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-20.4.43 Wildlife Restoration FY2017

PROJECT TITLE: Spatial relationships, harvest vulnerability, harvest rates, and population density of brown bears on the northern mainland coast of Southeast Alaska

PROJECT DURATION: 1 July 2009–30 June 2018

REPORT DUE DATE: 1 September 2017

PRINCIPAL INVESTIGATOR: Anthony Crupi

COOPERATORS: National Park Service

WORK LOCATION: Mainland coast of Southeast Alaska from Glacier Bay National Park to Icy Bay, including the Yakutat and Malaspina Forelands

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I. PROGRESS ON PROJECT OBJECTIVES DURING LAST SEGMENT

OBJECTIVE 1: Describe seasonal spatial relationships of brown bears in a portion of GMU 5 including seasonal home ranges and habitat selection.

During this study we captured and radiocollared 92 brown bears (49 males, 43 females) in game management unit (GMU) 5A, including the capture of 22 brown bears (15 males, 7 females) at the Yakutat landfill. We also captured and deployed GPS radiocollars on 18 brown bears (10 males, 8 females) in GMU 5B. By the end of the reporting period, we successfully retrieved all functioning GPS collars needed to describe spatial relationships. This included recapturing 1 animal to remove her collar, and we retrieved 5 collars from the field that had properly released. We performed preliminary analyses of location data including seasonal movement patterns, animal home range size, and den site selection.

We estimated the home range size for 21 brown bears with an adequate number of locations collected during the population estimate. The mean number of locations (± SD) for 10 female brown bears was 1,909.9 ± 210.8 and 1,399.9 ± 137.4 for 11 male brown bears. During the late summer period male brown bears had a mean home range size of 211.9 ± 55.7 km^2, larger than female home range size, which averaged 144.2 ± 39.3 km^2. We mapped the home ranges of each age-sex cohort to depict the array of home range sizes and spatial locations occupied by radiocollared bears during the population estimate. Adult males had the largest home range size and female bears with dependent offspring maintained the smallest home ranges.

OBJECTIVE 2: Estimate harvest rate of brown bears.

Between 2009 and 2016 we collected and analyzed 213 brown bear DNA tissue samples to estimate the harvest rate of brown bears in GMU 5A. We submitted an additional 35 samples to Wildlife Genetics International (WGI) for inclusion in our genetic estimate of harvest rate. We also calculated an apparent harvest rate from the brown bear harvest sealing records.

OBJECTIVE 3: Estimate the density of brown bear on the Yakutat Forelands

We modeled the population density and abundance of brown bears in Yakutat using a spatially explicit capture-recapture framework. We examined models that accounted for trap type, sex, time, behavior, site-specific capture probability, and the inclusion of telemetry data. The top model was improved by the inclusion of sex and telemetry data. Within the 2,447 km^2 of bear habitat in the study area we estimated the expected abundance to be 260.1 ± 21.5 brown bears.

OBJECTIVE 4: Characterize bear den selection

During the reporting period, we continued to evaluate brown bear den site selection within the Yakutat and Malaspina study areas. Using the GPS collar data combined with an aerial bear emergence survey in the spring, we located 140 brown bear dens at various elevations. We hiked in to 27 brown bear dens and collected den site factor data. The terrain and landcover factors of the den sites were evaluated using a resource selection function model.

II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD

JOB/ACTIVITY 1a: Capture bears, deploy GPS radio collars

Accomplishments: We concluded the capture and collaring portion of the project during FY2015.

JOB/ACTIVITY 1b: Retrieve collars

Accomplishments: By the end of the reporting period, we retrieved 102 GPS radio collars from 87 individual bears.

JOB/ACTIVITY 1c: Download and analyze location data.

Accomplishments: Brown bear GPS radiocollar data have been downloaded and entered into a GIS geodatabase. The location data have been analyzed according to seasonal movement patterns, animal home range size, and den site selection.

JOB/ACTIVITY 1d: Prepare reports and publications

Accomplishments: During the reporting period we published the final report, "Brown Bear Population Estimation in Yakutat, Southeast Alaska". During the next segment we will prepare this report for publication.

JOB/ACTIVITY 2a: Collect DNA samples

Accomplishments:

We collected DNA from 12 harvested bears, and 2 other human-caused mortalities. The DNA samples were processed, sent to WGI for analysis, and archived.

Job/Activity 2b: Estimating harvest rate

Accomplishments:

Exploitation rates were examined through the calculation of apparent harvest rate (AHR), or the harvest probability, using the population size point estimate and 95% binomial confidence interval for the harvest rate. Apparent harvest rate for GMU 5A was determined from the number of animals harvested in RY 2012 and the number of bears available after the fall 2012 and spring 2013 hunting seasons. The apparent harvest rate in 2013 was calculated as 19 harvested bears divided by the total population estimate of 354 bears in GMU 5A, yielding an estimated harvest rate of 5.4%, 95% CI [3.3–8.3]. Total mortality rate in RY 2012 for GMU 5A was 7.6%, 95% CI [5.1–10.9].

