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Survival of Breeding Age Male White-Tailed Deer in Central and Northern Illinois

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ABSTRACT

Male white-tailed deer (*Odocoileus virginianus*) were captured and marked during 1980-85 in Piatt County (east-central), and during 1990-1992 in Dekalb County (northern) and Brown-Adams Counties (west-central). A total of 117 2-year-old males whose ultimate fate were known were used to examine annual survival of breeding aged males. Annual survival averaged 0.56 ± 0.05 (n = 117) for 2-year-old males, 0.50 ± 0.06 (n = 66) for 3-year-old males, and 0.39 ± 0.09 (n = 33) for 4-year-old males. There were no significant differences in annual survival among study areas or between age classes. Comparison of these data with 1997 computer simulations of the Illinois deer herd suggest that breeding age male survival has not changed appreciably since the early 1980's.

INTRODUCTION

Beginning at age 18 months, male white-tailed deer experience considerably higher mortality than females as the result of breeding-induced behavior of males and hunter selection (Nixon et al. 1991, Roseberry and Woolf 1991). Most hunters and others interested in maintaining high densities of male deer in Illinois frequently argue that males are being exploited at levels that reduce the numbers of older, trophy-sized males. Dominance and breeding success in males are affected by antler size and body weight (Townsend and Bailey 1981, Miller et al. 1987), with the likelihood of successful breeding increasing with male age. Observations of yearling males indicated they are not usually successful breeders in Illinois (Nixon et al. 1994). Two-year -old males are likely the most frequent breeders, based on their greater numbers in the population compared to older males. To date, published data in Illinois have reported survival of yearling males (Nixon et al. 1994), but for adult males have used a composite of all males ≥ 2 years old (Nixon et al. 1991, Nixon et al. 1994, J. Roseberry, Southern Illinois University, computer model for the Illinois deer herd, 1997, unpublished data). If hunter exploitation in

the 1990's is greater than the 1980's in Illinois and is also greater compared to other areas throughout the whitetail range, 2- and 3-year-old males would be expected to experience low survival, leading to a decline in abundance of older males in the population.

METHODS

Males were captured using rocket nets during 1980-85 in Piatt County and 1990-92 in Brown-Adams Counties and Dekalb County (Nixon et al. 1994). Each area contained a mixture of public and private lands and included a wooded public park, which provided deer with abundant diurnal cover throughout the year, protection from severe winter weather, and some protection from firearm hunters. Portions of the public parks in Dekalb and Brown-Adams Counties were open to archery hunting. In addition, about half of the Brown-Adams park was open to firearm hunting beginning in 1992. Most of the adjacent farms on all three study areas were annually open to both archery and firearm hunting. To estimate survival of breeding age males, we used males known to have survived to age 2 after tagging and whose ultimate fate was known. The survival analysis was calculated using the staggered-entry design of the Kaplan-Meier product limit estimator and the log-rank test for homogeneity between groups (Kaplan and Meier 1958, Pollock et al. 1989). Differences in the numbers of males surviving among areas and between age classes were compared using log-likelihood ratios chi-square and for larger samples, Fisher's exact test.

RESULTS

A total of 117 marked males survived to age 2 (Table 1). Survival (mean ± S.E.) of 2-year-old males to age 3 averaged 0.56 ± 0.05 and did not differ among areas ($X^2_{(2)} = 2.9$, $P > 0.23$). Because hunting pressure increased between the 1980's in Piatt County and the 1990's in Dekalb and Brown-Adams Counties (Illinois Dept. Nat. Resources, unpublished data), we tested for a significant difference in the survival rate of 2-year-old males tagged in the combined Dekalb and Brown-Adams Counties and those marked in Piatt County. Annual survival was similar between counties (Fisher's exact $test_{(2)}$, $P > 0.9$).

