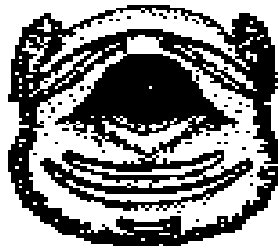


**Missouri  
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Association**



**Newsletter**

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**MISSOURI HERPETOLOGICAL ASSOCIATION NEWSLETTER NO. 13**

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**Cover art:** *Pseudacris crucifer* tadpole by Tom R. Johnson.

## INTRODUCTION

The Thirteenth Annual Meeting of the **Missouri Herpetological Association** was held jointly with the Twenty-seventh Annual Meeting of the **Kansas Herpetological Society** and the **Kansas City Herpetological Society** at the Adam's Mark Hotel in Kansas City, Missouri on October 21-22, 2000.

This organization is designed to provide herpetologists in Missouri and surrounding states with an opportunity to meet and exchange ideas regarding current efforts in research and other professional activities. High on the list of priorities is to provide students, involved in research at either the graduate or undergraduate level, (1) the chance to interact with senior herpetologists, and (2) an outlet to present, in a semi-formal setting, the results of their labors.

This newsletter is the result of a decision made at the inaugural meeting to provide a means of publicly acknowledging papers presented at this and subsequent Annual Meetings. Further, the Newsletter will inform the herpetological community of new distribution records of Missouri's herpetofauna and serve to provide an outlet for the publication of short notes dealing with the state's amphibians and reptiles.

## THANK YOU

This year **Robert Powell** stepped down as editor of the **Missouri Herpetological Association Newsletter**. Bob served as editor from the inaugural issue in 1988. The **Missouri Herpetological Association** would like to extend its deep appreciation to Bob for the countless hours he spent in preparation of the newsletter during his 12 year tenure.

## ANNOUNCEMENT

### **14<sup>th</sup> Annual Meeting of the Missouri Herpetological Association**

The 14<sup>th</sup> Annual Meeting of the **Missouri Herpetological Association** will be held on 29-30 September 2001 at the **Reis Biological Station** near Steelville, Crawford County, Missouri. A "call for papers" and registration materials will be sent in mid-July. For more information please contact **Jeff Briggler** at:

Missouri Department of Conservation  
P.O.Box 180  
Jefferson City, MO 65102-0180  
(573) 751-4115  
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**Abstracts of Papers Presented at the Joint Meeting  
of the  
Missouri Herpetological Association  
and the  
Kansas Herpetological Society**

**Kansas City, Missouri  
21-22 October 2000**

**THE EVOLUTION OF THE MATING SEASON IN THE PITVIPERS OF NORTH AMERICA**

**Robert D. Aldridge**

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In the majority of snakes in the temperate zone, the mating season is temporally dissociated from the time of fertilization. Similarly, in males, the mating season is often temporally dissociated from spermatogenesis. In the temperate zone pitvipers of North America, estrus, the time when females signal that they are receptive to males, occurs at some time during vitellogenesis. In these pitvipers, vitellogenesis is initiated in the late summer or fall. The vitellogenic follicles overwinter at an intermediate size, resume development in the spring, and culminate with ovulation in the spring. The seasonal patterns of estrus (late summer/fall or spring or both seasons) vary with the species and with populations within a species. In this model I assume (i) that females determine the mating season, (ii) that there are significance costs to females during estrus and, (iii) that males adapt their mating season to the combined time when females enter estrus. I propose that the primitive pitvipers in North America were originally tropical animals (climate wise, not current geographic definition). The vitellogenic cycle was continuous (no winter pause) and the mating season occurred at some time during vitellogenesis. As populations of pitvipers evolved into temperate climates, due to range expansion into the temperate regions or climate change in the existing ranges, the seasonal vitellogenic cycle was interrupted by the winter. Since the mating season occurred during vitellogenesis, having a summer/fall and spring mating season would be consistent with the tropical pattern. The different mating patterns seen today reflect a loss of either the summer/fall or the spring mating season. The reason for the loss may be due to two factors, (i) the success of one mating season (all the females being fertilized) and (ii) the costs associated with having a redundant mating season. Since males also have significant costs associated with being prepared to mate, the loss of the female mating season would result in the corresponding loss of that season in males.

**OBSERVATIONS ON THE SNAKES OF THE RED HILLS, KANSAS.**

**Sarah Bellows-Blakely**

Topeka Collegiate School, Topeka, Kansas

Results of a 1998 Topeka Collegiate School field trip to the Red Hills province in south central Kansas will be presented. The trip yielded a diverse array of snake species. Most notable among these was the Kiowa County record of the New Mexico Blind Snake, *Leptotyphlops dulcis*. This range extension represents the northern limit of the known distribution for this species in Kansas.

