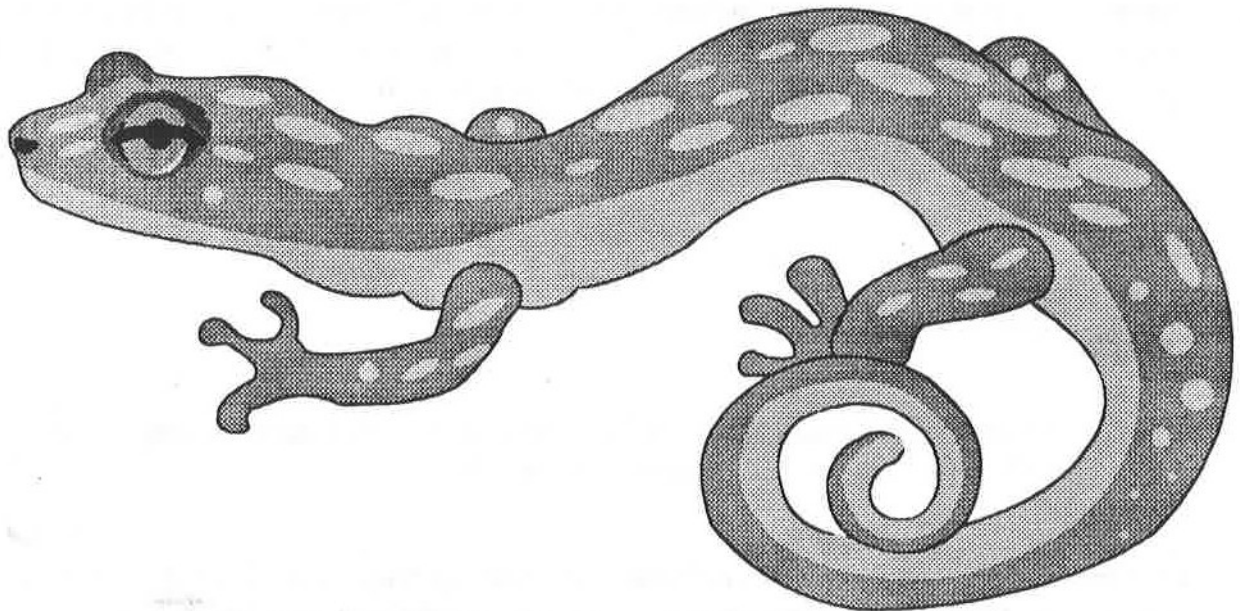


1996
Third Annual
Tennessee



HERPETOLOGY CONFERENCE

ABSTRACTS

THE MIXED FORAGING MODE OF JUVENILE NORTHERN WATER SNAKES

Paul T. Andreadis and Karla L. Balent, Ecology and Evolutionary Biology Dept.
569 Dabney Hall, Knoxville, University of Tennessee, Knoxville, TN 37996

Foraging mode is a continuum of hunting strategies ranging from passive, sit-and-wait ambushing to active, widely searching foraging, but the behavior of many species lies at one extreme or the other of this spectrum. One way that an "intermediate" mode may be manifested is by alternating between active and passive foraging. From July-September 1994, we made nocturnal observations of free ranging, yearling Northern water snakes, *Nerodia sipedon* L., in Blount and Sevier Counties, TN. By some criteria, these snakes would be classified as sit-and-wait predators: on average, they moved once every 5.0 min, and were moving for only 14% of the time. However, the short periods of activity consisted of widely searching, active foraging. Snakes searched for prey by probing into crevices as they crawled along the stream bottom. On average, 64% of an individual's moves included such active foraging behavior. Prey attacks were made during both passive and active foraging. The foraging mode of these snakes is thus a novel strategy wherein individuals use a mixture of divergent tactics within a single bout. Colubrid snakes may provide good examples of mixed strategies, and *N. sipedon* particularly so because both mobile and sedentary prey are included in their diet.

