

SOME POPULATION CHARACTERISTICS
OF DALL SHEEP IN SIX
ALASKA NATIONAL PARKS AND PRESERVES

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ABSTRACT

Dall Sheep (Ovis dalli dalli) were surveyed 1981-83 in six National Parks and Preserves in Alaska, which were newly designated in 1980. About 46 per cent of the sheep were observed in Preserves which are open to sport hunting and 54 percent in Parks or protected areas. Preserves contained 2-4x more legal rams per unit of land than Park lands. Sheep numbers averaged 76 percent higher than in the same portions of the new areas counted in the 1970's. Mature rams associated more with nursery groups than is commonly reported during summer and only minor segregation of ram groups was observed.

INTRODUCTION

In December 2, 1980, the Alaska National Interest Lands Conservation Act (ANILCA) was signed establishing 10 new National Parks, Monuments, and Preserves and adding lands to 3 existing National Park Service areas in Alaska. Six of the National Park Service areas had populations of Dall sheep. Sport hunting is allowed in the Preserve portions and limited subsistence hunting by local, traditional users is permitted in the Park portions of these areas.

The new Parks emphasized scenic mountainous terrain and interior areas and as a result, more Dall sheep were included than other Alaska big game species (Wright 1984). Events leading to ANILCA's passage on sport hunting of Dall sheep generated a considerable amount of debate. These events were reported in three papers presented at the Northern Wild Sheep and Goat Council Symposia (Heimer 1978; 1980; 1982). From 1981-83 the U.S. National Park Service (NPS) surveyed sheep populations in the newly designated areas. This paper presents information on the current numbers and some population features of Dall sheep in the Denali National Park and Preserve, Lake Clark National Park and Preserve, Wrangell-St. Elias National Park and Preserve, Gates of the Arctic National Park and Preserve, Noatak National Preserve, and Yukon-Charley Rivers National Preserve.

METHODS

Count units or sample blocks were arbitrarily delineated on the basis of major drainages and terrain. Efforts were made to reduce counting errors from

sheep movements by selecting unit boundaries on the basis of natural obstacles to sheep movements, such as broad flat areas, rivers, etc. Entire count units were surveyed in a day and in a consecutive fashion. Nevertheless, sheep movements undoubtedly occurred during the counting process but hopefully ingress approximated egress. Twenty-nine count units were established in Gates of the Arctic, 24 in Denali, 28 in Wrangell-St. Elias, 18 in the Noatak, and 6 in Lake Clark.

The NPS chartered helicopter (Bell Jet Ranger II) typically flew each count unit counter-clockwise thereby placing 2 observers on the left side of the helicopter against the mountain side, while the 3rd (right side) observer was responsible for observing lower slopes and across canyons. A single contour was flown usually at mid-slope except in Lake Clark and Wrangler-St. Elias, where the range of sheep habitat necessitated 2 flight contours. The following classification categories were employed: lamb, yearling, ewe, 1/4 curl ram, 1/2 curl ram, 3/4 curl ram, 7/8 curl ram, 4/4+ curl ram. Rams were assigned to the lowest category which they achieved. For example, a ram between 1/2 and 3/4 would be classified as 1/2. For the helicopter portion of the survey, this level of classification was obtained for 75 percent of the sheep seen in Denali, 95 percent in Wrangell-St. Elias, 98 percent in Lake Clark, 94 percent in Gates of the Arctic, and 82 percent in the Noatak. Some 1/4 curl ram in nursery groups were undoubtedly classed as ewes but this error source was minimized by the use of a spotting scope. Small groups were classified during 1 to 2 low passes but for larger groups of 20+, the helicopter landed 200-400 m away and 15-45x spotting scopes were used.

The Super Cub surveys were similar except that more effort was required to inspect narrow canyons, ravines and drainage heads. Also typically yearlings were not distinguished and all rams were classified as either $\leq 7/8$ or $\geq 7/8$ curl.