**THE DISTRIBUTION, HABITAT, AND TAXONOMIC STATUS OF THE PLAINBELLY WATER SNAKE (*Nerodia erythrogaster*) IN THE LOWER CUMBERLAND RIVER BASIN.**

**Angelo P. Bufalino<sup>1</sup>**

The Center for Field Biology, Department of Biology, Austin Peay State University, Clarksville, TN 37044; <sup>1</sup> Currently- Department of Biology, St. Louis University, St. Louis, MO 37044.

The distribution, habitat availability, and taxonomic status of the Plainbelly Water Snake (*Nerodia erythrogaster*) in the lower Cumberland River basin (LCRB) was studied to better understand its geographic, ecological, and phylogenetic relationship to populations of the surrounding regions. Prior to this study, existing data suggested a distributional hiatus between the Dover (Stewart Co., Tennessee) and Clarksville (Montgomery Co., Tennessee) populations, only anecdotal statements concerning habitat preference were available, and the taxonomic status of the region was very unclear. Walking and road-cruising searches near suitable habitat were used to locate specimens within the LCRB, National Wetland Inventory (NWI) maps were analyzed to determine habitat availability, and digital image analysis was used to quantify certain subspecific taxonomic characteristics. Excluding the stretches below Barley Dam (Kentucky) and above Ashland City (Tennessee), *N. erythrogaster* can be found in suitable palustrine habitat throughout the LCRB. The habitat associated with *N. erythrogaster* in the LCRB is dominated by forested, emergent, and scrub/scrub palustrine habitats as designated by the NWI maps. The LCRB has seen an 11% reduction in potential *N. erythrogaster* habitat between the early 1980's and the mid-1990's which is more than twice the regional average. *N. erythrogaster* from the southern half of The Land Between the Lakes (LBL) upstream throughout the remainder of the LCRB are Copperbelly Water Snakes (*N. e. neglecta*). *N. erythrogaster* from the northern half of LBL, the Reelfoot Lakes region of northwestern Tennessee, and the Jackson Purchase region of western Kentucky are intergrades between *N. e. neglecta* and the Yellowbelly Water Snake (*N. e. flavigaster*). These data also indicate that the area of intergradation encompasses northeast Arkansas, southeastern Missouri, most of southern Illinois, and all drainages of the Mississippi River within the species range north of southern Illinois.

**THE SECOND ANNUAL KANSAS AMPHIBIAN MONITORING PROGRAM (KAMP) CONFERENCE: MORE COMMENTS, CRITICISMS, AND DISCUSSIONS, PLUS A SUMMATION OF PROGRESS MADE**

**Joseph T. Collins**

The Center for North American Amphibians and Reptiles, Lawrence, Kansas

No abstract submitted

**A SOLITARY ANOLE IN ALTERED HABITATS: *Anolis gingivinus* IN ANGUILLA**

**J.M. Eaton,<sup>1</sup> S.C. Larimer,<sup>2</sup> K.G. Howard,<sup>3</sup> R. Powell,<sup>4</sup> & J.S. Parmerlee, Jr.<sup>4,5</sup>**

<sup>1</sup> Department of Biology, St. Louis University, St. Louis, MO; <sup>2</sup> Department of Biology, Earlham College, Richmond, IN; <sup>3</sup> Department of Biology, University of Idaho, Moscow, ID; <sup>4</sup> Department of Biology, Avila College, Kansas City, MO; <sup>5</sup> Department of Biology, Johnson County Community College, Overland Park, KS

The natural habitat of Anguilla is an evergreen scrub forest, much of it degraded by feral goats. Today the island is comprised of a patchwork of variously altered habitats. *Anolis gingivinus*, the Anguilla Bank Anole, is found throughout this island nation in varying densities. In June 2000, we investigated the natural history of *A. gingivinus* to identify the factors that most accurately predict anoline populations densities and to determine if ecological release has taken place. Ecological release occurs when individuals are released from niche constraints due to a lack of congeneric competition. We specifically examined population densities, structural habitat use, thermal biology, and diet. Based on the relative abundance of available perches, diameters of available perches, and insolation, we could predict with some degree of

accuracy the relative number of anoles in six representative habitats. Structural habitats, thermal biology, and diet were very similar to those of morphologically similar species on multi-species islands. These data suggest that ecological release has not occurred.

### **FEMALE COPPERHEAD AGGREGATIONS IN NORTHEASTERN KANSAS**

**Henry S. Fitch**

Fitch Natural History Reservation, University of Kansas, Lawrence, Kansas

Female copperhead aggregations (2 to 9, exceptionally 16) form when the females are in late pregnancy, from early July into September. Group security is involved; a predator attacking one female would be at risk from bites of others lying in contact or nearby. Groups are always associated with a den; in northeastern Kansas dens are usually in hilltop outcrops of the Oread Limestone. Many gravid females do not aggregate. Nine members of aggregations were equipped for radiotelemetry. Five stayed with their dens and den partners, but four others moved erratically between dens or away from dens and back. Neonates, like the females, seem to have mutual attraction, and remain closely associated for about a week until they shed. Aggregations, both gravid females and neonates, are vulnerable to slaughter by misguided humans.