AUTHOR:

Carol A. Britson

AFFILIATION:

The University of Memphis

TITLE:

Predatory responses of largemouth bass *Micropterus salmoides* to aposematic and cryptic hatchling turtles: comparative and manipulative experiments

ABSTRACT:

Prior research on the antipredator mechanisms of hatchling, freshwater turtles discovered a previously unknown defense associated with aposematic coloration: noxious behaviors. Hatchling painted turtles *Chrysemys picta* and red-eared sliders *Trachemys scripta* are able to avoid being preyed upon by largemouth bass *Micropterus salmoides* through the use of escape behaviors such as biting, clawing, etc., within the buccal cavity and upper digestive tract of bass. Bass are able to associate the aposematic plastral colors of the hatchlings with the potentially damaging escape behavior. Two experiments were performed to answer the following questions. Are there differences in the feeding responses of bass when presented with dead, anesthetized, and active, live hatchlings of (1) aposematic painted turtle and cryptic snapping turtle *Chelydra serpentina* hatchlings; (2a) aposematic and "cryptic" red-eared sliders; and (2b) cryptic and "aposematic" snapping turtles? In both experiments, there was a significantly greater number of attacks on cryptic turtles (after experience with an active, live hatchling of either coloration) indicating that bass are unable to associate the cryptic appearance of the hatchling with past predation experiences. This demonstrates that the association is independent of the general appearance of the hatchling (i.e., shape).

The Distribution, Habitat, and Subspecific Status of the Plainbelly Water Snake
(*Nerodia erythrogaster*) in the Lower Cumberland River Basin

Angelo Bufalino and A. Floyd Scott

The Center for Field Biology, Austin Peay State University, Clarksville, TN 37044

The distribution, habitat, and taxonomy of the plainbelly water snake (*Nerodia erythrogaster*) in the Cumberland River basin of Tennessee and Kentucky are poorly understood. We have attempted to remedy this situation by studying the species along the Cumberland River from Nashville, Tennessee to its confluence with the Ohio River at Smithland, Kentucky. Preliminary results indicate *N. erythrogaster* occurs regularly in suitable wetland habitats in the floodplain and sparingly in adjacent uplands from Ashland City (Cheatham Co.), Tennessee to Barkley Dam (Lyon Co.), Kentucky. Up river from Ashland City and down river from Barkley Dam, where floodplain wetlands are more reduced and fragmented and collecting has been minimal, the species has yet to be documented. As previously reported for northwestern Tennessee and the Jackson Purchase region of Kentucky, Cumberland River specimens appear intergradient between *N. e. flavigaster* and *N. e. neglecta*. However, of the two subspecies, their appearance is most like the latter.

Insights into the ecology and life history of the chicken turtle
(*Deirochelys reticularia*)

Kurt A. Buhlmann, University of Georgia, Savannah River Ecology
Laboratory, Drawer E, Aiken, South Carolina 29802

The chicken turtle (*Deirochelys reticularia*) is an enigmatic aquatic turtle of the southeastern United States. Ongoing studies at the Savannah River Site on the Upper Coastal Plain of South Carolina have found chicken turtles to have some unusual life history and natural history traits relative to other sympatric aquatic turtles. These include an autumn-winter nesting season, terrestrial periods of inactivity, and a diet specializing on crayfish and aquatic insects. In South Carolina, chicken turtles appear to be closely associated with natural, seasonal, fluctuating wetlands, such as Carolina bays. I have found chicken turtles to be associated with fluctuating habitats in other regions, including Virginia (interdunal ponds) and Missouri (cypress pools). It seems likely that chicken turtles would be found to occur in extreme western Tennessee. Methods for inventory as well as conservation concerns will be addressed in the talk.

