a. Title of Project: Distribution and Abundance of the Eastern Collared Lizard, *Crotaphytus collaris* (Say), in Arkansas: Part I. Reservoir and Glade-associated Demes

b. Project Summary: The eastern collared lizard is a large saxicolous, territorial predator whose range is locally patchy and unevenly distributed within the three distinctive subdivisions (Ozark Highlands, the Arkansas Valley, and the Ouachita Mountains) of the Interior Highlands ecoregion of Arkansas. Most populations of this lizard are associated with fragmented, sandstone/limestone "cedar glade" habitats within the White River drainage basin of northern Arkansas. No recent study has addressed this species' distribution and abundance within the state's borders.

c. Name of Project Leader and Job Title: Dr. Stanley E. Trauth, Professor and Interim Chair

d. Affiliation: Arkansas State University

e. Email Address: strauth@astate.edu

f. Physical Mailing Address: Department of Biological Sciences, Arkansas State University, P.O. Box 599, State University, AR 72467-0599.

g. Telephone: (870) 972-3111, 3194

h. Project Partners: Kelly Irwin, State Herpetologist, Arkansas Game & Fish Commission, 915 E. Sevier St., Benton, AR 72015, kjirwin@agfc.state.ar.us 877.847.2690 x 16.

i. Total Amount of Project Cost: $102,016.00

j. Total Amount of SWG Money Requested: $68,489.00

k. Amount and Source of Matching Funds or In-kind Services: Total - $23,974.00 – S. E. Trauth, (In kind Salary ($9,739.00); Fringes ($3,327.00); Waived indirect cost ($33,527.00)

a. Need - Among the 12 or so lizards species that occur in Arkansas, the eastern collared lizard, a visually-oriented predator, has colonized rocky outcroppings and open "glade" habitats that represent patchy prairie remnants of a once widespread xeric Pleistocene environment of the Interior Highlands ecoregion (Trauth, 1989; Hutchison et al., 1999; Trauth et al., 2004). In recent time, the suppression of fire through human intervention within the Ozark Plateau has led to a dramatic shift in the landscape patterns of patchy "prairie habitat islands" resulting in an encroachment of woody plants (mostly cedar or oak-hickory forest). This has caused a conversion of prairie vegetated environments into cedar woodlands, thereby resulting in a reduction or loss of suitable open habitat for this species (Trauth, 1989; Brisson et al., 2003).

Trauth et al. (2004) provided the most comprehensive distribution map (see figure below) for the eastern collared lizard in Arkansas. Localized populations (demes) of this species dominate within the Ozark Highlands (one of the three subdivisons of the Interior Highlands ecoregion), representing nearly 75% (57 of 73 records) of all locality records. Most colonies of this species are found in association with xeric habitats scattered within the White River drainage basin of northern Arkansas (Smith et al., 1984). Other than several recent new county records (i.e., in Franklin and Scott counties), no new locality records are available for the species.

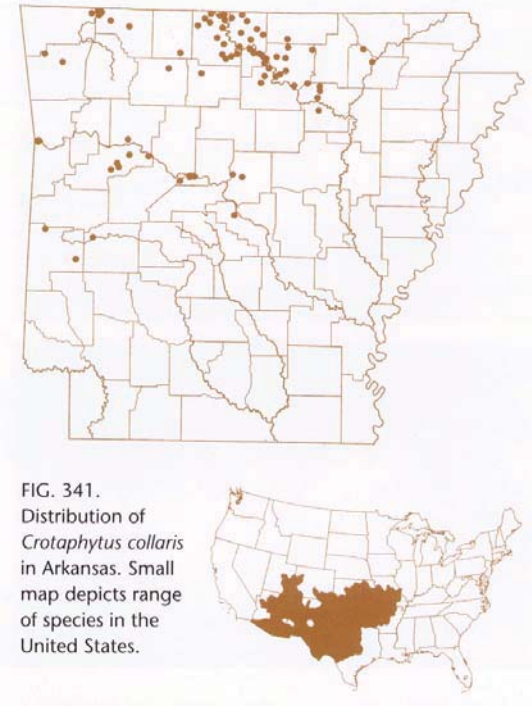


FIG. 341. Distribution of *Crotaphytus collaris* in Arkansas. Small map depicts range of species in the United States.

