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REPRODUCTIVE PERFORMANCE OF WHITE-TAILED DEER (ODOCOILEUS VIRGINIANUS) IN WEST-CENTRAL ILLINOIS

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ABSTRACT

Forty-four female white-tailed deer (*Odocoileus virginianus*) were collected as road-kills in west-central Illinois between 1 January and 31 July of 1980, 1981, and 1982. Reproductive tracts of the sample fawn, yearling, and adults were examined for corpora lutea and embryos or fetuses. Data indicated breeding began in late September and continued until early January with three peaks occurring at approximately four-week intervals. Adult does bred earlier than both yearlings and fawns. All adult and yearling does collected had successfully bred and usually carried twins; eighty-five percent of fawns were pregnant and usually carried a single embryo. Differences in counts of corpora lutea and embryos or fetuses suggested an overall failed pregnancy rate of 9 percent. The large percentage of breeding fawns, coupled with a gross natality of 52.3% per year, indicates good range and nutrient conditions are available to the white-tailed deer herd of west-central Illinois.

INTRODUCTION

Gross natality is an estimation of the maximum number of offspring a given population can produce per unit of time (Harder, 1980). Since this value does not consider postnatal mortality factors, it represents a baseline number to assess the effects of diet (Verme, 1969), predation (Bartush and Lewis, 1981), disease (Woolf and Harder, 1979), and management techniques (DelGiudice et al., 1986) on recruitment into a population. Determining gross natality is therefore useful in estimating population size and growth and is a necessary tool for population management (Harder, 1980) and modelling (Stocker, 1983).

Gross natality of white-tailed deer (*Odocoileus virginianus*) herds is often based upon ovulation rates determined from doe reproductive tracts which become readily available during autumn hunting seasons (Nixon, 1971; Harder, 1980). A valid assessment of gross natality from these tracts is often difficult because (1) does are sometimes harvested prior to ovulation, (2) corpora lutea, if present, may be either corpora lutea of estrus or very early corpora lutea of pregnancy (Harder and Moorhead, 1980), and (3) ovulation rates do not necessarily reflect implantation rates (Roseberry and Klimstra, 1970).

Counts of corpora luteal scars (corpora albicantia) from the prior breeding season have also been used to estimate gross natality from autumn reproductive tracts (Adams, 1960; Teer et al., 1965). These counts, too, can be misleading since remnants can be missed during examination of ovarian sections (Harder, 1980), and a 1:1 relationship of corpora albicantia to embryos does not always exist (Teer et al., 1965; Mansell, 1971).

The objectives of this study were to characterize the reproductive performance of fawn, yearling, and adult doe white-tailed deer in west-central Illinois in terms of breeding season and rates of conception, failed pregnancy, and fecundity; and second, to estimate gross natality of the west-central Illinois herd. Data used were from does killed by collisions with motor vehicles from January through July when gestation had sufficiently advanced to identify corpora lutea and count implanted embryos and fetuses (Harder, 1980).

METHODS AND MATERIALS

Forty-four does killed by collisions with motor vehicles between 1 January and 31 July of 1980, 1981, and 1982 were collected in Adams, Brown, Fulton, Hancock, Henderson, Pike, McDonough, Mercer, Schuyler, and Warren counties of west-central Illinois. Does were classified as fawn, yearling, or adult by the tooth replacement-tooth wear method (Severinghaus, 1949). Reproductive tracts were removed and uteri examined for embryos or fetuses, which were back-dated to week of conception (Cheatum and Morton, 1946; Armstrong, 1950).

Ovaries were removed, fixed in 10% formalin, sectioned with a razor blade and examined for corpora lutea (Kirkpatrick, 1980). Corpora lutea were measured and those were diameters greater than 4 mm were classified as corpora lutea of pregnancy (CLP); diameters less than 4 mm were classified corpora lutea of estrus (CLE) (Teer et al., 1965). Twenty randomly-selected ovaries were sectioned using standard histological procedures then stained with eosin and hematoxylin to verify macroscopic identification of structures.

