Alaska Department of Fish and Game
Division of Wildlife Conservation

Federal Aid in Wildlife Restoration
Research Progress Report
1 May 1995 - 30 April 1996

Bradley D Scotton

Estimation of Neonatal Mortality Rate and Determination of Neonatal Mortality Causes in Dall Sheep in the Central Alaska Range Unit 20A

Grant W-24-4
Study 6.12
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RESEARCH PROGRESS REPORT

STATE: Alaska **STUDY NO.:** 6.12

COOPERATORS: University of Montana

GRANT NO.: W-24-4

STUDY TITLE: Estimation of Neonatal Mortality Rate and Determination of Neonatal Mortality Causes in Dall Sheep in the Central Alaska Range Unit 20A

PERIOD: 1 May 1995-30 April 1996

SUMMARY

Progress this period was primarily the completion of the first season of fieldwork toward the goal of investigating the causes and timing of Dall sheep (*Ovis dalli*) lamb mortality in the Central Alaska Range. I also completed a thesis proposal for a Master of Science Degree from this project for the University of Montana. Twenty-five lambs were captured during this period and equipped with radiocollars. Two methods of lamb capture were employed and assessed. Lambs were radiotracked daily from 11 May through 11 June to determine survival rates and causes of mortality. Between 15 June and 31 August, the lambs were tracked approximately biweekly, after which they were tracked once per month until 30 April.

Key words: Dall sheep, lambs, mortality.

CONTENTS

BACKGROUND

Dall sheep (*Ovis dalli*) inhabit most of the major mountain ranges in Alaska. They are one of many big game species that thousands of visitors come to view or photograph each year. Up to 3000 hunters venture afield in Alaska every fall in pursuit of the Dall ram.

Dall sheep in the Central Alaska Range (CAR) have been a focus for people's attention. This group of mountains is in proximity to Fairbanks, Healy, and Delta Junction, 3 of the major population centers in Interior Alaska. The CAR contains 5560 km^2 of roadless area, is predominantly publicly owned state land, and is interspersed with private inholdings and mining claims. This area has been popular with hunters and other outdoor enthusiasts since the 1950s. Hunting without special permits is open from 10 August to 20 September each year for full-curl Dall rams. The area can be accessed with horses, ATVs, airplanes, or on foot. Population monitoring of Dall sheep began in the late 1960s and intensified after moose (*Alces alces*) and caribou (*Rangifer tarandus*) populations in the same area crashed during the early 1970s (Gasaway et al. 1983).

The CAR sheep population has numbered between 2000 and 5000 since 1968. Each fall, between 150 and 450 sheep hunters have gone afield in the CAR. The number of ecotourists is unknown; however, over the past 2 years 1 fly-in resort has accommodated 5000 person/nights each summer for the purposes of wildlife viewing and recreation. Flight-seeing operations based at Denali National Park are increasingly expanding eastward into the CAR to view spectacular scenery, sheep, and other wildlife. Other outdoor recreationists use the area primarily from June through August; snowmachining and trapping occurs during the winter months.

Dall sheep numbers (approximately 2000), hunter numbers (150), and hunter harvest (49) were all at recorded lows in 1994, and a June index of productivity was very low in 1991, 1992, and 1993 (Alaska Dep Fish and Game, 1996 Sheep Manage Rep, in press). This combination of numbers has evoked many valid questions from those concerned with Dall sheep, including the managing agency (Alaska Dep Fish and Game). What caused the population to decline rapidly between 1989 and 1994 (from 5000 to 2000)? Why were lamb:ewe ratios low in 1991, 1992, and 1993 (18:100, 5:100, 12:100)? In essence: what are the factors regulating this population? We may never know what exactly caused the

decline, nor why lamb:ewe ratios were low during those 3 years, but my research should provide insight into the factors regulating recruitment into the breeding population.

Dall sheep research has been given a low priority in recent years, partially because of the conservative management strategy of full-curl ram harvest only. Many biologists feel that if hunting is not adversely affecting Dall sheep populations and productivity, there is little point in spending money researching sheep. However, interests in research have rebounded following the decline in sheep numbers.

Several possible explanations for this sheep decline have been articulated. Hoefs (1984) found forage production on winter range was significantly correlated with spring lamb production and survival through their first winter in a Canadian Dall sheep population. Winter die-offs of sheep due to nutritional stress and increased predation have also been recorded periodically (Burles and Hoefs 1984). Nichols (1978) found an inverse relationship between spring lamb ratios and snow depths the previous winter.