Habitat fragmentation, viewed on a global scale, continues to be is a recognized phenomenon that represents a major pervasive threat to genetic continuity within a species and can lead to reduced genetic variability and increased extinction rates (see reviews in Saunders et al., 1991; Fahrig, 2003). Any exclusion of fire on cedar glade habitats of northern Arkansas should be viewed as a major habitat alteration and a serious threat to the continued existence of the collared lizard (Guyette and McGinnes, 1982; Ware, 2002). Dispersal to and from glade habitats by juvenile as well as adult lizards has been demonstrated to be paramount to preventing genetic bottlenecking within localized demes and is key to the overall genetic diversity within and among collared lizards populations (Templeton et al., 2001).

b. Objective - The primary objectives of the present study are threefold: 1) to update specific locality information for this lizard in all subdivisions of the Interior Highlands ecoregion, but with an emphasis on the Ozark Highlands; 2) to evaluate site-specific habitat characteristics within stable as well as disturbed habitats (e.g., rock quarries vs. reservoir shoreline habitats), and 3) document population structure, especially within larger demes that inhabitat reservoirs and associated xeric habitats. These new data are crucial to sound management decisions pertaining to the conservation status of this species.

c. Expected Results and Benefits to Species of Concern - Reports and manuscripts will include the following topics:

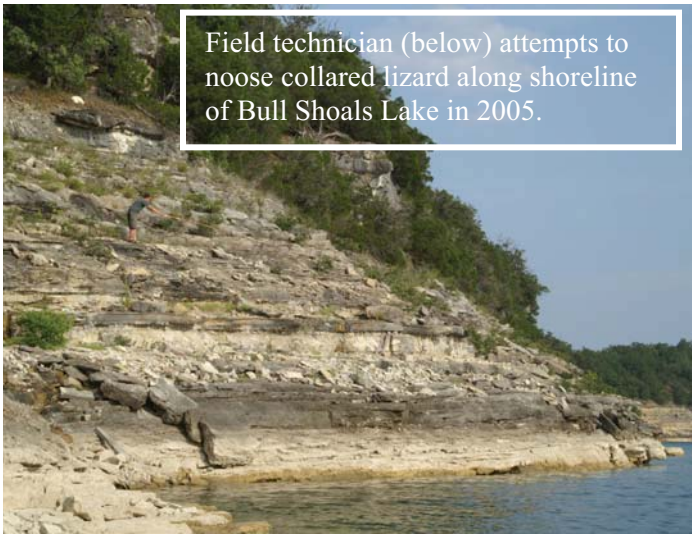
1. The results will provide an updated inventory for the species in the state.
2. Site-specific habitat features, including mesic forest (oak-hickory, pine), xeric forest (glade, talus), bluffy escarpment (deciduous, pine), and prairie should provide a measure of habitat stability or vulnerability for future reference or study.

3. This study should provide basic data that can be used to generate a population viability analysis for this species in the future.

4. The results will provide important insights for improving management of existing populations and for guiding the development of proper species survival and habitat management plans for this spectacular, yet highly vulnerable, lizard.

d. Approach - This 2-year field investigation on collared lizards will be during the summer 2009 and will end during the summer 2011. I am requesting a field technician (graduate student) to assist me during this study. The project will roll over into a Master's Thesis for this student. Time and/or area-constrained searches will be performed. An attempt will be made to capture each lizard by noosing (see photo at right) using an extendable pole with a floss string attachment. Measurements recorded for each captured lizard will include snout-vent length, tail length, and mass; in addition, each lizard will be toe clipped (with the removal of a single terminal phalanx of one digit; following Ferner, 2007), sexed, and photographed prior to release at capture site. All toe clippings will be placed into 100% ethanol for possible later use.

e. Location of Work - The field techniques during the 1st year of study will include documenting the presence and/or absence of collared lizards along the margins of U.S. Corps of Engineers reservoirs or impoundments within the White River drainage basin. Reservoirs to be searched include Bull Shoals Lake, Norfork Lake, and Beaver Lake. A GPS locality reading will be recorded for every 100 m segment of shoreline habitat searched or containing lizards.