RESULTS AND DISCUSSION

Dates of Conception

Thirty does yielded embryos or fetuses which could be back-dated to week of conception (Fig. 1). It was evident that breeding began in mid-September and continued until early January, indicating a fawning period from late April to late July. Three peaks in breeding activity occurred at approximately four-week intervals with the largest number of conceptions occurring in mid-November (Fig. 1).

Other studies of production in the white-tailed deer have indicated recurrence of estrus cycles every 21 to 28 days are possible throughout the breeding season if a doe is not successfully bred (Cheatum and Morton, 1946; Verme, 1961; Plotka et al., 1977; Plotka et al., 1980). Also, adult does generally enter estrus 28 days prior to yearling and fawn does (Cheatum and Morton, 1946). Consistent with these studies the first peak in breeding activity of the west-central Illinois herd was made up of only adult does (Fig. 1). The second peak approximately four weeks later contained does of all three age groups which probably represented adults re-entering estrus and yearlings and fawns coming into estrus for the first time. The third breeding peak in December may represent the third adult estrus and second estrus for fawns and yearlings (Fig. 1).

The mid-November conception peak is similar to that reported for northern Ohio (Nixon, 1971), western Iowa (Haugen, 1975), and Pennsylvania (Woolf and Harder, 1979), but earlier than for southern Illinois (Roseberry and Klimstra, 1970) and southern Ohio (Nixon, 1971). This variation with respect to latitude, first reported by Cheatum and Morton (1946), has been attributed to thermal or photoperiodic stimulation as well as variations in herd diet and physical condition (Verme and Ozoga, 1987). Conception peak for the west-central Illinois herd is only reported here incidentally and a controlling mechanism is not suggested.

Conception, Failed Pregnancy, and Fecundity Rates

Presence of CLP was assumed to indicate successful conception. Of 44 sets of ovaries, 41 contained at least one CLP, resulting in an overall conception rate of 92 percent (Table 1). Seventeen of 20 fawns (85 percent) yielded CLPs; CLPs were present in all yearling and adult does indicating a 100 percent conception rate (Table 1).

The percent of CLP present without embryo implantation was used as an indicator of the failed pregnancy rate, with probable causes being spontaneous abortion or embryo resorption. A total of 55 CLP were counted from 30 does which carried 50 embryos or fetuses (Table 1). The overall failed pregnancy rate was 9% and appeared to be relatively constant for all three age groups (Table 1).

The fecundity rate was determined by counting the number of embryos or fetuses per total does sampled (Table 1). In most cases, yearling and adult does carried twins while pregnant fawns had a single embryo or fetus. Exceptions were triplets in one adult and one yearling, twins carried by one fawn, and one adult with a single embryo. The overall fecundity rate of the west-central Illinois herd was calculated to be 1.22 offspring per doe (Table 1).

Gross Natality

It is essential to characterize the overall percentage and age distribution of does within the herd to determine gross natality (Harder, 1980). Cumulative harvest data

(Illinois Department of Conservation, 1980-1985) for the ten-county study area prior to "antler-only" hunting gives a reasonable estimation of the sex and age distribution since hunter selectivity biases are diminished by a short hunting season (Nixon, 1971) and large sample size (Harder, 1980). Harvest records indicate does make up 42.6% of the population with percentages of fawn, yearling and adult does being 12.4%, 16.5%, and 22.4%, respectively (Table 2). By applying the age-specific fecundity rates (Table 1) to the doe population percentages for each age group, gross natality of the west-central Illinois deer herd was estimated to be 52.3% (Table 2).

Age-specific fecundity rates and gross natality of the west-central Illinois herd are high in relation to all white-tailed deer of North America, but comparable to other herds from agricultural areas of similar latitude (for regional comparisons see Harder, 1980; Stoll and Parker, 1986). The preponderence of breeding fawn does and similar fecundity rates of yearlings to adults are indicative of good range and nutrient conditions available to the west-central Illinois herd (Woolf and Harder, 1979; Gladfelter, 1980; Severinghaus and Moen, 1983).

