DIURNAL RANGE AND MOVEMENTS OF YOUNG WHITE-TAILED DEER FAWNS IN SOUTHWESTERN OKLAHOMA

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Abstract: Average diurnal range sizes for 10 white-tailed deer (*Odocoileus virginianus*) fawns indicate an increase from 3.3 ha at 1 week of age to 52.0 ha at 12 weeks of age. Distance between successive diel locations increased with age, but total daytime movements did not increase with age, therefore increasing diurnal range size appears to result from increasing nocturnal movements as fawns grow older. Partial cause for large diurnal ranges of fawns in the Wichita Mountains is believed to be the open prairie habitat, but other ecological and behavioral factors may also influence diurnal range size.

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Earlier studies of home range and movements of white-tailed deer relied on occasional resightings of marked deer for obtaining locations used in calculating estimates of home range size and movements (Hahn and Taylor 1950, Thomas et al. 1964, Michael 1965, and Alexander 1968). Movement data became more readily obtainable with the advent of reliable radio-telemetry equipment (Cochran and Lord 1963, Tester et al. 1964). A majority of the subsequent studies have dealt with home ranges and movements of adult and yearling deer, but relatively few studies have been concerned with fawns. Fawns employ cryptic behavior for long periods (Jackson et al. 1972), thus radio-telemetry has proven to be an invaluable asset for studying fawn ecology during the first months of life, because transmitters reveal the location of a hidden animal (Cook et al. 1967 and 1971).

Despite the availability of dependable equipment, few reports of telemetrically determined fawn home ranges and movements occur in the literature. Kjos and Montgomery (1969) reported on size of home ranges for a wild and a tame fawn in Illinois. Byford (1970) compared home range sizes of 2 fawns and of adult deer in Alabama. Responses of young fawns to high water levels were reported by Samuel and Glazener (1970), and Logan (1972) described fawn home range size in a fawn mortality study in eastern Oklahoma.

A recent study of fawn mortality in southwestern Oklahoma (Garner et al. 1976) provided numerous radio-locations of young fawns. Preliminary examination of fawn locations indicated much larger diurnal ranges than had previously been reported in the literature. This paper presents diurnal ranges and movements of 10 fawns monitored from June through August 1975 (until 3 months of age) in the Wichita Mountains, Oklahoma.

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STUDY AREA AND METHODS

The study area includes portions of the contiguous Wichita Mountains National Wildlife Refuge and Fort Sill Military Reservation in southwestern Comanche County; it has been described in detail by Buck (1964), Crockett (1964), and Garner et al. (1976).

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Two locations—Wye area and Pinchot area (Garner et al. 1976)—within the mountain complex, were used as fawn capture areas in May and June 1975. Twenty-five fawns were captured, measured, weighed, sexed, instrumented, and released at the capture site as described by Garner et al. (1976). Each fawn was monitored and observed daily until 1 July; after which date multiple daily locations were recorded for each surviving fawn. Daytime movements were obtained at this time by monitoring each fawn at 3 hr intervals (5 observations per day) between 0600 hr and 2100 hr on 3 alternating days per week. Preliminary observations indicated triangulation errors of 400 m were not uncommon if normal triangulation procedures were followed. Consequently fawn locations were obtained by radio triangulating the fawn at 90 to 180 m distances to avoid the inherent error associated with longer-distance triangulations (Heezen and Tester 1967) and because the high-frequency transmitter signs (164 mHz) used in the study were subject to severe bounce and deflection in the rocky terrain of the Wichita Mountains. Periodic checks indicated that triangulations were accurate to within 10 m of the fawn's actual location.

Fawn locations were recorded on field forms with an accompanying hand drawn map. Locations were transferred from the field map to overlays on large-scale aerial photographs. All movement distances and diurnal range calculations were obtained by using these overlays. Diurnal ranges were constructed for each fawn at weekly intervals using the minimum home range modification (Marchinton and Jeter 1966) of the modified minimum area method described by Harvey and Barbour (1965). A compensating polar planimeter was used to determine diurnal range size.

RESULTS AND DISCUSSION

Ten fawns survived for adequate lengths of time to provide sufficient data for calculations of diurnal range sizes and movement distances in 1975. The remaining 15 fawns died before enough locations could be obtained for determining diurnal ranges.

