Alaska Department of Fish and Game
Division of Wildlife Conservation
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Utilizing harvest data to improve assessment of brown bear population management

Harry V. Reynolds
Robert D. Sutherland

Research Final Performance Report
1 July 2003–30 June 2004
Federal Aid in Wildlife Restoration
W-33-2
Study 4.33

FEDERAL AID
FINAL RESEARCH REPORT

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 25526
Juneau, AK 99802-5526

PROJECT TITLE: Utilizing harvest data to improve assessment of brown bear population management

PRINCIPAL INVESTIGATOR: Harry V. Reynolds; Robert D. Sutherland

COOPERATORS: None

FEDERAL AID GRANT PROGRAM: Wildlife Restoration

GRANT AND SEGMENT NR: W-33-2

PROJECT NUMBER: 4.33

WORK LOCATION: Statewide

STATE: Alaska

PERIOD:1 July 2003–30 June 2004

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

Assessment of the effects of regulatory structure and management actions on brown bear population trajectory is very difficult to determine. While visibility and annual behavioral patterns make it possible to annually monitor population size or trend of other species of large game mammals, it is difficult to monitor populations of bears because of their solitary nature and cryptic behavior. Changes in sex, age, and numbers of brown/grizzly bear harvest are the primary measures that are presently used to assess management effectiveness in Alaska, but these may lead to equivocal conclusions. Sex and age of the harvest can be determined from brown bear hides and skulls because hunters are required to present those specimens for sealing. Development of models that corroborate relationships between these harvest parameters and population trends could be very useful for management.

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

A finding of the 2002 ADFG Bear Workshop was that bear harvest information was not presently utilized to its full potential. Some issues that should be explored include whether harvest data could be used to determine or refine: variability in annual cohort strengths and

selectivity by hunters (sex and age of bears, by region in the state, resident vs. no-resident, differences in areas with tag fee waivers, differences related to management approach). Harvest density should also be compared to harvest of estimated density between adjacent Game Management Units and further work needs to assess new ways in which research data in combination with harvest data can be used to for trend analysis.

A modeling effort by Tait (1983) to utilize Alaskan brown bear harvest data to assess population trends was unsuccessful. Later approaches by Harris and Metzgar (1987a; 1987b) concluded that harvest trend data could produce wide variability and that the slowness in predicting trends limited their usefulness. However, new modeling approaches have been developed that may improve ability to assess trends and improve effective management capability.

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

OBJECTIVE 1: Use presently available hunter harvest data for brown/grizzly bears to provide estimates of abundance, harvest rates and annual survival rates.

We suggest application of at least two approaches to these problems. One is population reconstruction using age-at-harvest data which in fisheries management is called virtual population analysis (VPA) or catch-at-age (Gove et. al., 2002) and (Quinn et al, 1998). This method basically inflates the harvest data by estimates of natural mortality and harvest rates to obtain a population size. From this approach, we can obtain estimates of abundance of any cohort in a year, total abundance, harvest rates and annual survival rates. Model selection techniques are available to find which might be the most appropriate model (for instance, a constant survival rate or year specific survival rates). Unfortunately, sophisticated models can suffer from over-parameterization (not enough data, too many parameters) so auxiliary studies would be necessary to provide parameters such as natural survival rates.

The second approach will be to use stage-classified matrix population models based on the Leslie matrix (Caswell, 2001). Treated in this context, harvest (as in a harvest rate) is a multiplier of the population projection matrix. Possible stages for the projection matrix include yearlings, juveniles, mature reproductive females and post-reproductive females. Caswell provides a chapter on parameter estimation and provides clear guidance on a sensitivity analysis. This stage-structured approach has been used for killer whale (Brault and Caswell, 1993), sea turtles, and tortoises.

IV. MANAGEMENT IMPLICATIONS

Results of this project would provide improved utility of presently available harvest data to management of brown/grizzly bears. In concert with data on population size and structure compiled from brown bear research studies throughout the state, modeling harvest data to estimate cohort-specific harvest rates and survival rates and corroborate measures of abundance that have been extrapolated from research will allow managers to more effectively assess that status and trend of brown bears in each Game Management Unit (GMU). This could be applied to all GMUs, including those where research studies have not been

completed. It would provide another measure of vital rates and population abundance estimation that is important to effective management.

V. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN FOR LAST SEGMENT PERIOD ONLY

JOB _1_: Analysis of brown/grizzly bear harvest data to provide estimates of abundance, harvest rates and annual survival rates.

The statewide brown bear harvest database from 1960 to the present was adapted for use in modeling efforts so that the new approach suggested by Holmes and York (2003) could be applied. Although progress was made on this job, the time necessary to complete it was in excess of the Federal Aid funds dedicated to it. However, application of the model is still progressing and final analysis may be complete by February 2005.

VI. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THE LAST SEGMENT PERIOD, IF NOT REPORTED PREVIOUSLY None.

VII. PUBLICATIONS

None.

VIII. RESEARCH EVALUATION AND RECOMMENDATIONS

None.

IX. PROJECT COSTS FROM LAST SEGMENT PERIOD ONLY

FEDERAL AID SHARE $8,226 STATE SHARE $2,742 = TOTAL $10,968

X. APPENDIX

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XI. PREPARED BY:

Harry Reynolds
Wildlife Biologist III

SUBMITTED BY:

Mark McNay
Research Coordinator

APPROVED BY:

_____
Thomas W. Paul
Federal Aid Coordinator
Division of Wildlife Conservation

_____
Matthew H. Robus, Director
Division of Wildlife Conservation

APPROVAL DATE: _____