### **THE NATURAL HISTORY OF THE NORTHERN PRAIRIE SKINK IN A HEAVILY DISTURBED LANDSCAPE**

**Paul W. Frese**

Natural Resources Conservation Service, 510 E. Hwy 136, Albany, Missouri 64402

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The northern prairie skink (*Eumeces septentrionalis*) has a poorly known life history. I conducted a visual encounter survey from 1996-2000 at a disturbed landscape in Adair, County, Iowa, to gain information on the relative abundance, phenology, and reproductive ecology of the northern prairie skink. Northern prairie skinks were active from mid-April to late September of most years. The relative abundance of skinks was highest in 1998 at 9 skinks/trip. There was an increase in relative abundance from 1996 to 1997 and there was a stable trend in the relative abundance for 1997-2000. Males with breeding colors were present from 12 May to 18 June when copulation is assumed to occur and the earliest nest was observed on 21 June. Nests were short burrows excavated beneath a cover object in an area that received adequate sunlight. Females were observed to move eggs out of the burrow onto a shallow shelf, which received heat more efficiently. Females averaged 6 eggs per clutch. Hatchlings appeared 18 July to 17 August, with the majority of skink observations in August and September being hatchlings. Skink activity decreased from late July-September. *Eumeces septentrionalis* is able to successfully colonize disturbed habitat. Cover object placement, maintenance of open grassy areas, and proper fire management are effective practices in the conservation and management of the northern prairie skink.

### **THE KANSAS-GAP PROJECT: IMPLICATIONS FOR KANSAS HERPETOLOGY**

**Nicole M. Gerlanc**

Kansas State University, Manhattan, Kansas

The mission of the Gap Analysis Program (GAP) is to provide state, regional, and national assessments of the conservation status of native vertebrate species, to identify natural land cover types of the U. S., and to facilitate the application of this information to land management activities. One of the objectives of GAP is to generate digital distribution maps for each vertebrate species. The development of the vertebrate layer of the Kansas GAP Analysis Project began in the spring of 1997. We are developing a database of habitat associations and location records (historical and current) of each vertebrate species to be mapped. When completed the vertebrate layer will provide maps with error estimates that predict the

distributions of terrestrial vertebrate species in Kansas. I will present an update on the progress of the herpetological layer in Kansas and discuss possible applications of our models.

#### **DIVERSIFICATION AND SPECIALIZATION IN THE CYBOTID ANOLES OF HISPANIOLA**

**Rich Glor**

Washington University, St. Louis, Missouri

No abstract submitted

#### **THE ROLE OF ZOOS IN CONSERVATION OF AMPHIBIANS AND REPTILES**

**Ronald Goellner**

St. Louis Zoo, St. Louis, Missouri

No abstract submitted

#### **CONSERVATION OF AMPHIBIANS AND REPTILES AT THE SEDGWICK COUNTY ZOO**

**Karen Graham**

Sedgwick County Zoo, Wichita, Kansas

It is estimated that over 134 million people visit American Zoo and Aquarium Association (AZA) accredited institutions annually; more than attend all professional football, baseball, and basketball games combined. Most of these people have a very incomplete understanding of biological concepts and conservation issues. Thus, zoos serve as important links between biologists and local communities.

Conservation efforts in which zoo's participate can promote both the zoos and the plight of animals and their ecosystems. However, it is of crucial importance that the visitor is not left with the impression that they are not culpable for environmental degradation because zoos will "save the day". Zoos must provide a realist view of the biodiversity crisis and provide positive choices that their visitors can make to affect the slowing of biodiversity loss.

An overview of international, national, and local amphibian and reptile conservation projects in which the Sedgwick County Zoo is involved are presented and proposals for further local involvement are investigated.

#### **SOME AMPHIBIANS AND REPTILES OF EL SALVADOR**

**Eli Greenbaum.**

Natural History Museum, University of Kansas, Lawrence, Kansas 66045-2454

E-mail: [elig@eagle.cc.ukans.edu](mailto:elig@eagle.cc.ukans.edu)

Results of a recent collecting trip to numerous localities in El Salvador will be presented.

#### **AMPHIBIANS AND REPTILES OF SEQUOYAH NATIONAL WILDLIFE REFUGE**

**Joe Hachler and J. Daren Riedle**

Department of Zoology, Oklahoma State University, Stillwater, Oklahoma 74078

Sequoiah National Wildlife Refuge is a 8,320 ha management area located in Haskell, Sequoyah, and Muskogee Counties in eastern Oklahoma. Terrestrial habitats on the refuge consist of primary bottomland hardwood forests, abandoned crop fields and active agricultural land. Lentic and lotic aquatic

habitats are represented by shallow sloughs, cattail marshes, Robert S. Kerr Reservoir, the Canadian and Arkansas rivers. Many small tributaries to the Canadian and Arkansas rivers also flow through the refuge. From May 2000 through September 2000 various herpetofaunal survey methods were implemented to develop a baseline amphibian and reptile inventory for the refuge. Methods used were coverboards, road cruising, nocturnal anuran surveys, and commercial hoop nets for aquatic turtles. Thirty-four reptile species and 11 amphibian species were documented.

