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

PROJECT CODE NO.: 06210

TITLE: White-tailed Deer Research/Management

PROJECT JOB NO.: 21009

TITLE: Evaluation of biological effects and social acceptance of new antler restrictions for white-tailed deer hunting season in Pennsylvania

PERIOD COVERED: 1 July 2003 through 30 June 2004

COOPERATING AGENCIES: Pennsylvania Cooperative Fish and Wildlife Research Unit, The Pennsylvania State University

WORK LOCATION(S): Centre and Armstrong counties and statewide

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Abstract: We captured and attached radio transmitters to 223 male white-tailed deer (*Odocoileus virginianus*) to monitor their survival and dispersal in Pennsylvania. One hundred twenty-two (77 fawns and 45 adults) and 101 (72 fawns and 29 adults) male deer were captured in Armstrong and Centre counties, respectively. As of 15 May 2004, 17 bucks in Armstrong County and 14 in Centre County had died. Pre- and post-hunting season deer hunter surveys were conducted for the second of 3 years. Only those panel members completing the first two surveys were sent the pre-season survey, and only those panel members completing the pre-season survey were sent the post-season survey. Eighty-six percent of panel members completed the pre-season survey, and 88% of panel members completed the post-season survey. Panel members who continue to complete surveys are kept to monitor trends in hunter opinion and attitude over time. In a separate, randomly chosen group for each survey, 67% and 70% responded to the pre-season and post-season survey, respectively. The randomly selected group is chosen for each survey to ensure that the estimates for a given point in time are representative.

OBJECTIVES

1. To estimate survival and identify mortality causes of male white-tailed deer from 6 to 30 months of age.

   a. Survival of males from 6 to 18 months of age will provide an estimate of how many yearling males survive the hunting seasons under antler restrictions. This information will be used, in part, to evaluate the effectiveness of Pennsylvania's antler restriction regulations for protecting yearling bucks.

   b. Survival of males from 19 to 30 months of age will estimate the proportion of males that survive consecutive hunting seasons. This information will quantitatively address survival rates of males, which will be used for

modeling herd dynamics and to simulate population responses to proposed management strategies.

c. For explanatory purposes, it is important to determine proximate causes of mortality to individuals in a population. Further, this information will facilitate refining management strategies. For example, minimum-point restrictions may need to be adjusted if buck harvest rates do not significantly decrease over time.

2. To monitor movements of male white-tailed deer from 6 to 30 months of age. Some males are expected to disperse between 10 and 30 months of age. Information related to dispersal (distance, timing, and rates) may explain differences in behavior among deer populations occupying different landscapes. These movement data may be used to develop spatially explicit population models and may assist in developing transmission of disease models.

3. To monitor changes in age structure of antlered deer. We hypothesize the percentage of 2.5 years and older males in the adult male population will increase as antlered harvest rates decrease over time. In addition, behavioral changes in the form of increased antler rub densities would be expected as adult buck densities increase.

4. To evaluate hunter acceptance and satisfaction with antler restrictions. We anticipate hunter attitudes and satisfaction will change as hunter expectations change from an altered sex- and age-ratio in the pre-hunt deer herd. This information will provide insight about hunter acceptance and satisfaction of future changes in Pennsylvania's deer management program.

METHODS

We used drop nets (Conner et al. 1987), rocket nets, and modified Clover traps (Clover 1954, McCullough 1975) baited with corn to capture deer. Deer captured using drop-nets and rocket nets were sedated with a light, intramuscular (IM) dose of xylazine hydrochloride (XYL) and face-masked. XYL was delivered via hand syringe at about 0.6 mg/kg body weight, or about 20 mg for a fawn, 30 mg for a yearling, and 40 mg for an adult. These dosages were well below the dosage recommended by Bubenik (1982) for immobilization of white-tailed deer using xylazine alone; complete sedation was not required to facilitate handling deer tangled in the nets. Deer captured with Clover traps were manually restrained and face-masked.

After capture, all deer were fitted with an ear tag in each ear. Male fawns were marked in one of 2 ways: with an ear tag transmitter in each ear or with 2 ear tags and a radio collar. Some males were fitted with a global positioning (GPS) collar.

