Weight Gain of White-tailed Deer Fawns Relative to Fawning Date

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Abstract: Fifty-two white-tailed deer fawns (*Odocoileus virginianus*) were obtained from penned breeding stock (31) and wild captures (21) during the 1985 fawning period. Birth dates ranged from mid-April to late August. Fawns were reared in pens on evaporated milk. Water and calf starter were provided ad libitum. Fawns were weighed at 2 week intervals. Birth weights recorded for 23 fawns and estimated for 8 fawns of known birth date, differed ($P \leq 0.05$) among early, middle, and late born fawns. Weight gain also differed ($P \leq 0.05$) among birth categories with fawns born during the middle period gaining weight the fastest and reaching the heaviest weaning weights.

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The annual deer harvest in Louisiana has increased from about 32,000 in the mid-1960s (Newsom 1969) to about 143,000 in the early 1980s (Stransky 1984). Hunting pressure is increasing on public lands because much private land is now leased by hunting clubs. As hunting pressure increases, the deer population may decrease (Noble 1974). If managers are to meet the challenge of an increasing hunter population on decreasing habitat, recruitment must be maximized. Recruitment may be enhanced by producing large, robust fawns, because such fawns have a better chance for survival through winter (Holter and Hayes 1977) and are more fecund as yearlings (Haugen 1972).

Roberson and Dennet (1966) reported that the breeding season of white-tailed deer in Louisiana ranges from late September through February, and fawns can be born from early April through August (Halls 1978). In addition, they noted that the length of the season varies with location within the state. Quantitative data on effects of birth date on subsequent weight gain in white-tailed deer fawns are lacking. Here we present results of a study that compares growth of early, middle, and late born fawns in Louisiana.

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Methods

Fawns were obtained from penned breeding stock on the Ben Hur Biological Research Area (BHBRA) located 6 km south of Baton Rouge or were wild captures donated by private individuals or confiscated by the Louisiana Department of Wildlife and Fisheries during the 1985 fawning season. Penned breeding stock consisted of Louisiana deer that had been confiscated or donated during previous years and maintained as a single herd throughout the year. Pregnant does were fed a maintenance diet of pelleted feed containing 13% crude protein until mid-February. Calf starter (17% crude protein) was then provided ad libitum through mid-July, after which does were returned to the maintenance diet. From April through August, complete searches of the pens were conducted twice daily for newborn fawns. Searches were at sunrise and sunset to reduce the chances of death due to heat stress or abandonment. Birth date was recorded for all fawns collected from pens. Birth date was estimated for wild captures following procedures established by Haugen and Speake (1958).

Sex and weight were recorded for each collected fawn prior to placement in covered, 4-m^2 pens. Two fawns were placed in each pen. Subsequent weight measurements were taken twice monthly through weaning at 85 days of age. Fawns were bottle fed Holstein colostrum the first 2 days, then were fed similar amounts of evaporated milk following a diet recommended by Pekins and Mautz (1985). Calf starter and fresh water were supplied ad libitum from birth.

For analyses, fawns were assigned to 1 of 3 groups on the basis of date of birth: fawns born on or before 30 June were placed in the early group, fawns born on or between 1 July and 31 July were assigned to the middle group, and fawns born on or after 1 August were termed late born. Data were analyzed using general linear models procedure (GLM) available on the statistical analysis systems (SAS) computer program (Stat. Anal. Systems (SAS) Inst., Inc. 1982). This procedure was used to conduct regressions, analyses of variance (ANOVA), test for homogeneity of slopes, and for common intercepts.

Results

A total of 52 fawns was collected: 26 males and 26 females. Birth dates ranged from mid-April to late August with the peak of fawning occurring around 1 June. Of 31 fawns born in pens, 15 were born in the early period (7 F, 8 M); 11 were born in the middle period (5 F, 6 M); and 5 were born in the late period (3 F, 2 M). The 21 donated fawns consisted of 8 males born during the early period; 6 females and 1 male born during the middle period; and 5 females and 1 male born during the late period. More males were donated during the early period, but females predominated during the middle and late periods. Sex ratio for fawns collected from pens was similar among periods. Within the pen, we found 1 set of triplets and 9 sets of twins. The remaining 10 fawns were assumed singles.

