

DALL SHEEP COUNT, 1981
Denali National Park and Preserve

Francis J. Singer
John Dalle-Molle
Joseph Van Horn

D-234

File:
Denali

U.S. Department of the Interior
National Park Service
540 West 5th Avenue
Anchorage, Alaska 99501

INTRODUCTION

The Regional-based National Park Service (NPS) contract helicopter was detailed to Denali National Park, July 2-3 and 6-11, 1981 in part to conduct an aerial count of Dall sheep (Ovis dalli). The helicopter returned to survey additional areas of the park on August 9, 10, 12, and 18. Objectives of the aerial surveys were:

1. To repeat a count of the traditional counting units 1-24 in the eastern half of the old McKinley National Park. These units have been surveyed seven times since 1953 by a variety of workers.
2. To conduct a count of sheep in the new preserve areas.
3. To search the western end of the park beyond Muldrow Glacier for sheep.

Dall sheep have been studied by a variety of people since Murie's (1944) early classic work. Two Master's students using primarily ground surveys worked on population dynamics (Murphy 1974) and habitat relations (Whitten 1974), while one Ph. D. candidate included inventories of sheep in his wolf-prey studies (Haber 1977). NPS conducted aerial Super Cub surveys of the western park herd in 1934, 1953, 1955, 1959, 1961, 1965, 1978, and 1981. Ground classifications were made in 1974-78 (Alaska Fish and Game Dept.) and 1979-81 (NPS).

The helicopter was piloted by Bill Roberts, with John Dalle-Molle, Francis Singer, and Joe Van Horn observing.

METHODS

We systematically searched counting units 1-24 in the eastern half of Denali National Park as described in Murphy (1974). Following the technique of Troyer (1975, 1979), we plotted the location of each group of sheep on a map (1:250,000 scale). We attempted to classify all animals from the air into the general categories used by Troyer (1975): lamb, ewe and yearling, and ram. In addition, we attempted more specific classification through low level (120 yards circling) of small groups, or by landing near large groups, getting out and classifying with a spotting scope. We landed the ship 120-270 yards from the sheep, and two observers independently classified using variable 15-45x spotting scopes on tripods. Any discrepancies between the two observers were

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rectified by a recount. In these cases the categories used were: lamb, yearling, ewe, $\geq 1/4$ curl, $\geq 1/2$ curl, $\geq 3/4$ curl and $\geq$ full curl. Some 2-year old rams may be classified as ewes.

The annual ground classification of a subsample of the herd (usually about 300 animals) was again conducted along the park road between Igloo and Highway pass. The extensive helicopter classifications presented an opportunity to test the validity of these subsamples.

Behavioral responses to the helicopter were noted: none, stand up and stare, walk/trot, lope or full run. Distances of closest approach to the sheep were visually estimated and should be viewed as rough approximations.