Diurnal Range

Weekly diurnal ranges for the 10 fawns are presented in Table 1, and total diurnal

Table 1. Home range size (ha) at weekly age intervals for fawns in the Wichita Mountains, Comanche County, Oklahoma, 1975.

Age Interval (weeks)	*Fawn Number and Sex*										*Mean ±S.D.*
	B-2 F	*B-4 F*	*B-7 F*	*B-8 F*	*B-14 F*	*C-2 M*	*C-3 F*	*C-4 F*	*C-6 F*	*C-8 F*	
1	5.3[a] (5)	I[b]	2.2 (6)	I	I	2.3 (3)	I	I	I	I	3.3± 1.8
2	7.4 (12)	3.5 (12)	5.4 (13)	4.7 (7)	I	3.2 (10)	1.6 (6)	I	8.4 (6)	I	4.9± 2.4
3	9.4 (14)	12.2 (19)	13.8 (21)	20.6 (14)	10.4 (7)	5.1 (17)	3.7 (13)	3.8 (11)	23.6 (13)	I	11.8± 7.1
4	Dead	20.3 (26)	19.4 (24)	Dead	20.9 (14)	7.7 (33)	8.4 (20)	8.2 (18)	30.3 (22)	23.8 (10)	17.4± 8.1
5		20.9 (33)	Dead		26.9 (30)	8.7 (49)	13.5 (41)	26.0 (30)	37.1 (41)	34.0 (32)	23.9± 9.7
6		24.1 (55)			31.2 (46)	12.2 (69)	20.9 (55)	28.3 (52)	39.4 (57)	34.9 (48)	27.3± 9.1
7		24.9 (70)			57.9 (67)	15.9 (90)	32.7 (76)	32.5 (65)	42.1 (81)	39.5 (69)	35.1±13.4
8		26.9 (91)			59.1 (89)	16.4 (110)	32.7 (96)	43.2 (85)	Dead	45.3 (89)	37.3±15.1
9		31.8 (112)			62.8 (105)	18.9 (116)	34.4 (117)	46.1 (106)		49.9 (110)	40.7±15.5
10		32.7 (128)			77.5 (124)	Dead	46.8 (135)	59.8 (125)		50.0 (123)	53.4±16.6
11		35.6 (147)			77.5 (132)		51.6 (140)	65.0 (129)		50.7 (130)	56.1±15.9
12		35.6 (151)			Dead		51.6 (143)	65.0 (132)		55.8 (133)	52.0±12.3

[a]Number of fawn locations used in each calculation of home range is shown in parentheses.
[b]Insufficient data or fawn not captured at this age.

range for each fawn is depicted in Figures 1-5. Average diurnal range size increased steadily with increasing age (Table 1). The mean 8 wk. diurnal range size of 37.3 ha is much larger than corresponding home range size averages (2.2 ha) of surviving fawns in densely forested localities of eastern Oklahoma (Logan 1972). The 6 wk. average size (27.3 ha) is also much larger than the home range size of a wild fawn (1.0 ha) observed in Illinois (Kjos and Montgomery 1969). In fact, the average 1 wk. diurnal

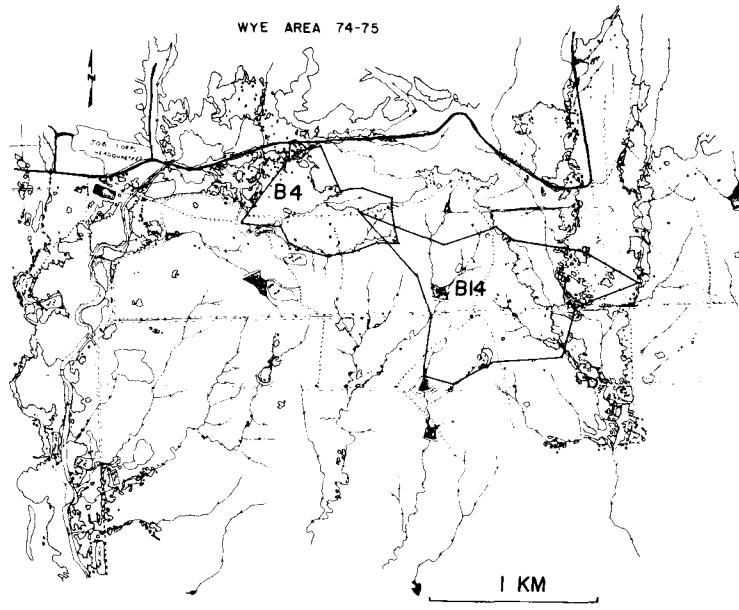

Fig. 1. Diurnal ranges of fawns B4 and B14 at the Wye area of Fort Sill and the Wichita Mountains National Wildlife Refuge at Wichita Mountains, Comanche County, Oklahoma, summer 1975.