DEMOGRAPHIC CHANGES IN A WOOD TURTLE POPULATION OVER TWO DECADES

DAVID E. COLLINS
Tennessee Aquarium

Abstract

A population of wood turtles (*Clemmys insculpta*) in Schoharie County, New York was studied extensively from 1973 through 1977. These investigations addressed home range, habitat use and demographics. During the course of this work 96 turtles were marked and a total of 1712 captures of these turtles recorded. The results of this work have not been published. This study area was revisited during spring and fall, 1995 to evaluate the status of the habitat and assess the potential for resuming this study. A total of 23 wood turtles were captured during seven survey days. These included seven individuals which were previously marked between 1973 and 1977 and 16 new captures. The new captures included seven juvenile to young-adult individuals less than 20 years of age and nine turtles greater than 20 years old. These three groups may represent three distinct demographic elements: surviving residents, new recruits born into the population since last work, and immigrants or transients. These elements are discussed in relation to previous knowledge of this population and the direction of future work with this population is explored. In light of reported declines of wood turtle population elsewhere, the apparent well-being of this population is probably related to the stability of the environment at this site. Undoubtedly, the fate of wood turtle populations is inextricably tied to human land-use practices.

STOCK ASSESSMENT OF TURTLE SPECIES AT REELFOOT LAKE

Status report

and a look at aging techniques as a tool in turtle demographic studies

DAVID E. COLLINS
Tennessee Aquarium

Abstract

In 1993, staff from the University of Tennessee -Martin and the Tennessee Aquarium initiated a two-year study of turtle populations at Reelfoot Lake in west Tennessee. This TWRA-funded project was subsequently extended for a third year, to include the 1995 field season. The primary goal of this project is to determine if turtle populations at Reelfoot are stable, increasing or decreasing. In the course of three field seasons approximately 3500 turtles were captured, marked and released. *Trachemys scripta* and *Chrysemys picta* represent over 75% of turtles captured. The final analysis of data is still underway and will be presented to TWRA upon completion. Aging of individual turtles is an integral part of our analysis in this project and is an important tool in better understanding turtle demographics in many studies. Techniques we have used here are discussed and compared to studies involving turtle species exhibiting different growth patterns.

The Effects of Agonistic Displays on Spermatogenesis in the Green Anole, *Anolis carolinensis*. RL Courtney, HC Tidwell, SR Shiao, AE Jetton, Biology Department, Middle Tennessee State University, Murfreesboro, TN 37132-0001

Testosterone levels correlate with testicular function and with position in dominance hierarchies in *Anolis carolinensis*. These dominance hierarchies are established due to agonistic displays. Submissive animals have high levels of stress hormones and may die as a result. This study asks whether chronic social stress due to establishing and maintaining social hierarchies affects spermatogenesis. Male *Anolis carolinensis* were housed in duos. They were observed for four weeks in which a distinct social hierarchy was established, and then the testes were removed. The left testis was crushed in Ringer's solution such that sperm heads could be counted. The right testis was prepared for study by light microscopy. These testes will be examined for the relative abundance of pre-spermatocytes, spermatids and spermatozoa. Statistical analysis showed there was not a significant difference in sperm head counts between the dominant and submissive animals. Data will be presented from histological analyses.

RADIOISOTOPE TAGGING AND TRACING TECHNIQUES IN HERPETOLOGICAL RESEARCH

**Michael J. Harvey
Tennessee Technological University
Cookeville, TN**

ABSTRACT: The use of radioisotopes to tag individual animals so they can be relocated or monitored with the aid of a radiation detecting device is a useful tool for studying various aspects of the behavior of small animals in the field. This technique has been used primarily in studies of movements, home range, and activity patterns. Cobalt-60 (half-life 5.3 years) and Tantalum-182 (half-life 115 days), both strong gamma emitters, have been used most frequently for this purpose. Both are available in the form of minute pieces of wire which can be attached externally to an animal by various methods or injected subcutaneously with a hypodermic needle and plunger apparatus. A tag with an activity of less than 100 microcuries is adequate for most purposes. A typical 100 microcurie tag is approximately 2-5 mm long and less than 1 mm in diameter.