RESULTS AND DISCUSSION

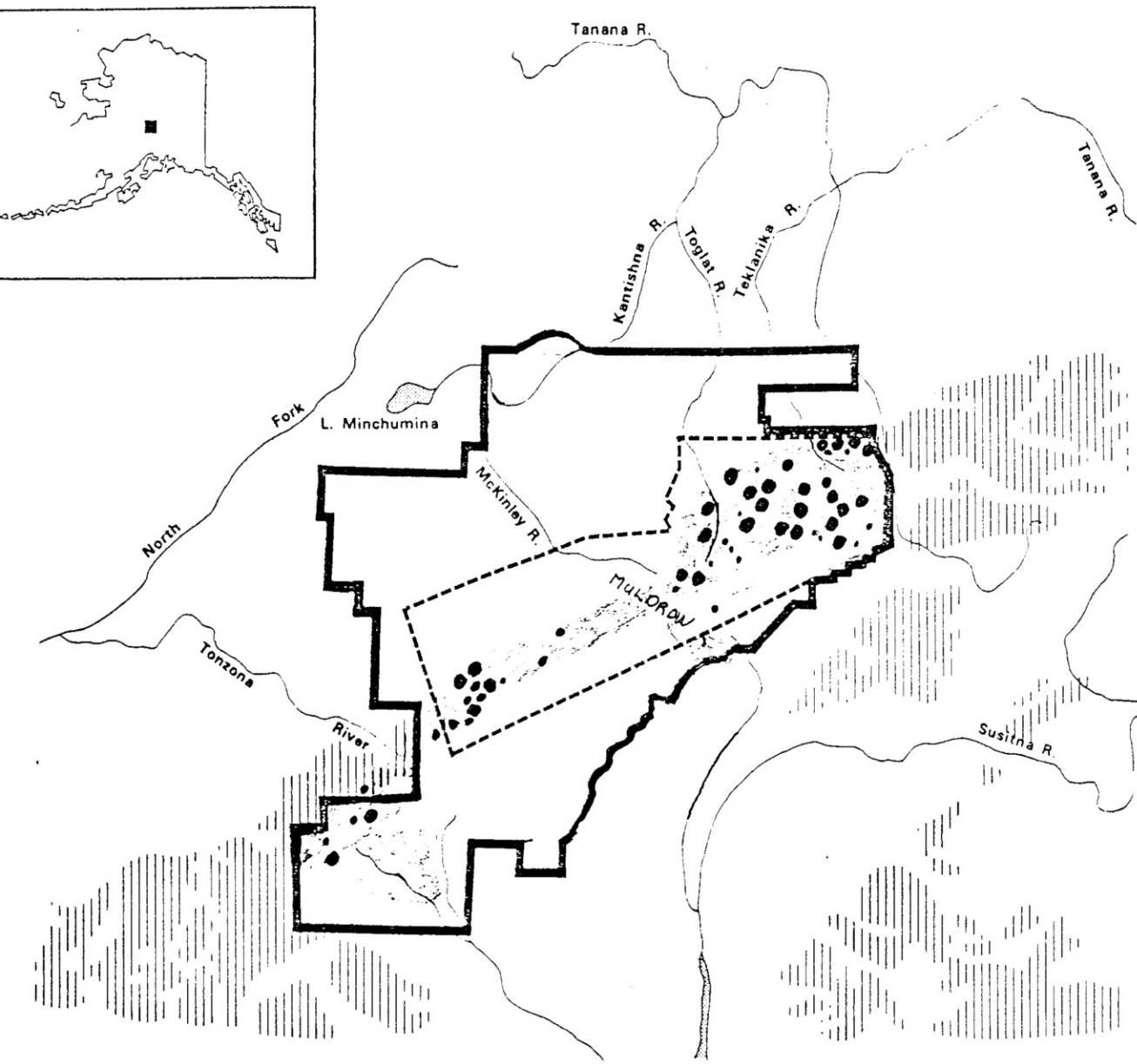
Numbers

The traditional counting areas east of the Muldrow Glacier were surveyed in 22.5 hours of flying time, during 5 flight days. The area west of the Muldrow Glacier required 5.0 hours (over 3 days) and the southwestern preserve 4.0 hours on 2 days (total = 31.5 hours).

We required 55% more flying time for the 1981 survey than the more recent Super Cub surveys (Table 1), primarily because of the large number of set-downs near groups. The helicopter was normally left running if we could accomplish our work in 4-7 minutes.

In parks where group sizes were smaller and few or no landings were made, e.g. Lake Clark, helicopter flying time was equivalent or less than previous Super Cub efforts.

A total of 2,182 sheep were counted east of Muldrow Glacier in traditional counting units 1-24 (Fig. 1), and 180 west of the Muldrow in range counted very infrequently (Park total = 2,362). An additional 114 were observed in the southwest preserve (Table 2) for a park + preserve total of 2,476. We are not so naive as to believe that we counted all of the sheep on park and preserve lands. We observed no sheep in the southern park boundary area and new addition, yet tracks were observed in Costello Creek and Ohio Creek and three rams were observed by NPS personnel near the West Fork Glacier on May 23, 1981. We know that at least a few small groups must occur here. In addition, the extreme southwest corner of the preserve (Simpson Pass-Fourth of July Creek) was not flown and might support sheep.



- - Area surveyed
- - Groups or clusters of groups
- ||| - Suspected sheep range outside of the Park/Preserve

Fig. 1. Survey area and approximate locations of Dall's sheep observed in Denali National Park/Preserve, 1981.

Table 1. Aerial surveys of the Dall sheep herd east of Muldrow Glacier, Denali National Park. ^{1/}

Year	Total Observed	Aircraft	No. Hours of Flying	Pilot/ Observers
1934 ^{2/}	2,280	Swallow TP	4	White/Liek
1953 ^{3/}	1,368	SuperCub	7	Scott/Steenbergh
1955 ^{3/}	1,745	SuperCub	7	Scott/Steenbergh
1959	1,809	SuberCub	?	Sheldon/Stenmark, Bohlin
1961	2,641	SuperCub	10	Sheldon/Larson, Watson
1972	954	SuperCub	10	Harris/Haber
1975	898	SuperCub	15	Harris/Troyer
1978	1,104	SuperCub	14	Troyer/Grosnik
1981	2,182	Helicopter	22.5	Roberts, Dalle-Molle, Singer, Van Horn

^{1/} An additional 14 flights were attempted since 1947 by a variety of parties, but only 2-21 units were covered and the data are not felt to be comparable.
Source - Park records and Pearson (1953).