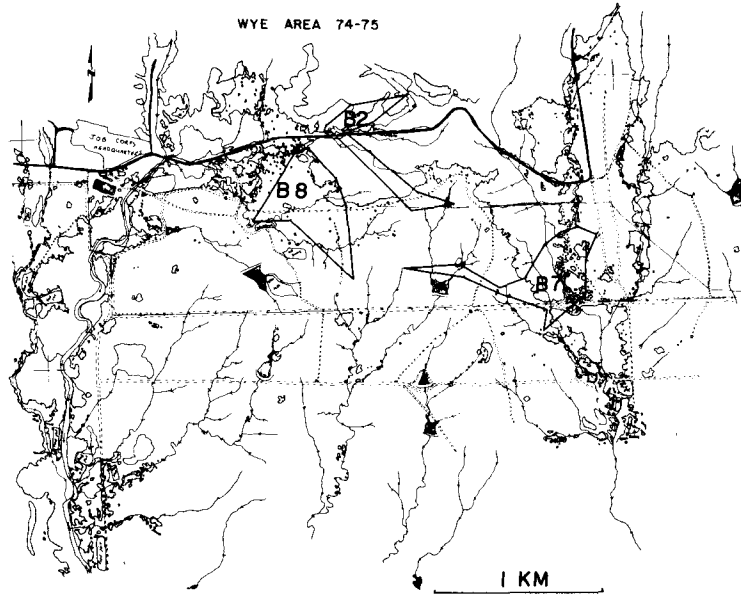

Fig. 2. Diurnal ranges of fawns B2, B7, and B8 at the Wye area of Fort Sill and the Wichita Mountains National Wildlife Refuge, Comanche County, Oklahoma, summer 1975.

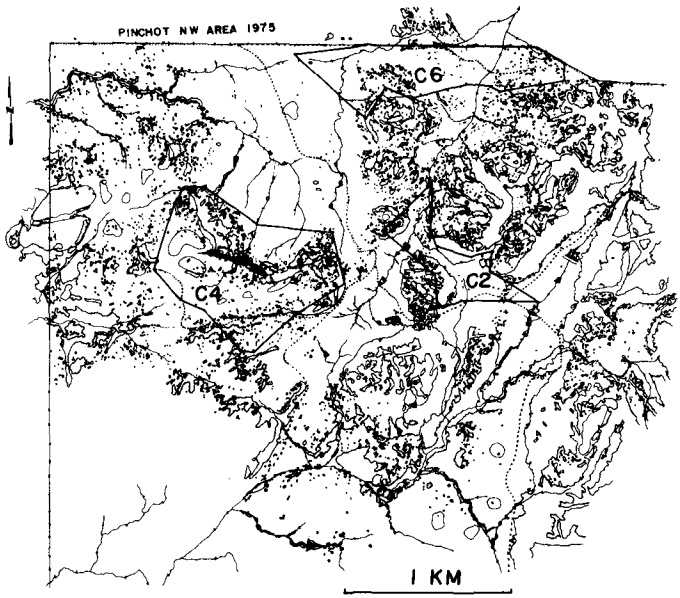

Fig. 3. Diurnal ranges of fawns C2, C4, and C6 in the Pinchot area of the Wichita Mountains National Wildlife Refuge, Comanche County, Oklahoma, summer 1975.

