AERIAL DALL SHEEP SURVEY IN GAME MANAGEMENT ZONES 12 AND 19, MACKENZIE MOUNTAINS APRIL 7 - 15, 1968.

by
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Abstract

The first intensive aerial survey of Dall sheep habitat in Game Management Zones 12 and 19, Mackenzie Mountains, N.W.T. was conducted by the Canadian Wildlife Service in eight sample areas in April 1968. The survey was designed to help determine the size and distribution of sheep populations on winter ranges, to develop a satisfactory technique for making aerial surveys for sheep, and to determine what other information could be obtained from such surveys. Survey conditions were poor in the northern half of Zone 12 and in Zone 19 because unseasonable chinook winds melted much of the snow from the alpine tundra slopes in late March. In that area I could not be sure that the sheep were still on their normally restricted wintering grounds. Nevertheless a satisfactory technique for conducting aerial surveys of sheep winter range was developed, and I was confident that my survey of the southern half of Zone 12 produced estimates of sheep populations on winter ranges that were close to true values. A total of 683 sheep were seen in a minimum of 2010 square miles of alpine tundra for an average density of .34 sheep per square mile (range .00-.72). Recommendations were made concerning future aerial surveys that would form a basis for harvest management in Zones 12 and 19.

Introduction

In 1966, I was assigned to study big game animals in the Mackenzie Mountains, N.W.T. The Chief of the Territorial Game Management Division, P. Kwaterowski, suggested that I consider in particular the Dall sheep (Ovis dalli) in this area. Subsequently, I conducted two aerial reconnaissances of Dall sheep habitat in Game Management Zones 12 and 19, areas which cover the major part of the Mackenzie Mountains in the N.W.T. The flight made in the latter half of September, 1966, was designed to help me:

1. Familiarize myself with the area,
2. Identify fall Dall sheep habitat,
3. Locate potential study areas and camp sites, and
4. Contact hunting outfitters and guides (Simmons, 1966).

Another flight was made in early March, 1967, to:

1. Determine the characteristics of Dall sheep winter habitat,
2. Select a tentative study area that would encompass both summer and winter Dall habitat,
3. Familiarize myself with working conditions in the mountains in the winter, and to
4. Establish contacts with residents of settlements near the mountains (Simmons, 1967).

Both flights gave me the experience I needed to select a suitable aircraft and develop a technique for aerial census work.

My September, 1966 and March, 1967 flights were made in a DeHavilland "Beaver". I found that the high minimum practical speed, poor low-speed manoeuverability, noisiness, and poor visibility from this aircraft made it unsuitable for intensive sheep surveys in the mountains. A Piper "Super Cub" tested by Canadian Wildlife biologist Stelfox (1967) and myself in the fall of 1967 proved far more satisfactory.

A "Super Cub", piloted by Stan Burrell, was used by J. Stelfox to fly an intensive survey of an isolated block of mountains near the

Keele River (area 6h in Fig. 1) in September, 1967 (Stelfox, 1967). That was the most thorough survey of sheep habitat that had been conducted by the Canadian Wildlife Service in the Mackenzie Mountains up to that time.

My first intensive Dall sheep survey in the Mackenzie Mountains was conducted in April, 1968, to determine the size and distribution of the sheep populations on winter ranges, to develop a satisfactory technique for making aerial surveys for sheep, and to determine what other information could be obtained from such surveys. That survey is discussed in this report. Other aerial surveys planned for August and September, 1968, were cancelled because of poor weather, forest fire smoke, aircraft failures and delays, and early snowfall.

Methods and Materials

Zones 12 and 19 were divided into 20 major areas that appeared easily defined by wide river or stream valleys and/or dense timber stands. These areas were divided into 173 subdivisions also bounded by timber and river and stream valleys. Each subdivision appeared small enough to be thoroughly searched by aircraft in less than 10 hours. The major divisions were identified by numbers and the subdivisions by letters (Fig. 1).

