FECUNDITY OF WHITE-TAILED DEER IN MISSISSIPPI AND PERIODICITY OF CORPORA LUTEA AND LACTATION

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Abstract: Reproductive data were collected from 774 female white-tailed deer (*Odocoileus virginianus*) taken in Mississippi between 1976 and 1979. One- to 2-year old does and 2-year or older does had mean corpora lutea counts of 1.61 and 1.78 and mean fetus counts of 1.40 and 1.66 respectively. Fawn breeding was observed in 4 of 140 fawns and also was evidenced by the presence of lactation in 5 of 146 1-1/2 year old deer. Breeding occurred between November 20 and March 15. Over 80% of breeding occurred December 21 to January 21 with 50% of all breeding between January 7-21.

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Knowledge of the temporal events of white-tailed deer reproduction is critical to the establishment of harvest strategies and habitat management practices. In Mississippi, white-tailed deer appear to have increased greatly in population in 3 years. Deer harvest estimates increased from 41,558 in 1973 (Quisenberry 1974) to 93,871 in 1976 (Guynn et al. 1978). Because of the rapid growth of this resource, serious management problems, including overpopulation and range deterioration, can be expected unless sound management prevails.

One major study was conducted on the reproductive characteristics of white-tailed deer in Mississippi during 1960 to 1963 (Noble 1960, 1974). That study included data from 354 deer, of which 311 were from 4 counties in the Mississippi Delta. The present study was undertaken to provide additional information on the reproductive status of white-tailed deer for areas in Mississippi where no previous information was available. We are grateful to Mississippi Game and Fish biologists E. Cliburn, B. Herring, J. Smith, B. Wilson, G. chandler, D. Cotton, L. Castle, E. Hackett and L. Bays for assistance in the collection of these data. This study was supported by Federal Aid Project No. 2-48-25, Job No. VII-B.

MATERIAL AND METHODS

Between November 1976 and February 1978, reproductive data were collected from 774 female deer taken from 29 separate locations in Mississippi (Fig. 1). Collection sites were widely distributed throughout 6 biological planning units defined by the Mississippi Game and Fish Commission (1978). Planning units are based on soils, vegetative elements and socio-economic regions. Deer were examined at hunter check stations or were taken during special collections. All deer were aged by tooth wear and replacement (Severinghaus 1949) and examined for lactation and the presence of fetuses. Ovaries were collected and preserved in 10% formalin until they were examined for corpora lutea as described by Cheatum (1949). Fetuses over 14 mm (crown-rump) were aged by the fetal development criteria of Armstrong (1950) and fetuses smaller than 10 mm were assumed to be 28 days of age (Severinghaus and Cheatum 1956). Breeding dates were established from fetal age and by assuming that all deer with corpora lutea (CL) present, but without evidence of conceptus presence, had bred or were receptive to breeding 10 days earlier. Since changes do not occur in the external appearance of the uterus during the first 20 days of gestation (Cheatum and Morton 1946), all corpora lutea that were not accompanied with uterine swellings were assumed to be 10 days old (±10 days). No

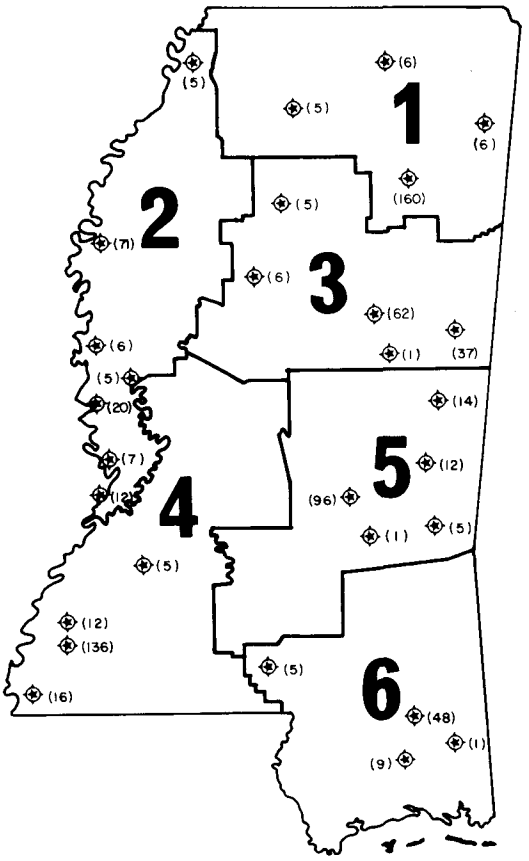

Fig. 1. Deer collection sites and the number of deer sampled (parenthesis) within each of the 6 biological planning units in Mississippi.

attempt was made to distinguish CL of estrus from CL of pregnancy. Therefore, breeding dates derived from CL presence are not necessarily conception dates.

RESULTS

Deer were collected during all months of the year (Table 1). Corpora lutea were not observed during August, September, October or November, and lactation was not observed during April, May or June. One- to 2-year-old does averaged 1.62 corpora lutea and 1.40 fetuses per doe; 2-year and older does had higher fecundity with an average of 1.78 corpora lutea and 1.66 fetuses per doe (Table 2).

