pine (*Pinus contorta*), spruce (*Picea* spp.), and alpine fir (*Abies lasiocarpaI*) found at higher elevations. The Liard Range provides excellent Dall's sheep habitat (Ecosystem Classification Group 2010).

Currently, Dall's sheep populations in the survey area remain relatively isolated with a limited degree of man-made disturbance. Resident and subsistence harvest is minimal. Non-resident trophy hunters are required to use the services of an outfitter (Environment and Natural Resources 2018). Non-resident harvest of sheep from the survey area is ≤8 rams annually.

METHODS

We used an A-star helicopter for the 15 August, 2018 survey. We planned on surveying the Nahanni Range from north to south and then continuing south to survey the Liard Range on both east and west sides (following Larter and Allaire 2016). Unfortunately inclement weather forced us to fly to the southern end of the Liard Range and work northward. Low cloud precluded flying the eastern side of the Liard Range (Figure 1). We flew in a sinusoidal path the length of the eastern side of the Liard Range and a similar sinusoidal path for the first 40% of the Nahanni Range. All attempts were made to avoid directly approaching sheep to minimize disturbance and flight of the animals (Frid 2003).

Figure 1. Low lying cloud on the east side of the Liard Range.

The recorder/observer was located in the front passenger seat with observers located in the rear right and left seats. Sheep were classified sheep into four sex and age classes: ram, ewe, yearling and lamb. Observers used 7x35 binoculars to assist with classification. The recorder had a handheld GPS that was used to waypoint all wildlife observations and record a track log. Digital photos were taken of larger groups to verify sheep numbers and the age and sex of each sheep observed. For comparisons with some previous surveys we defined nursery sheep as the number of ewes plus the number yearlings seen.

RESULTS

We flew for 116 minutes (12:53-14:49) along a 220 km flight line on the west side of the Liard Range observing 20 groups of Dall's sheep. After refuelling at Netla we flew for 26 minutes (15:37-16:03) along a 62 km flight line covering the southern 40% of the Nahanni Range observing four groups of Dall's sheep (Figure 2). See Table 1 for the composition of the Dall's sheep observed in the survey.

Table 1. The number of groups, different sex/age classes, and ratios of lambs and rams per 100 ewes (L:E and R:E, respectively) of Dall's sheep observed during the 2018, 2011 (Larter and Allaire 2016) and 2003 (Larter and Allaire 2005) surveys.

**Note the 2018 survey covered just 50% and 40% of the Liard and Nahanni survey areas, respectively.

2018**

Range	Groups	Ewes	Lambs	Yearlings	Rams	Total	L:E	R:E
Nahanni	4	6	2	0	7	15	33.3	116.7
Liard	20	49	24	0	15	88	49.0	30.6
Total	24	55	26	0	22	103	47.3	40.0

2011

Range	Groups	Ewes	Lambs	Yearlings	Rams	Total	L:E	R:E
Nahanni	15	26	20	2	15	63	76.9	57.7
Liard	35	116	46	0	41	203	39.7	35.3
Total	50	142	66	2	56	266	46.5	39.4

2003

Range	Groups	Ewes	Lambs	Yearlings	Rams	Total	L:E	R:E
Nahanni	13	40	18	1	9	68	45.0	22.5
Liard	17	52	31	3	36	122	59.6	69.2
Total	30	92	49	4	45	190	53.3	48.9