I selected eight of the subdivisions to survey in April, 1968. Most of the subdivisions in Zone 12 were chosen because they had been hunted in 1967, would probably be hunted with equal or greater intensity in the future, and appeared to be small enough for one-day surveys. The one exception in Zone 12, area 4g, was chosen because it was easily accessible

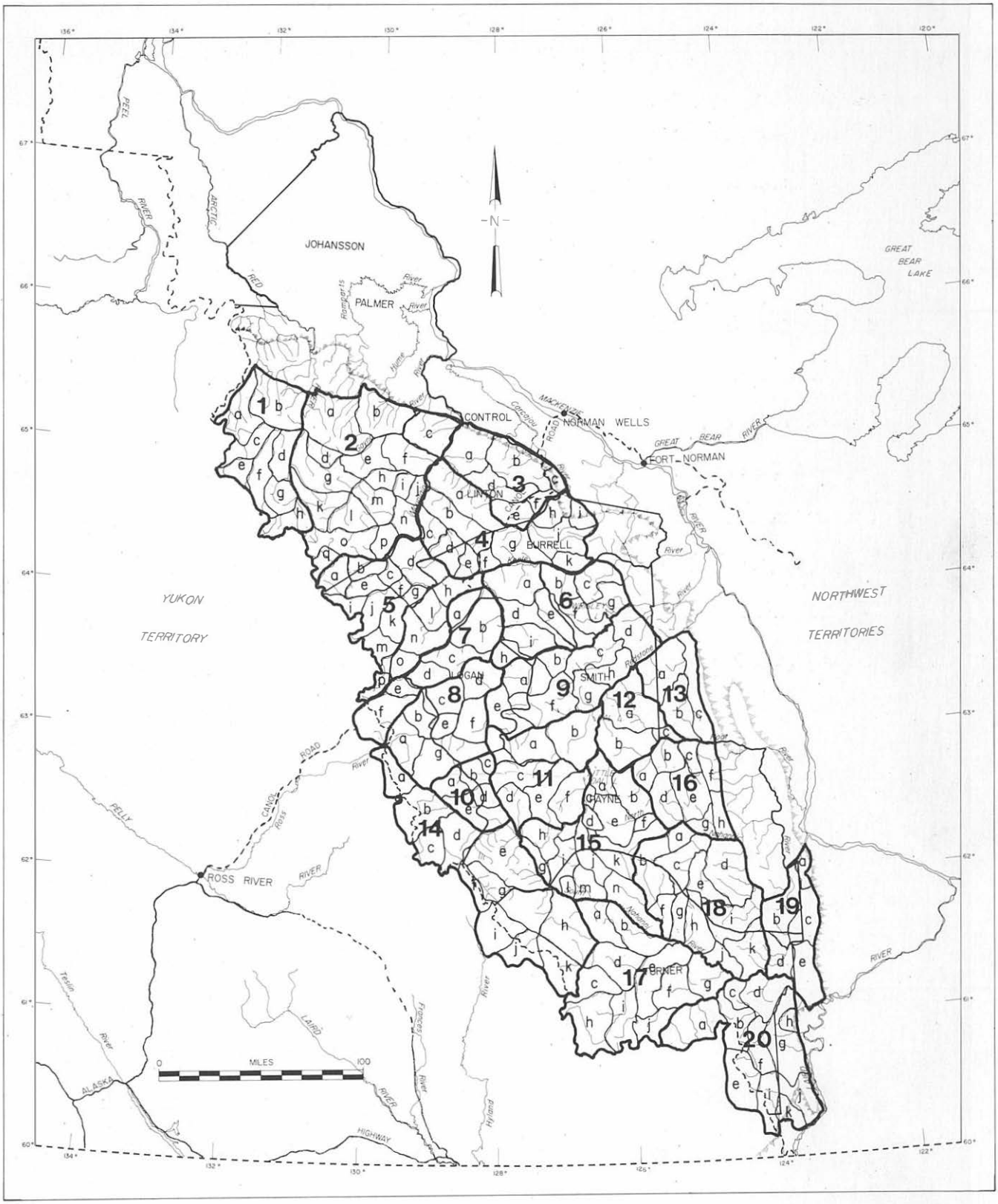

Fig. 1 -- Divisions and subdivisions of Game Management Zones 12 and 19 into sample areas for aerial surveys.

from my main base camp for ground surveys and because it would be hunted by non-residents in the near future. The subdivision in Zone 19 was selected because it has been designated a control area and was closed to hunting.

I determined the approximate relative sizes of the treeless portions of the eight survey areas with a polar planimeter. From these figures I was able to estimate sheep population densities in each sample area.

A Piper "Super Cub" on skis, flown by Stan Burrell, was chartered for the survey. Flights over sample areas were made on bright, sunny days in relatively calm air. The flights usually began about 0930 and ended about 1630, though no more than five hours were spent in the air each day.