## NEOTROPICAL BOAS: FROM THE SUBLIME TO THE ENORMOUS

**Robert W. Henderson**

Milwaukee Public Museum, Milwaukee, Wisconsin

The *Corallus hortulanus* complex of neotropical tree boas is comprised of four species: (1) *C. cookii* (St. Vincent), (2) *C. grenadensis* (Grenada Bank), (3) *C. hortulanus* (Amazonia, Guianas, Atlantic forest of southeastern Brazil), (4) *C. ruschenbergerii* (southern Central America, northern Colombia, northern Venezuela, Trinidad and Tobago). Aspects of the ecology of *C. grenadensis* has been studied on Grenada. *Corallus grenadensis* is extremely variable in color and pattern. Predominant dorsal ground color is correlated with elevation, rainfall, temperature, and cloud cover. Pale colored snakes predominate in low, hot, xeric areas, and dark brown snakes occur at high elevations (> 400 m) in areas of low percentage of possible sunshine, high rainfall, and depressed temperature. Taupe colored snakes predominate at moderate elevations. *Corallus grenadensis* is a highly arboreal, nocturnally active, anole and rodent predator that exhibits both active (for sleeping anoles) and ambush (for active rodents) foraging modes. It is especially common in areas under 100 m elevation in mixed agriculture with tree crowns forming a contiguous canopy. Tree boas were censused at several sites, sometimes over a period spanning ten years. One population exhibited a steady decline over a six-year period; one showed a steady increase over a ten-year period, and several others exhibited fluctuations.

## PROBLEMS IN ARKANSAS HERPETOLOGY

**Kelly J. Irwin**

Arkansas Game & Fish Commission, 915 E. Sevier St., Benton, AR 72103

Approximately 118 species of amphibians and reptiles are currently recognized as occurring in the state of Arkansas. As the new state herpetologist I have been charged with the long term conservation and management of these species. My focus in accomplishing this task may be categorized in three major working groups: (1) assessment of true herpetological diversity; (2) geographic distribution; and (3) implementation of conservation and management strategies.

Arkansas harbors several allopatric and geographically isolated populations of amphibians and reptiles, such as the Spotted Dusky Salamander *Desmognathus "conanti"*, Wood Frog *Rana sylvatica*, and Queen Snake *Regina septemvittata*. It is very important to assess the specific identity of these populations, through the use of molecular systematic techniques and comparative ecological studies, so appropriate conservation measures can be applied for their long-term survival.

The peripheral distribution of several species and the documentation of possibly occurring species needs further clarification. Those species with peripheral distributions include such species as the Gulf Coast Toad *Bufo valliceps*, Southern Prairie Skink *Eumeces obtusirostris*, Great Plains Skink *Eumeces obsoletus*, and Ground Snake *Sonora semiannulata*.

Conservation and management of commercially viable species such as the American Alligator *Alligator mississippiensis*, Alligator Snapping Turtle *Macrochelys temminckii*, and common aquatic turtles is currently regulated in Arkansas. There is a pressing need to curtail present unregulated take of Box Turtles genus *Terrapene* within Arkansas.



## HIGHLIGHTS IN THE CAREER OF A STATE HERPETOLOGIST

**Tom R. Johnson**

3107 Rademan Ln, Jefferson City, Missouri 65109

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In this slide program I will discuss some of the important, successful or exciting projects and discoveries in my career as state herpetologist with the Missouri Department of Conservation.

### DIGESTIVE PARAMETERS OF GREAT PLAINS SKINKS (*Eumeces obsoletus*) IN KANSAS

**Meagan Kearney and Lynette Sievert**

Department of Biological Sciences, Box 4050, Emporia State University, Emporia, Kansas 66801

E-mail: kearney\_megan@stumail.emporia.edu

Ten *Eumeces obsoletus* were collected from Chase County and Greenwood County, Kansas. Thirty-seven fecal and 5 food samples were collected. Bomb calorimetry was used to calculate digestive efficiency (D.E.=  $91.0 \pm$  S.D. 2.1%). Skinks were fed marked crickets for 5 d to determine food passage time. We found a bimodal distribution with peaks at  $25.96 \pm$  S.D. 1.56 and  $47.06 \pm$  S.D. 2.77. Resting metabolic rate was measured between 0900 and 1500 hr at 21° C with an oxygen analyzer ( $16.71 \pm$  0.88 l/g/hr).