RESULTS AND DISCUSSION

Survey Effort

Approximately 505 hours of aircraft time were devoted to the counting of sheep in 1981, 1982, and 1983. These times include local travel to and from units, but not major moves or the time to supply base camps. Survey effort was 58 percent by the helicopter and 42 percent by Super Cubs. Pilot (B. Roberts) and classifier (F. Singer) were the same for 56 percent of the survey time. About 98 percent of the sheep-occupied areas in the six National Parks and Preserves were surveyed 1981-83 with both aircraft types, with 34% of the survey effort in 1981, 15% in 1982, and 51% in 1983.

The largest percentage of survey effort (36 percent) was devoted to Wrangell-St. Elias, 35 percent was devoted to Gates of the Arctic, 12 percent to Noatak, 6 percent to Denali, 4 percent to Lake Clark, and 4 percent to Yukon-Charley Rivers.

Sheep Numbers

Two large count units were not counted in Gates of the Arctic but sheep

numbers were estimated from adjacent surveyed units. Numbers in 4 other units in Gates of the Arctic were extrapolated from ADF&G counts made there in 1974. Only 2 mountains south of the Chitina River in Wrangell-St. Elias were uncounted -- only 78 sheep were counted there in 1973.

A total of 30,455 Dall sheep were counted in the 6 National Parks and Preserves. Approximately 16,523 (54 percent) of the sheep were in Park category lands and 13,932 (46 percent) in Preserve lands (Table 1). In all but Denali, the highest densities were in the Preserve sectors. Also, one count unit in Gates of the Arctic, and 7 count units in Wrangell-St. Elias are split between Park and Preserve status, suggesting additional sheep might be available for sport hunting if they moved through the mountains at hunting season. Location of sheep harvest influenced placement of Preserve boundaries (Wright 1984) and as a result, 79 percent of the sheep in Wrangell-St. Elias, the most significant State sheep harvest area, were observed in the Preserve.

We counted 76 percent more sheep in 1981-83 than were counted in 1972-78 in previously-counted portions of the Parks and Preserves (Table 2).

The considerable increases in sheep seen in those areas may be due to one or a combination of the following factors:

- 1) Sheep increase. An increase in sheep population numbers could have caused some but likely not all the increase we observed. Some sheep populations in Alaska have increases since 1975, e.g. Chugach State Park (Harkness, 1984), Kenai Peninsula (Spraker, 1984) and in the central Brooks Range (Singer, unpubl. data). However, other populations were stable or even declining during the same period, such as in the Talkeetna Mountains (Harkness, 1984) and in portions of the Alaska Range (Heimer, 1984).
- 2) Aircraft types. The helicopter, which was used for 58 percent of the work in the 1980's but not in the 1970's, may be more maneuverable, holds 3 observers, and has a more stable viewing platform than a Super Cub, which holds only 1 observer. However, the 1980's Super Cub counts were also higher than the 1970's Super Cub counts.
- 3) Survey efficiency. A smaller number of pilots and observers participated in the State of Alaska portions of the 1980's surveys and they had relatively more years of survey experience than in the 1970's effort.
- 4) Lamb crops. Hoefs and Bayer (1983) observed the Kluane Lake sheep herd to be stable 1969-80. Fluctuations of 17 percent around a mean value were largely due to differences in lamb crops. Lamb percent was higher in Alaska in the 1980's counts over the 1970's counts (Table 3), but the differences were trivial.
- 5) Survey intensity. Time spent per unit area where documented, increased in many of the 1980's Super Cub and helicopter surveys over the 1970's count. However, in a few areas such as all of the Noatak count units, 1980's survey times were equal or even less.

Table 1. Dall sheep numbers in 6 National Parks and Preserves in Alaska, 1981-83.

Administrative Area	Total Sheep	PARK		PRESERVE	
		Sub-Total	Sheep/mi ²	Sub-Total	Sheep/mi ²
Wrangell-St. Elias	13,095	2,717	1.7	10,378	2.8
Gates of the Arctic	12,343	10,831	1.1	1,512	2.1
Denali	2,476	2,362	2.0	114	---
Lake Clark	805	613	0.8	192	1.0
Noatak	1,556			1,556	0.4
Yukon-charley Rivers	180			180	
TOTAL	10,455	16,523		13,932	

1. Based on our estimation of sheep occupied habitat.

Table 2. Dall sheep counts in the 1970's compared to 1981-83 counts in 5 National Parks and Preserves in Alaska.

