PENNSYLVANIA GAME COMMISSION BUREAU OF WILDLIFE MANAGEMENT RESEARCH DIVISION PROJECT ANNUAL JOB REPORT

PROJECT CODE NO.: 06250

TITLE: Elk Research/Management

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TITLE: Elk Population Survey/Elk Harvest Management

PERIOD COVERED: 1 July 2003 to 30 June 2004

COOPERATING AGENCIES: Department of Conservation & Natural Resources, Bureau of Forestry (BOF) and Bureau of State Parks; Penn State Animal Diagnostics Laboratory, Pennsylvania State University, University Park, Pennsylvania.

WORK LOCATION(S): Cameron, Clearfield, Clinton, Elk, and Potter Counties

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Abstract: Elk (Cervus elaphus) marked with radio-collars were used to calculate a mark-resignting population estimator and to monitor elk range expansion. Personnel from the Pennsylvania Game Commission (PGC) and Department of Conservation and Natural Resources' Bureaus of Forestry and State Parks and volunteers conducted a fall 2003 and spring 2004 ground based elk survey. The population estimates resulting from the fall 2003 and spring 2004 surveys was 374 (95% Confidence Interval 271 - 515) and 421 (95% Confidence Interval 314-566), respectively. Known elk mortalities (30) were recorded 31 January 2003 through 31 January 2004. Crop-damage kills (12) and elk-vehicle collisions (8) were the leading causes of known elk mortality. One hundred hunters participated in the 6-day elk season from 10-15 November 2003. Sixty-eight elk (18 antlered and 50 antlerless) were harvested during the third elk season in 70 years. All elk tissue and blood samples tested for chronic wasting disease (CWD), tuberculosis, and brucellosis were negative. I recommend that we continue evaluating the new elk survey for the southern and northeastern (expanded) part of the elk range as well as the northwestern (traditional) part, and we continue the elk check station to collect biological data and monitor herd health.

OBJECTIVE

To measure annual changes in demographic characteristics of the elk population, monitor herd distribution, and document elk harvest.

METHODS

As in previous years, elk ≥ 1 year old were captured and fitted with radiocollars (Advanced Telemetry Systems, Isanti, Minnesota, USA). Freeranging elk were captured using a Pneu-Dart Cartridge (Pneu-Dart Inc., Williamsport, Pennsylvania, USA) dartgun and 1 cc Pneu-Darts. Carfentanil citrate (Wildlife Laboratories, Inc., Fort Collins, Colorado, USA) was used as the immobilizing drug and the antagonist was Naltrexone (Wildlife Laboratories, Inc., Fort Collins, Colorado, USA). Elk were captured using 1 cc doses of Carfentanil citrate (3 mg/cc). Following processing, each elk received 1.25 cc of Naltrexone (50 mg/cc) intravenously and 3.75 cc subcutaneously.

Each captured adult elk was equipped with a numbered yellow radiotransmitter collar. Transmitters were at 150-151 MHz frequencies and powered by lithium batteries.

Population Survey

Since 1971, annual elk surveys have been used to monitor elk populations. Recent surveys provided 100% aerial coverage of the "Traditional" elk range permitting a population estimate based on Chapman's mark-recapture method (Chapman 1951). However, these annual surveys only provided a minimum number of elk residing in the "Expanded" range, not a population estimate. Elk residing in the expanded range were only counted if associated with radio-collared elk or if their location is known prior to the survey. Thus, the lack of a random sample in the "Expanded" range prevents calculation of population estimates.

To resolve this problem we focused on ground-based capture-recapture methods when identifying potential alternatives. After considering a number of alternatives, we identified Bowden's estimator (Bowden and Kufeld 1995) as a possible alternative (Rosenberry and DeBerti 2003).

Bowden's estimator is a unique variation of traditional capturerecapture methodology. In its basic form, the Bowden estimator divides the total number of animals sighted during a survey by the average number of sightings of marked animals to estimate the population. A favorable quality of Bowden's estimator is that animal sightings can occur within a less structured survey.

Assumptions of Bowden's estimator include: 1) each animal has an equal chance of being marked, 2) the number of times a marked animal is seen is recorded without error (i.e., marks are not lost), 3) sighting effort must be adequate enough to produce ≥ 1 sighting per marked animal and preferably many sightings of marked animals would occur, 4) sightings of unmarked animals are determined without error, 5) likelihood of sighting is independent of marked status, and 6) the population is closed to additions and removals.

There are 3 options for sighting effort. First, predetermined routes could be surveyed by assigned individuals. Second, personnel from the PGC and Bureau of Forestry personnel could be asked to record elk sightings during the course of everyday activities for a predetermined period of time. And finally, a combination of fixed routes and workday sightings could be used.

