Effects of Early-Weaning on Captive White-tailed Deer Fawns

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Abstract: The welfare of white-tailed deer (*Odocoileus virginianus*) fawns orphaned during an early doe harvest is of management interest when the hunting and fawning seasons are temporally close. A 2-year study on early-weaned, captive white-tailed deer fawns was conducted to evaluate potential effects of early orphaning on growth and survival. Comparisons were made between survival of 60-day-old weaned fawns (N = 28), 90-day-old weaned fawns (N = 21), and control fawns left with their does (N = 21). No significant differences were found between survival rates in 1994 (P = 0.68) and 1995 (P = 1.00). There were no significant differences between groups for any growth measurement at 7 months of age. These data demonstrate fawns orphaned at ≥60 days of age are capable of normal development with proper nutrition.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 50:386-390

A question of management concern in Mississippi, where the hunting season opens 1 October and fawning season peaks in most areas on 15 July, is the effect of orphaning on the welfare of white-tailed deer fawns (Jacobson et al. 1979). Hölzenbein and Marchinton (1992) found that orphaned bucks had a higher survival rate and lower emigration rate than unorphaned bucks in Virginia. A similar study in Texas reported that orphaned female fawns had higher pregnancy rates their first year than unorphaned females, although orphaned females also had lower body weights (Demarais et al. 1988). These 2 studies addressed separate issues of orphaning, but did not address timing of orphaning. Orphaning of fawns in the Texas study was at a mean age of 114 days (Demarais et al. 1988), and approximately 5 months in the Virginia study (Hölzenbein and Marchinton 1992). Verme (1991) hypothesized that the declining proportion of antlerless deer in the Michigan deer harvest decreased doe fawn fertility rates. He showed that orphaned doe fawns reached sexual maturity before fawns not orphaned because of a lack of maternal domination (Verme 1991).

Timing of orphaning may be an important management consideration in Mississippi because most fawns are <3 months old when antlerless harvest is initiated (Jacob-

son et al. 1979). If fawns orphaned at a young age have low survival or poor growth rates, it may be necessary to delay doe harvest. We simulated orphaning by removal of does from their fawns at a captive deer facility. Survival and growth were then examined at 7 months of age for control, 60-day, and 90-day weaned fawns.

Sincere appreciation is extended to Drs. B. D. Leopold, G. Weerakkody, S. W. Jack, R. E. Reagan, and H. R. Robinette, who provided advice and assistance during all parts of this research. Special thanks to R. Dawkins and S. McKinney without whom we could not have completed this research. We thank K. Causey, R. J. Hamilton, G. A. Hurst, D. A. Miller and 1 anonymous reviewer for reviewing this manuscript.

Methods

The captive deer research facility was located at Mississippi State University in east-central Mississippi. Annual average maximum and minimum temperatures are 23 C and 11 C, respectively (Natl. Oceanic and Atmos. Admin. 1995). The area experiences high humidity and an average annual rainfall of 142 cm (Natl. Oceanic and Atmos. Admin. 1995). The facility is divided into 5 main pens. Four of the pens are connected by gated lanes and chutes to facilitate moving and maintenance of the deer herd. Pens varied in size from 0.8 to 1.3 ha. A 2.7-m net wire fence with 0.6 m of barbed wire surrounds these pens. Scattered trees provided shade. The fifth pen, located 200 m from the other pens, is 0.4 ha in size. A 2.4 m cyclone fence with 0.3 m of barbed wire surrounds this pen. Commercial dairy cattle feed (16% crude protein, 2.5% crude fat, 22% crude fiber, 0.5%–1.5% calcium, 0.6% phosphorus) was provided ad libitum for all study animals. All pens had supplemental plantings of crimson clover, ladino clover, rye grass, and winter wheat each fall of this study.

Fawns born at the captive facility were ear-tagged on the day of birth, and measured and freeze-branded within 2 days of birth. Measurements included: crown-rump length (cm), shoulder height (cm), and weight (kg). Crown-rump and shoulder height measurements were taken using a flexible tape while weight was measured using a spring scale. Fawns were divided randomly into 3 groups: control, 60-day weaning, and 90-day weaning. Fawns were assigned randomly by doe parturition dates in groups of 3 to eliminate bias from early- or late-born fawns. Treatment does were removed from the pen in which their fawns were present within ±5 days of the 60- or 90-day birth date of their fawns to simulate the effect of orphaning, while control fawns remained with their does until 7 months of age. All fawns were measured within ±5 days of 7 months of age to determine differences among groups.