Administrative Area	Count Units Involved	Year of Last Count	Last Count	1981-83 Count	Percent Difference
Wrangell-St. Elias	2,6,7,8,9,12,13,14,21	1972-73	3,054	5,283	+ 73
Gates of the Arctic	5,6,7,8,9b,16b	1974	789	1,589	+101
Denali		1978	1,104	2,362	+114
Noatak	2,3,4,5,6,15,16	1974	834	1,074	+ 29
Lake Clark	1 - 6	1978	530	805	+ 52
TOTAL			6,311	11,113	+ 76

Table 3. Proportion of lambs in 1970's and 1980's counts in parts of the National Parks and Preserves in Alaska.

Area	1970's Counts (%)	1980's Counts (%)	Difference
Wrangell-St. Elias	18	19	+1
Gates of the Arctic	18	18	0
Noatak	18	21	+3
Denali	21	23	+2
Lake Clark	28	32	+4

The difficulty of accurately surveying Dall sheep is clearly demonstrated by the survey efforts in Denali National Park. A number of authors have based their conclusions upon counts or estimates in the Park made from ground or Super Cub (Murphy and Whitten 1976; Haber 1977; Heimer 1979). Partial counts have often been reported on, however, many of the sheep cross from the northern winter range to the southern Alaska Range and back again each summer (Murie 1944; Whitten 1975). Highly inconsistent percentages of the sheep herd may be found in Park sections in any survey (Table 4), thereby mandating that the entire Park and both ranges be counted during any trend count. In addition, the helicopter count in 1981 was 114 percent higher than a Super Cub count in 1978, suggesting great inefficiency in both that and possibly all the earlier Cub counts. During the 1978-81 period, lamb ratios per 100 ewes averaged 58 percent, yearling ratios 27 percent, and lamb to yearling overwinter survival 45 percent, which does not suggest a large increase in Dall sheep (Simmons et al. 1984). The greatest annual rates of increase for Dall sheep actually documented is 11 percent (L. Nicholes, unpubl. data), 16 percent (Harkness, 1984) and 21-33 percent (Calef 1983).

Table 4. Proportions of Dall sheep found in the Outside versus the Alaska Ranges in Denali National Park during complete aerial surveys.

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

Wrangell-St. Elias held the most variable population with count unit densities ranging from 0.6-8.2 sheep per square mile of sheep occupied terrain, and Gates of the Arctic was the next most variable with densities ranging from

0.3-3.1 sheep per square mile. Both are large and diverse land areas. Densities of 0.3 sheep per square mile of occupied habitat or less were considered low. Densities of < 0.3 sheep per square mile were observed in 0 of 24 count units in Denali, 0 or 23 count units in the Wrangells (north of the Chitina River), but 2 of 29 count units in Gates of the Arctic, 1 or 6 count units in Lake Clark, but 9 of 18 count units in the Noatak. Four count units in the Noatak had less than 0.10 sheep per square mile.

Ram Statistics

Wrangell-St. Elias possessed the highest number of legal (7/8 + curl) rams per 100 square miles and the highest ratio of 7/8+ rams to younger rams, but it was followed closely by Denali (Table 5). Lower legal ram densities were largely due to lower sheep densities (Table 1). There were more 7/8+ rams per area on Preserve lands than Park lands and in the cases of Gates of the Arctic and Wrangell-St. Elias, the differences were very substantial, 2.6 and 4 times, respectively. In addition, in 3 of those count units (mountain units) split between Park and Preserve status, where groups were plotted on maps, 2 units had an average of 90 percent more rams in the Preserve than Parks sector. Efforts were made when the Preserve boundaries were drawn to consult hunting guides and harvest figures and to include areas with highest ram concentrations (Wright 1984).

Table 5. Legal ram percentages and relative densities in 5 National Parks and Preserves in Alaska.