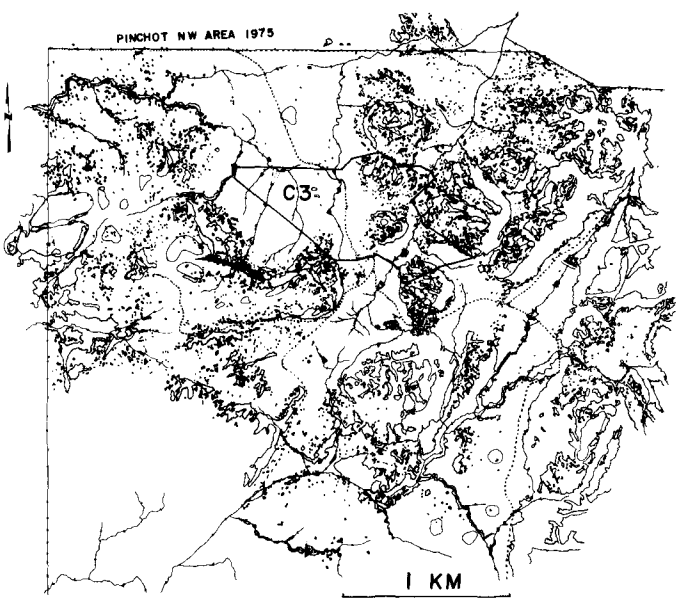

Fig. 4. Diurnal range of fawn C3 at the Pinchot area of the Wichita Mountains National Wildlife Refuge, Comanche County, Oklahoma, summer 1975.

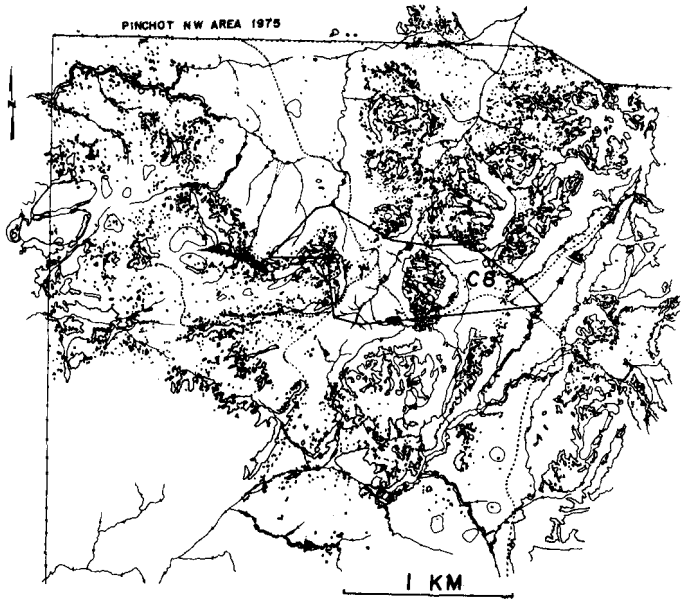

Fig. 5. Diurnal range of fawn C8 at the Pinchot area of the Wichita Mountains National Wildlife Refuge, Comanche County, Oklahoma, summer 1975.

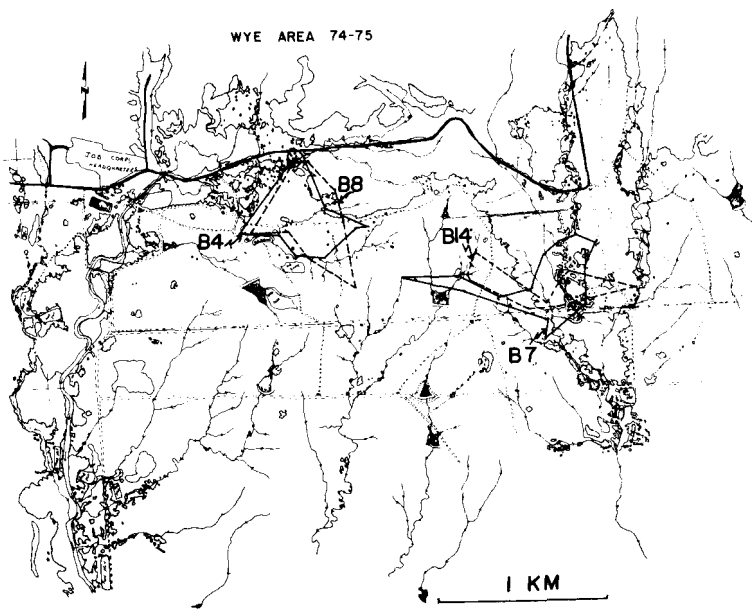

Fig. 6. Concurrent diurnal ranges of two sets of twins (B4 and B8, B7 and B14), at the Wye area of Fort Sill and the Wichita Mountains National Wildlife Refuge, Comanche County, Oklahoma, summer 1975.

range size at the Wichita Mountains (3.3 ha) is larger than either the 6 or 8 wk. home ranges in these 2 studies. Reasons for much larger diurnal range sizes at the Wichita Mountains may be partially explained by the more open terrain, but this fact alone seems insufficient to explain such large differences. More research on fawn ecology at the Wichita Mountains is needed before causes for the larger fawn diurnal range size can be clarified. High fawn-mortality rates reported by Garner et al. (1976) may somehow be related to these large diurnal ranges, but the nature of this relationship is unclear.

