

**Ecology of the Eastern Collared Lizard, *Crotaphytus collaris*,
at its only known locality in Illinois**

**Beth Burke
Department of Zoology
Southern Illinois University, Carbondale
Carbondale, Illinois 62901-6501
(618) 549-5996**

Final Report

Introduction

Crotaphytus collaris collaris (Say, 1823), the eastern collared lizard, occurs from east and south-central Missouri through central Texas; north into eastern New Mexico and southeastern Colorado (Conant and Collins 1991). Behler and King (1988) showed *C. collaris* as occurring in extreme southwestern Illinois, prior to substantiation that it occurred in Illinois, had been published. Smith (1961) recognized the possibility of a population in Valmeyer, Monroe County, Illinois because of the apparent suitability of habitat and their close proximity to a population across the Mississippi River, in Pevely, Missouri. The presence of *Crotaphytus collaris* was not confirmed in Illinois until a population was discovered at Ferne Clyffe State Park, Johnson County (Brandon and Wilson, 1994). This population, the easternmost known locality for the species, is suspected of being introduced because of the extensive previous field work done in the area without its discovery (Brandon and Wilson, 1994). The ecology and life history of *C. collaris* have been extensively described throughout its range with a bias toward western populations (Fitch, 1956; Dawson and Templeton, 1963; Best and Pfaffenberger, 1987; Trauth, 1978; Sanborn and Loomis, 1979; Andre and MacMahon, 1980; Robinson and Tanner, 1962; Banta, 1960; Ballinger and Hipp, 1985; McAllister, 1985; Legler and Fitch, 1957). Fitch (1956) studied the ecology of this lizard in a disjunct, introduced population in Kansas beyond the northern edge of its range, an area where studies are few. Sexton et al. (1992) studied growth of a peripheral population along the eastern edge of their range. Because the Ferne Clyffe population is beyond the eastern edge of the natural range, it provides us with an opportunity to study the ecological structure of an extralimital lizard population.

The fence lizard, *Sceloporus undulatus*, is distributed uniformly over roughly the southern one-third of Illinois. At Ferne Clyffe it is sympatric with *C. collaris*. Indeed, *C. collaris* and *S. undulatus* occur sympatrically over much of their ranges and share many ecological similarities (diet, habitat and activity periods). Because of these similarities one can hypothesize that each species exerts some competitive effect on the other.

Traditionally, the experimental approach to the study of interspecific competition involved density manipulations by the removal or addition of individuals to populations to demonstrate the existence of competition (Dunham, 1980). For the current study, I have two proximate and nearly identical sites with different lizard assemblages allowing for direct comparison without manipulation.

The objectives of the study were as follows: to describe demographic characteristics (sex and age classes ratios) of collared lizards and microsympatric fence lizards; to estimate the population size of collared lizards, microsympatric fence lizards and allopatric fence lizards; to evaluate the effect, if any, of collared lizards on the demography and population density of microsympatric fence lizards; and the inventory the species of amphibian and reptile living along the sandstone glades in the park.

Materials and Methods

Study Area. The study area consists of three main study sites within Ferne Clyffe State Park/ Round Bluff Nature Preserve, Johnson County. The main study area is the BlackJack Oak Trail where collared lizards were first observed in the state. In addition, two other sites, Round Bluff Nature Preserve and the bluff above the Waterfall trail, were periodically checked for the presence of collared lizards and/ or fence lizards.

A total of 18 trips lasting approximately two hours each were made to the study area between late May and the middle of July. During each trip at least two people were present in the field resulting in seventy two person hours (this study is ongoing and will proceed until late October or until lizard activity ceases). All lizards encountered within two hours were captured using a noose of 6-lb test monofilament line attached to a collapsible fishing pole. Data collected for each lizard included: snout to vent length measured to the nearest 1.0 mm using dial calipers; weight taken on a digital scale to the nearest 0.1 g; sex determined by sexually dimorphic coloration; age estimated from the size/age correlation reported by Fitch (1956). Cloacal temperatures, air temperature (taken from 1 meter above the substrate), rock surface temperature at capture site were measured using an analog thermometer and appropriate probes and recorded. Upon initial capture, animals were given unique alphanumeric identification marks by amputating the entire toe, up to three toes per animal (modified from Ferner) (1979). Recapture data were used to estimate population size based on actual numbers of lizards marked and the application of Bailey's modification of the Lincoln Index (Bailey, 1951). In addition to locating collared lizards along the BlackJack Oak Trail, efforts were made to survey other areas in the park with suitable collared lizard habitat to determine if the collared lizard has spread its small range.

