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INTERPRETATION OF BEAR HARVEST DATA

By

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Progress Report

Federal Aid in Wildlife Restoration
Project W-22-6. Job 4.18R

(Printed July 1987)

PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperators: None

Project No.: W-22-6 Project Title: Big Game Investigations

Job No.: 4.18R Job Title: Interpretation of Bear Harvest Data

Period Covered: 1 July 1986-30 June 1987

SUMMARY

Progress during this period was limited to obtaining the final tool needed to work on project objectives and to learning how to use it. This tool was the Generalized Animal Population Projection System (GAPPS), a modeling system developed by Harris et al. (1986). This tool and the model developed by Tait (1983) have now been obtained and converted for use on the IBM-compatible personal computers available to ADF&G biologists. Biologists now can use these tools to improve their ability to interpret bear harvest data. The delay in obtaining these tools requires extension of this project.

CONTENTS

BACKGROUND AND OBJECTIVES

Background and objectives for this project were stated by Miller and Miller (1986).

RESULTS

During this reporting period the modeling approach developed to interpret bear harvest statistics (Harris 1984) has undergone additional development and been finalized (Harris et al. 1986). This modeling approach is the Generalized Animal Population Projection System (GAPPS). Part of the delay in publishing the modeling approach, and making it available to other workers, resulted from the effort to make GAPPS applicable to different species with different life histories rather than using it only for species with life histories similar to that of brown/grizzly bears (*Ursus arctos*) (Harris, pers. commun.).

The original version of GAPPS was written to use dBase III for input files. During this reporting period we contracted with C. Bevins, who wrote the code for the original version of GAPPS, to convert GAPPS so that it could use dBase III instead. This conversion was necessary as computers available to most ADF&G staff use dBase III or dBase III Plus.

Subsequent to this conversion, several weeks were spent learning to use GAPPS and constructing input population files for several different simulated bear populations (e.g., unhunted or heavily hunted, differing initial sizes). These input files will facilitate use of GAPPS to model bear harvests of different populations around Alaska.

GAPPS is a tool for construction of probabilistic models. These are distinct from deterministic models in that rates are treated as probabilities and, correspondingly, different runs can have different outcomes even though the same rates are used as input values. For example, even though the probability of a cub being born male is assigned a probability of 0.5, on few runs will exactly 50% of the cubs created by the model be male. This is because the model will independently determine the sex of each cub (or other life history event) using the assigned probability. Similarly, for harvest, if the probability of a 25-year-old male being harvested is assigned the value 0.05, the model will independently examine each 25-year-old male and on 5% of such cases, on the average, a particular male will be harvested.

In the preliminary runs of GAPPS it was apparent that these probabilistic models will produce widely disparate outcomes even in relatively uncomplicated models with input rates that are simple constants. Staff used to dealing with deterministic models may encounter problems in dealing with the variation produced by probabilistic models like GAPPS. It is likely, however, that the population dynamics of actual populations function more like probabilistic than deterministic models and that the range of outcomes seen in different runs of this model better reflects reality tha deterministic models.

The GAPPS model keeps track of specific individuals in the population and the rates entered into the GAPPS program are applied to individual population members rather than to cohorts as in deterministic Leslie Matrix models, for example. This means that GAPPS can be unwieldy and take long execution times to produce runs for large populations (>700 individuals). However, we would have expected that different runs using the same input values for large populations would produce results that were more similar than the same runs for small populations. This is because low probability chance events could, when they occur, have more impact on small, versus large, populations. This expected result was not apparent in the preliminary runs.

A portion of the work anticipated under this project is to collect empirical data on changes in bear population status and numbers. The harvest data from the area where these empirical data were collected can be used to evaluate the capability of harvest data to reflect known changes in bear population status. In spring 1987 empirical data were obtained in GMU 13E which showed reduced bear numbers and altered population composition since 1978 and 1979 (Miller and Ballard 1982; Spraker et al. 1981; Ballard et al. 1980). We hypothesize these changes are a consequence of heavy harvest. Similar empirical data showing altered population density and composition because of hunting is being collected in a portion of GMU 20 (Reynolds and Hechtel 1987). Also, in the Black Lake area of GMU 9, an estimate of changes in bear population composition (and perhaps density) will be obtained in spring 1989. These estimates can be used for comparison with corresponding data obtained in the early 1970's in the same area (Glenn 1976).

Final conclusions regarding the ability of harvest data to reflect changes in bear population status requires that good empirical data be available. Therefore it is necessary to extend this project until these applications can be adequately tested. We will submit a revised program in the coming year to cover another 4 years' work.

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