R. Stephen Howard

Abstract

Several species of Plethodontid salamanders are known to exhibit territorial behavior in the defense of resources. In the present study, I conducted a series of laboratory and field experiments to test for the occurrence of territoriality in the cave salamander, *Eurycea lucifuga*. Specifically, I tested for 1) advertisement of areas by chemical communication, 2) aggressive behavior in the defense of such areas, and 3) site attachment in the field. The data from these experiments provided no evidence for the existence of territoriality in this species. While it is possible that *E. lucifuga* evolved under conditions which failed to promote selection for such behavior, an adequate test of the territoriality hypothesis will require more extensive testing over a broader range of conditions.

A FIELD STUDY OF THE BLACK KINGSNAKE (*LAMPROPELTIS GETULUS NIGER*)

Leanne N. Jenkins and John G. Byrd
Clinton High School
425 Dragon Drive
Clinton, TN 37716

Abstract

From 1990-1996, we conducted a mark-recapture study on *Lampropeltis getulus niger* (black kingsnake) inhabiting old-fields at the Clinch River Environmental site in Anderson County, TN. This paper presents life history information previously not reported on *L. getulus niger*. Of 11 species of snakes found at the site, *L. getulus niger* made up 55% of 729 total captures. The number of individuals captured ranged from 28 in 1996 to 41 in 1992 (mean = 33). Thirty-two individuals were captured in more than one year. There was no difference between the number of males and females captured. Mean snout-vent lengths (SVLs) did not vary from year to year (except 1990 and 1994) indicating a relatively stable age structure. Mean SVLs and masses of males and females did not differ, but mature males had longer tails than females with equivalent SVLs. Recaptured *L. getulus niger* grew a mean of 1.4 cm / month (N = 41). First and second year snakes showed the largest growth rate (mean = 2.5 cm / month), with growth rates decreasing noticeably thereafter, possibly indicating maturity. This agrees with the time of observed maturity in *L. calligaster* (prairie kingsnake). Mass (g) - length relationships showed a significant correlation ($r = 0.98$) with mass = $0.0005(\text{SVL})^{2.92}$.

Regurgitated food items included 4 snakes and 5 mammals, with individuals (N = 4) over 60 cm regurgitating only *Microtus pinetorum*. Weight loss from regurgitation ranged from 8.4% to 30.9% of total body mass. For snakes found under wood and metal cover objects, the mean cloacal temperature (26.5°C, N = 36) was higher than air (24°C) and substrate (24.5°C) temperatures. Mean temperatures of males (25.6°C, N = 18) and females (27.4°C) varied, but were not significantly different. At time of capture, no difference was found between wood and metal substrate temperatures. This may explain why there was no difference between the number of captures under wood versus those under metal. During a 26-hour survey of two male snakes implanted with temperature sensitive transmitters, body temperatures varied only 3.5°C and 7°C for an air temperature change of 20°C.

Seven individuals were radio-tracked 413 times over a 3 year period. The mean home range (convex polygon method) was 23,260 m², with males having substantially larger home ranges than females. The mean distance moved for males was 65.5 m while that of females was 40.6 m. On 176 of 381 (46%) tracking days individuals made no apparent move. This supports the hypothesis that individuals spend substantial time in small areas. Individual snakes frequently travel considerable distances only to return to these fixed areas. Tracked individuals were often active during the warmest part of the day - two individuals were observed feeding at mid-day when temperatures ranged from 25.7°C to 31.9°C.

A number of interesting observations, previously not described for *L. getulus niger*, were recorded during this study. When captured, certain individuals protruded a bright red cloaca and released cloacal contents, including variable amounts of blood, a behavior known as cloacal autohemorrhaging. Twenty-eight individuals (71% of them females) had a total of 53 hemorrhaging events. Snakes demonstrating this response were at least a year old and ranged in SVL from 44 cm to 91 cm.