It is important to stress that these rates represent gross natality, or maximum reproductive potential, of the white-tailed deer herd of west-central Illinois. Actual or net natality cannot accurately be expressed until factors of postnatal mortality, often highly significant (Bartush and Lewis, 1981), have also been characterized for the herd (Woolf and Harder, 1979; Harder, 1980).

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Table 1. Numbers of does collected, CLP and embryos or fetuses counted, and subsequent rates of conception, pregnancy failure, and fecundity for the west-central Illinois deer herd.

Age	Does Collected	Does Pregnant	Conception Rate	Does with Embryos/ Fetuses	Number of Embryos/ Fetuses	Number of CLP	Pregnancy Failure Rate	Fecundity Rate
Fawn	20	17	0.85	11	13	14	0.07	0.76
Yearling	7	7	1.00	5	10	11	0.09	1.43
Adult	17	17	1.00	14	27	30	0.10	1.59
Total	44	41	0.93	30	50	55	0.09	1.22

Table 2. Determination of gross natality for the west-central Illinois deer herd. Percentages for each age group and sex are based on the cumulative deer harvest from 1981 to 1985 for the ten-county study area (n = 32,324).

Age Group	*Males* No.	%	*Females* No.	%	Fecundity	Gross Natality %
Fawn	7319	22.6	5282	16.3	0.76	12.4
Yearling	6424	19.9	3729	11.5	1.43	16.5
Adult	4818	14.9	4752	14.7	1.59	22.4
					Total Annual Gross Natality:	52.3

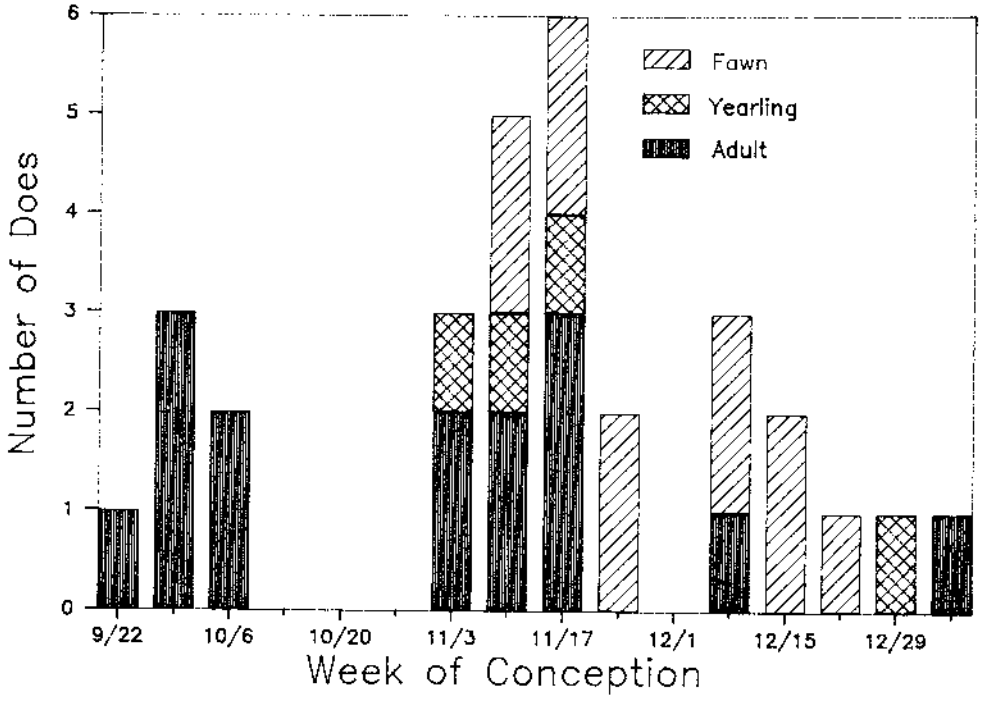

Fig. 1. Calculated weeks of conception for 30 fawn, yearling, and adult does collected in west-central Illinois.