Deer held with manual restraints (by personnel or hobbling) were immediately released after individual markers were applied. Chemical immobilizations were antagonized with IM injections of tolazoline hydrochloride (TOL; 4.0 mg/kg) because it provides a more consistent antagonism of xylazine than yohimbine hydrochloride (Kreeger 1996).

Radiomarked deer were monitored for survival at least once per week after capture. From March through May, telemetry locations were obtained twice per week to delineate home ranges before the anticipated spring dispersal during late May and June. Ground tracking was used whenever possible to locate deer, but deer that could not be found with ground tracking were located via aerial telemetry.

We monitored changes in age structure of antlered deer in two ways. First, by comparing the proportion of adult males captured during the post-hunt period; and second, by looking at antler rubbing in the field. Antler rubbing is a behavior in which adult males participate more often than yearlings. If more adult males are present in the population then more rubbing activity should be detected (Miller et al. 1987, Miller et al. 1995). Density of antler rubs was estimated using line transects and distance sampling (Buckland et al. 1993). Rub densities were estimated on 2 areas (Moshannon State Forest, Centre County and State Game Lands 256, Perry County) during 2003 and on one area (SGL 256) in 2004. Data from 2003 represents pre-antler restriction baseline information. Rub densities were estimated using Program MARK (White and Burnham 1999).

A pre-hunting season and post-hunting season deer-hunter survey was mailed to a randomly selected group of hunters. Both surveys followed the procedures described by Dillman (2000). The pre-hunting season survey was conducted during October and November 2003. Only surveys received before or on the opening day of gun season for deer were accepted for the pre-season survey. The post-hunting season survey was sent out in February 2004.

The pre-season survey was designed to measure hunter's attitudes regarding antler restriction regulations in their second year, and to measure support for them. The post-season survey was to compare hunters' real experiences with antler restriction regulations to those preconceived before the hunt. This is the second year of post-treatment data.

The survey was also designed to monitor changes in attitudes and opinions over time. Survey participants responding to the pre-treatment survey were kept as part of a survey panel (LaPage 1994). Only those panel members who complete the series of 6 surveys will be used in the final analysis. A separate, representative sample of all license holders will also be used for each survey to provide accurate estimates for a given point in time. The confidence interval for the random sample is ±4%. The confidence interval for the panel will depend on the number of participants who complete the series of surveys.

We mailed 2,313 and 2,127 surveys in the pre-season and post-season mailings, respectively. In the pre-season mailing 1,154 were mailed to panel members, and 1,159 were randomly selected. In the post-season mailing 989 were mailed to panel members, and 1,138 were randomly selected.

RESULTS

Eight hundred thirty-six deer were captured and released in the 2004 winter trapping season from 12 January-16 April (Table 1). This includes 257 recaptures. There were 122 (77 fawns and 45 adults) and 101 (72 fawns and 29 adults) individual male deer captured in Armstrong and Centre counties, respectively. An additional 13 deer (11 juveniles and 2 adults) died from trapping-related injuries. These deer were not included in Table 1. As of 15 May 2004 in Armstrong County, 7 bucks (4 fawns and 3 adults; Table 2) had died of causes not related to capture. In Centre County, 10 bucks (7 fawns and 3 adults; Table 2) had died of causes not related to capture and another 6 (6 fawns) had lost their radiocollar or both ear tag transmitters. This loss of transmitters seems to be within the normal range.

Based on capture results, number of antlered males surviving the hunting seasons appears to be increasing (Figure 1). In 2002, antlered males constituted 9% of total male captures. In 2004, antlered males accounted for 33% of total male captures.

Pre-antler restriction (2003) rub density was 3.02 (95% Confidence Interval (CI), 1.81 to 5.03) on Moshannon State Forest and 6.34 (95% CI, 4.07 to 9.88) per

hectare on SGL 256. In 2004, antler rub densities on SGL 256 (4.43, 95% CI 2.51 to 7.83) did not differ from 2003.

In the pre-season survey 989 panel members (those responding to the first, and second survey) responded, 3 were undeliverable, and 35 requested to be deleted from the panel. After adjusting for undeliverable surveys, 86% (989 of 1,151) chose to remain as part of the survey panel. Of the 1,159 hunters chosen for the random sample, 738 responded and 55 had undeliverable addresses, for a 67% (738 of 1104) response rate. In the post-season survey to 868 panel members (those responding to the first, second and third survey) responded, 1 was undeliverable, and 39 requested to be deleted from the panel. After adjusting for undeliverable surveys, 88% (868 of 988) chose to remain as part of the survey panel. Of the 1,138 hunters chosen for the random sample, 754 responded and 58 had undeliverable addresses, for a 70% (754/1,080) response rate.