Birth weights were recorded for 23 fawns (12 F, 11 M) collected from pens. Birth weights of this group ranged from 2.9 to 4.4 kg with a mean of 3.2 ± 1.2 kg ($\bar{x}$ ± SD). There was no difference in birth weight and weight gain between single and multiple births ($P = 0.1138$), so all 23 fawns of known birth weight were treated singularly. We tested for a relationship between birth weight and time of birth. The following quadratic equation describes the birth weight relationship over time for fawns of known birth weight. All weights are in kg.

$$2.2Y \text{ (birth weight)} = 24.098 - 5.91X + 0.466X^2 \text{ (birth date).} \quad (1)$$

Birth dates were introduced into the equation in the SAS date format. This quadratic equation was used to estimate birth weight for the remaining 8 fawns of known birth date. Approximate test for lack of fit was not significant ($P = 0.5415$) (Draper and Smith 1981).

Birth weights differed among early, middle, and late born fawns ($P < 0.0001$); however, the test for differences between sexes within categories was inconclusive ($P = 0.0866$) (Table 1). Late born fawns were heaviest at birth, followed by early and middle born fawns.

Because birth date was known for only fawns born in pens, only 29 of these fawns were used in analysis of weight gain. Sufficient data for analysis was unavailable for 2 pen-born fawns. Mean weaning weight for the group of known birth weight fawns was 15.6 ± 3.4 kg ($\bar{x}$ ± SD) and weight gain averaged 12.7 ± 3.7 kg ($\bar{x}$ ± SD) from birth to weaning. To compare weight gain among birth periods, we fit an ANOVA with the categorical variables sex, birth period, and days since birth. Analysis showed that weight gain was dependent upon sex, birth period, and days since birth, jointly ($P = 0.0024$, MSE = 21.06, DF = 171) (Fig. 1).

Early born fawns attained the lowest weaning weight and least weight gain. In the following equations, age is in days since birth. The equation:

$$2.2Y \text{ (weight kg)} = 6.15 + 0.30X \text{ (age in days)} \quad (2)$$

Table 1. Birth, weaning, and weight gain (kg) for early, middle, and late born white-tailed deer fawns of known birth date reared at Ben Hur Biological Research Area, Baton Rouge, Louisiana, 1985.

Birth period	*N*	Birth weight	Weaning weight	Weight gain
Early (29 May–30 Jun)	15	2.96 ± 0.94[a]	14.42 ± 3.4[a]	11.88 ± 3.46[a]
Middle (1–31 Jul)	11	2.85 ± 0.68	17.60 ± 2.05	14.75 ± 2.18
Late (1–25 Aug)	5	4.36 ± 1.39	15.57 ± 3.41	12.74 ± 3.72

[a] $\bar{x}$ ± SD.