### REINTRODUCTION OF THE PICKEREL FROG IN CHEROKEE COUNTY, KANSAS

**Jay Kirk**

Friends University, Wichita, Kansas

The Pickerel Frog (*Rana palustris*) has not been seen in Kansas since 1932, when the only three specimens were collected. Many factors could have caused the pickerel frog's disappearance, but the most likely reason is the extensive lead and zinc mining that was conducted throughout the Ozark Plateau of southeastern Cherokee County, their sole suitable habitat. One hundred and twenty pickerel frogs were collected from Missouri and relocated to Schemmerhorn Cave. Schemmerhorn Cave is located in a city park, just south of Galena, Kansas. Each frog was toe-clipped for identification, weighed, and measured from snout to vent. Breeding was not observed during the one breeding season that overlapped the study period. Most of the frogs released were juveniles, so success of this project cannot be judged until they have reached maturity.

### SLEEP SITE FIDELITY AND OTHER NOCTURNAL BEHAVIORS OF *Anolis gingivinus* FROM ANGUILLA

**Samantha Larimer<sup>1</sup> and Justin Shew<sup>2</sup>**

<sup>1</sup> Department of Biology, Earlham College, Richmond, IN; <sup>2</sup> Department of Biology, Truman State University, Kirksville, MO

Nocturnal behaviors and sleep site fidelity of *Anolis gingivinus* were studied in three ecologically distinct habitats on Anguilla. Our observations provided an opportunity to examine an anole with few or no nocturnal predators and no sleep perch competition from sympatric congeners. Perch height, perch diameter, and distance from the center of the vegetation all varied significantly across the three sites, indicating a wide use of available habitats. Relaxed specificity of orientation on the sleeping perch suggested a lack of fear of predation. Although no significant differences existed in perch characteristics between the sexes, females showed much greater sleep site fidelity. Sleep site fidelity, although present,

was less prevalent than in a previous study of Puerto Rican anoles, probably reflecting the lack of predation pressure. Future studies of nocturnal behaviors in solitary anoles and complex anoline communities could illuminate the factors that control the sleep site decisions in a given species.

### **MICROHABITAT, ACTIVITY, AND DENSITY OF DWARF GECKOS (*Sphaerodactylus*) ON THE ANGUILLA BANK**

**C.R. Lindsay<sup>1</sup>, S.S. Nava<sup>2</sup>, R.W. Henderson<sup>3</sup>, and R. Powell<sup>4</sup>**

<sup>1</sup>Department of Biology, Wayne State College, Wayne, Nebraska 68787; <sup>2</sup>Department of Biology, University of Texas at El Paso, El Paso, Texas 79968; <sup>3</sup>Section of Vertebrate Zoology, Milwaukee Public Museum, Milwaukee, Wisconsin 53233; <sup>4</sup>Department of Biology, Avila College, Kansas City, Missouri 64145.

The ecology of West Indian geckos in the genus *Sphaerodactylus* is largely unknown, despite their great diversity, broad distribution, and high population densities (to 67,000/ha). The lack of knowledge is largely attributable to their diminutive size (most species obtain an SVL of <35mm) and secretive habits which make observations very difficult. Two species of *Sphaerodactylus* occur on the Anguilla Bank, *S. parvus* and *S. sputator*. *Sphaerodactylus parvus* was originally described as a subspecies of *S. macrolepis*, but after re-evaluating previously published morphological and biogeographical data, we have elevated *S. parvus* to a full species. We examined the factors that influence macro- and microhabitat use, activity, and population densities. The single most critical microhabitat variable for *S. parvus* was the abundance of rock cover. Higher rock density was significantly correlated with encounter rate, percentage of rocks harboring geckos, and population density. The substrate composition under and around the rocks was also important, with geckos using rocks in complex microhabitats in much greater frequency than they were available in the habitat. More than 90% of *S. parvus* encountered during the day were found under rock cover, whereas 60% observed after dusk were emergent on leaf litter, presumably active. *Sphaerodactylus parvus* densities ranged from 0–5.2/m<sup>2</sup> (52,000/ha), with an average density across all study sites of 2.6/m<sup>2</sup> (26,000/ha).

### **THE KNIGHT ANOLE (*Anolis equestris*) IN EXTREME SOUTHERN MAINLAND FLORIDA: LIFE HAS NEVER BEEN SO GOOD**

**Walter E. Meshaka, Jr.<sup>1</sup> and Kenneth G. Rice<sup>2</sup>**

<sup>1</sup>Section of Zoology and Botany, Pennsylvania State Museum, 300 North Street, Harrisburg, PA 17120-0024 USA, E-mail: wmeshaka@state.pa.us; <sup>2</sup>BRD/USGS, Everglades National Park, 40001 SR-9336, Homestead, Florida 33034-6733 USA

A marked population of the exotic knight anole (*Anolis equestris*) was studied during September 1996 - April 2000 in an urban system in extreme southern mainland Florida. Sexual maturity was achieved faster in females (7.5 mo.) than in males (13 mo.). The age at which body size reached an asymptote was older for males (4.5 yrs) than females (1.8 yrs). Monthly survivorship for adults was nearly 1.0, and sex ratios were even. The population turned over in about six years, although some individuals were estimated to have lived a decade or longer. General and courtship activity were continuous with seasonal summer peaks during April - October. Floristic and climatic similarity between extreme southern Florida and the Havana province provided amenable conditions to an exotic species whose high survivorship, rapid sexual maturity, omnivorous diet, extended breeding season, and dearth of predators and competitors increased the likelihood of colonization success in subtropical systems, including those of the West Indies.