Administrative Area		Total Sheep	7/8+ Rams as % of Herd	7/8+ Rams as % of all Rams	Sportsman's Index
Wrangell-St. Elias:	Preserve	7,096	10	29	29
	Park/Preserve	3,777	10	42	30
	Park	1,307	7	60	7
Gates of the Arctic:	Preserve	1,512	16	20	18
	Park	10,831	9	22	7
Denali:	Park	2,362	7	49	22
Noatak:	Preserve	1,556	9	36	4
Lake Clark:	Preserve	192	7	39	8
	Park	613	8	45	7

¹Number of legal (7/8+ curl) rams per 100 square miles of sheep occupied habitat.

²Count units split between Park and Preserve status.

Ram Distributions

Past observers reported no Dall sheep rams older than 3 years in nursery groups during summer (Haber 1977; Hoefs and Cowan 1979; Hoefs and Bayer 1983). This situation was nearly approximated in lower density Parks and Preserves such as the Noatak (Table 6) but in higher density areas such as Denali (Table 6) ram association in nursery groups was 8 x higher than in the Noatak, and full curl rams were found in nursery groups as often as were younger rams.

A distinct separation of the sexes is observed in bighorn sheep (Geist 1971; Shank 1982). I observed no obvious differences in habitat selection by rams or nursery groups, and no difference in ram-ram or ram-ewe intergroup distances (t-tests for unpaired variates). I observed approximately 1 ram of all ages in nursery groups in Denali Park. A common observation by local residents and guides in both the Wrangells and Lake Clark is that many rams, in particular large-horned individuals, segregate themselves up-drainage in the steepest habitat adjacent to the glacial sources of a drainage. Average distance of ram groups was 3.0 and 5.2 miles closer than ewe groups to the glacial source of a drainage in 2 count units in the Wrangells, but not significantly closer as in 2 others of the Wrangells and not in any units in Lake Clark (t-test, $P < 0.05$).

Table 6. Distribution of rams by horn size class in group types in Denali and Noatak.

Ram Curl Class	Administrative Area	No. of Rams (%) in Various Groups			Total Rams
		Ram	Nursery	Solitary	
1/4	Denali	31(72)	12(28)	0	43
	Noatak	57(86)	5(7)	5(7)	67
1/2	Denali	29(58)	19(38)	2(4)	50
	Noatak	61(94)	3(5)	1(1)	65
3/4	Denali	31(67)	14(31)	1(2)	46
	Noatak	142(96)	3(2)	3(2)	148
4/4	Denali	50(72)	17(25)	2(3)	69
	Noatak	60(98)	0	1(2)	61

Impact of ANILCA on Dall Sheep Hunting in Alaska

Heimer and Smith (1975), and Heimer (1978), estimated there were 40,000 Dall sheep in the State of Alaska. Heimer (1980) increased the estimate to

50,000. The comparable area counts presented here are 70 percent higher than corresponding 1975 and 1978 estimates, and 45 percent higher than the 1980 estimate. If this expansion factor holds true for areas outside the National Parks and Preserves, the Alaska number of Dall sheep is 73,000.

Previous calculations suggested that from 29 percent (Parker 1975) to 49% (Heimer 1980) of Alaska's Dall sheep inhabit the new National Parks and Preserves, and their creation would reduce statewide harvest of Dall sheep by 36 percent (Heimer 1980). This has not proven to be the case. Prior to Monument withdrawals, Alaska harvest of 3/4+ curl rams average 1,250 in the years 1977 and 1978. Since passage of ANILCA from 1981-83 the statewide harvest has averaged 976 or only 22 percent less. Sport hunter effort has decreased about 25 percent. In 1979, a more restrictive 7/8+ curl restriction was passed suggesting the reduction in ram harvest due to ANILCA alone was actually less than 22 percent. The State of Alaska has since refined their estimates of sheep removed from sport hunting by ANILCA based upon this survey data to 25 percent (Heimer 1982).

The new Alaska National Parks and Preserves probably contain 29-41 percent of Alaska's sheep. However, 46 percent of the sheep in the Parks and Preserves are still available for sport hunting. Modest increases in Alaska is likely as many 3/4 curl rams grew to legal (7/8+ curl) status, since some populations are apparently increasing, and as sportsmen better understand the new boundaries and regulations.

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