Survival of 3-year-old males averaged 0.52 ± 0.06 and did not differ among areas ($X^2_{(2)} = 3.38$, $P > 0.18$). Survival of males in Piatt county marked in 1980-85 did not differ significantly from males marked in 1990-92 (Fisher's exact $test_{(2)}$, $P > 0.62$). Survival of 4-year-old males averaged 0.39 ± 0.09 with survival among areas not significantly different ($P > 0.13$). However, sample sizes of marked males were relatively small by age 4 (n = 10, Brown-Adams, n = 7, Dekalb, and n = 16, Piatt) (Table 1). Combining areas, annual survival of 2-, 3-, and 4-year-old males did not differ significantly ($X^2_{(2)} = 3.1$, $P > 0.20$). In central and northern Illinois, < 10 males will survive to their 5th birthday for each 100 2-year-old males (Table 1).

DISCUSSION

Survival of 2-year-old male white-tailed deer varies throughout their range, dependent on hunting pressure. In Illinois, hunting is the ultimate cause, but social status/behavior during the breeding season is the proximate cause of lower survival of males compared to females (Nixon et al. 1991, Roseberry and Woolf 1991). McCullough (1979) found that

2-year-old males were consistently underrepresented in cull removals from the George Reserve enclosure. Older males dominated these 2-year-old males and tended to exclude them from breeding activities, thus reducing their daily movements and vulnerability to harvest. However, Roseberry and Klimstra (1974) reported that yearling and 2-year-old males were overrepresented in the harvest at the Crab Orchard National Wildlife Refuge in southern Illinois. Dasmann and Taber (1956) believed that 2-year-old black-tailed deer males (*Odocoileus hemionus*) were more vulnerable to harvest early in the hunting season because of inexperience with hunters. DeYoung (1989) found lower mortality in 2- and 3-year-old male whitetails compared to older males on 2 private ranches in Texas. However, this may have been the result of more careful selection for larger males by hunters on these ranches.

Our results indicate a gradual decline in annual survival as males grow older in Illinois, with 2-year-old males surviving at higher rates than older males (Table 1). Older males usually grow larger antlers and become even more attractive to hunters, with corresponding increase in harvest mortality. There was no indication that 2-year-old males were dying at very high levels in Illinois. Our marked 2-year-old males survived at higher levels than marked males in Minnesota (0.46, Fuller 1990; 0.47, Nelson and Mech 1986) and Montana (0.40, Dusek et al. 1989) and survival was markedly higher than a radio marked sample in Michigan (0.22, Van Deelen et al. 1997). Males in these more northern states must also survive often harsh winters which kills proportionally more adult males than adult females (Fuller 1990, Nelson and Mech 1986).

Our study areas included some refuge protection from hunting for males and may have improved male survival to some unknown degree. However, refuges from hunting are scattered throughout private lands in central and northern Illinois and may also influence male survival. Radiotagging has shown that breeding-age males wander over large areas during the breeding season (Dusek et al. 1989, Nixon et al. 1994, Sparrowe and Springer 1970). This searching behavior frequently takes these males away from refuge protection onto hunted areas. These movements frequently ocurred on all three of our study areas. Recent (1997) computer modeling of the statewide Illinois deer population indicated that annual survival of adult males (≥ 2 years) averaged about 0.57 (J. Roseberry, Southern Illinois University, personal communication, 1998), which was very close to the annual survival of our marked sample of 2-year-old males. However, the current computer model may be overestimating actual population size by 10-15% (J. Roseberry, personal communication, 1998). If true, the model would underestimate harvest rates and inflate annual survival estimates somewhat above actual numbers. Thus, actual survival of adult males may be slightly below that reported for the tagged males. However, there was no indication that adult males between 2- and 4-years old, the prime breeding age classes in Illinois, were being exploited at excessive levels or that exploitation has changed appreciably since the early 1980's.

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Table 1. Number of male white-tailed deer ≥ 2 years old surviving in Brown-Adams Counties (1990-92), Dekalb County (1990-92), and Piatt County (1980-85). Survival values represent the Kaplan-Meier survival functions for the entire cohort (n = 117).

	Number of males alive at age					
County	2	3	4	5	6	7
Brown-Adams	45	22	10	2	0	0
Dekalb	18	9	7	2	0	0
Piatt	54	35	16	9	3	1
Total	117	66	33	13	3	1
Survival		0.56	0.28	0.11	0.03	
(SE)		(0.05)	(0.04)	(0.03)	(0.01)	