Marden, Susan, Jeanette Jones, and Patricia Miller. The Mapping of Amphibian and Reptile Species for the Tennessee Gap Analysis Program. Tennessee Technological University c/o Tennessee Gap Analysis, P.O. Box 40747, Nashville, TN 37204.

The Gap Analysis Program (GAP) provides an overview of the present level of protection afforded biodiversity. GAP uses Geographic Information Systems (GIS) by identifying lands that are high in vertebrate species richness, but are not actively managed for conservation of biodiversity. The Tennessee Gap Analysis Program is in the process of developing a vegetation map of the state which will be used in conjunction with habitat relationship models to predict vertebrate species distributions. A public lands data base overlaid with the vertebrate species distributions will identify the "gaps" in protection of biodiversity.

Distributions for Tennessee's terrestrial vertebrate species were mapped according to the county, physiographic province and watershed of occurrence and translated to the EPA hexagonal grid. Species were then predicted for each physiographic province by relating their habitat specifications to the vegetation classification map. Ranges and habitat associations for the reptile and amphibian species in Tennessee were determined by utilizing information from the Tennessee Animal Biographies System, the Vertebrate Characterization Abstracts. State biologists will review range maps and habitat associations.

The Structure of the Gills in the Embryonic and Hatchling *Plethodon dorsalis*

Brian T. Miller and Joyce L. Miller
Middle Tennessee State University

An aggregation of *Plethodon dorsalis*, including seven females brooding eggs, was found on 2 August 1995 in a series of fissures associated with the clay-floor of a privately-owned cave in Rutherford Co., TN. Two clutches of eggs were transported to the laboratory, photographed, and subsequently incubated in a constant temperature chamber (15° C, 12hD:12hL cycle). The embryos were well developed and fully pigmented (including a prominent dorsal stripe) at the time of collection. All embryos were gilled as evidenced by a distinct series of arterial loops extending laterally from the base of the head and laying upon and partially wrapping around the yolk mass. Hatching occurred on or before 2 September. Gills or their remnants were present on all hatchlings. These gills consisted of three primary divisions, each with five to seven finger-like lobes, that diverged from a common base. Although gills have been documented in other *Plethodon* species, this represents the first report for *P. dorsalis*.

MONITORING AMPHIBIANS IN THE BLUE RIDGE MOUNTAINS OF VIRGINIA:
EFFECTS OF ACIDIFICATION AND FLOODS

Joseph C. Mitchell, Department of Biology and School of Continuing Studies, University of Richmond, Richmond, VA 23173. Mitchell@Richmond.edu

Two environmental factors apparently contribute to real and potential amphibian decline in the mid-Atlantic region: habitat loss and acid precipitation. The effects of these forces were studied in three Blue Ridge Mountain streams in Shenandoah National Park (SNP) in Virginia from September 1994 through September 1996. These streams are designated Long Term Ecological Monitoring sites and have been studied extensively for water chemistry, fish, and invertebrates. The three streams represent an alkalinity gradient from low acid neutralizing capacity (ANC, Paine Run), to moderate ANC (Staunton River), to high ANC (Piney River). Amphibian communities were monitored by time-constrained visual encounter surveys and linear transects with randomly placed m^2 quadrants. All available surface objects were overturned and all microhabitats were searched that might harbor amphibians.

I found a total of 15 species of amphibians (8 frogs, 7 salamanders) in these streams. They were unevenly distributed in the streams, with Paine Run having the highest species richness (14), Staunton River the intermediate (9), and Piney River the lowest (8). This result is directly contrary to the numbers of fish and invertebrates. The difference is apparently related to the pH tolerance limits of the amphibians (no pH was below 5.0) and the abundance of optimal habitat in Paine Run. Densities of streamside salamanders were similar among streams.

