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LONGEVITY RECORDS FOR THE FOX SQUIRREL

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Fox squirrels (*Sciurus niger*) have survived under captive conditions as long as 13 years (Crandall, 1964; Flower, 1931; Flyger and Gates, 1982; Snyder and Moore, 1968), but survival in the wild has not exceeded 7.5 years (Fouch, 1958). Herein we report on 11 fox squirrels that exceeded 7.5 years of age during an 18-year study of a protected urban fox squirrel population.

The study area, a 7-ha woodlot at the center of the Southern Illinois University campus, Carbondale, Jackson Co., Illinois, was essentially an island of high-quality squirrel habitat dominated by mature oaks (primarily *Quercus velutina*, *Q. falcata*, and *Q. palustris*). Vehicle-induced trauma and dog predation were the principal known causes of squirrel mortality. Since December 1968, squirrels have been captured in wooden box traps during quarterly 10-day periods. On initial capture, individuals were toe-clipped and received a monel wing band (No. 3, National Band and Tag Co., Newport, Kentucky) with a 1.5 by 1.0 cm uniquely colored and symbol-coded vinyl tag in each ear. Squirrels were not captured until at least 3 months of age; consequently, exact birth dates are not known. Squirrels were aged as adults (>1 year), spring-born (generally March) juveniles, and summer-born (generally August) juveniles based on the appearance of external genitalia and tail pelage (Larson and Taber, 1980; McCloskey, 1977). Because few new individuals were captured during March and August, when yearlings were present, the difficulty of distinguishing this age-class from older squirrels was minimal. Squirrels first captured as adults were assigned a birthdate of the most recent season of birth to which they could belong giving a minimum age of >1 year.

Eleven (six males, five females) of 321 squirrels (158 males, 163 females) born before August 1978 exceeded the previously reported natural longevity record of 7.5 years (Table 1). The oldest animal (female 220), with a minimum age of 12.6 years in March 1986, establishes a new longevity record for this species in the wild. The oldest male recorded was 8.3 years. Reproductive activity evidently was not reduced in these long-lived individuals; four of six males and four of five females, including 220, displayed signs of reproduction (scrotal testes or enlarged nipples) in the last 1.5 years of their recorded lifespan.

The unhunted and protected nature of this urban population undoubtedly contributed to the frequency of long-lived squirrels. Habitat fragmentation associated with urban sprawl probably results in a decrease in natural predators, and extreme longevities may be a consequence of insularity of habitat. Ecological longevity, the maximum life span under natural conditions (Barkalow and Soots, 1975), is not a peculiarity of trivial ecological importance. Fox squirrels can reproduce as yearlings and females can bear two litters

TABLE 1.—*Longevities of fox squirrels (Sciurus niger) equalling or surpassing 7.5 years, Jackson Co., Illinois.*

Squirrel number	Sex	Date		Minimum age (years)	
		First capture	Last capture	First capture	Last capture
1	M	Mar. 1977	Nov. 1983	1.6 ^a	8.3
2	F	Jun. 1977	Jan. 1985	0.3	7.8
18	M	Dec. 1977	Mar. 1985	0.3	7.6
34	M	Jun. 1978	Jan. 1986	0.3	7.8
50	F	Dec. 1974	Jun. 1982	1.3 ^a	8.8
220	F	Dec. 1974	Mar. 1986	1.3 ^a	12.6
420	F	Aug. 1975	Aug. 1983	1.4 ^a	9.4
442	M	Mar. 1976	Jun. 1983	0.6	7.8
504	M	Dec. 1976	Jun. 1983	1.3 ^a	7.8
514	F	Dec. 1976	Aug. 1985	1.3 ^a	10.0
895	M	Dec. 1971	Mar. 1979	0.8	8.0

^a First captured as an adult and assigned a minimum age >1 year.

each year (Flyger and Gates, 1982). Age is an important determinant of dominance in the fox squirrel social system (Benson, 1975), and an extremely long-lived individual may affect significantly the genetic and phenotypic composition of a population. Extreme longevity may be relatively common in small, isolated woodlots and deserves further study.

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LITERATURE CITED

- BARKALOW, F. S., JR., AND R. F. SOOTS, JR. 1975. Life span and reproductive longevity of the gray squirrel, *Sciurus c. carolinensis* Gmelin. *J. Mamm.*, 56:522-524.
- BENSON, B. N. 1975. Dominance relationships, mating behavior and scent marking in fox squirrels (*Sciurus niger rufiventer*). Unpubl. Ph.D. dissert., Southern Illinois Univ., Carbondale, 96 pp.
- CRANDALL, L. S. 1964. The management of wild mammals in captivity. Univ. Chicago Press, Chicago, 761 pp.
- FLOWER, S. S. 1931. Contributions to our knowledge of the duration of life in vertebrate animals. *Proc. Zool. Soc. London*, 101:149-234.
- FLYGER, V., AND J. E. GATES. 1982. Fox and gray squirrels. Pp. 209-229, in *Wild mammals of North America* (J. A. Chapman and G. A. Feldhamer, eds.). Johns Hopkins Univ. Press, Baltimore, 1147 pp.
- FOUCH, W. R. 1958. Longevity records for the fox squirrel. *J. Mamm.*, 39:154-155.
- LARSON, J. S., AND R. D. TABER. 1980. Criteria of sex and age. Pp. 143-202, in *Wildlife management techniques manual* (S. D. Schemnitz, ed.). Fourth ed. The Wildl. Soc., Washington, D.C., 686 pp.
- MCCLOSKEY, R. J. 1977. Accuracy of criteria used to determine age of fox squirrels. *Proc. Iowa Acad. Sci.*, 84:32-34.
- SNYDER, R. L., AND S. C. MOORE. 1968. Longevity of captive mammals in the Philadelphia Zoo. *Internat. Zoo. Yearb.*, 8:175-183.

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RECURRENT ESTROUS CYCLES IN WHITE-TAILED DEER

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Female white-tailed deer (*Odocoileus virginianus*) have been reported to experience as many as three or four estrous cycles during a breeding season (Asdell, 1964; Cheatum and Morton, 1946; Hamilton et al., 1985). Severinghaus and Cheatum (1956) reported that estrous cycles occurred on a 28-29 day recurrent basis. In the Upper Peninsula of Michigan, estrous-cycle lengths for 15 females ranged from 21 to 27 days (Verme and Ullrey, 1985). Hamilton et al. (1985), Haugen (1959), and Verme (1965) reported that a female's receptive period lasts about 24 h.

Although Plotka et al. (1977) hypothesized that white-tailed deer were capable of cycling into March, we know of no other study that has determined the number of recurrent estrous cycles in unbred females. In this paper we demonstrate that under penned conditions white-tailed deer may experience up to seven estrous cycles during a breeding season. We also report that estrous-cycle length appears to increase with time, and that behavioral estrus frequently lasts >24 h.

In our study, five yearling (1.5-year-old) and three adult (>2.5-year-old) female white-tailed deer were housed in individual stalls (3 by 6 m) at the University of Georgia Whitehall Deer Research Facility. All adults had given birth to and raised healthy fawns the previous summer; all yearlings were prepubertal. Deer were fed ad lib. the high-energy, high-protein ration described by Kirkpatrick et al. (1975) and supplemented with a commercial feed (Purina Sweetena®, Purina Mills, Inc.). From 14 October 1985 through 21 May 1986, estrus was determined by allowing each female to associate individually with a mature, sexually experienced, epididymectomized male for 10 min once each day between 0800 and 1400. Behavioral patterns