Field technician (below) attempts to noose collared lizard along shoreline of Bull Shoals Lake in 2005.

During the 2nd year of study, habitats within the two remaining subdivisions of the Interior Highlands will be investigated using similar field techniques as mentioned above. Rocky terrains along selected reservoirs, including Greers Ferry, Table Rock Lake (Boone County), Lake Dardanelle, Lake Ouachita, Blue Mountain Lake, and Lake Nimrod, will be spot checked (time-constrained searches) for suitable collared lizard habitat. Rocky outcroppings of selected pinnacles within the Arkansas Valley will also be searched. Analyzes of population structure will be conducted on selected demes within the Arkansas Valley and Ouachita Mountains. Physical features and biotic descriptions of habitat characteristic types will also be recorded. Digital photographs of habitats will be taken. Ecological associates, such as the northern fence lizard (*Sceloporus undulatus hyacinthinus*), will be documented (Angert et al., 2002).

f. Budget -

Salaries and Fringe:	
Principal Investigator (2 yr summer term)	**$22,156.00**
MS Student (2 yr)	**$27,600.00**
Fringes (PI & MS Student)	**$ 4,707.00**
Supplies:	
Miscellaneous Field supplies	**$ 3,250.00**

Travel:	
Mileage (.42 per mile)	**$ 4,050.00**
Meals	**$ 500.00**
Total Direct Cost	**$62,263.00**
Indirect Cost (10% SWG allowed)	**$ 6,226.00**
Direct and Indirect Cost Totals	**$68,489.00**
ASU Match (65:35 ratio):	
Principal Investigator	**$ 9,739.00**
Fringes	**$ 3,327.00**
Waived indirect cost	**$20,461.00**
ASU Match Total	**$33,527.00**

Literature Cited:

Angert, A. L., D. Hutchison, D. Glossip, and J. B. Losos. 2002. Microhabitat use and thermal biology of the collared lizard (*Crotaphytus collaris collaris*) and the fence lizard (*Sceloporus undulatus hyacinthinus*) in Missouri glades. Journal of Herpetology 36:23-29.

Brisson, J. A., J. L. Strasburg, and A. R. Templeton. 2003. Impact of fire management on the ecology of collared lizard (*Crotaphytus collaris*) populations living on the Ozark Plateau. Animal Conservation 6:247-254.

Fahrig, L. 2003. Effects of habitat fragmentation on biodiversity. Annual Review of Evolution and Systematics 34:487-515.

Ferner, J. W. 2007. A review of marking and individual recognition techniques for amphibians and reptiles. Society for the Study of Amphibians and Reptiles. 72 p.

Guyette, R., and E. A. McGinnes, Jr. 1982. Fire history of an Ozark glade in Missouri. Transactions of the Missouri Academy of Science 16:85-93.

Hutchison, D. W., S. T. Malcomber, and L. S. Pletscher. 1999. A multidisciplinary investigation of the applicability of the Pleistocene herpetofaunal stability model to collared lizards (*Crotaphytus collaris*). Herpetological Monographs 13:81-141.

Saunders, D. A., R. J. Hobbs, and C. R. Margules. 1991. Biological consequences of ecosystem fragmentation: A review. Conservation Biology 5:18-32.

Smith, K. L., W. F. Pell, J. H. Rettig, R. H. Davis, and H. W. Robison. 1984. Arkansas's natural heritage. August House Publishers, Little Rock. 116 p.

Templeton, A. R., R. J. Robertson, J. Brisson, and J. Strasburg. 2001. Disrupting evolutionary processes: The effect of habitat fragmentation on collared lizards in the Missouri Ozarks. Proceedings of the National Academy of Sciences 98:5426-5432.

Trauth, S. E. 1989. Distributional survey of the eastern collared lizard, *Crotaphytus collaris collaris* (Squamata: Iguanidae), within the Arkansas River valley of Arkansas. Proc. Arkansas Acad. Sci. 43:101-104.

Trauth, S. E., H. W. Robison, and M. V. Plummer. 2004. The Amphibians and Reptiles of Arkansas. Univ. Arkansas Press, Fayetteville. xviii + 421 pp.

