

Alaska Department of Fish and Game
State Wildlife Grant

Grant Number: T-27 **Segment Number:** 2
Project Title: Conservation Genetics of the Alaska hare (*Lepus othus*).
Project Duration: 1 July 2012 – 30 June 2015
Report Period: 1 July 2013 – 30 June 2014
Report Due Date: 1 December 2014
Principle Investigator: Travis Booms, ADF&G
Project Location: Western Alaska (ADF&G Region 5), from approximately King Salmon to Kotzebue, AK.

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

The Alaska hare (*Lepus othus*) is an endemic species in Alaska that has received little research attention, and many aspects of its biology and conservation status are unknown. It is classified as a small game species with no closed season and no bag limit across its known range in western Alaska. The state manages the species without detailed information on its abundance, population status, or level of harvest.

It has been suggested that *L. othus* occurred north of the Brooks Range from the vicinity of the Colville River westward in historic time (Bee and Hall 1956). Specimen records in North American museum collections, however, are limited to the Seward Peninsula, along the west coast to the Yukon-Kuskokwim Delta, continuing south to the extremity of the Alaska Peninsula. Populations from Kotzebue to the Yukon-Kuskokwim Delta have remained low since population highs in the 1970s, whereas hare densities on the Alaska Peninsula have been reported low since the early 1950s (Klein 1995). Current distribution of the Alaska hare is largely speculative and based on sporadic reports from hunters and trappers. It appears that populations are disjunct, at low densities, and in decline, possibly due to recent climate change (MacDonald and Cook 2009).

Long-standing controversy exists concerning the taxonomic status of the Alaska hare (Baker et al. 1983). Some authors (Chapman et al. 1983, Dixon et al. 1983, Flux 1983, Honacki et al. 1982) have considered the three Arctic *Lepus* species (*L. timidus* of Siberia, *L. othus* of Alaska, and *L. arcticus* of Canada) as a single holarctic species. Rausch (reported by Anderson 1974) suggested that *L. othus* is a valid species not conspecific with *L. timidus* or *L. arcticus*. Hall (1981), following Howell (1936), recognized *L. othus* as a distinct species composed of two geographically distinct subspecies (*L. o. othus* and *L. o. podromus*). Recent DNA sequence-based analyses (Halanych et al. 1999) found that *L. othus*, *L. timidus*, and *L. arcticus* displayed minimal genetic divergence, suggesting a single circumpolar species or species complex.

MacDonald and Cook (2009) considered *L. othus* a distinct species found only in Alaska, which would make it one of only four extant mammal species endemic to mainland Alaska. (The other three include the Alaska marmot [*Marmota broweri*], the Glacier Bay water shrew [*Sorex alaskanus*], and the tiny shrew [*Sorex yukonicus*]. The latter two species are currently the focus of taxonomic revision and will likely be synonymized with *S. palustris* and *S. minutissimus*, respectively, in which case only the Alaska hare and the Alaska marmot would be the state's mainland endemics.) In its most recent Red List assessment, the IUCN concluded that "[r]esearch is needed to determine the taxonomic status of this species in relation to *L. arcticus* and *L. timidus*. Research should also be conducted in the areas of habitat and population status, harvest levels, and trends" (Murray and Smith, 2008).

How Project Relates to Alaska's Comprehensive Wildlife Conservation Strategy:

Because of the species' apparent wide-scale decline and unresolved distribution and taxonomy, it is considered a species of greatest conservation need in Alaska's Comprehensive Wildlife Conservation Strategy (CWCS) (Appendix 7 – Nominee Species List, pg. 794). The species has a NatureServe global and state rank as either vulnerable (G/S3) or apparently secure (G/S4) with cause for long-term concern due to declines. This study will address the above issues identified in the CWCS and provide important information for management and conservation of the species.

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

See text above.

III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

This project will be completed by a master's-level graduate student (Michelle Cason) at the University of Alaska Fairbanks (UAF) advised by Dr. Link Olson. The student will be responsible for coordinating and completing all aspects of the project, including logistics, field work, laboratory work, curatorial work, analysis, and publication of results.

Objective 1: Will be completed by partnering with various organizations and stakeholders to collect historical and extant occurrence data to investigate the distribution of *L. othus*. If occurrence information from portions of the species' presumed distribution is lacking, we will collect additional field observations and/or specimens to fill information gaps to the extent possible. Because the species is considered a game species with no closed season and no bag limit throughout its distribution, specimens can be legally collected by biologists and members of the public holding a valid hunting license. All specimen-collecting activities undertaken by the principle investigators and the master's student will be conducted under the Scientific Permit annually issued to the University of Alaska Museum of the North. Occurrence data will be displayed and analyzed spatially using GIS and species distribution models will be constructed using the maximum entropy algorithm as implemented in Maxent (ver. 3.3; Phillips et al. 2006). Specimens and

information obtained from this objective will be used to inform objectives one and two. All specimens collected in the field will be prepared as voucher specimens and deposited in the Mammal Collection at the University of Alaska Museum of the North in Fairbanks, AK. All specimen data will thereby be available to the global internet audience through Arctos (<http://arctos.database.museum/>).