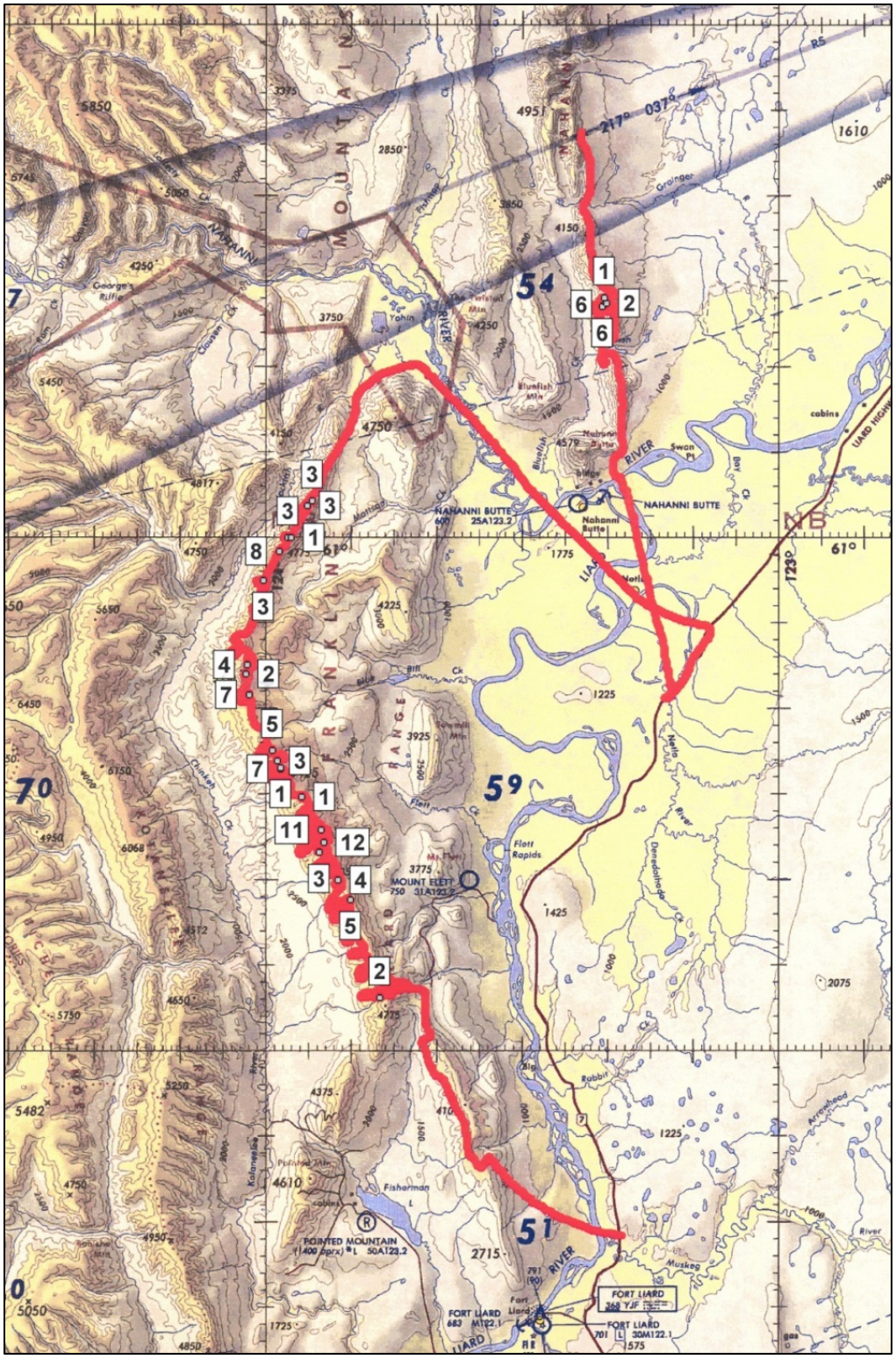

Figure 2. The survey flight line with the east side of Liard Range to the south and the reduced Nahanni Range to the north. Numbers of sheep observed in groups is indicated.

DISCUSSION

Aerial surveys of Dall's sheep in the Mackenzie Mountains have been conducted on a sporadic basis and usually occur only in years when the territorial summer fire season has been quiet and there are excess hours remaining on rotary-winged aircraft contracts in August. This was the case 15 August, 2018 when ENR Wildlife, Fort Simpson, was provided with the use of a contract A-Star helicopter for the day. Unfortunately, low lying fog restricted the area that could be surveyed; therefore comparisons with previous surveys need to take this into account.

Historically there have been more resident sheep in the Liard than the Nahanni Range. This was consistent with our survey. With our survey restricted to the southern 40% of the Nahanni Range we were unable to survey the area north of the Grainger River where the majority of sheep are found (Figure 2). We saw only four groups on the limited survey of the range. Clearly these results are not representative of the entire range and are not comparable to other historic surveys (Table 2).

Although fog restricted us to flying only the west side of the Liard Range, our results are directly comparable to those reported from the 2011 survey for just the west side of the Liard Range. In both the 2011 and 2018 surveys 20 groups of Dall's sheep were observed, however there were differences in group composition that are evidenced by the different estimates of lambs and rams per 100 nursery sheep between surveys (Table 2). In 2011 we observed larger ram only groups and more rams associated with nursery groups which resulted in an estimate of 38.2 rams/100 nursery sheep versus the 30.6 rams/100 nursery sheep estimated in 2018. Mean nursery group size was smaller in 2018 than 2011 (6.2, n=11 versus 6.6, n=15) with the largest group size being 12 and 18 sheep in 2018 and 2011, respectively. There were fewer lambs in nursery groups and ewe only groups were larger in 2011; only one ewe only group was observed in 2018, a lone animal. These differences explain why the estimated number of lambs/100 nursery sheep was higher in 2018 (49.0) than in 2011 (30.9).

There is substantial variability in the number of rams and lambs/100 nursery sheep estimated from aerial surveys of the Nahanni and Liard Ranges in the southern Mackenzie Mountains. Ground-based surveys of Dall's sheep in the central Mackenzie Mountains also demonstrate substantial variability (Heather Sayine-Crawford personal communication;

Larter and Allaire 2016). Results from this survey fall within the range of those found from both aerial and ground-based surveys.

Table 2. Results from aerial classification surveys of Dall's sheep in the Nahanni and Liard ranges in different years from 1984-2018. Nursery sheep are all ewes and non-breeders. All surveys conducted in August except where noted. The Liard range is partitioned into east and west sides in 2011 and 2018 for comparison.

Range	Year	Nursery	Lamb	Ram	Total	L:N	R:N	Reference
Nahanni	86	69	5	29	107	7.2	42.0	Case 1989[1]
Nahanni	03	41	18	9	68	43.9	22.0	Larter and Allaire 2005
Nahanni	11	28	20	15	63	71.4	53.4	Larter and Allaire 2016
Nahanni[2]	18	6	2	7	15	33.3	116.7	This study
Liard	84	175	105	77	358	60.0	42.9	Ferguson et al. 1985[1]
Liard	87	218	81	86	385	37.2	39.4	Case 1989[1]
Liard	03	55	31	36	122	56.4	65.5	Larter and Allaire 2005
Liard E	11	48	25	15	88	52.1	31.3	Larter and Allaire 2016
Liard W	11	68	21	26	115	30.9	38.2	Larter and Allaire 2016
Liard W	18	49	24	15	88	49.0	30.6	This study

[1] Survey conducted in June.
[2] ≤40% of range surveyed due to fog.

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PERSONAL COMMUNICATIONS

Clay Lancaster, Nahanni Butte Outfitters, Lake Country, BC

Heather Sayine-Crawford, Manager Wildlife Research and Monitoring, Environment and Natural Resources, Yellowknife, NT

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