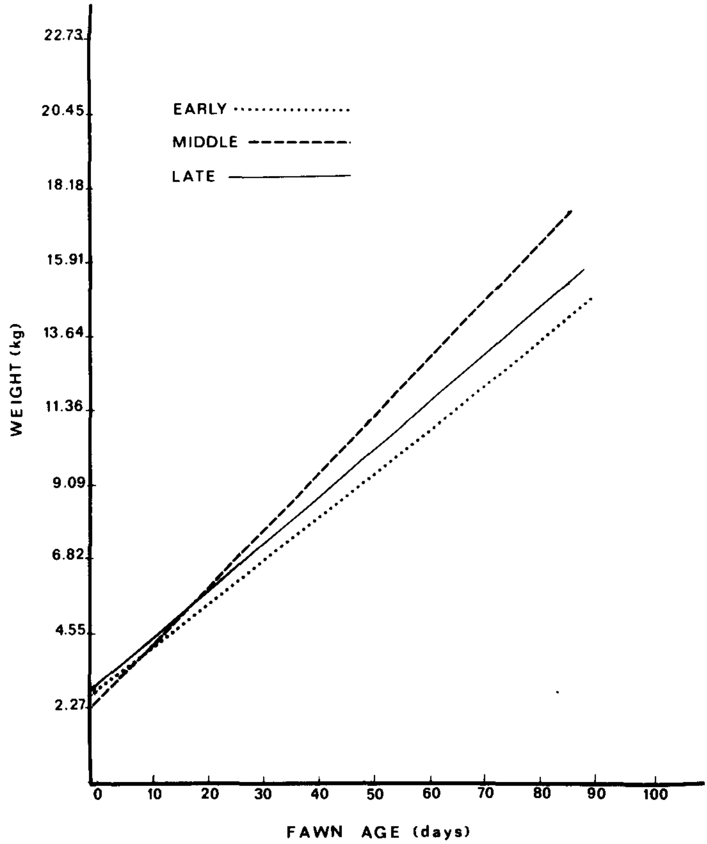

Figure 1. Plot of age-body weight relationship for early, middle, and late born fawns reared at Ben Hur Biological Research Area, Baton Rouge, Louisiana, 1985.

describes the age-body weight relationship for early born fawns. Variation ranged from a difference of 2.2 kg at 10 days to a difference of 1.5 kg at 85 days.

Middle born fawns attained greatest weaning weight and greatest weight gain. The age-weight relationship of fawns born during this period followed the equation:

$$2.2Y \text{ (weight kg)} = 5.26 + 0.39X \text{ (age in days)}. \qquad (3)$$

The widest range was 9.1 kg at 50 days, while the smallest was 1.3 kg at 75 days.

The equation for the age-weight relationship of late born fawns was

$$2.2Y \text{ (weight kg)} = 6.4 + 0.32X \text{ (age in days)}. \qquad (4)$$

A range of 2.3 kg at 10 days was the smallest, while the range of 13.6 kg at 85 days was the largest.

Discussion

The taxonomic status of the fawns used in this study is unknown but probably is a mixture of subspecies. *O. v. macrourus* and *O. v. mcilhennyi* historically inhabited Louisiana (Baker 1984). Resident numbers were reduced to approximately 67,000 before a major restocking effort was initiated in 1948 with *O. v. borealis* from Wisconsin and *O. v. texanus* from Texas (Newsom 1969). Deer maintained in the herd at BHBRA have been collected throughout the state and, thus, may have originated from any combination of the 4 subspecies. The importance of recognizing uncertain taxonomy when comparing parameters of birth size and growth among populations has been previously noted by Nelson and Woolf (1985).

BHBRA fawns born during the early and middle periods were similar in birth weight to fawns in Illinois (Nelson and Woolf 1985), while late born fawns had birth weights similar to heavier northern deer (Haugen and Davenport 1950, Verme 1963). We suspect fawn weights at birth in the pen reflect the high nutritive quality of available feed. Quality of nutrition during pregnancy has been previously shown to affect fawn birth weight (Verme 1963).

Our findings of no differences between birth weights of male and female fawns support findings of Verme (1963) in Michigan and Nelson and Woolf (1985) in Illinois, who reported little sex-related differences in birth weights, but differ from findings of Bartush and Garner (1979) in Oklahoma who report heavier male birth weights.

Fawns born during all periods had slower daily growth rates than reported for captive and wild-reared fawns nursed by their mothers (Murphy and Coates 1966, Robbins and Moen 1975, Bartush and Garner 1979). The fact that doe milk is more nutritious than cow milk (Verme and Ullrey 1984) may have contributed to the slower growth rate for bottle reared fawns in this study.

Growth rate differences relative to date of birth, that we observed, have not previously been reported. We were unable to identify factors that may have been responsible for these differences. Daily minimum and maximum temperatures and mean monthly temperatures on the study area did not differ by more than 1° C for June, July, and August (U.S. Dep. Commerce 1985), so we do not believe that temperature influenced milk consumption or subsequent growth differently among periods. Nutritional differences among periods do not seem responsible, because the quantity and quality of foods provided were similar from the first day of life through weaning. Distinct genetic populations with differing growth potentials also appear unlikely, due to the probable mixing of genetic material within the state and within the holding pens.

Game managers may wish to consider the implications of fawn growth rates that differ according to fawning date. If growth rate remained similar after weaning, by November, fawns born in July would weigh approximately 20 kg, while fawns born in August would weigh 4 kg less. This weight differential may be sufficient to influence survivability through the winter stress period in Louisiana (Short 1975).

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