^{2/} Obviously a rapid survey but note the high count.

^{3/} Only a small unit (No. 8) was omitted from these two counts.

Table 2. Dall sheep counts, Denali National Park and Preserve, 1981

Area	Ewes + Yearlings	Lambs	Rams	Total
Park East of Muldrow Glacier	1,222	490	470	2,182
Park West of Muldrow Glacier	99	54	27	180
Southwest Preserve	48	23	43	114
Total	1,369	567	540	2,476

Haber (1977) observed very few sheep west of Muldrow Glacier, and Smith (1972) observed only 14 there. Our count of 180 is the highest we could find records of. The State of Alaska has surveyed the Southwest Preserve area before, but not in relation to the new boundaries.

Our count represents an increase of 1,078 (97%) from the 1978 Super Cub survey (Table 1). A minimum of 62% of this increase must be 1978 Super Cub error, since the most rapid, well-documented rate of increase for a Dall sheep herd is 11% (Nichols et al. in press). This would have allowed a herd increase to only 1,510 by 1981. Lamb crops in Denali have been moderately good, and some other populations in the State have increased 10-20% in the last three years, but we consider a 37% increase in the Denali herd over the last three seasons to be highly unlikely. Whitten (1974) reported a similar problem between Super Cub surveys in 1972 (938 sheep) and 1973 (1,154 sheep), an increase which lamb crops and yearling survival indicated was improbable. Whitten (1974) felt that accuracy of the two surveys varied from 55-70%, but that accuracy determination was sheer guesswork. We conclude that population sizes obtained in the previous eight complete surveys (Table 1) could be quite misleading, and we caution against their use in anything other than a general manner.

Weather conditions in 1981 promoted high sightability. The heavy overcast we experienced was desirable -- sunlight causes glare and strong shadows (Nichols 1981). The low cloud ceiling and some snow occasionally covered the highest peaks, but the sheep were below these levels. We suspect that the extended period of precipitation prior to the census had brought the sheep down where we were able to better survey them. We do not know the accuracy of our helicopter survey. We did discover one group of 27 animals on a return-home flight of Unit 11 that had apparently been hidden from our view in a mountain top depression. This suggests that some groups could have been missed.

Population Mobility

We investigated the possibility of one small discrete area of the park being valid to fly as an index or trend area. This would save money and perhaps allow annual counts, instead of the present 3-year cycle.

Murie (1944), Murphy (1974) and Haber (1977) all reported extensive sheep movements between the Outside and Alaska Ranges in the park. Apparently, variable weather and snow conditions dictate when sheep will migrate to and from summer habitat in the Alaska Range, and whether or not they will winter there. Even for July surveys alone, the proportion of the population using the Alaska Range varied from 38-62% (Table 3). Between range movements are obviously extensive.

Table 3. Proportion of Dall sheep found in the Alaska versus Outside Ranges, Denali National Park, during aerial surveys

Year	Survey Date	Percent of Population	
		Outside Range	Alaska Range
1957	Aug. 14-15	54	46
1959	July 18	62	38
1961	June 29	80	20
1975	July 8-11	35	62
1978	July 22-24	47	53
1981	July 7-11	51	49

We identified seven fairly discrete blocks of land bounded by the larger rivers and valleys, and pooled the counts from those units (1-24) within the blocks (Fig. 2, Table 4). The only block with any prospects for a trend area was VII, which only fluctuated between 14-18% of the entire population (Units 12, 16, 19, 20, 21, 22, 24; Teklanika River - Muldrow Glacier in the Alaska Range). This area, unfortunately, is heavily-glaciated and may not be representative of the rest of the park. In comparison to the herd park-wide, the ratio of rams per 100 ewes was 30 higher; lambs; 100 - 21 higher, and yearlings: 100 - the same. The other six blocks varied tremendously between years (Table 4) in proportion of the herd, or in one case (Block IV) were very small.

Table 4. Proportion of Dall sheep occurring in fairly discrete sectors of Denali National Park between survey years

Year	I 1,2 ^{1/}	II 9,10,11	III 14,15	IV 17,18,23	V 3,4,7,8	VI 5,6,13	VII 12,16,19, 20,21,22,24
1961	5	43	27	5	1	4	16
1975	4	19	9	6	30	18	14
1978	12	26	5	4	17	21	15
1981	10	29	7	5	18	13	18

^{1/} Corresponds to Count Units proposed by Murphy (1974).