In an effort to get a total count of the sheep in each sample area, we flew the contours of each area at about 75 to 80 mph and at approximately 200 foot intervals of elevation. Each pass overlapped the previous one so that "blind spots" obscured by the fuselage or the wing were covered. The pilot doubled as observer most of the time. We co-ordinated our observation so that we looked out opposite sides of the two-seat tandem aircraft.

The pilot acted as navigator. He plotted our course on a 1:250,000 scale topographic map and marked a serial number on the map for each observation. I recorded each observation on a form (Fig. 2) and recorded descriptions of habitat conditions, observations, and flying conditions on a DeJur Grundig Stenorette tape recorder. Groups of animals were

AERIAL OBSERVATIONS

Area Designation 14h Date 10 April 1968 Observer N. Simmons
S. Burrell

Sheep + ♂	Sheep + ♀	Sheep + ♀	Caribou + ♂	Caribou + ♀	Caribou + ♀	Moose ♂	Moose ♀	Moose ♀	Goat +	Grizzly	Wolf	Remarks and Time of Observation
									1			Obs. #1
									1			2
									2			3 ♀ and yearl.
						1 unclassified						4
									2			5
		[Not in area 14h]										6
						2 unclassified						7
									1			8
2												9
							1	1				10
									1			10a
	1	1										~~12~~ 11
	3	2										~~13~~ 12
						5 unsexed			(8)			13

Do not put data from more than one area on this sheet.

+ Separate column for each band seen.

Fig. 2 Form on which observations were recorded during an aerial survey in Game Management Zones 12 and 19, Mackenzie Mountains, 7-15 April, 1968.

photographed with an Asahi Pentax 35mm camera with a 70-150mm "zoom" lens. I classified Dall sheep rams having half-curl horns or longer as adults (about three years old or older). At about the age of three, bighorn sheep (Ovis canadensis) usually leave groups of ewes and younger rams and form ram bands with older males. These three year old rams are considered sexually and behavioristically mature (Buechner, 1960; Geist, 1966; Simmons, 1961; and others). Jones (1963), Geist (op cit.) and others have described similar behavior in Dall sheep. At the time of my survey, ram bands had already been formed. A ram whose horn curl I could not estimate was automatically called an adult if he was in a ram band.

Although observations of moose (Alces alces) and caribou (Rangifer tarandus) were recorded, no special effort was made to locate these species. A systematic search for mountain goats (Oreamnos americanus) was included with the Dall sheep survey since both species occupy similar winter habitat.

Results

Survey conditions. Unseasonably warm chinook winds had melted much of the snow from the sample areas north of area 11f in February and March. Between that time and the survey, there was almost no snowfall in the Mackenzie Mountains. Consequently, poor conditions existed for locating Dall in half the sample areas that were surveyed.

The patchy and shallow snow-cover in the four northernmost survey areas permitted nearly unrestricted sheep movement. That situation contrasted sharply with that of March, 1967, when complete and deep snow

cover (1 to 2 feet deep on mountain plateaus) caused sheep to remain in areas less than 1/2 mile in diameter for long periods. Since conditions were abnormal, I could not be sure that the Dall were still on their normally restricted wintering grounds in early April, 1968.

Wintery temperatures prevailed during the aerial survey period. Temperatures at 500 feet elevation ranged between -5° and +5°F.

Flying conditions were good during survey days except for three days of moderate air turbulence. The skies were usually cloud-free. The aircraft was poorly heated, however, and on one occasion my ears became frostbitten, reducing my diligence. The tape recorder also ceased to function when it became cold.

Survey areas 4b, 11b, and 14h required two days of flying for complete coverage. Area 14k was so rugged and dissected by long, deep canyons that it was more difficult to search than the other sample blocks. In those areas we became less thorough and systematic, and we surveyed cursorily areas where no tracks were seen.

Dall sheep. The results of the Dall sheep survey are summarized in Table 1. When the snow cover was even, I found that I could identify rams that were about two years old or older (estimated from horn size). Even under less favorable conditions, I was able to estimate the degree of horn curl to the nearest 45°.

Table 1 also presents estimated sheep densities in alpine tundra and average elevations at which sheep were found. Records of elevations for five areas were lost when my tape recorder failed in cold temperatures.

