Physical development of orphaned white-tailed deer fawns in southern Texas

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Abstract

The effect of doe harvest on the physical development of orphaned fawns is an important unanswered question in white-tailed deer management. Twenty-seven white-tailed deer *(Odocoileus virginianus)* fawns were captured, fitted with telemetry collars, and released in southern Texas during 15-16 October 1985. Three fawns died from capture-related trauma. Thirteen of the remaining 24 fawns were orphaned during 15 October–8 November 1985. Eleven fawns remained with their dams as controls. Surviving animals were collected 9–10 October 1986. Covariate-adjusted eviscerated carcass weight was lower (P = 0.08) for orphaned females ($\bar{X}$ = 28.3 kg) than for control females ($\bar{X}$ 32.4 kg). Two of 4 orphaned females bred as fawns compared to 0 of 5 control females. Metabolic demands associated with lactation could account for the lower eviscerated carcass weight and weight gain of orphaned females. Physical development of males was not affected by dam harvest (P>0.10). We conclude that in good quality habitat there are minimal, if any, negative effects of dam removal on physical development of surviving fawns.

Key Words: white-tailed deer, *Odocoileus virginianus*, Texas, orphaned, harvest effects, physical development, growth

Recent declines in physical development of white-tailed deer in southern Texas may be due to insufficient harvest of the female population segment (Harmel 1983). Biopolitical concerns were raised when Texas Parks and Wildlife Department attempted to correct this problem by instituting a 2-week special antlerless deer harvest beginning mid-October. The biopolitical controversy centered on potential negative effects of doe harvest on the physical development of orphaned fawns. Antlerless harvest should produce orphaned fawns because adult does are believed to be more vulnerable to harvest than other antlerless deer (Coe et al. 1980).

Although the relationship between dam and fawn during the post-partum period is intense and well studied (Downing and McGinnes 1969, White et al. 1972, Ozoga et al. 1982, Ozoga and Verme 1984), the effect of disrupting this relationship has not been adequately addressed. Mule deer *(Odocoileus hemionous)* fawns in Colorado orphaned after 6 weeks of age appeared able to obtain sufficient nutrition for short-term survival but did not survive the winter (Swenson 1972). Studies on penned deer in Texas showed that weaning 60- and 90-day-old white-tailed deer fawns onto 16% crude protein pelleted ration did not affect physical development to 180 days of age (Williams and Harmel 1986). The high survival of fawns in an 826-ha enclosure in Virginia indicated that 135-day old fawns were nutritionally independent of their dams (Woodson et al. 1980).

We tested the hypothesis that dam harvest does not effect subsequent physical development of fawns in a field situation.

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Methods

The study was conducted on the 42,510-ha Piloncillo Ranch located approximately 80 km north of Laredo, Texas, in Dimmit, Webb, and La Salle counties. Topography is level to gently rolling at an elevation of approximately 250 m. The sandy loam and loamy sand range sites are dominated by a mixed-brush overstory and a grass understory (Stevens and Arriaga 1985). Total annual rainfall during 1985 and 1986 exceeded the long-term average of 51 cm by approximately 30 cm. Habitat conditions were considered good for deer during 1985–1986.

Median date of parturition on the study area was estimated using fetal measurements (Hamilton et al. 1985) from 13 adult females collected during April 1984. These data were used to estimate a median age at time of orphaning, assuming a 200-day gestation period (Short 1970).

Twenty-seven fawns were captured during 15–16 October 1985 using a helicopter-assisted drive net (Beasom et al. 1980). Data collected at capture included forehead-rump length (Armstrong 1950), hind foot length, chest girth (Anderson et al. 1974), and body weight. A 150-gram radio transmitter with expandable collar was placed on each fawn prior to release.

Family groups (Hawkins and Klimstra 1970) were identified by behavioral observation from the helicopter at an elevation of 100–200 m. Family groups stayed together when hazed gently by the helicopter, because doe-fawn fidelity is high (Hawkins and Klimstra 1970). Apparently unrelated groups of deer dispersed readily when hazed by the helicopter. If both observers were confident of family-group identification, the entire family group was drifted toward the net, but only fawns were captured. We assumed that captured fawns would rejoin their family group following release. This assumption was tested by making at least one helicopter-assisted observation of all fawns during 7–8 November 1985 and 16 January 1986.

Twenty-four radio-instrumented fawns were assigned to treatment groups in a stratified random fashion to ensure uniform distribution of treatments over the study area. Half of the fawns in each pasture were randomly assigned to each group. Three of the initial 27 fawns died from capture-related trauma. Eleven fawns were orphaned 7–8 November 1985 by shooting from a helicopter all adult-sized deer in the family group. However, a fawn was assigned to the control group if more than 2 adult-sized deer were in the family group. It would have been difficult to ensure the removal of more than 2 adult-sized deer from a specific family group due to scattering of deer during the helicopter-assisted harvest. One fawn was orphaned 15 October 1985 because its dam was captured simultaneously. One additional fawn was assigned to the orphan treatment when it was observed alone on 7 and 8 November 1985 and 16 January 1986. We believe that either the fawn was unable to locate its dam after release or its dam died of natural causes. The 11 control fawns were observed with what we believed to be their dams on 16 January 1986.