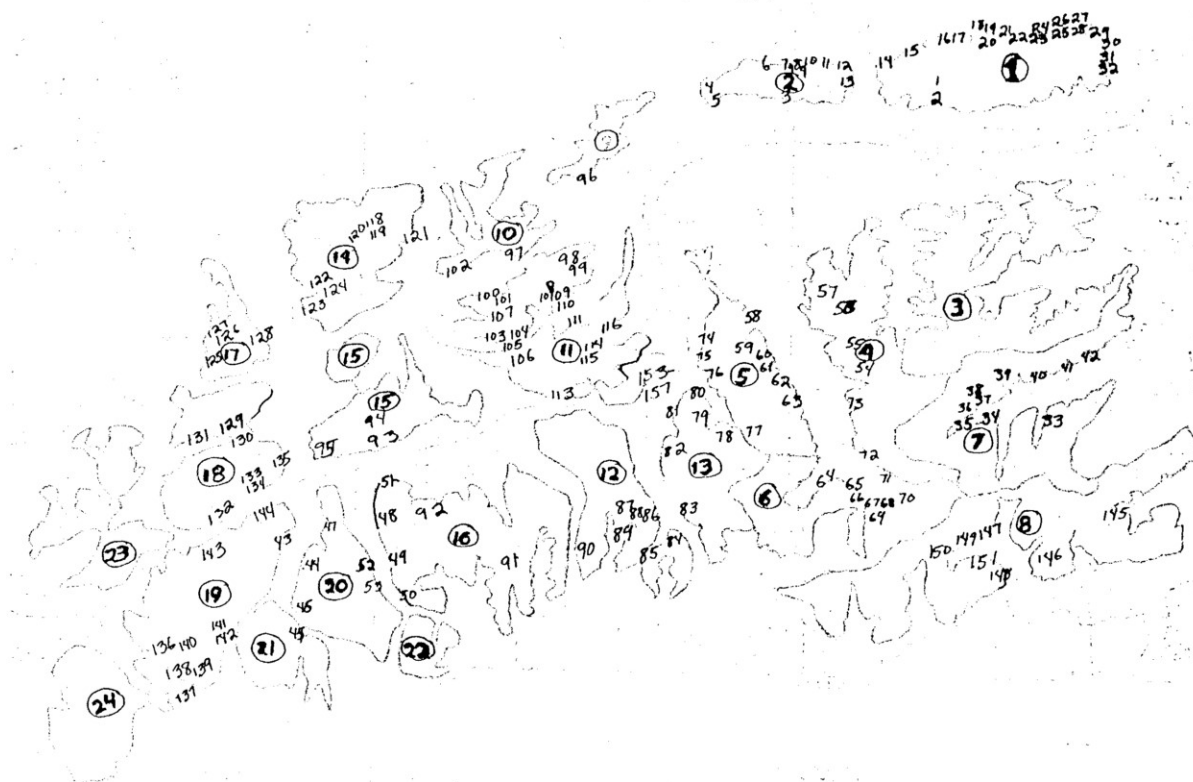


Fig. 2. Location of 157 groups of Dall's sheep, east Denali National Park, 1981.

The 24 count units proposed by Murphy (1974) are shown in circles.

These data support the contention of Murphy (1975) that Dall sheep in Denali National Park are highly variable in movements and show low fidelity to specific ranges. On the other hand, Whitten (1974) and Tracy (1977) recognized several individual sheep which occupied the same summer ranges. Their sample size of sheep, however, was very small, and limited to two years of observation. We conclude that the entire sheep herd in units 1-24 must be counted to establish numerical trends for Denali National Park.

Sex and Age Classification

We landed near 35 larger groups for scope classification and this combined with some aerial classifications resulted in 1,627 (76%) of the sheep classified. The road classification appeared to be a representative sample of the east park's lamb and yearling ratios (Table 5) and varied only 1-3 points from those obtained by helicopter. The ram ratio, however, was not representative of the total east herd.

Table 5. Comparison between ground and helicopter classifications of Dall sheep, 1981

Survey Technique	Lambs :100♀	Yrls :100♀	Rams :100♀	Sample Size
Ground	51	19	13	202
Helicopter	48	10	50	1,434
Combined	48	19	46	1,636

Ratios per 100 ewes were six less for lambs, six less for yearlings, and five higher for rams in the Alaska versus the Outside Range. Possibly a few more rams and barren ewes make the move to the Alaska Range.