## **AMPHIBIANS, TURTLES, AND REPTILES OF THE SMOKY HILL RANCH AND SURROUNDING AREAS OF WESTERN KANSAS**

**Larry L. Miller**

Kansas Heritage Photography, Wakarusa, Kansas

The Smoky Hill Ranch which is owned by the Kansas Chapter of the Nature Conservancy and located in Logan County, and the counties surrounding the ranch and Logan County are home to a unique diversity of amphibians, turtles, and reptiles. Several of the species from the area have been studied extensively and photographed during the past twenty years by groups such as the Kansas Herpetological Society, Fort Hays State University, Lawrence High School, Kansas Heritage Photography, Topeka Collegiate School, and other organizations. A brief summary of their findings was presented in a short slide presentation and lecture at the 27<sup>th</sup> annual meeting of The Kansas Herpetological Society.

## **BLOOD VISCOSITY COMPARISONS BETWEEN ENDOTHERMS AND ECTOTHERMS AT TWO TEMPERATURES**

**Nicole Palenske and David Saunders**

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Ectotherms, as compared to endotherms, are more dependent on their external environment for temperature regulation. The purpose of this study was to investigate the effects of temperature on the blood viscosity of selected endotherms and ectotherms. Blood viscosity measurements were taken at two temperatures, 3° C and 38° C. Blood viscosity was investigated among rats, marine toads, and bullfrogs that were collected in Kansas. At hematocrits of 40%, 30%, and 20%, a significant difference was found between the blood viscosity of the rat and the marine toad at 38° C. There was no significant difference in apparent blood viscosity between the three animals at 3° C at all hematocrits. When comparing the percent difference between blood viscosity values at 38° C and 3° C for endotherms and ectotherms, it was found that the endotherms had at least a four-fold increase in blood viscosity at 3° C relative to that 38° C. In contrast, the ectotherms showed only a two-fold increase at 3° C relative to that 38° C. No significant differences in plasma viscosity existed between endotherms and ectotherms. The difference in relative viscosity (blood viscosity/plasma viscosity) values when compared at 38° C and 3° C was 2.5X greater in the rat at 3° C, but was approximately 2.0X lower in the ectotherms. This suggests that ectotherms have red blood cells that are less viscous at colder temperatures. Such adaptation of the red blood cells would benefit ectotherms in the maintenance of blood flow during the winter hibernation.

## **FOOD HABITS OF SNAKES ON A SAND PRAIRIE IN SOUTH-CENTRAL KANSAS**

**Dwight R. Platt**

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Food records were obtained from 1,883 scats and 156 regurgitated stomach contents collected from snakes of eight species captured on a sand prairie in western Harvey County, Kansas from 1966 through 1974 and in 1984-85. Diet was analyzed as frequency, percent of items and percent of biomass for each food type. The Eastern Yellowbelly Racer was most euryphagous, including large numbers of both insects and vertebrates in its diet. Differences in food habits between sexes, among three age groups and at different seasons and in different years were studied. The Western Hognose Snake fed on many kinds of small vertebrates, especially lizards, lizard eggs, rodents and amphibians. The Bullsnake, Prairie Kingsnake and Kansas Glossy Snake specialized on mammalian prey, with each species selecting differently from the common small mammal populations. The foods eaten by the Western Plains Garter Snake, Red-sided Garter Snake and Eastern Hognose Snake were predominantly amphibians, mostly Plains leopard Frogs.

## **ECOLOGY OF THE ALLIGATOR SNAPPING TURTLE, *Macrochelys temminckii*, AT SEQUOYAH NATIONAL WILDLIFE REFUGE**

**J. Daren Riedle, Stanley F. Fox and Paul A. Shipman**

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Sequoyah National Wildlife Refuge is a 8,320 ha management area located in Haskell, Sequoyah, and Muskogee Counties in eastern Oklahoma. Roughly 4,000 ha are occupied by Robert S. Kerr Reservoir, the Canadian River, Arkansas River and their tributaries. Between 1997 and 2000 we sampled the refuge for alligator snapping turtles resulting in an effort of 565 net nights and a total 197 alligator snapping turtle captures, representing 156 individual turtles. In 1999 and 2000 we conducted an ultrasonic telemetry study in order to determine movements, home range and microhabitat use. Data analysis of population densities, home ranges, movement patterns, and habitat use will be discussed. Comments will also be made on diet and nesting habitats.