On 27-28 June 1995 approximately 53 cm (21 inches) of rainfall occurred over the confluence of the Staunton River and the Rapidan River at the margin of SNP. Massive flooding also occurred in other streams throughout this portion of the Blue Ridge Mountains. Staunton River was once a cool, canopy-covered stream but the lower third was transformed by the flood into a barren wasteland about 60-80 m wide. Post-flood assessments revealed that salamander densities had decreased dramatically from pre-flood assessments, but no species had been completely extirpated from this portion of the watershed. Visual encounter surveys in 1996 revealed that at least four species of frogs were breeding in the backwaters and pools in this stream, whereas only one species (*Rana clamitans*) was present before the flood.

My conclusions are that (1) the acidity of these mountain streams have not yet reached levels that are intolerable by the salamanders and frogs inhabiting them, (2) major flood events in mountain streams do not always eliminate streamside salamanders, and (3) natural flood events can modify the species composition of amphibian communities through massive alteration of the habitat.

Dr. Steve Reichling, University of Memphis.

"Taxonomic status of *Pituophis melanoleucus* and its relevance to the evolutionary species concept"

ABSTRACT - A phenetic analysis of eight North American subspecies of *Pituophis* was conducted to assess the taxonomic status of the Louisiana pine snake, *P. melanoleucus ruthveni*, which has been reported as a species-level taxon under the evolutionary species definition. The status of a disjunct population of the nominate subspecies was also examined. Eighty-nine specimens representing nine operational taxonomic units (OTU) were described using 14 geographically varying, but sexually invariant morphometric features. Cluster analysis defined two distinct groupings based on character correlations, corresponding to *P. catenifer* and *P. melanoleucus*. Principal component and discriminant-function analyses indicated that *P. m. ruthveni* has diverged from other eastern congeners, suggesting an independent evolutionary pathway. Little character divergence was detected in the isolated population of *P. m. melanoleucus*. *Pituophis m. sayi* is closely allied with the pine snakes, and its similarity to *P. m. ruthveni* suggests recent parapatry. *Pituophis m. ruthveni* is a valid evolutionary species, being both geographically isolated and phenetically distinct, which supports its current conservation status as a managed taxon.

The status and ecology of gopher frogs: Implications for monitoring and surveying for anuran populations.

Richter, S. C.¹, Young, J. E.², Doody, J. S.², Johnson, G. N.³, Seigel, R. A.¹

¹ Dept. of Biol. Sciences, Southeastern Louisiana University, Hammond, LA 70402.

² Applied Ecology Research Group, Univ. of Canberra, Belconnen, ACT 2616, Australia.

³ Southern Forest Experiment Station, Gulfport, Mississippi 39501.

Although gopher frogs (*Rana capito*) and crawfish frogs (*Rana areolata*) have been considered conspecific, recent biochemical data supports the separation of the two species. Gopher frog populations have been diminished, and in the western portion of the range in particular, suitable habitat has been greatly reduced. Because there is little known of their ecology, especially their reproductive ecology, we focused our study on reproduction. Eight years of observations have shown that gopher frogs at our study site in Mississippi breed from late December to mid March. However, for the 1995-1996 breeding season, we found that the frogs bred from late December to mid to late April. Also, because a complete drift fence was used for the first time at this site, we found that there were two distinct waves of breeding and that there was no correlation between number of egg masses and recruitment. Based on our data and field observations, current monitoring methodologies that utilize egg mass counts may produce biased results. In addition, different techniques for surveying for anuran populations will be discussed.

The Effects of Temperature on Social Interactions in the Green Anole, *Anolis carolinensis*. HC Tidwell, RL Courtney, SR Shiao, AE Jetton, Biology Department, Middle Tennessee State University, Murfreesboro, TN 37132-0001

Anolis carolinensis exhibits a marked annual cycle of behavior. They breed in spring following establishment of territories by males. Territories are claimed and defended by social displays. Dominant males should be greener in color, select higher perch sites, display the dewlap and pushup. Submissive males should be browner, select lower perch sites and nod. This study examined the effects of temperature on social interactions which were characterized by observing these behaviors. Eight duos of male anoles were housed between 30-33°C, and another eight duos of anoles were housed between 18-22°C. All animals were observed every day for color change and perch site selection. Statistical analyses show no significant differences in color and perch site selection. Other behaviors were not observed after initial pairing of males. Animals were browner in the last 3 weeks than immediately after initial pairing. This may be an effect of moving animals from group housing to pairs.