Lamb and yearling ratios suggest that the herd increased in 1979, may have either been stable or increased in 1980, and probably slightly declined in 1981 (Table 6), based upon comparisons to herd statistics provided by Nichols et al. (in press). These are probable predictions only. Murphy (1974) through aging of ram's horns, documented widely fluctuating age cohorts in Denali sheep and showed that survival rate was more important to cohort size than an initial large lamb crop.

Table 6. Productivity of the Denali sheep herd, 1978-81, based upon ground classifications

Year	Lambs :100♀	Yrlgs :100♀	Over-Winter Lamb Survival	N
1978	57	24	42	212
1979	65	24	60	246
1980	60	39	32	336
1981	48	19		202

Classified rams included 43 (19%) of 1/4 curl, 53 (24%) $\geq 1/2$ curl, 53 (24%) $\geq 3/4$ curl, and 82 (37%) full curl or greater. A few young rams were probably classified as ewes.

Groupings

Average groups size was 14 for the park east of Muldrow Glacier and 7 and 10 for the lower density areas west of Muldrow and along the Yenta River.

Table 7. Group sizes for Dall sheep, 1981

Area	Percent of Groups by Size Category						
	1	2-10	11-20	21-30	31-50	51-100	101-150
Park East of Muldrow Glacier	8	53	17	8	10	3	1
Park West of Muldrow Glacier		80	20				
Southwest Preserve		67	25				

For the eastern park population, female/young mixed groups were consistently larger than ram groups (Table 8). Noteworthy were the relatively few single rams, the large size of a few ram groups (the largest was 27), and the high number (19) of mixed sex groups (12% of the groups).

Table 8. Group sizes by sex for Dall sheep east of the Muldrow Glacier, 1981.

Group Type(N)	Percent of Groups by Size Category						
	1	2-10	11-20	21-30	31-50	51-100	101-150
Ram(69)	10	73	14	3			
Ewe/lamb/yrl(69)	2	52	18	9	12	7	
Mixed Classes(19)		11	11	27	39	6	6

Many ram groups included all ages of rams (Table 9). There was little segregation of old versus young rams. Young rams (2-yr; 1/4 curl) were observed in only two ewe/lamb/yearling groups, while the 21 other groups with young rams included 1/2 curl or older rams.

Table 9. Ram groups, east of Muldrow Glacier, 1981

	Groups by Curl Class			
	2yr-1/4	1/2-4/4	3/4-4/4	All Ram Ages
No.	3	7	2	12
(%)	(13)	(29)	(8)	(50)

Sex Segregation

We observed almost no segregation of the sexes by range or habitat. As stated earlier there were only slightly more rams in the more rugged Alaska Range. Block VII, the most glaciated sector east of Muldrow, did have a slightly higher proportion of rams than other sectors. Rams did not segregate closer to glaciers and steeper terrain at the headwaters of a drainage as they do in some hunter populations. Distance from the source of the Teklinika River averaged 5.5 miles for ewe/lamb groups and 5.7 for rams; for the Sanctuary River averages were 6.5 for ewe/lambs and 5.1 for rams (no difference, t-tests).

Reactions to the Helicopter

Responses were recorded for 19 groups of sheep. We landed near 10 (53%) of these groups, circled 4 (21%) groups, and made a single pass by 5 (26%). Our estimated distance of closest approach averaged 129 yards (range 20-300). Five groups (26%) stood and stared, 4 (22%) walked/trotted, 5 (26%) went into a full run, and 5 (26%) did not respond. Sheep moved an estimated average of 69 yards (range 0-250) after being disturbed.

FUTURE WORK

1. A great deal of movement is suggested for the Denali sheep herd. This implies that the entire eastern herd should be surveyed to establish trends. We suggest the following procedures for future counts:
 - a. A helicopter with three observers be used,
 - b. Units 1-24 of Murphy (1974) be consolidated into 7 in order to reduce the possibility of inter-unit travel by sheep between count days. These 7 units are still small enough that one or two may be counted each day (see Table 4).
 - c. The aerial survey be conducted July 1-15, every 3 years.
 - d. The difficulty of aerial survey of the Denali sheep herd has been underestimated. The herd is highly mobile, widely dispersed and occupies some steep and rugged terrain. Additional effort should be put into standardizing the survey using the same observers and pilot whenever possible, flying under optimum observational conditions whenever possible, and flying the same dates.
2. Population trends are poorly understood for the Denali sheep herd. Last winter, 1980-81, was considered "mild" yet lamb over-winter survival was apparently poor. Winter severity conditions could be monitored more closely. Also, an additional ground survey classification in April would provide a sample of the 2-year old class, and help to better predict trends.

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