Ware, S. 2002. Rock outcrop plant communities (glades) in the Ozarks: A synthesis. The Southwestern Naturalist:47:585-597.

Stanley E. Trauth - BIOGRAPHICAL SKETCH

EDUCATION

BS	University of Arkansas	1970	Zoology
MS	University of Arkansas	1974	Zoology

Thesis Title: Demography and Reproduction in the Eastern Collared Lizard, *Crotaphytus collaris collaris* (Say), from Northern Arkansas

PhD	Auburn University	1980	Zoology

Dissertation Title: Geographic Variation and Systematics in the Lizard *Cnemidophorus sexlineatus* (Linnaeus)

PROFESSIONAL EMPLOYMENT

Assistant Professor and Director of Electron Microscope Facility	Arkansas State University	1984-1989
Associate Professor and Director of Electron Microscope Facility	Arkansas State University	1989-1994
Professor and Director of Electron Microscope Facility	Arkansas State University	1994-Present
Interim Chair – Biological Sciences	Arkansas State University	2009-2010

RELEVANT OR RELATED PUBLICATIONS

Trauth, S. E. 1978. Ovarian cycle of *Crotaphytus collaris* (Reptilia, Lacertilia, Iguanidae) from Arkansas with emphasis on corpora albicantia, follicular atresia, and reproductive potential. J. Herpetol. 12:461-470.

Trauth, S. E. 1979. Testicular cycle and timing of reproduction in the collared lizard (*Crotaphytus collaris*) in Arkansas. Herpetologica 35:184-192.

McAllister, C. T. and S. E. Trauth. 1982. An instance of the eastern collared lizard, *Crotaphytus collaris* (Sauria: Iguanidae), feeding on *Sigmodon hispidus* (Rodentia: Cricetidae). Southwest. Nat. 27:358-359.

McAllister, C. T. and S. E. Trauth. 1985. Endoparasites of *Crotaphytus collaris collaris* (Sauria: Iguanidae). Southwest. Nat. 30:363-370.

McAllister, C. T., S. E. Trauth and J. E. Ubelaker. 1985. *Oochoristica crotaphyti* n. sp. (Cestoda: Linstowiidae) from *Crotaphytus collaris* (Sauria: Iguanidae) in northern Arkansas. J. Parasitol. 71:803-807.

Trauth, S. E. 1989. Distributional survey of the eastern collared lizard, *Crotaphytus collaris collaris* (Squamata: Iguanidae), within the Arkansas River valley of Arkansas. Proc. Arkansas Acad. Sci. 43:101-104.

Trauth, S. E., C. T. McAllister, and W. Chen. 1994. Microscopic eggshell characteristics in the collared lizard, *Crotaphytus collaris* (Sauria: Crotaphytidae). Southwest. Nat. 39:45-52.

Trauth, S. E., H. W. Robison, and M. V. Plummer. 2004. The Amphibians and Reptiles of Arkansas. Univ. Arkansas Press, Fayetteville. xviii + 421 pp.

LIST OF STEM GRADUATE ADVISEES FOR LAST 4 YEARS

Joe.R. Milanovich, Jonathan Stanley, Josh Engelbert, Melissa Patrick, Robert Neal, Phillip Stewart, Charles McDowell, Jacob Sawyer, Corey Shaffer, Nate Stephens, Waylon Hiler, Ben Wheeler, Sarah Webb

LIST OF CURRENT AND PAST COLLABORATORS, INCLUDING CO-AUTHORED PAPERS FOR LAST 5 YEARS

M. L. McCallum, R. R. Jordan, D. A. Saugey, C. McDowell, R. G. Neal, T. L. Klotz, W. E. Meshaka, Jr., C. T. McAllister, C. R. Bursey, D. B. Fenolio, J. B. Trauth, R. L. Johnson, W. R. Hiler, B. A. Wheeler, M. M. Mary, J. R. Milanovich, R. Tumlison, J. A. Sawyer, W. E. Moser, D. J. Klemm, D. J. Richardson, D. Fenolio, M. Redmer, J. P. Stewart, H. A. Dundee, H. Rauschenberger, H. W. Robison, and M. V. Plummer.