Other big game mammals. The numbers of caribou, moose, mountain goats, and wolves (Canis lupus) observed during the survey of sheep habitat are recorded in Table 2.

Conclusions

Except for the inadequate heating system on the aircraft, which in turn caused a malfunction in the tape recorder and a loss of data, the equipment used during the survey seemed sufficient. The timing of the survey, however, was poor because it followed chinook winds which melted much of the snow in the northern four sample areas.

In the southern four areas, where the snow cover was nearly complete, I could readily detect the presence of sheep and mountain goats by their tracks in the snow. Sometimes an estimate of the number of sheep or goats making the tracks can be made. It is possible for an airborn observer to distinguish recent sharp-edged tracks from the partly snow-filled, soft-edged, old tracks if the sunlight is bright. Sheep and mountain goat tracks are distinguishable from caribou and moose tracks but not from each other. Snow cover, therefore, was an asset to the survey and improved the accuracy of my counts of sheep and goats in alpine tundra areas.

Sheep and goats were invariably found in the precipitous terrain on the peripheries of each sample area. This was where the least and shallowest snow could be found. The highest ridges and plateaus were usually blanketed with snow unmarked by ungulate tracks.

The highest sheep population densities (Table 1) were in areas 11b (.72 sheep per square mile), and 4a (.65). The lowest densities

TABLE 1. Dall sheep seen during the April, 1968, aerial survey in Game Management Zones 12 and 19, Mackenzie Mountains, N.W.T.

Sample area.	Area size * (minimum). sq. mi.	Adult rams.	Number in ewe groups.#	Unclassified.	Total.	Per cent adult rams.	Estimated density: sheep per sq. mi. alpine tundra	Average estimated elevation of sheep. Feet.	Non-resident hunter harvest of sheep in sample area. 1967	1968
2c	360	22	35	9	66	39	.18	4000	Control area. No Hunting.	
4a	300	56	139	-	195	29	.65	4300	1	3
4g	220	9	54	-	63	14	.29	-	Not hunted.	
6h	90	23	24	-	47	49	.52	-	3	4
11b	350	92	159	2	253	37	.72	5500	9	6
11f	240	18	32	-	50	36	.21	-	3	6
14h	300	2	7	-	9	22	.03	-	0	1
14k	150	-	-	-	-	-	-	-	4	4
Totals	2010	222	450	11	683		Avg..34		20	24

* Alpine tundra area only.
\# Ewes and juvenile rams (see page 6.).

TABLE 2. Caribou, moose, mountain goats, and wolves seen during aerial Dall sheep survey, Game Management Zones 12 and 19, Mackenzie Mountains, April, 1968.

Sample area.	Caribou.	Moose.	Mountain goat.	Wolf.
2c	-	7	-	-
4a	-	2	-	-
4g	3	-	-	-
6h	213	10	-	-
11b	97	-	1	9
11f	5	2	5	-
14h	8	10	8	-
14k	8	8	8	
Totals	334	39	22	9

were in 14h (.03) and 14k (no sheep seen). These relative density estimates have been subjectively confirmed during other aerial surveys and by hunters and outfitters.

There is some evidence that the sheep density in 6h may be higher than .52 at least during the fall. In September, 1967, J. Stelfox (1967) saw 148 sheep in the same area during an aerial search. I saw 60 sheep during an aborted survey of 6h in September, 1968.

The low density in 11f is partly due to the fact that a large portion of the area is covered by 8,000-foot high peaks and glaciers, and is not suitable for sheep. The western half of 11f was covered with snow that was free of ungulate tracks.

I believe that the surveys of 14h and 14k precisely reflected the density of sheep and goats there. These areas were almost completely covered with snow, and a clear, sunny sky made survey conditions nearly ideal. Ungulate tracks were easy to see and follow to their source. Unless we missed seeing a significant number of sheep in dense timber, I must conclude that neither area is good winter or early spring sheep habitat. The lack of sheep hunter success in these areas in 1967 and 1968 (lowest in Zone 12) would suggest that these areas are occupied by only a small number of sheep during the summer and fall as well (Simmons, 1968).

The Dall sheep kill by non-residents appears to have been light in all areas except 14h and 14k where sheep densities are lowest (Ibid.). The flights made over 6h, 11b, 14k in September, 1966, 1967 and 1968, confirm this thesis. Comments on just how heavy the harvests have been will have to await the results of aerial and ground surveys planned for July, 1969.