## **NATURAL HISTORY OF THE MOLE SALAMANDER, *Ambystoma talpoideum*, IN SOUTHEASTERN MISSOURI**

**Ben Russell**

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Although much of the life history of *A. talpoideum* has been well documented in the southern and eastern portions of its distribution, little has been documented on this species in southeastern Missouri, which represents the northern-most extent of its distribution. I present data collected from one season of research on individual populations of *A. talpoideum* at two research ponds (Taylor Pond and Wet Pond) in southeastern Missouri. Data presented includes time of hatching, larval growth, timing of metamorphosis, size at metamorphosis, size of breeding adults, and timing of breeding period. Larval growth was more stable in the more permanent pond (Wet Pond), while growth slacked during a high larval density/low water situation from mid to late summer in the less permanent pond (Taylor Pond). Regardless, metamorphosis in both ponds occurred in May of the following year, approximately 15 months after hatching, and size at metamorphosis was similar, averaging approximately 55mm snout-vent length (SVL). Paedomorphosis was documented at the permanent pond, but unrecorded at the less permanent pond. Breeding adults began immigrating to Taylor Pond in early December, and peaks in immigration occurred in early January and mid-February. While earliest immigrating groups were composed of males and females, most males reached the pond by early January, with succeeding inward migrating groups composed primarily of females. Emigration from the pond began primarily in mid-February, with earliest movements composed primarily of females. Subsequently, mixed groups of males and females left the pond until early April, with a peak in emigration occurring in mid-March. Of the total breeding population, females outnumbered males 1.43 to 1. Breeding adults ranged in size from 55.8mm to 75.0mm SVL, with females ( $\bar{x}$ =66.3mm,  $n$ =92) slightly larger than males ( $\bar{x}$ =65.5mm,  $n$ =64).

## **THE HERPETOFAUNA OF KISATCHIE, LOUISIANA**

**Travis W. Taggart**

Fort Hays State University, Hays, Kansas

A pictorial overview of the herpetofauna and physiography of Kisatchie National Forest region of North Central Louisiana. Discussion includes distribution, natural history, historical biogeography, and systematics of the reptiles in this region. Special emphasis is placed on endemic species and unique phenotypes.

## PRELIMINARY OBSERVATIONS ON TURTLE ASSEMBLAGES IN THE KANSAS RIVER DRAINAGE

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Sampling for aquatic turtles in a section of the Kansas River drainage in Douglas and Leavenworth counties, Kansas, was completed during the summer of 2000. Four distinct habitat types were sampled within the drainage: main channel, backwater, tributary, and floodplain scour. Aquatic turtle assemblages were compared between the four habitat types. A total of 182 turtles, representing 7 species, were captured. Main channel sites produced the greatest abundance of turtles with *Apalone mutica* comprising 93% of all captures. Main channel, backwater, and scour habitats appear to support distinctly different aquatic turtle assemblages. Tributary sites showed the greatest species richness, diversity, and evenness and may be important diversity pockets when considering turtle conservation issues.

## THERMAL BIOLOGY OF *Ameiva plei* AND *Ameiva corax* FROM THE ANGUILLA BANK

**April M. White,<sup>1</sup> Ellen J. Censky,<sup>2</sup> Robert Powell,<sup>3</sup> John S. Parmerlee, Jr.,<sup>3,4</sup> and Robert W. Henderson<sup>5</sup>**

<sup>1</sup> Department of Biology, Southwest Missouri State University, Springfield, MO 65804, <sup>2</sup> Connecticut Museum of Natural History, University of Connecticut, Storrs, CT 06269, <sup>3</sup> Department of Biology, Avila College, Kansas City, MO 64145, <sup>4</sup> Department of Biology, Johnson County Community College, Overland Park, KS 66210, <sup>5</sup> Section of Vertebrate Zoology, Milwaukee Public Museum, Milwaukee, WI 53233

We examined the thermal biology of two species of teiid lizards, *Ameiva plei* from Anguilla and Scrub Island and melanistic *A. corax* from Little Scrub Island. Both species maintained body temperatures well above ambient, although body and environmental temperatures for *A. corax* were significantly lower than for *A. plei*. Heating and cooling rates of both species did not differ significantly under controlled laboratory conditions, suggesting that melanism in *A. corax* has little or no impact on its thermal biology.

## THE HELLBENDER, *Cryptobranchus alleganiensis*: THEN AND NOW

**Robert Wilkinson**

Southwest Missouri State University, Springfield, Missouri

A global decline in amphibian populations has been noted by biologists since the early 1970's. There are two problems with documenting the decline in amphibian populations: natural fluctuations in population numbers and lack of long-term data. We censused populations of the long-lived hellbender, *Cryptobranchus alleganiensis*, in Missouri's rivers, and compared the 1998-1999 data to data from previous studies from the 1970's and 1980's. The hellbender populations appear to have declined in all rivers sampled. This decline is characterized by an increase in average body size, due to an apparent lack of recruitment of young into the population. Hellbenders from all rivers, except the Niangua, tended to be in better body condition in the 1998-1999 sample than they were in the past. It is not known whether the population decline for hellbenders has a single cause or whether each population has experienced independent declines.