Job/Activity 3a: Estimating the density of brown bears in the Yakutat Forelands

Accomplishments: Our objective was to examine brown bear population density and abundance in a 3,191 km^2 study area along the northern mainland coast of Southeast Alaska, near Yakutat, between the Gulf of Alaska and the Saint Elias Mountains. Using noninvasive sampling techniques, we collected bear hair from 15 July to 30 August 2013 to genetically identify individuals and develop capture histories for SECR models using multiple detector types: single-catch hair snares; scent-baited barbed wire corrals; and bear rub trees. We deployed 565 detectors and revisited these hair traps during 4 consecutive 9-day sampling occasions. We set 518 hair snares along bear trails adjacent to prioritized salmon streams and other frequented land cover types, such as herbaceous habitats with abundant wild coastal strawberries. To uniformly sample the landscape, we used scent lures to attract bears to 41 barbed wire corrals within 36 systematically distributed 8 km^2 grid cells. Bears also used marking trees to transmit chemical signals and we collected hair samples from 6 rub trees equipped with barbed wire. From our spatial array of these 3 detector types, we collected 849 hair samples and identified 152 unique individuals from 389 successfully genotyped detections, with 1–10 detections per individual. As part of a comprehensive study on brown bear spatial ecology and population dynamics, we captured and radiocollared brown bears and used these telemetry data to enhance the current population estimate. We incorporated 35,293 locations from 28 GPS radiocollared bears with capture–recapture data into SECR models to refine population parameters. We

examined models that accounted for trap type, sex, time, site-specific behavioral changes, and integrated spatial capture histories with and without telemetry data to estimate bear density and abundance. We estimated the density of brown bears at 98.8 ± 8.2 bears/1,000 km^2, 95% CI [84.1–116.2], CV=0.08, and an abundance of 260.1 ± 21.5 bears, 95% CI [221.2–305.7]. Using the study area density, we estimated the population size for GMU 5A as 353.8 ± 29.2 bears, 95% CI [300.9–415.8], with 225 female and 129 male brown bears. We suggest integrating hair snare detectors with traditional detectors in future bear genetic mark–recapture population estimates and augmenting SECR models with telemetry data when available. The results from this study provide reliable baseline density and population estimates from which state and federal managers can successfully guide brown bear harvest management strategies in Southeast Alaska.

To compare this estimate to other study areas in Southeast Alaska, we recalculated the available bear habitat for Berners Bay and Bradfield Canal/Unuk River study areas follow the protocol used in the Yakutat estimate. Brown bear density in Berners Bay was similar to Yakutat with 90.2 bears/1,000 km^2 and Bradfield Canal/Unuk River was considerably lower with 58.1 bears/1,000 km^2.

Job/Activity 4a: Locate brown bear dens from tracking the radiocollared bears and from surveys in the spring.

Accomplishments: We have identified 140 brown bear dens from GPS radio collars in the Yakutat Forelands and during spring aerial surveys in GMU5A. We visited 68 den sites and measured terrain factors for use in the model of selection probability. The timing of den entrance, emergence, and duration varied by sex and reproductive cohort as well as by elevation zone for the 95 bears with entrance data and 89 bears with emergence date. In general there was a prolonged period of den entrance at low and medium elevations and a positive relationship between emergence date and den elevation. Overall, male bears were the last to enter the den and were the first to emerge in all elevation strata.

Job/Activity 4b: Describe the attributes of the den sites and then compare those attributes with random (available) locations.

Accomplishments:

We developed a prioritized list of brown bear den sites to assess den site selection and we navigated to 27 brown bear dens to collect and validate den site factor data. We developed a suite of remotely sensed habitat data to estimate a resource selection function model to identify habitats with the greatest relative probability of having a brown bear den. We evaluated dens based on three elevation classes, low (0–99m), medium (100–500m), and high (>500m). We developed an RSF for each elevation zone and found that the top model for the low zone was driven by vegetation height and slope, forest cover and slope were most influential in the middle zone, and elevation and solar radiation helped predict dens site selection in the high zone.

III. SIGNIFICANT DEVIATIONS AND/OR ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD

None.

IV. PUBLICATIONS

Crupi, A. P., J. N. Waite, R. W. Flynn, and L. R. Beier. 2017. Brown bear population estimation in Yakutat, Southeast Alaska. Alaska Department of Fish and Game, Final Wildlife Research Report ADF&G/DWC/WRR-2017-1, Juneau.

V. RECOMMENDATIONS FOR THIS PROJECT

We have concluded the field work phase of this of this project and in the coming segment we will prepare final project reports following objectives and job activities outlined in the project statement.

Prepared by: Anthony P. Crupi, Wildlife Biologist III

Date: September 1, 2017