Two sets of twins were marked in the sample of 10 fawns (B4 and B8; B7 and B14). Unfortunately B7 and B8 succumbed to predation at 3 and 4 weeks of age respectively. Figure 6 compares concurrent diurnal ranges of each set of twins at the time of death. Although large areas of diurnal range for individuals overlap for both sets of twins (especially B4 and B8), individuals of neither set of twins were located together. Fawns B4 and B8 were never concurrently located closer than 45 m, whereas B7 and B14 were never closer than 110 m. These data indicate that fawns at the Wichitas do not bed together during daytime hours until at least 4 weeks of age.

Movements

Distances between successive diel locations during a fawn's first months of life were examined to determine if diurnal range expansion may be related to increasing distances between diel locations (Table 2). Although there is considerable variation among an

Table 2. Weekly mean diel movements (m) for 10 fawns during the first four weeks of life at Wichita Mountains, 1975.

Fawn	*Age Interval in Weeks*			
Number	*1*	*2*	*3*	*4*
B-2	260	148	Dead	
B-4	49	189	347	415
B-7	153	131	338	250
B-8	I[a]	225	415	Dead
B-14	I	I	475	346
C-2	151	77	195	226
C-3	I	135	115	241
C-4	I	235	131	245
C-6	I	331	262	458
C-8	I	I	I	539
Mean	153	184	285	340

[a]Insufficient data or fawn not captured at this age interval.

individual fawn's weekly average of diel movements, overall mean diel movements do indicate increasing diel movement distances with increasing fawn age. The magnitude of this increase also appears to increase with time. A minimum diel movement of 12 m was recorded at 5 days of age for fawn B4, whereas the maximum diel movement of 953 m was recorded at 25 days of age for fawn C8. These data suggest that increasing diurnal range size is directly related to increasing diel movements.

Weekly average daytime movements (5 locations per day) for fawns between the ages of 4 and 11 wks. do not indicate that distance of daytime movements increase with age (Table 3). Minimum daytime movement was zero and the maximum daytime movement was 1,208 m. Daytime movements of individual fawns were quite variable. Some fawns would change locations once or twice a day, while others would be in a different location in each of the 5 daily monitorings. The same fawn might move extensively on 1 day, and then remain in 1 location on another day. The majority of the daytime movements were less than 750 m, with the longer distance movements being less frequent (Table 4). Because increasing diurnal range size did not result in a corresponding increase in daytime movements, these data suggest that increasing diurnal range size is a result of increasing nocturnal movements.

Table 3. Weekly average for total daytime movements (0600-2,100 hrs) of 4 to 11-week-old fawns at Wichita Mountains, 1975.

Age Interval (weeks)	*Average Distance of Total Daytime Movements (m)*
4	315
5	446
6	425
7	347
8	361
9	458
10	508
11	258

Table 4. Distribution (%) of daytime fawn movements by distance intervals at Wichita Mountains, 1975.

Distance Interval (m)	*% of Daytime Fawn Movements In Distance Interval*
0-150	13.3
150-300	30.1
300-450	20.5
450-600	18.1
600-750	10.8
750-900	1.2
900-1,050	3.6
1,050-1,200	2.4

Conclusions

Diurnal ranges of young fawns at the Wichita Mountains were much larger than home ranges reported in other studies. The open prairie habitat in the Wichita Mountains is believed to contribute to this larger diurnal range, but other unknown factors are probably involved. Relationships between high fawn-mortality rates due to predation and larger diurnal range sizes are unclear, but may involve either predator harassment or a predator avoidance mechanism by the fawns. Development of a fawn's diurnal range appears to be a function of increasing nocturnal movements by the growing fawn. Diurnal ranges increased steadily as the fawns grew older. Daytime movements of fawns did not appear to be related to diurnal range size and were quite variable among fawns and sampling days.

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