Wildlife Restoration OPERATING GRANT FINAL PERFORMANCE REPORT	ALASKA DEPARTMENT OF FISH AND GAME DIVISION OF WILDLIFE CONSERVATION PO Box 115526 Juneau, AK 99811-5526

Alaska Department of Fish and Game
Wildlife Restoration Grant

GRANT NUMBER: AKW-23

PROJECT NUMBER : 6.18

PROJECT TITLE: Ewe Dall's sheep survival, pregnancy and parturition rates, and lamb recruitment in GMU 14C, Chugach Mountains, AK

PERIOD OF PERFORMANCE: July 1 2017-June 30 2018

REPORT DUE DATE: Sept 1, 2018

PRINCIPAL INVESTIGATOR: Tom Lohuis

COOPERATORS: Dr. Roman Dial, Alaska Pacific University; Brad Wendling, Alaska Department of Fish and Game, Fairbanks, AK

I.   PROGRESS ON PROJECT OBJECTIVES DURING PERIOD OF PERFORMANCE

Objective 1. Determine adult survival, pregnancy, natality, and recruitment rates.
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ACCOMPLISHMENTS: During the 2018 reporting period, 33/36 radio collared animals survived. Two adult ewes were killed by avalanches, while another individual died of an unknown cause.
We recaptured 14 of the 36; 13/14 were pregnant for a 93% pregnancy rate.
We have not captured neonate lambs since the 2014 reporting period, so we do not have measures for natality and recruitment.

Objective 2. Develop animal health profile.
    2a. Disease presence and prevalence

    2b. Trace mineral levels and blood chemistry (CBC, CMP)

    2c. Body Condition Scoring (BCS)

ACCOMPLISHMENTS:

2a. Blood sera and fecal samples, and nasal swabs were collected from all 143ewes captured during the current reporting period. These samples are currently being analyzed

by the Washington Animal Disease Diagnostic Laboratory at Washington State University, and the USDA-Animal research section (Dr. Highland's laboratory) for indications of standard wildlife disease including Mycoplasma ovipneumoniae. In addition, during 11 two to five day summer field sampling sessions, field crews collected 310 fecal samples for laboratory analysis.

2b. At capture, 60-75 ml of blood was collected from adult ewes to assess serum levels of trace elements. Laboratory analysis is complete and data analysis is ongoing. Preliminary analyses suggest some animals may be selenium deficient relative to reference levels for Bighorn and/or domestic sheep.

2c. Each animal captured was assigned a qualitative body condition score (BCS) of 1-6. Chugach sheep are typically in poor body condition, even for ungulates in late winter, with most rating 1.5-2.0.

During the two most recent reporting periods, we have begun to use ultrasound to more precisely measure subcutaneous rump fat in our sample of sheep. All animals sampled were in poor condition with 0.0-0.77cm of subcutaneous rump fat.

Objective 3. Assess weather effects on habitat and nutrition
3a, b, and c. Temperature and snow depth monitoring

We have modified these objectives due to the extreme variation in snow deposition and persistence across the study area. It is apparent that direct measures of snow depth and hardness at a few selected points are not representative of the study area as a whole. Landsat and MODIS satellite imagery does not appear practicable due to infrequent and irregular imagery due to darkness and cloud cover. We are attempting to identify and validate metrics that accurately represent these measures.

In collaboration with Dr. Roman Dial at Alaska Pacific University, we are attempting to develop metrics that accurately represent snowpack across the study area. Potential indicators of snowpack and persistence include date and volume of peak streamflow of streams draining the project area, newer 'Planetcube' 1-3M pixel satellite imagery.

3d. (New objective) Developing and validate techniques to assess the effect of summer weather patterns on sheep forage nutritional quality.

ACOMPLISHMENTS:

3a-c. In collaboration with Dr. Roman Dial at Alaska Pacific University, we are attempting to develop metrics that accurately represent snowpack across the study area. Potential indicators of snowpack and persistence include date and volume of peak streamflow of streams draining the project area, newer 'Planetcube' 1-3M pixel satellite imagery.

3d. We are developing and validating techniques to assess the effect of summer weather patterns on sheep forage nutritional quality. To date, summer field crews composed of

short term nonpermanent technicians have conducted 11 2-5 day field sampling sessions and collected 345 separate vegetation samples. We are analyzing the protein content and quality of these samples at the University of Alaska Anchorage's Stable Isotope Laboratory and at Washington State University's Wildlife Habitat Laboratory. When complete, we will determine if there is a relationship between summer temperature and precipitation and protein content and/or other measures of nutritional quality.

Objective 4. Data analysis and writing.

ACOMPLISHMENTS: We are developing a study plan for future research to better investigate the relationship between habitat quality, weather patterns, and sheep population performance, and to build a carrying capacity model for GMU 14C sheep.

II. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE.

Over the last several years of research, it appears that predation plays a smaller role in driving demography of Chugach sheep than in other ranges. Only 1 of 4-6 radiocollared adults are killed by predators, and only 1 in 3 lambs. This low percentage of sheep lost to predators, and the broad distribution of mortalities across predator species, suggests strongly that Chugach sheep populations are not predation limited. Additionally, the low level presence and prevalence of major wildlife diseases indicates that disease does not have a population-level effect. Some individuals are lost to pneumonia or other disease, but it is likely that these animals are in some way compromised and therefore susceptible.

Low and variable pregnancy rates, coupled with poor body condition strongly suggests that Chugach sheep are limited by nutrition and habitat, with long term weather patterns and climate change playing a major role. Work to identify specific limiting factors is ongoing.

III. SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS.

Not applicable

IV. PUBLICATIONS

In press in: 'Proceedings of the 21st Biennial Symposium of the Northern Wild Sheep and Goat Council'

Dall's Sheep Population Declines in Alaska's Chugach Range May be Related to Climate and Weather Patterns

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ABSTRACT: Dall's sheep populations in the Chugach range in Alaska have declined 30-50% since the late 1980s. Research in two study areas was initiated in 2009 and 2012 to identify rates and causes of mortality, assess nutritional condition, screen for disease, and check pregnancy rates on adult (age 3-17) ewes. Additional objectives were to quantify rates and causes of mortality on lambs from natality to one year of age. In the absence of baseline data, the project was designed to identify primary factors influencing sheep populations in Southcentral Alaska. With 134 and 183 sheep-years of data on adult sheep in the two study populations, annual adult survival was 87% in each population. Lamb survival was 57% and 32%, respectively. While these rates are very similar to that reported in other study populations, pregnancy rates in Chugach ewes are low and variable, ranging from 18-88% in one population, and 44-96% in the other. It appears likely that weather, climate, nutrition, and habitat play a far greater role in shaping the trajectories of these populations than does predation. Using a combination of nutritional condition measures, forage quality assessment, and remote sensing, current research efforts are focused on assessing changes in habitat quantity and quality due to changing weather and climatic conditions. We will discuss data that led to the current research direction, and present preliminary results that suggest that tree and shrubline advance has reduced available habitat, and that warmer, drier weather has reduced diet quality. Together, these pieces of evidence suggest that carrying capacity has declined to support sheep populations at present levels.

V.   RECOMMENDATIONS FOR THIS PROJECT

Project will continue with a focus on identifying specific limiting factors related to climate change and weather patterns, nutritional quality, and habitat limitation.

In the upcoming project year, I recommend that project objectives are specifically targeted to these topics.

Prepared by: Tom Lohuis

Date: 8/24/2018