Results

Collared lizards were very conspicuous and were encountered on every occasion at the BlackJack Oak study site. A total of seven different collared lizards were encountered at this site. Three of these animals were adult males (average length at last capture 101.66 mm) and four were adult females (average length at last capture

87.25 mm). All females were observed to have orange spotting along the side of their body, an indication that they are reproductively active. There were no juvenile collared lizards found at the site since hatching does not occur until August or September. No collared lizards were found at any other site in the park. Fence lizards were less conspicuous and were not encountered frequently. No fence lizards were captured at either the Waterfall Trail site nor at Round Bluff nature preserve. Although many fence lizards were observed along the BlackJack Oak Trail, catchability rates were lower than for collared lizards (approximately 50% for fence lizards and 95% average capture rates for collared lizards). A total of four male fence lizards were captured averaging 67.5 mm in length. No female *Sceloporus* were captured during this portion of the study.

Collared lizards were observed basking on exposed rock surfaces on the edges of the bluff and never in the scrubby or wooded habitats found along the bluff edge. Collared lizards require relatively high body temperatures, with a mean body temperature of 94.96 °F (n=32). They require exposed rock, which is often hotter than the mean air temperature, to thermoregulate. The basking surfaces sampled averaged 89.06 °F. Temperatures this high would be unavailable from basking sites in more vegetated bluff top habitat.

A list of all other species of amphibian and reptile occupying glades or the immediate surrounding woods for each of the three main study sites was compiled (table 1). A total of four amphibian species and eight reptile species were encountered during this study. The most common species encountered were *Bufo woodhousii*, *Acris crepitans*, *Eumeces sp.*, and *Cnemidophorus sexlineatus*.

Table 1. Additional species observed along the blufftops at Ferne Clyffe State Park.

Species	Sites		
	BlackJack Oak Trail	Waterfall Trail	Round Bluff Nature Preserve
<i>Plethodon glutinosus</i>	X		
<i>Bufo woodhousii</i>	X	X	X
<i>Acris crepitans</i>	X	X	
<i>Hyla chrysoscelis</i>	X	X	
<i>Eumeces sp.</i>	X	X	X
<i>Cnemidophorus sexlineatus</i>			X
<i>Terrapene carolina</i>	X		
<i>Coluber constrictor</i>	X		
<i>Elaphe obsoleta</i>	X		
<i>Heterodon platirhinos</i>			X
<i>Thamnophis sirtalis</i>	X		
<i>Agkistrodon contortrix</i>	X	X	

Discussion

All females observed were of adult length and thus capable of breeding. Fitch (1956) stated that Kansas collared lizards hatch from their eggs in August or September and may sexually mature early the following summer. He concluded that this early attainment of sexual maturity together with the species' ability to produce more than one clutch of eggs per season, gives the collared lizard a reproductive potential much higher than those of most other North American lizards. Fitch (1970) states that the

number of eggs produced per clutch may be anywhere from 1 to 21 eggs with 1 to 12 eggs per clutch more common (average = 5.76) If each of the four adult females double clutched with the average amount of eggs possible a total of 46 young could hatch by this summers end. Evidence however support a high mortality rate based on only seven adults being located this summer, and the fact that animals usually live in small groups (Sexton, 1992). An amendment to this report will be compiled by the end of the year documenting the number of juveniles hatched this fall.

Collared lizards appear to be isolated to open bluff areas and will rarely go into scrubby habitat even when pursued (Fitch, 1956). This population of collared lizards has been extensively surveyed for the past three summers and no collared lizards have been found in any other areas of the park. For this reason I believe the lizards will remain isolated on the BlackJack Oak Trail and not disperse to other areas of the park.

Few fence lizards were captured during this study because they are more wary than collared lizards and will retreat into grass or scrub making noosing impossible. More males than females were observed presumably because they are more viable when defending their territories.

Literature Cited

- Andre, J. B. & MacMahon, J. A. 1980. Reproduction in three sympatric lizard species from west-central Utah. *Great Basin nat.* 40(1):68-72.
- Bailey, N. T. J. 1951. On estimating the size of mobile populations from recapture data. *Biometrika* 38:293-306.
- Ballinger, R. E. & Hipp, T. G. 1985. Reproduction in the collared lizard *Crotaphytus collaris*, in west central Texas. *Copeia* 1985(4):976-980.

