Counting Grizzly Bears in Northwest Alaska

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Will a world-class lead/zinc mine being developed between Noatak National Preserve and Cape Krusenstern National Monument adversely affect their grizzly bear populations? That is the question faced by the Northwest Alaska Areas and the Alaska Department of Fish & Game. Grizzly bears in northwest Alaska are harvested by both sport and subsistence hunters. This, in addition to the impending development of the mine, called Red Dog, highlighted the need to obtain better population data on bears.

Historically, managers in Alaska have relied primarily on gross analysis of harvest data and miscellaneous observations to assess bear population trends. However, the use of harvest statistics for monitoring population status is not well documented and appears to be imprecise and questionable. More importantly, the information collected cannot be reliably compared to later observations.

Mark and Recapture

Our objectives were to obtain information on bear density, population structure, movements, and reproductive parameters by using a combination of conventional radio telemetry, satellite telemetry, and density estimates acquired with "mark/recapture" techniques.

The mark/recapture method of estimating wildlife numbers has been widely used for a variety of animals. The basic technique is to capture, mark, and release a known number of animals within a population. Later, you recapture animals from that population. In our case the marked animals, those with radio collars, were recaptured visually rather than physically. The proportion of the visually located animals which are marked as compared to the total number captured should correspond to the total marked animals as a proportion of the entire population. The full equation is:

$$\frac{\text{Number of captured animals which are marked (m)}}{\text{Number of animals captured (n)}} = \frac{\text{Total number marked animals in population (M)}}{\text{Estimated total population (N)}}$$

In addition to the population estimate, confidence intervals (CI) can be calculated. The CIs indicate the probability that the true population size falls within the bounds of the interval. This estimate of "confidence" in a population estimate is important when, in the future, we attempt to determine whether a change has occurred in the population.

Catching Grizzlies

The helicopter maneuvered into position and Warren Ballard, project leader, darted the female grizzly bear with immobilizing drugs, *tiletamine hydrochloride* and *zolazepam hydrochloride*. The amount of drug delivered was based on a visual estimate of her weight. It took approximately 10 minutes for the bear to go down.

The capture team's work had just begun. Sow 51 had two "cubs of the year." These cubs needed to be sedated to insure the family group remained together. The cubs were to be captured by hand. While a spotting plane kept an eye on the cubs, the helicopter placed team members in strategic locations. Then the foot race began. The speed, strength, and endurance of 25 pound grizzly bear cubs is incredible, as exhausted team members will verify!

Once both cubs were captured, they were trans-

The Northwest Alaska Areas includes three units of the National Park system; Noatak National Preserve (6,600,000 acres), Cape Krusenstern NM (660,000 acres), and Kobuk Valley NP (1,750,000 acres).

The Red Dog Mine is currently under construction on private land between the Noatak and Cape Krusenstern. Approximately one-half of the 54 mile road which connects the mine to the coast runs through Cape Krusenstern. The mine site is located 7 miles from the western boundary of the Noatak National Preserve.

The mine is expected to begin operation in 1990, primarily for lead and zinc. The project will include tailing ponds, a mill, power plant, worker housing, a saltwater port, water reservoir, the road, and several gravel borrow sites. The facilities will occupy at least 22,200 acres. The project is expected to operate a minimum of 40 years and much longer if additional nearby mining claims are developed.

ported back to their mother. The radio collar Sow 51 had been wearing for two years was now replaced, ear tags and tattoos checked, antibiotics administered, and physical measurements taken. She had been wearing a conventional radio collar. Her new collar had both conventional and satellite transmitters. Six grizzlies with home ranges that include the Red Dog mine were fitted with the satellite collars. These collars transmit daily movement data and provide much more detailed information.

Counting Grizzlies

The census was done using several fixed-wing aircraft and a helicopter. Each day the census area was thoroughly searched for "marked" bears. Marked bears were those with functioning radio collars. Once a bear was spotted by a search plane, all active radio collar frequencies were scanned on a receiver. If no frequency was picked up from the bear, it was categorized as unmarked. Generally the helicopter was called in to place a radio collar on unmarked bears. In this way the number of bears within the population which were marked (M) increased each day. The census lasted 7 days.

Sow 51 was one of 12 radio-collared grizzlies that had been captured and radio-collared in previous years and was available as a marked bear at the beginning of the census. By the last day of the census, there were 37 radio-collared bears in the area.

Assumptions of the Mark/Recapture Technique

Mark/recapture has a number of assumptions which must be met to be valid. The one most frequently violated is that of "population closure." We needed to determine how many of the collared bears remained in the census area and were available for recapture. This was done by deploying a radio-tracking plane, which searched for and located all collared bears each day. Each bear was identified as being in or out of the census area for that day.