Annual lamb production has varied from year to year in all mountain ranges in Alaska. Some areas have higher variability than others (Heimer and Watson 1986). Lamb ratios between 5 and 67 lambs:100 ewes have been recorded in the CAR during late June/early July since 1968. This variability in lamb:ewe ratios has been loosely correlated with weather indices in some studies (Heimer and Watson 1986, Nichols 1990). Caribou and moose populations in the same general range have had much less variability in early summer calf:cow ratios (Gasaway et al. 1983). Summer lamb:ewe ratios have never been compared with known ratios of pregnant ewes, and lambs have not been collared to determine causes and timing of mortality. Survival of lambs through their first winter has been estimated by comparing yearling:ewe ratios the following spring. Yearlings can be difficult to classify and estimations can easily be complicated by ingress or egress of yearlings or ewes from the count area. Causes of death are rarely known without marked individuals.

Harvest of Dall sheep in Alaska was also examined and found to have little or no effect on productivity of populations (Murphy et al. 1990). Hunting has been for any male (1944-1949), 3/4-curl minimum (1950-1978), 7/8-curl (1979-1983), and full-curl (1984 to present). Dall rams are usually 3/4 curl at 5 years of age, 7/8 curl at 6 or 7 years, and full curl at > 8 years. No hunting is allowed for ewes or lambs in the CAR. There were 65 rams per 100 ewes in the CAR in July 1994 (ADF&G unpubl data). Some yearling rams and all rams > 2 years old are included in this ratio.

Effects of predation on sheep in the CAR are largely unknown and effects of wolf (*Canis lupus*) removal have been unclear. Wolves, grizzly bears (*Ursus arctos*), coyotes (*Canis latrans*), and wolverines (*Gulo gulo*) inhabit the area and are potential predators of adults and lambs. Golden eagles (*Aquila chrysaetos*) also inhabit the CAR and have been observed killing Dall sheep lambs in Canada (Nette et al. 1984). Burles and Hoefs (1984) noted an increase in predation by wolves and coyotes during a period of deep snow in Kluane Park, Yukon. Sumanik (1987) studied wolves in Canada that preyed almost exclusively on sheep during the winter. Wolves that preyed on sheep exclusively had small

pack sizes and low consumption rates ($\bar{x}$ = 0.078 kg/kg wolf/day) (Sumanik 1987). Sumanik believed wolves could not limit the sheep population in that single prey system (Sumanik 1987). Wolf removal experiments in the CAR during the 1970s improved fall (Sep, Oct) and late winter (Mar, Apr) calf:cow ratios for moose, but had little effect on Dall sheep according to Gasaway et al. (1983). Heimer and Stephenson (1982) provided some anecdotal evidence that Dall sheep numbers were declining prior to wolf removal and may have stabilized as a result of the removal program. Lamb:ewe ratios in late June were the only indicator of sheep productivity measured at the time and did not differ from an adjacent area's ratios (Denali National Park) where wolves were not removed (Gasaway et al. 1983).

The wolf population in the Central Alaska Range was again experimentally decreased during the winters of 1993-1994 and 1994-1995 to benefit the declining caribou population. Wolf numbers within Dall sheep habitat were reduced by approximately 50% during these 2 winters. Wolf removal ended in January 1995, and wolf numbers are rebounding quickly (M McNay, Alaska Dep Fish and Game, pers commun). If wolves are a significant component of Dall sheep lamb mortality, I should see the predation rate increase in 1996, when more wolves are present in the study area.

OBJECTIVES

1 Develop a technique for the capture and handling of neonatal Dall sheep lambs (this has never been done).

2 Determine the rate and causes of lamb (> 24 hr old) mortality within the study area.

a from age 1-30 days.

b from age 31-365 days.

3 Assess possible changes in predation rates on lambs as the CAR wolf population rebounds following a 2-year wolf removal program.

4 Determine the peak lambing date, lambing areas and average birth weights of lambs in this study area.

METHODS

Field operations took place from an airstrip/cabin complex in the study area at the confluence of Newman Creek and Dry Creek in the Central Alaska Range. Capture and daily radiotracking operations took place from this field camp between 11 May and 11 June 1995. Once these daily operations were completed, personnel and aircraft were moved to Fairbanks.