- Banta, B. H. 1960. Notes on the feeding of the western collared lizard, *Crotaphytus collaris baileyi* Stenjneger. *Wasmann J. Biol.* 18:309-311.
- Behler, J. L. & King, F. W. 1988. *The Audubon Society Field Guide to North American Reptiles and Amphibians*. Knopf, New York. 743p.
- Best, T. L. & Pfaffenberger, G. S. 1987. Age and sexual variation in the diet of collared lizards, *Crotaphytus collaris*. *Southwest nat.* 32(4):415-426.
- Brandon, R. A. & Wilson, A. K. 1994. *Crotaphytus collaris*. Geographic distribution. *Herpetol. Rev.* 25(2):76.
- Conant, R. & Collins, J. 1991. *A Field Guide to Reptiles and Amphibians, Eastern/Central North America*. Peterson Field Guides, no. 12. Houghton Mifflin.
- Dawson, W. R. & Templeton, J. R. 1963. Physiological responses to temperature in the lizard *Crotaphytus collaris*. *Physiol. Zool.* 36:219-236.
- Dunham, Arthur E. 1980. An experimental study of interspecific competition between the iguanid lizards *Sceloporus undulatus* and *Urosaurus ornatus*. *Ecological Monographs* 50(3):309-330.
- Ferner, J. W. 1979. A Review of Marking Techniques for Amphibians and Reptiles. SSAR Herpetological Circular No. 9 941p.
- Fitch, H. S. 1956. An ecological study of the collared lizard, *Crotaphytus collaris*. *Publ. Mus. nat. Hist. Univ. Kansas* 8(3):213-274.
- Fitch, H. S. 1970. Reproductive Cycles in Lizards and Snakes. *Publ. Mus. Nat. Hist. Univ. Kansas* 53:1-274.
- Legler, J. M. & Fitch, H. S. 1957. Observations on hibernation and nests of the collared lizard, *Crotaphytus collaris*. *Copeia* 1957:305-306.

- McAllister, C. T. 1985. Food habits and feeding behavior of *Crotaphytus collaris collaris* (Iguanidae) from Arkansas and Missouri. *Southwest nat.* 30(4):597-600.
- Robison, W. G. & Tanner, W. W. 1962. A comparative study of the species of the genus *Crotaphytus* Holbrook (Iguanidae) Brigham Young Univ. Sci. Bull. Ser. 2(1):1-31.
- Sanborn, S. R. & Loomis, R. B. 1979. Systematics and behaviour of collared lizards (*Crotaphytus*, Iguanidae) in Southern California. *Herpetologica* 35(2):101-106.
- Sexton, O. J., Andrews, R. M. & Bramble, J. E. 1992. Size and growth rate characteristics of a peripheral population of *Crotaphytus collaris* (Sauria: Crotaphytidae). *Copeia* 1992 4:968-980.
- Smith, P. W. 1961. *The Amphibians and Reptiles of Illinois*. Illinois Natural History Survey Bulletin 28(1):298p.
- Trauth, S. E. 1978. Ovarian cycle of *Crotaphytus collaris* (Reptilia: Lacertilia: Iguanidae) from Arkansas with emphasis on corpora albicantia follicular atresia, and reproductive potential. *Journal Herpet.* 12(4):461-470.

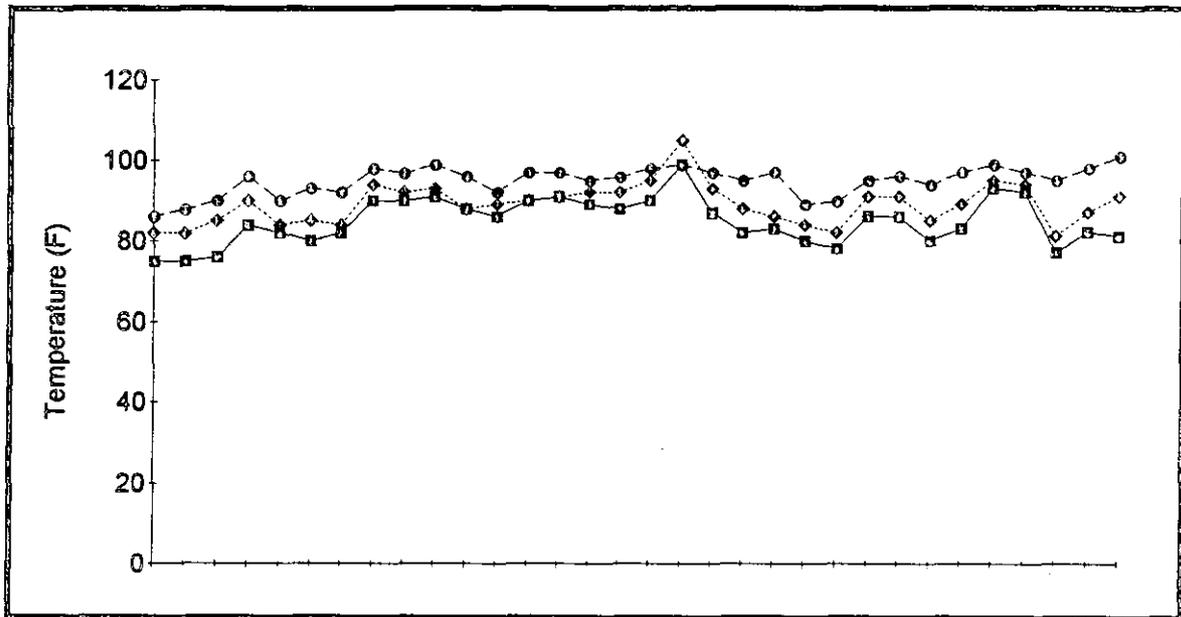


Fig. 1 Relative cloacal (circles), air temperature (diamonds) and basking surface temperatures (squares) for *Crotaphytus collaris* (n=32).