Objective 2: Will be completed by Dr. Olson and the UAF master's student recruited for this project and co-advised by Drs. Booms and Olson. Olson has amassed a database of all known museum specimens of *Lepus othus* (n=256) collected from 78 unique locations (Figure 1). The small number of specimens associated with fresh tissue and therefore readily amendable to DNA extraction, amplification, and sequencing are restricted to the Seward Peninsula. The vast majority of the remaining specimens are represented only by skulls, with a subset of those including skins. Therefore, in order to include representatives from throughout the known distribution of the species, we will need to rely on degraded sources of DNA (dried tissue, hair, skin, or bone fragments) from historic specimens for the molecular analyses. UAM is uniquely equipped for such studies as it hosts the only dedicated ancient DNA extraction facility in Alaska, and Olson's lab has a proven record of successfully sequencing DNA from historic museum specimens. Available samples will be supplemented with newly-obtained voucher specimens as part of this project. Modern methods of phylogeographic and demographic analysis and landscape genetics will be employed to assess recent demographic trends and ongoing gene flow among populations.

Objective 3: Will be completed by the student preparing a master's thesis consisting of 2-3 chapters in scientific journal format according to accepted scientific and university guidelines. The student will then submit at least two chapters as independent manuscripts for publication in a peer-reviewed scientific journal and present at appropriate scientific meetings, including the Alaska Chapter of the Wildlife Society Annual Meeting.

All appropriate scientific collecting permits (see above) and Animal Use and Care Assurances will be obtained prior to project initiation that will cover all necessary field methods mentioned above.

IV. MANAGEMENT IMPLICATIONS

This is the second year of a three-year study. Hence, final results are not yet available for management purposes.

V. SUMMARY OF WORK COMPLETED ON JOBS FOR LAST SEGMENT PERIOD ONLY

Objective 1: Assess and compare the current and historical distributions of *L. othus* in Alaska.

Job/Activity 1a: Collate occurrence information for *L. othus* across its

distribution by querying appropriate data repositories. Likely data sources include museum collections, Alaska Natural Heritage Program, Alaska Department of Fish and Game, species experts, hunters, trappers, and other sources as appropriate. Critically re-evaluate evidence of historic occupation of northern Alaska by *L. othus* presented by Bee and Hall (1956).

Accomplishments: The graduate student (Michelle Cason) has added specimens listed on the VertNet and BISON online databases to the occurrence data collected in the previous reporting period for a total of 316 known *Lepus othus* specimens. Ms. Cason has assigned geographic coordinates to the 111 collection localities that did not have previously assigned coordinates, and has provided error radii for coordinates according to BioGeomancer guidelines (2006). Collection localities have been mapped for visual reference. Ms. Cason has investigated historical anecdotal records of *L. othus* cited in Bee & Hall (1956) and found no North Slope records substantiated by specimens or other physical evidence other than the specimen located at the Canadian Museum of Nature in the previous reporting period.

Job/Activity 1b: Supplement distribution information with field collection of museum specimens or field observations as necessary, especially in areas with little or no available information or along putative distributional boundaries.

Accomplishments: During this reporting period, we received through a citizen science initiative 7 new specimens and 2 new reputable observation records. Observations of *Lepus othus* from Unimak Island are the first from any Aleutian Island. Specimens were collected from the southern and northern extents of the species' range; the Alaska Peninsula and north of Kotzebue respectively. The northern range limit was extended approximately 50 km after a local hunter's collection and donation of a specimen near the Noatak River. This specimen was also the first voucher of *L. othus* in Noatak National Preserve. All specimens have been prepared for preservation, will be archived at the University of Alaska Museum, will be used for Objectives 1 and 2 here, and will be useful for future investigations well beyond the life of this research project.

Objective 2: Assess connectivity of potential subpopulations and/or subspecies of *L. othus* in Alaska.

Job/Activity 2a: Using museum and freshly-collected material, collect and assess genetic information to determine recent demographic trends and population connectivity.

Accomplishments: Genetic samples of fifty-one specimens have been successfully sequenced and combined with sixty *Lepus othus* sequences from GenBank in preliminary phylogenetic analysis.

Objective 3: Publish results from objectives in peer-reviewed scientific journals and present at appropriate scientific and/or professional meetings.

Job/Activity 3a: Write two manuscripts reporting project results in appropriate UAF master's thesis and scientific journal format.

Accomplishments: A manuscript with results from objective 1 is approaching completion.

Job/Activity 3b: Submit both manuscripts for publication to appropriate journals.

Accomplishments: Objective to be completed in subsequent reporting periods.

Job/Activity 3c: Present preliminary and final results as oral and/or poster presentations at the Alaska Wildlife Society Annual Meeting and other appropriate professional and scientific meetings.

Accomplishments: Presented research plan and preliminary results at the Western Alaska Interdisciplinary Science Conference 2014 in Kotzebue.

VI. PUBLICATIONS

None yet.

I. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

n/a

II. RECOMMENDATIONS FOR THIS PROJECT

Continued funding.

Prepared by: Travis Booms

Date: 09/02/14