Another key assumption in mark/recapture estimates is that all individuals have an equal chance of being captured (sighted in our case). We are in the process of determining whether this assumption was met. There seems to be a reduced sightability for sows

with cubs. Our data are being combined with data from similar Alaskan studies. With larger sample sizes, we anticipate that statistically significant differences among sex, age, and family groups can be properly tested.

Results

The intensive capture efforts allowed us to estimate the current sex and age structure of the bear population in the study area. Yearlings and cubs comprised 31 percent of the population. Ratio of adult (greater than five years of age) males to females was 61/100.

Two additional groups of populations estimates were developed: (1) numbers of adult bears greater than three years of age and (2) total numbers of bears

Warren Ballard and Kate Roney marking, collaring, and collecting data on a grizzly bear. 5/27/89. (Photo by Ayres).

Here's how you weigh a bear. (Photo by Ayres).

Adult Bear Population Estimate (N)
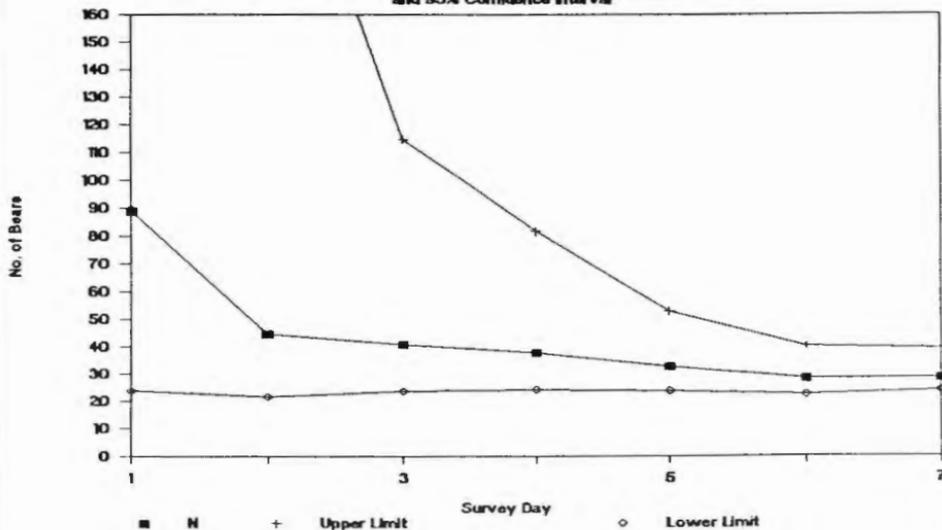### and 95% Confidence Interval

Figure 1

Radio collars *and a drugged grizzly bear. A conventional radio collar is on the right. A collar with both conventional and satellite transmitters is on the left.*

including young. The most statistically valid estimate was the former because it violated fewer crucial assumptions (primarily the assumption that all captures are independent of one another).

The adult population estimate within the census area was 28 bears (95% CI of 24 - 39) and the total population estimate was 37 bears (95% CI of 31 - 46). The population estimate did not change greatly as the survey progressed (Figure 1). What did change was the size of the CIs; they narrowed as the survey progressed. Population estimates and associated CIs leveled off by day 6. We surveyed one additional day to confirm that result and terminated the census after day 7. The primary benefit to marking additional bears during the census was to decrease the CIs.

Our reported total density estimate was 1 adult bear per 25 square miles. This falls near the midpoint of published density estimates for arctic study areas in

North America.

The grizzly bear in northwest Alaska is near the limits of its range. Its reproductive rate is low. Bear 51 bred for the first time at 4 years of age. She probably will live for 15 to 20 years and produce a litter every 3 years.

Because of their low reproductive rate, management of grizzly bears needs to be very conservative. Historically, populations of grizzlies have responded slowly, or not at all, following a reduction in numbers due to some impact or habitat loss. Typically, by the time a change in status of a bear population is identified, needed remedial actions are severe and often futile.

The Future

The status and health of the northwest Alaska bear population will be assessed at a later date by repeating the study using identical methods. The advantage of the mark/recapture technique over more common

methods is that the population estimates have known precision and can be statistically compared to later estimates. The causes of any changes are more difficult to decipher. The movement, productivity, and harvest data should help us understand reasons for changes.

Alaska contains approximately 65 percent of the North American population of grizzly bears. However, we cannot take for granted the current healthy populations of bears here. The precarious situation for grizzlies in the remainder of the United States, highlights the fact that bear populations can be greatly reduced by habitat loss and other human impacts. A well-

Lee Anne Ayres *with a captured grizzly bear cub. The cubs weigh approximately 20 lbs. in late May. They can easily outrun people.*

designed and scientifically valid study is an important first step. We plan to repeat the population count. This will allow us to compare density data and movement patterns. We also will be able to more accurately evaluate, and perhaps mitigate, any impacts of the Red Dog mine, or other developments, on grizzly bears.

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