This survey will be conducted in phases until we find the best methodology that will provide the most repeatable and reliable results. In the fall of 2003, we conducted our first survey using this technique, using limited personnel from Wildlife Management, local WCOs, and LMOs. We used a combination of survey routes and opportunistic sightings. In the spring of 2004 we expanded this effort to include PGC Food and Cover and DCNR (Forestry and Parks) personnel.

Mortalities

Known elk deaths were recorded from 31 January 2003 to 31 January 2004. Mortalities were recorded by cause, date of death, sex, age, and location for each elk. Field or laboratory necropsies were performed to determine cause of death, when appropriate.

Harvest

Commission personnel manned a check station in Quehanna Wild Area during the 6-day elk season from 10-15 November 2003; successful hunters were required to visit the check station within 24 hours of harvest. All elk were inspected, and a harvest report was completed. Sex, age, weight, antler and body measurements, harvest time and location, hunter information, and previous tagging information were recorded. A central incisor was removed for cementum age analysis. Blood samples were collected in the field by hunters for brucellosis testing. Tissue samples were collected for CWD and tuberculosis.

RESULTS

Population Surveys

This fall (15 September to 17 October), personnel from the Bureau of Wildlife Management and North Central Region conducted a pilot test of a new elk population survey. A total of 10 survey routes were designated; 7 within the traditional range and 3 in the expanded range. Routes in the expanded range included routes on SGL 34, Quehanna wild area including Gilmore Trail and Hoover Road, and up PA route 872 from Sinnemahoning to Potter County. Opportunistic sightings were also included in calculations.

Seventy-two survey routes were completed (Table 1). In addition, 16 opportunistic sightings were included. A total of 944 (37 marked, 907 unmarked) were observed.

The population estimate resulting from the fall 2003 survey was 374 (95% Confidence Interval 271 - 515). It is important to realize collars were not evenly distributed across the area surveyed. Consequently, this result may be best interpreted as a population estimate of highly visible elk in the areas surveyed.

In the spring 2004, we included the PGC Food and Cover and DCNR personnel to record opportunistic sighting. WLM personnel ran and developed new routes across the entire elk range. A total of 1443 (100 marked, 1343 unmarked) were observed. The combined (routes and opportunistic sightings) population estimate resulting from the spring 2004 survey was 421 (95% Confidence Interval 314-566).

Based on this result and its comparison with previous years (Figure 1), we are encouraged that it may provide an effective alternative to the current aerial survey.

Mortality

I compiled records on 30 known elk mortalities (excluding legal harvest) from 31 January 2003 to 31 January 2004 (Table 1). Crop damage

kills (12), elk-vehicle collisions (8), illegal harvests (2), accidental (2) were the leading causes of known elk mortality, which decreased from 2002 (50).

Harvest

One hundred hunters participated in the 6-day elk season from 10-15 November 2003. Sixty-eight hunters successfully harvested an elk. Fifty antlerless and 18 antlered elk were harvested in Elk, Cameron, and Clearfield Counties. Average estimated live weight of cows was 406 lbs and 707 for bulls. Cementum aging analysis showed cows averaged 5.24 years old and 6.38 for bulls (Figure 2). All elk tissue and blood samples tested for CWD, tuberculosis, and brucellosis were negative.

RECOMMENDATIONS

1. Continue to evaluate Bowden's estimator for conducting a ground based elk survey.

2. Monitor elk range expansion within the 835 mi² range using radiocollared elk.

3. Monitor movements of translocated nuisance elk using radiotelemetry via vehicle and aircraft.

4. Maintain the elk check station to collect biological data and continue disease testing of harvested elk.

		Males			Females			
Cause	<1	1 - 2	>2	<1	1 - 2	>2	Unknown	Total
Crop Damage			8	1		3		12
Highway		1	2	1		4		8
Illegal			1			1		2
Unknown	1		1				1	3
Train							1	1
Accidental		2						2
Brainworm*					2			2
Total	1	3	12	2	2	8	2	30

Table 1. Causes and number of known elk mortalities by sex and age (yr) in Cameron, Clearfield, Clinton and Elk Counties, Pennsylvania, 31 January 2003 to 31 January 2004.

*Confirmed by necropsy at Penn State University Animal Diagnostics Lab.

Figure 1. Elk population estimates and 95% confidence intervals from aerial and ground surveys, Pennsylvania, 1998-2004.





Figure 2. Age of harvested elk in Pennsylvania determined by cementum analysis from 2001-2003.