

**FEDERAL AID
INTERIM 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
State Wildlife Grant**

Grant Number: T-11 **Segment Number: 1**
Project Number: 2.0
Project Title: Long-term monitoring and the importance of glacial habitat to harbor seals in Alaska
Project Duration: 1 July 2008 – 30 June 2010
Report Period: July 1, 2008 – June 30, 2009
Report Due Date: September 30, 2009
Partner: Alaska Department of Fish and Game

Project Objectives:

OBJECTIVE 1: Long-term monitoring of vital rates, diet, population trend, molting and pupping phenology and factors affecting population dynamics of harbor seals at Tugidak Island.

JOB/ACTIVITY 1A: Use photo-identification of individuals and mark-resighting techniques to estimate annual age and/or age-class specific survival probabilities, reproductive rates, pre-weaning pup survival probabilities, population size, and annual pup production; and determine reproductive histories of breeding females.

JOB/ACTIVITY 1B: Conduct daily counts of pups and non-pups during pupping and molting seasons each year to continue estimation of long-term trends at Tugidak.

JOB/ACTIVITY 1C: Continue monitoring pupping and molting phenology, to examine if significant shifts in timing of pupping or molting (such as observed during the period of population decline, Jemison and Kelly 2001) may result from shifts in age-structure, shifts in the timing of food web development and/or prey availability for harbor seals, or other factors.

JOB/ACTIVITY 1D: Monitor annual and seasonal variation in diet by scat collection during pupping and molting seasons (May – September).

JOB/ACTIVITY 1E: Explore how population dynamics may respond to environmental conditions by combining population data, Tugidak harbor seal diet data, and available environmental data collected around the Kodiak area.

OBJECTIVE 2: Assess the importance of glacial habitat to harbor seals, estimate the energetic costs of inhabiting glacial habitat (with and without vessel disturbance), assess diet/condition of seals foraging locally vs. those that travel outside the fjords to forage (costs/trade offs of these two strategies), and monitor over-wintering locations and survival.

JOB/ACTIVITY 2A: Equip harbor seals with dive instruments, heart-rate monitors, and VHF transmitters. Heart rate will be used as a proxy to estimate metabolic costs of harbor seals and calculate energetic expenditures. Seals will be instrumented before tourism vessel traffic arrives to obtain baseline data (i.e., “normal” resting and foraging behavior)

prior to influences of increased vessel traffic, and will retain the instruments through the peak of tourist season until they are shed during molt.

JOB/ACTIVITY 2B: Deploy Crittercams (video cameras, mounted on a seal's back, that record 8 hours of digital images before releasing from seal) to determine what prey harbor seals are foraging on (within, and beyond the glacial fjords where they were captured), and whether any changes noted in foraging behavior of seals over time are related to seasonal availability of prey, which may be unrelated to changes in vessel traffic.

JOB/ACTIVITY 2C: Capture pups and reproductive females immediately post-weaning to determine weaning weight of pups and body condition of moms and pups. Compare data with post-weaning captures at terrestrial sites. A complete suite of biological samples are obtained from each seal captured in spring and summer to assess diet, body condition, general health, immunocompetency, and exposure to disease and contaminants.

JOB/ACTIVITY 2D: Deploy satellite tags on seals captured post-weaning to track locations of seals during late-summer NMFS abundance surveys, determine where seals over-winter, and how diet, body condition, and winter locations affect first-year survival, and whether immature and reproductive-aged seals return to the fjords the following year

JOB/ACTIVITY 2E: Conduct land-based observations of vessel disturbance to harbor seals, especially seals tagged with heart-rate monitors. Determine frequency of disturbance to an individual, document exact timing of specific behavioral responses to approaching vessels (paired with changes in heart-rate of that individual to estimate energetic costs), distance/type of vessel, and subsequent response of seal prior to leaving the iceberg due to disturbance.

Summary of Project Accomplishments:

JOB/ACTIVITY 1A: Use photo-identification of individuals and mark-resighting techniques to estimate annual age and/or age-class specific survival probabilities, reproductive rates, pre-weaning pup survival probabilities, population size, and annual pup production; and determine reproductive histories of breeding females.

During the molting season, photographs of 2,533 seals were collected and archived for population studies. Age-specific survival was analyzed using data collected from 2000-2007 in the following manner. From 2000-2007, we collected 13,251 good quality photographs of up to 4,801 individuals in a photograph library. We estimated apparent age-specific survival probabilities of the seals first photographed as pups (n=569) using mark-recapture models incorporating effects of cohort, birth site, year, sex, color phase and age. For non-light-phase seals, annual apparent survival estimates were 0.66 (95CI: 0.48-0.62) to age 1 yr and 0.88 (0.82-0.90) from 1 to 7 yrs. Compared to non-light-phase seals, apparent survival of light-phase seals was reduced by 0.11 to age 1 and by 0.06 from 1 to 7 yrs. Compared to females, annual apparent survival of males was 0.06-0.07 lower to age 1 and 0.03-0.05 lower from 1 to 7 yrs. A photogrammetrically-derived index of body size indicated males were slightly larger than females from 1-4 yrs, with this sex difference more pronounced from 4-7 yrs. Resighting probabilities averaged 0.43/yr (range of 0.06 – 0.84) and increased linearly with age, nearly doubling from age 1 to 7. These analyses are currently being prepared in a manuscript.