The sightings of mountain goats in 11b and 11f are the first positive records of goats north of the South Nahanni River in Zone 12 that I know of. Besides observations in 14h and 14k, goats have also been seen as far up the Flat River as Tungsten and near Glacier Lake on the upper South Nahanni River.

My observations in 14h and 14k in 1967 and 1968 lead me to believe that there are no more than 30 goats there. The outfitter operating in those areas believes that there may be as many as 100 goats in 14k in the fall (Simmons, 1968).

I cannot objectively evaluate the significance of the 1967 and 1968 goat harvests at this time. However the kill from such small groups seems high. The fact that over 50% of the goats killed in 1967 and 1968 in 14h and 14k were female may be cause for concern (Ibid.)

Recommendations

A continuation of the aerial survey program discussed here is needed to determine gross sheep and goat population fluctuations and movements. This information is needed as a foundation for mangement recommendations.

A special emphasis should be placed on identifying the seasonal ranges of the sheep that occupy the sample areas during the surveys. Without this information survey results cannot be adequately interpreted. A sheep tagging and dyeing program should be instituted as soon as possible so that sheep ranges can be defined.

Future aerial surveys should not include areas 4g, 11b, 11f, and 14h because they are too large and rugged to search in 10 hours or less.

Surveys of longer duration may result in significant errors due to sheep movements within sample areas. Area 14k is difficult to survey, but it is important mountain goat habitat that is relatively accessible to hunters. Area 4a seems to be such good and accessible sheep habitat that it should receive further attention in spite of its size. Area 6h lends itself to aerial and ground surveys so well, and it is so easily defined by surrounding forest and the Keele River, that it should be used as a special study area. The topography and vegetation of 6h is similar to much of the sheep habitat in Zone 12 north of the South Nahanni River and east of 128°30'W lat.

Checks should be made on the accuracy of aerial surveys of alpine tundra, either by men on foot or by helicopter. Checks by men on foot are impractical in the winter, so a helicopter should be used for this purpose if possible.

Late winter or early spring is the best time of year to conduct surveys to estimate lamb survival to the yearling class and to determine more completely the sex composition of the sheep bands. The juveniles must be counted from the ground, however, because they cannot be readily distinguished from adult ewes from an aircraft.

Nichols (1968) states that a more accurate estimate of the ram proportion of a population can be obtained during or shortly after the rutting season when the adult rams are with the ewes in large bands. The daylight period during the November - December rutting season in Zone 12 and 19, however, is too brief to permit the necessary four to five-hour surveys.

The next cold season survey of sample areas in Zone 12 and 19 should be conducted as soon after mid-winter as practical. This survey should probably be in late February or early March when the length of daylight is adequate. If a suitable helicopter can be chartered, a check of all or part of area 6h should be conducted in an effort to estimate the accuracy of the survey from a fixed-wing aircraft.

I suggest that areas 2c, 4a, 6h, and 15c be surveyed in 1969. Area 15c would replace areas 11b and 11f as a sample of the Dal-Little Dal Lake vicinity. Winter is a poor time for a mountain goat survey in 14k, and it seems to be poor sheep habitat.

The late winter aerial survey should be designed to determine:

1. The ram population (rams two years old and older),
2. The total numbers and distribution of sheep occupying each winter range, and
3. The boundaries of the winter sheep ranges.

An effort should be made to determine yearling-ewe ratios from the ground in some sample areas.

The winter survey should be followed by an aerial survey in July to ascertain.

1. Lamb: ewe ratios,
2. Total numbers of sheep in sample areas, and
3. The number of rams that will be subject to harvest during the fall hunting season.

The same areas mentioned above should be surveyed in July. I also plan to survey in July such areas as 9b, 19e, 20f, and 20g, which

outfitters plan to hunt in August and September, 1969, for the first time.

An attempt will be made in July to make a total count of the mountain goats in area 14k. This aerial survey will probably be repeated in 1970.

The results of this survey have not indicated a need for immediate institution of harvest controls. A major problem area, that of the mountain goat harvest in areas 14h and 14k, does not demand immediate action because the outfitter concerned does not plan to have his clients hunt goats in 1969. By October, 1969, I should have enough information about the goat population in 14h and 14k, based on aerial surveys and data on the ages and sexes of goats killed in 1967 and 1968 (Simmons, 1968) to make management recommendations.

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