Program KAPLAN was used to calculate survival rates of treatment groups and program CONTRAST tested for differences in survival rates between groups (Hines and Sauer 1989, Heisey and Fuller 1985). Randomized-complete-block-design analysis of variance (ANOVA) with year and treatment as factors and sex as the block was used to analyze data on body measurements. This analysis tested for differences among treatment groups while accounting for variation between sexes. The null hypothesis was that body measurements were not different among groups or years. The Shapiro-Wilk test was used to test for normality and Levene's test was used to test

homogeneity of variances (Milliken and Johnson 1992). An a priori significance level of alpha = 0.05 was used for all tests.

Results

Survival rates between treatment groups were not different in 1994 (0.72 ± 0.13, $P = 0.6818$) or 1995 (0.91 ± 0.05, $P = 1.0000$). An epizootic hemorrhagic disease outbreak was responsible for the high mortality rate in 1994. All mortalities both years were linked to epizootic hemorrhagic disease at necropsy. A significant year effect (weight $P = 0.0018$; crown-rump: $P = 0.0018$; shoulder height: $P = 0.0392$) was found for the 3 growth measurements, with fawns being larger in 1995 (Table 1). There was no treatment effect (weight $P = 0.9955$, crown-rump; $P = 0.6403$; shoulder height: $P = 0.5282$) or year by treatment interaction (weight $P = 0.6438$, crown-rump $P = 0.4323$, shoulder height, $P = 0.7701$). Tests for normality and homogeneity of variance showed that data met assumptions. No treatment effects were observed for body measurements at birth.

Discussion

Premature weaning of captive deer fawns did not cause any reductions in growth or survival. This study represents excellent environmental conditions for fawns and does not represent differences that might exist under natural conditions. Therefore, inferences to the effects of early orphaning on wild fawns should be made with caution. However, results do demonstrate that weaning of fawns as early as 60 days of age under captive conditions and optimum nutrition has no effect on growth and survival rates. Woodson et al. (1980) reported similar results for wild fawns that were orphaned at 4–6 months of age. No significant effects in survival or behavior were found between orphaned and unorphaned fawns.

We found no evidence under these study conditions to demonstrate that an early doe harvest, within the current Mississippi hunting season, will affect fawn growth or survival. Additionally, similar proximity between deer harvest and reproduction in Alabama (Lueth 1967), Louisiana (Roberson and Dennett 1966), and South Carolina (Payne et al. 1966) demonstrate the relevance of this study to deer management in the southeastern United States. This research did not demonstrate at what age fawn growth is adversely affected by early weaning, but it may be less than 2 months of age. However, it is unknown if orphaning of wild fawns at 2–3 months of age would give comparable results to those in captivity. Short (1964) reported that fawns were functional ruminants at 60 days of age. These findings suggest that fawns are capable of meeting nutritional requirements from a physiological standpoint, but behaviorally, fawns may not be able to identify viable food sources at this age.

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Table 1. Means ± SE and *P*-values for physical measurements of early-weaned white-tailed deer fawns by treatment group and year at Mississippi State University, Mississippi.

Measurement	1994			1995			Year *P*-value	Treatment *P*-value
	60 day	90 day	Control	60 day	90 day	Control		
Sample size								
Birth	13	11	15	12	10	10		
7 months	10	8	6	12	7	10		
Mass (kg)								
Birth	3.2 ± 0.20	3.5 ± 0.26	3.2 ± 0.37	3.7 ± 0.14	3.5 ± 0.21	3.7 ± 0.20	0.1138	0.9488
7 months	30.3 ± 0.13	29.3 ± 0.22	27.4 ± 0.23	33.1 ± 0.12	35.0 ± 0.22	34.8 ± 0.17	0.0018	0.9955
Crown-rump (cm)								
Birth	51.2 ± 1.21	52.1 ± 1.22	45.0 ± 4.88	49.6 ± 1.22	49.7 ± 1.41	51.0 ± 0.91	0.7828	0.5095
7 months	98.3 ± 0.14	95.9 ± 0.22	94.2 ± 0.24	101.2 ± 0.13	104.2 ± 0.22	101.3 ± 0.16	0.0018	0.6403
Shoulder height (cm)								
Birth	44.2 ± 0.53	42.4 ± 1.19	38.3 ± 4.10	42.8 ± 0.64	42.6 ± 1.18	44.4 ± 1.05	0.4104	0.6080
7 months	75.1 ± 0.13	75.6 ± 0.22	73.0 ± 0.23	76.5 ± 0.12	79.4 ± 0.20	76.9 ± 0.15	0.0392	0.5282

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