The Oak Ridge Reservation as Habitat for Herpetofauna: Present and Future
Third Tennessee Herpetological Conference, November
14-15, 1996, Murfreesboro, Tennessee.

J. Warren Webb, Ph.D.
Coordinator, Wildlife Management Activities
Oak Ridge National Laboratory
Environmental Sciences Division

The Oak Ridge Reservation/Wildlife Management Area consists of about 35,000 acres of largely natural wildlife habitat. The reservation is managed for wildlife jointly through an agreement between the Department of Energy (DOE) and the Tennessee Wildlife Resources Agency and through a contract of DOE with Lockheed Martin Energy Research Corporation (Oak Ridge National Laboratory). The reservation presents a diversity of habitats characterized by sizeable tracts of unfragmented, mature eastern deciduous forest interspersed with planted and natural pine, fields with hedgerows and woodlots, and transmission line corridors. Notable herpetofauna habitats include, among others, former farm ponds; seasonal pools and seeps; beaver ponds; limestone outcrops, caves, sinkholes and other karst features; and old-field successional areas. Associated with these and other features, the reservation harbors at least 34 species of reptiles and 27 species of amphibians, including several state-listed amphibian species. Potential habitat exists for several additional reptile or amphibian species. Despite its great value for these and other animal species, the reservation is subject to a number of activities that would decrease its value for wildlife. These existing and potential activities include recent leasing of land for industrial development, proposals of areas for DOE waste disposal and mission facilities, and proposals for major roadways traversing the reservation. In light of expected decreases in federal government activities, it is likely that proposals to release land for industrial, housing, and other development will increase. Concurrently, there are possibilities for increased public use of the area for various game and non-game wildlife-related activities. To help provide a more complete basis for deciding on these competing needs and resource values, continued surveys for herpetofauna are planned as resources permit.

**Seasonal Population Fluctuations of the Cave Salamander, *Eurycea lucifuga*,
in Selected Tennessee and Kentucky Caves**

Colleen M. White and A. Floyd Scott

The Center for Field Biology, Austin Peay State University, Clarksville, TN 37044

The cave salamander, *Eurycea lucifuga*, occurs in regions of karst topography in the eastern United States. In caves, they are most often observed in the twilight zone. Some systematic and many incidental observations have been made by several investigators concerning this salamander's life history. Much of the resulting information, however, is incomplete or misleading. The objective of this study was to investigate seasonal fluctuations in size and dispersion of the visible populations of *Eurycea lucifuga* occupying the twilight zones of six caves, three in Montgomery County, Tennessee and three in Edmondson County, Kentucky. Twelve monthly trips to each cave were made beginning in September 1994 and ending in August 1995. On each visit, a systematic examination of the first several meters of each cave was conducted and the following data recorded: number of salamanders observed; size, location, and orientation of each individual; and air temperature, relative humidity, relative amount of surface moisture and its pH. Outside each cave, air temperature, relative humidity, and general weather conditions were recorded. Data on total monthly rainfall occurring during the study in each region were obtained from the nearest official weather station. Combined data from all caves reveal no significant differences ($P = 0.05$) between the means for abiotic conditions at the Kentucky versus Tennessee caves. However, they do show significant parallel seasonal changes in the sizes of the visible populations of caves in both regions, with individuals being most numerous in May and June and least numerous in January and February. Monthly changes in population size correlated significantly with means for cave temperature, cave relative humidity, and total rainfall during the previous month. Though no strong evidence for a possible cause was found, as a group the Kentucky caves had significantly higher densities of salamanders than the Tennessee caves.