Twenty of the 24 animals were located by helicopter 9–10 October 1986 and collected by shooting. Three animals died during the study and 1 could not be located. Measurements of the 20 animals included forehead-rump length, chest girth, hind foot length, bled carcass weight, eviscerated carcass weight (Anderson et al. 1974), and a kidney fat index (KFI) similar to Riney (1955) but using total perirenal fat (Verme and Ozoga 1980). Weight gain was calculated as the difference between bled carcass weight at termination and body weight at initial capture. Ovaries and mammae were examined for evidence of reproductive activity (Kirkpatrick 1980). Antler measurements included total number of points, inside spread, and mean beam basal circumference and length (Nesbitt and Wright 1985).

A general linear models procedure was used in a 1-way analysis of variance to test treatment effects within sex (SAS Institute, Inc. 1982). Measurements taken at initial capture were used as covariates for corresponding variables measured at termination. Body weight at initial capture was used as a covariate to analyze antler measurements, KFI, and weight gain. Least-squares means are presented as the measure of central tendency for covariate-adjusted variables. Because of the small sample, differences between means were considered to have potential biological significance at $P<0.10$ (Tacha et al. 1982).

Results and Discussion

The median conception date of 9 January for 13 adult does collected April 1984 was similar to the results of Harwell and Barron (1975). Based on our data, the estimated median age of fawns at orphaning was 114 days, with a range of 99–129 days.

Previous studies on the effect of orphaning on white-tailed deer used known-aged fawns. However, no attempt was made to use fawns of known age in this study. It was logistically impractical to capture neonates due to high neonatal mortality (Kie et al. 1979). Additionally, the age of fawns at orphaning has limited management application because harvest regulations are set according to calendar dates and not fawn ages.

Covariate-adjusted mean eviscerated carcass weight for orphaned females was 4.1 kg less ($P=0.08$) than for control females (Table 1).

Table 1. The effect of orphaning as fawns on covariate-adjusted mean physical characteristics of 1.5 year old female white-tailed deer in southern Texas.

	Orphans (N=4)[a]		Controls (N=5)[a]	
Variable	$\overline{X}$	SE	$\overline{X}$	SE
Bled carcass (kg)	38.4	2.6	41.4	2.5
Eviscerated carcass (kg)[b]	28.3	1.7	32.4	1.6
Weight gain (kg)[c]	19.9	2.4	23.2	2.4
Kidney fat index (%)	23.5	12.1	30.1	11.5
Chest girth (cm)	73.1	1.4	75.3	1.2
Forehead-rump (cm)	108.0	2.6	109.3	2.4
Hind foot (cm)	39.6	1.0	41.4	1.0

[a]Bred as fawns: 2 of 4 orphans; 0 of 5 controls.
[b]Means differ (P=0.08).
[c]Weight gain = bled carcass weight–body weight as fawn.

A similar but nonsignificant trend was present in all other physical characteristics measured (Table 1).

The orphan treatment for female fawns was confounded because 2 of 4 orphaned females bred as fawns compared to 0 of 5 control females (Table 2). Persistence of lacation and presence of corpora albicans indicate that they each produced a fawn which survived at least temporarily. Metabolic demands associated with fetal growth and lactation (Moen 1978) probably stunted the physical development of these 2 females and could account for the lowered orphan-treatment means.

Fawn production by yearling deer indicates a high nutritional plane (Abler et al. 1976), quality habitat (Morton and Cheatum 1946, Ransom 1967) and attainment of a critical body size (Robinette et al. 1973). Fawn production by orphaned females indicates that dam removal probably did not negatively affect their physical development.

Table 2. The effect of orphaning as fawns on covariate-adjusted mean physical characteristics of 1.5 year old male white-tailed deer in southern Texas.

	Orphans (N=6)		Controls (N=5)	
Variable	$\overline{X}$	SE	$\overline{X}$	SE
Bled carcass (kg)	46.9	2.1	44.3	2.3
Eviscerated carcass (kg)	35.4	1.7	34.0	1.5
Weight gain (kg)[a]	28.4	1.9	27.0	1.8
Kidney fat index (%)	46.5	9.7	38.9	10.7
Chest girth (cm)	78.9	1.1	77.1	1.2
Forehead-rump (cm)	113.8	2.0	112.1	2.2
Hind foot (cm)	42.3	0.8	41.7	0.9
Total antler points	4.8	1.2	5.0	1.2
Antler basal circumference (cm)	5.9	0.4	6.1	0.4
Antler beam length (cm)	22.5	3.0	23.4	2.8
Antler inside spread (cm)	19.8	2.9	18.7	2.9

[a]Weight gain = bled carcass weight–body weight as fawn.

Dam removal apparently did not affect the physical development of male fawns (Table 2). There were no differences ($P>0.10$) between any of the measured physical characteristics.

No differences were found in physical characteristics at 180 days of age when fawns were removed from their dams at 60 and 90 days of age (Williams and Harmel 1986). Lactation by the dam may persist for up to 6–7 months post-parturition (Scanlon and Urbston 1978), although fawns become functional ruminants at approximately 2 months of age (Short 1964). The availability of a high quality, pelleted ration as an alternative to the dam's milk may have minimized any nutritional impact of early-weaning on fawns in the penned study (Williams and Harmel 1986). Good habitat conditions on the Piloncillo Ranch also may have minimized any nutrition-related effects due to orphaning in this study. Our results may not be indicative of what would happen in poor quality habitat.

Antlerless deer harvest is an important population control method where hunting is allowed. Our results from good quality habitat indicate minimal, if any, negative effects of dam removal on physical development of surviving fawns. Additional studies of the effect of dam removal on fawns are needed in other ecological regions and with larger sample sizes to further quantify the impact of this important management tool.

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