Five of 146 1-1/2-year-old deer were lactating, indicating they had successfully bred as fawns. Additionally, 4 of 140 fawns had corpora lutea. Two fawns each had 2 corpora lutea present and 2 fawns each had a single corpus luteum. Two fawns each carried a single fetus, but no visible swelling of the uterus was found in the other fawns.

One hundred twenty-nine does had 202 fetuses and 222 corpora lutea. Eighty-seven of the fetuses were old enough to easily distinguish external sex organs. Forty-seven were males and 40 were females.

TABLE 1. Summary of monthly collections of female deer in Mississippi and seasonal prevalence of corpora lutea, lactation and conceptus 1976-79.[a]

Age Class	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
4 Mos. - 1 year												
Number sampled	97	5	5	4	1	8	0	0	0	3	3	14
Percentage with corpora lutea	2.1	20.0	0.0	0.0	0.0	12.5	-	-	-	0.0	.0	0.0
Percentage with conceptus	0	20.0	0.0	0.0	0.0	12.5	-	-	-	0.0	0.0	0.0
1-2 Years												
Number sampled	77	16	7	4	4	4	1	0	0	5	5	25
Percentage with corpora lutea	70.1	87.5	100.0	100.0	50.0	75.0	100.0	-	-	0.0	0.0	20.0
Percentage with conceptus	1.3	81.2	100.0	100.0	50.0	75.0	100.0	-	-	0.0	0.0	0.0
Percentage lactating	1.3	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	16.0
2 Years and Older												
Number sampled	248	73	30	10	7	4	6	6	6	6	7	54
Percentage with corpora lutea	76.2	90.4	100.0	100.0	100.0	100.0	16.7	0.0	0.0	0.0	0.0	13.0
Percentage with conceptus	5.6	64.4	100.0	100.0	100.0	100.0	16.7	0.0	0.0	0.0	0.0	0.0
Percentage lactating	58.9	25.7	18.5	0.0	0.0	0.0	83.3	83.3	83.3	50.0	100.0	68.5

[a]Does not include data collected on 29 female deer of unknown age.

TABLE 2. Mean number of corpora lutea and fetuses from female white-tailed deer in Mississippi.

Age Class	Number Examined	No. With Corpora Lutea	Mean Number[a] Corpora Lutea Per Doe	No. With Fetuses	Mean Number[b] Fetuses Per Doe
4 mos - 1 year	140	4	1.50	2	1.00
1 - 2 years	134	86	1.62	25	1.40
2 years and older	420	284	1.78	105	1.66
Unknown age	29	13	1.46	-0-	--
TOTAL[c]	723	387	1.73	132	1.57

[a]Means do not include deer examined without corpora lutea.
[b]Means do not include deer examined without conceptus.
[c]Does not include data from 51 does for which the complete reproductive tract was not obtained.

The median breeding date of 387 does was January 11 but breeding dates ranged from November 20 to March 15. Median breeding dates were between January 7 and January 19 in all planning units except unit 2 where the median breeding date fell on December 27 (Fig. 2). Planning unit 2 is composed of the counties within the Mississippi Delta. Ninety-nine percent of all breeding occurred in December, January and February. Over 80% of the breeding activity occurred from December 21 to January 21 and 50% was between January 7-21.

Twins were present in 51% of pregnant does and 3% carried triplets. The number of

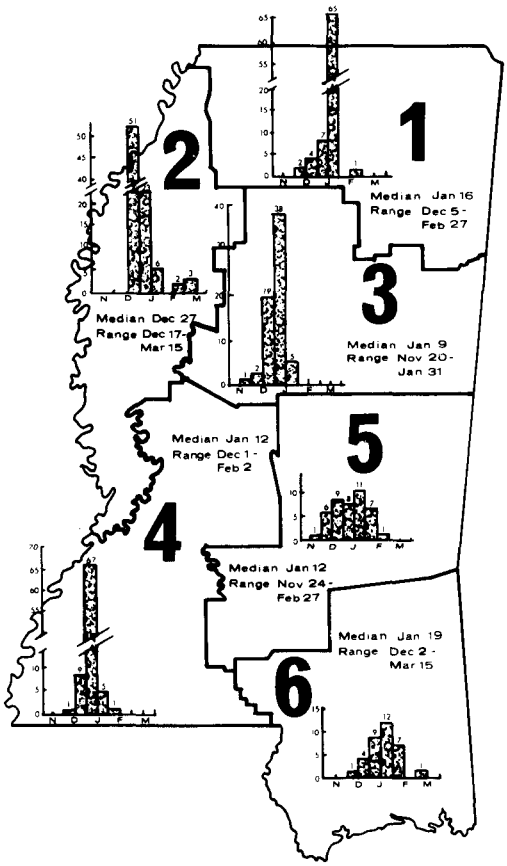

Fig. 2. Breeding dates of deer within the 6 biological planning units in Mississippi (number of deer with breeding dates in each bimonthly period is indicated).

fetuses present was greater than the number of corpora lutea in 2 cases. These does were both carrying twin male fawns but had only 1 corpus luteum, suggesting they were identical twins. Unfortunately, ovarian analysis was not conducted at the same time as fetal examination and the ovaries were discarded following examination. It was, therefore, not possible to confirm by histology of the ovaries that these were identical twins.