Two types of helicopter were employed to develop a capture technique for lambs. A Hughes 500 turbine helicopter with a skid-mounted net gun was used to fire a 3.5 m x 3.5 m net over newborn lambs. The net was of nylon composition and had a 40 cm mesh

size. Two hundred fifty gram weights were attached to each corner of the net, which was propelled by a blank .308 rifle cartridge. The Hughes 500 and a much smaller piston-engine powered Robinson-22 helicopter were also used to land near lambs as we ran them down on foot.

Each of the 25 lambs captured was fitted with an expandable radiocollar. The lamb collars had a motion-sensing, "mortality" switch; after a 1-hour period with no movement, the signal rate doubled. Collars were designed to transmit for 15 months and to fall off between 12 and 18 months. Each collar weighed approximately 220 grams. Observation of the umbilical cord provided an indication of the age of the lamb. Lambs with a wet or partially wet umbilical cord were considered less than 24 hours old. Weight, sex, and location of capture were recorded. Lambs were radiotracked at least once daily for approximately 20 days after capture with either a fixed-wing aircraft (Bellanca Scout) or R-22 helicopter. Thereafter, lambs were tracked approximately biweekly during the summer, and then at least once per month until the end of April. Mortality signals were investigated immediately and cause of death determined if possible. A blood soaked collar was taken as a positive indication of predation. Animal tracks, feces, and patterns of consumption provided clues about the agent of death. Survival rates will be estimated using product-limit estimators (Kaplan and Meier 1958).

RESULTS

The objective to develop a technique for capturing lambs has been achieved. Essentially 3 methods were tested. First, I and Jonathan Larrivee (the Robinson-22 pilot) attempted to capture lambs by landing and chasing them. This proved futile. Lambs older than a few hours can easily outrun people on steep slopes. Eventually we were able to catch lambs by maneuvering the helicopter into a hovering position directly over the lamb/ewe pair. This usually confused the pair, temporarily causing them to mill around in one spot. While they were under the helicopter, I would step off the helicopter skid and land within arms reach of the lamb and knock it down before it had a chance to run away. If we were quick enough at maneuvering into position and getting on the ground, the attempt would be successful. Each capture attempt was somewhat different from the next, but this method was the most common and successful. Fifteen lambs were captured in this manner while using the R-22.

Occasionally a lamb only a few hours old was located. These were easily captured by landing several hundred meters away and walking up to the still wet lamb. Collars were placed on 2 such lambs, but weights and sexing were forgone to prevent possible abandonment by the ewe. Of these 17 lambs captured using the R-22, 1 was thought to have died as a result of the capture and was censored from mortality analysis. It was killed by an eagle the day following capture and had not been seen with its mother since its capture. Its stomach contained a few pebbles and no milk. It is likely the capture separated the ewe from this lamb, and they were unable to reunite before the eagle found the lamb. This particular capture was 1 of 2 that were made in a small valley at the same time. The helicopter was in the area more than twice as long as any of the single captures and may have frightened 1 of the ewes out of the valley.

The Hughes 500 turbine helicopter was employed for the capture of 8 of the 25 lambs. Four captures were attempted using the net gun. Two were successful, 1 of which was a lamb that was probably older than 36 hours and could not have been caught using any other method. The 2 unsuccessful attempts were a result of missing multiple times with the net and abandonment of the chases after I deemed them too lengthy. Six other lambs were captured by using the same method employed by the R-22. Two of the 8 lambs captured using the Hughes-500 were predated by an eagle within hours of capture. The mothers of these 2 lambs were observed to run into some nearby rocks more than 300 m from the lambs during the capture. Four hours later I returned to find the ewes at the capture site with the remains of both lambs which had been killed by an eagle. Because of the uncertainty whether these lambs had reunited with their mothers before the eagle attacked, they were censored from mortality analysis.

The cost of the Robinson-22 helicopter was $235/hour. The cost of the Hughes-500 was $550/hour. Fuel costs for the Hughes-500 were also higher.

Of the 22 lambs available for mortality rate analysis, 2 shed their collars, 1 radiocollar likely failed, 7 were killed by predators, and 12 are still alive and on the air. Time-specific mortality rates, average weight, and peak birthing date have not yet been calculated.