JOB/ACTIVITY 1B: Conduct daily counts of pups and non-pups during pupping and molting seasons each year to continue estimation of long-term trends at Tugidak.

During the molting season 2008, counts of pups and non-pups were collected during every survey day at both beaches. Age-structure of seals hauled out during each survey was provided by photograph survey data.

JOB/ACTIVITY 1C: Continue monitoring pupping and molting phenology, to examine if significant shifts in timing of pupping or molting (such as observed during the period of population decline, Jemison and Kelly 2001) may result from shifts in age-structure, shifts in the timing of food web development and/or prey availability for harbor seals, or other factors.

Molting phenology information for 2008 was provided through count and age structure data provided during the photograph surveys.

JOB/ACTIVITY 1D: Monitor annual and seasonal variation in diet by scat collection during pupping and molting seasons (May – September).

Scats were collected in 2008 on the following dates: 5/28 (~50), 6/24 (~65), 8/13 (77), 8/24 (63), 8/30 (78). Scats were frozen and stored with Kate Wynne in Kodiak for future analysis.

JOB/ACTIVITY 1E: Explore how population dynamics may respond to environmental conditions by combining population data, Tugidak harbor seal diet data, and available environmental data collected around the Kodiak area.

Data from 2008 will be incorporated in our long-term database for future modeling of environmental correlates to harbor seal population dynamics. Required to accomplish this activity: matching of 2008-2009 photographs, further by-eye matching of adult female and pup data during pupping seasons (2000-02, 04, 06, 08), analysis of diet composition as indicated by scat samples (2000-2009), and acquiring environmental data available in the region.

JOB/ACTIVITY 2A: Equip harbor seals with dive instruments, heart-rate monitors, and VHF transmitters.

In May 2009, 15 harbor seals captured in Tracy Arm-Ford's Terror (TAFT) Wilderness Area were equipped with instrumentation packages containing a time-depth recorder (TDR), heart rate monitor and VHF transmitter. To date, 13 (87%) of the packages have been retrieved. Heart rate data collected in 2008 is currently being analyzed and a poster of preliminary results was presented at the Marine Science Symposium in January 2009.

JOB/ACTIVITY 2B: Deploy Crittercams (video cameras, mounted on a seal's back, that record 8 hours of digital images before releasing from seal) to determine what prey harbor seals are foraging on (within, and beyond the glacial fjords where they were captured), and whether any changes noted in foraging behavior of seals over time are related to seasonal availability of prey, which may be unrelated to changes in vessel traffic.

In Spring 2008, 12 seals captured in TAFT were equipped with back-mounted National Geographic Society (NGS) Crittercams for <24 hours to determine what prey foraging seals were catching. The Crittercam footage is currently being analyzed and a poster will

be presented in October 2009 at the Society of Marine Mammalogy Biennial Conference on the Biology of Marine Mammals.

We intended to deploy more Crittercams in 2009, but NGS was not able to fit the project into their schedule this year. We will deploy more Crittercams in 2010 if it fits into the NGS schedule.

JOB/ACTIVITY 2C: Capture pups and reproductive females immediately post-weaning to determine weaning weight of pups and body condition of moms and pups. Compare data with post-weaning captures at terrestrial sites. A complete suite of biological samples are obtained from each seal captured in spring and summer to assess diet, body condition, general health, immunocompetency, and exposure to disease and contaminants.

In summer 2008, 15 pups and 15 adult females were captured in TAFT. Eight of the adult females were with pups and four were in estrus. Weights and biological samples were collected from all animals captured. Biological samples include: body condition by D₂O injection and ultrasound, blubber core, skin, hair, whisker and blood.

JOB/ACTIVITY 2D: Deploy satellite tags on seals captured post-weaning to track locations of seals during late-summer NMFS abundance surveys, determine where seals over-winter, and how diet, body condition, and winter locations affect first-year survival, and whether immature and reproductive-aged seals return to the fjords the following year.

During the summer of 2008 satellite tags were deployed on pups ($n=15$) and adults ($n=14$) captured in TAFT to collect movement and haulout data. Preliminary data was presented at the 2009 Alaska Marine Science Symposium. Twelve more satellite tags were deployed on seals captured in TAFT in spring 2009.

JOB/ACTIVITY 2E: Conduct land-based observations of vessel disturbance to harbor seals, especially seals tagged with heart-rate monitors. Determine frequency of disturbance to an individual, document exact timing of specific behavioral responses to approaching vessels (paired with changes in heart-rate of that individual to estimate energetic costs), distance/type of vessel, and subsequent response of seal prior to leaving the iceberg due to disturbance.

A field camp was established in Endicott Arm June 1-26, 2009 to conduct land-based observations of harbor seal behaviors both with and without vessel disturbances.

Significant Deviations: none

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