DISCUSSION

Cumulatively, pregnant does carried a mean of 1.57 fetuses. Twenty-five of 31 (80.6%) 2-year-old and older does were lactating during the 5 months spanning peak fawning and fawn milk dependence from July through November (Table 1). These figures suggest high population recruitment. Assuming that lactating does produced fawns which were added to the population at a minimum weaning age of 4 months and that lactation rates in the sample were representative of the population, fawn recruitment in Mississippi during the present study was between 0.80 fawns (lactation rate) and 1.26 fawns per doe (lactation rate times mean number of fetuses per doe). Since high lactation rates of 2-year-old or older does were seen even in January, when 58.9% of 248 does were still lactating (Table

1), we believe fawn survival was very high. This coincides with rapid growth of the Mississippi deer population during recent years.

Greater numbers of corpora lutea and fetuses in 2-year or older deer than in 1- to 2-year-old deer was not unexpected. Yearling does generally give birth to only 1 fawn (McDowell 1962, cited by Noble 1974). However, fecundity of does in all age classes examined in the present study was considerably greater than that reported for Mississippi deer collected between 1960 and 1963 by Noble (1974). He reported that none of 36 doe fawns examined showed visible evidence of ovulation; 6 1-1/2-year-old does averaged 1 fetus per doe; and 78 2-year-old and older does averaged 1.58 corpora lutea and 1.41 fetuses per doe if there was evidence of ovulation.

The range of breeding dates observed during this study is of major managerial significance. Assuming a minimum period of 3 to 4 months of fawn dependence on the doe (Severinghaus and Cheatum 1956, Madson 1961), harvest of mature doe deer in Mississippi prior to the third week in November may result in some fawn mortality. Based on a 204-day gestation period (Asdell 1964), our findings indicate that about 9% of fawn births in Mississippi occur between July 1-15, 30% between July 15-31, and 50% between August 1-15. Approximately 2% occur prior to July 1 and approximately 9% occur after August 15.

Breeding dates should also be considered when timing antlered deer harvest. Unlike most northern states where harvest of antlered deer occurs after peak breeding, all of the antlered-deer firearms seasons in Mississippi are traditionally set before the median January 11 breeding date. We believe this may affect deer population biology. Major unanswered questions remain concerning the effects of herd genetics and reproduction of harvesting antlered animals prior to peak breeding. Phenotypic characteristics such as body size and antler growth are heritable characteristics (Harmel 1979). Because of trophy value, large antlers and large body size are likely to be selected by hunters. In addition, minimum length requirements on antlers as the result of game laws also increase hunting pressure on animals with superior qualities. Until 1975, Mississippi bucks had to have antlers 4 inches above the hairline to be legally taken during antlered only seasons. The result could be the reverse of natural selection, since a large number of bucks having desirable secondary sex characteristics are removed from the population prior to the time of peak breeding. Selection pressures would be greatest in the yearling age class. Small, spike antlered yearlings would have obvious survival advantage over larger, forked antlered yearlings. Thus, inferior genetic quality would remain in the breeding population and superior (trophy) quality animals would be removed from the breeding population.

Another question relating the early buck harvest is, "What effect might this practice have on the timing of breeding?" It has been reported that mature male deer can produce sufficient sperm for 1 or 2 fertile matings daily during periods of sexual activity (Lambiase et al. 1972). In a few areas of Mississippi, average annual mortality of mature (1-1/2-year or older) male deer is as high as 80 to 85% (Hackett 1978). This has resulted in mature male to female sex rations that approximate 1 male to 10 females during the peak breeding period. Because of natural synchronization of estrus within a short period (Fig. 2), this could lead to a greater number of does not breeding during the first estrus. Instead, these would breed during their second or third estrus cycle. What are the long-term effects on herd biology? Are fawns born to late breeding does physically inferior and do they reach puberty later than fawns born to earlier breeding does? Do does that breed on their second or third estrus cycle continue to breed late in subsequent years?

It is of interest to compare the breeding daters determined in this study with the earlier work of Noble (1974). Noble did not sample any deer in planning unit 5; however, median breeding dates he determined in the Northwestern (planning unit 2), Eastcentral (planning unit 3), Southwestern (planning unit 4), and southern (planning unit 6) areas of Mississippi differ by less than 7 days from the present study. Median breeding dates

determined for Northcentral (planning unit 1) are almost a month earlier (December 22) in Noble's work than those seen in this study (January 16). Could this difference reflect intensive harvest of bucks prior to peak breeding? The majority (160) of the deer collected in planning unit 1 were from the Chickasaw Wildlife Management Area (WMA). During this study, average annual mortality for mature (>1 year of age) bucks on the Chickasaw WMA approximated 80% (Hackett 1978). Other public hunting areas experienced annual mortality rates from 39-67% for mature males during this same period of time.

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