RECOMMENDATIONS

1. Continue telemetry monitoring to measure survival rates through the following year and dispersal parameters during the fall 2004 dispersal period.

2. Annual changes in rub densities appear minimal to date. As a result, annual monitoring may not be warranted; however, conducting rub surveys every 2 to 3 years should be done to determine if a rub density increase occurred following antler restrictions.

3. Begin data analysis of completed deer hunter surveys.

4. Conduct a pre-season deer hunter survey to evaluate satisfaction with changes in deer hunting regulations.

5. Conduct a post-season deer hunter survey to evaluate satisfaction with changes in deer hunting regulations after the second year of implementation.

6. Complete a preliminary analysis of hunter satisfaction as measured through 5 deer hunter surveys by January 10, 2005.

7. Complete a preliminary analysis of hunter satisfaction as measured through 6 deer hunter surveys by April 1, 2005.

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Table 1. White-tailed deer captures (totals including recaptures reported in parentheses) by sex and age class from 12 January-16 April 2004 in Armstrong and Centre counties, Pennsylvania. An adult is classified as an animal 1.5 years old or older. Totals do not include 13 trapping-related mortalities.

	County		
Sex/age class	Armstrong	Centre	Total
Male adults	45 (63)	29 (30)	74 (93)
Male fawns	77 (108)	72 (99)	149 (207)
Female adults	98 (152)	78 (112)	176 (264)
Female fawns	122 (187)	58 (85)	180 (272)
Total	342 (510)	237 (326)	579 (836)

Table 2. Deaths of radiomarked male white-tailed deer in Armstrong and Centre counties from winter 2004 capture through 15 May 2004.

	County		
Cause of death	Armstrong	Centre	Total
Roadkill	4	3	6
Capture-Related	10	4	14
Poached	0	0	0
Red Tag Hunting	1	0	1
Predation	0	1	1
Disease	0	0	0
Malnutrition	0	6	6
Unknown	1	0	1
Other	1	0	1
Total	17	14	31

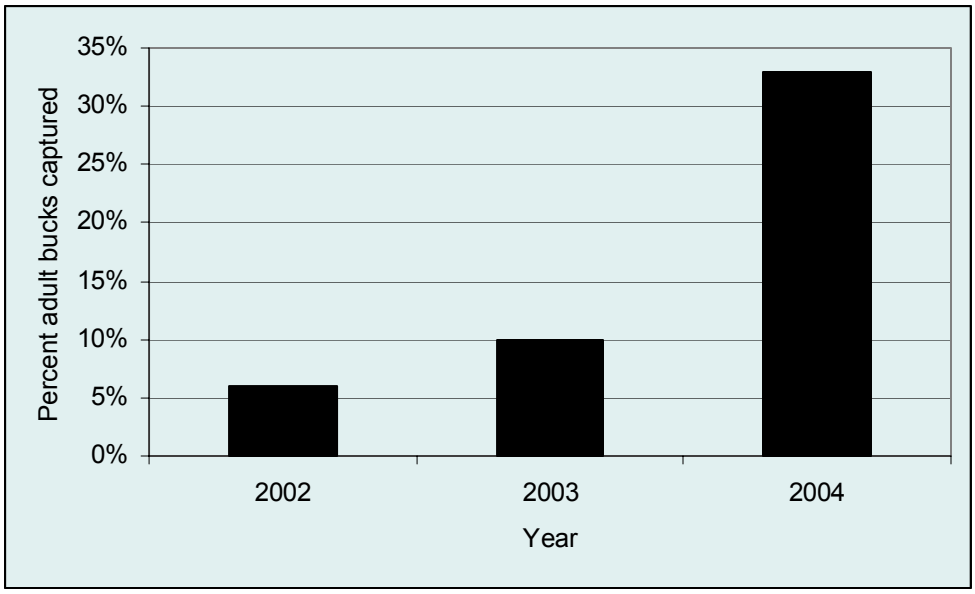

Figure 1. Out of all males captured, the percent of adult bucks captured 2002-2004.