CONCLUSIONS

The Robinson-22 helicopter will be the only aircraft used in capturing lambs during the 1996 field season. Dall sheep are sensitive to disturbance by aircraft. Both the duration and the loudness of the encounter may affect the way sheep react. In general, ewes would run further from the Hughes-500 helicopter than the R-22. Noise levels on the ground from each helicopter were very different. The turbine whine of the Hughes could be heard for more than 500 m while the R-22 was barely audible at 200 m. The disturbance level of the Hughes seemed to be greater, and the monetary cost much higher than the R-22.

There are no other conclusions at this time.

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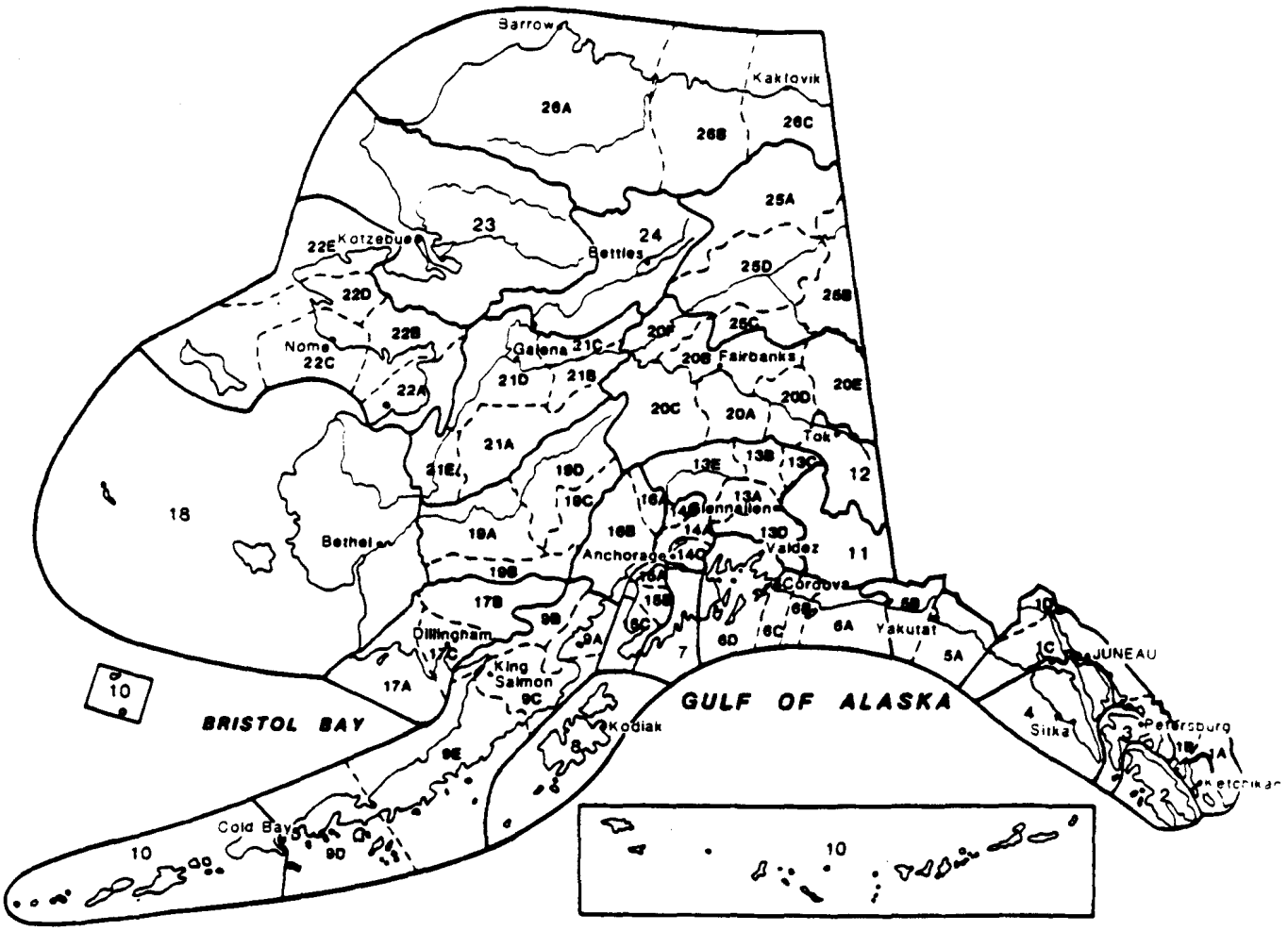
Alaska's Game Management Units



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PAT COSTELLO