## AMPHIBIAN CONSERVATION AT THE DETROIT ZOO

**Kevin Zippel**

Detroit Zoo, Detroit, Michigan

The Detroit Zoological Institute (DZI) has a long history of success with amphibians. In 1997, DZI intensified its commitment to amphibian conservation with the inception of the National Amphibian Conservation Center (NACC), the first facility in the world designed, constructed, and interpreted specifically for amphibians. Set in a 2-acre resurrected Michigan wetland, this 12,000-square-foot facility is dedicated to saving amphibians and shaping public attitude toward these threatened and valuable animals. Nearly half the facility will be off-exhibit, comprising holding and breeding rooms, offices, and research space. Four to five staff members will be present to take care of the day-to-day needs of the animals and to support breeding and research programs. Opened in June of 2000, the facility will eventually contain nearly 100 species of amphibians, and over 1000 specimens. The NACC will serve as a national resource that physically and programmatically provides a foundation for amphibian research and conservation.

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Five-legged *Acris crepitans* collected along Big Creek in Sam A. Baker State Park, Wayne Co., Missouri. The specimen was photographed 8 October 2000 while it was on display in the park Nature Center.

**NEW AND PREVIOUSLY UNREPORTED DISTRIBUTION RECORDS OF AMPHIBIANS AND  
REPTILES IN MISSOURI FOR 2000**

**Richard E. Daniel<sup>1</sup> and Brian S. Edmond<sup>2</sup>**

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The following list represents new county records accumulated or brought to our attention since the publication of Johnson (2000). Publication of these records extends our knowledge of the amphibians and reptiles native to Missouri. In addition, recipients of this list have the opportunity to update checklists and range maps. Finally, the publication of this list allows us to acknowledge the contributions of the many individuals who have provided information or specimens.

The specimens listed below represent the first reported occurrence of the species within a given county and are based on catalogued voucher specimens or photographs deposited in a public institution. Johnson (2000) inadvertently omitted some previously reported distribution records and these have been included in this list. Distribution records are presented in the standardized format of Collins (1989): common and scientific name, county, specific locality (unless withheld for species of special concern), legal description of locality, date of collection, collector(s), catalogue number and institution where the specimen is deposited. The citation is provided for all records that have been published elsewhere.

The following acronyms indicate the institutional collections where specimens are deposited: AMNH- American Museum of Natural History, New York, NY; ARK-University of Arkansas, Fayetteville, AR; BWMC- Bobby Witcher Memorial Collection, Avila College, Kansas City, MO; CA- Chicago Academy of Science, Chicago, IL; CM- Carnegie Museum, Pittsburgh, PA; FMNH- Field Museum of Natural History, Chicago, IL; INHS-Illinois Natural History Survey, Champaign, IL; KU- Museum of Natural History, University of Kansas, Lawrence, KS; SEMSU- Southeast Missouri State University, Cape Girardeau, MO; SMSU- Southwest Missouri State University, Springfield, MO; UMC-University of Missouri, Columbia, MO; UMMZ- Museum of Zoology, University of Michigan, Ann Arbor, MI; WJCTC- William Jewel College, Liberty, MO.

We would like to extend our appreciation to N. Bass, J. Briggler, P. Frese, T. Johnson, B. Schuette and G. Smith for generously providing information or specimens included in this note.

**Amphibia: Caudata**

**RINGED SALAMANDER**

*Ambystoma annulatum*

**Laclede Co:** CR OO-888, 1.75 mi. E Jct. Rt. OO (S17 T34N R17W); 27 February 2000; B. Edmond, R. Daniel (color slide, UMC 196P).

**SPOTTED SALAMANDER**

*Ambystoma maculatum*

**Laclede Co:** Rt. OO, 0.25 mi. SE Jct. CR OO-888 (S18 T34N R17W); 26 February 2000; B. Edmond, P. Frese (color slide, UMC 197P).

**Hickory Co:** Mule Shoe Conservation Area (S36 T38N R20W); 7 March 2000; P. Frese (egg mass color slide, UMC 247P).

**Polk Co:** Pleasant Hope Conservation Area (S12 T31N R22W); 8 March 2000; B. Edmond (color slide, UMC 198P).

**MARBLED SALAMANDER**

*Ambystoma opacum*

**Ripley Co:** Cupola Pond Natural Area (S29 T25N R1W); 16 October 2000, J. Briggler (color photograph, UMC 283P).

**SMALLMOUTH SALAMANDER**

*Ambystoma texanum*

**Cooper Co:** Prairie Home Conservation Area; 2.1 mi. SSW Prairie Home (S5 T46N R15W); 29 February 2000; R. Daniel (UMC 6868).

**\*OKLAHOMA SALAMANDER**

*Eurycea tynerensis*

**Texas Co:** 0.5 mi. S Tyrone (S13 T29N R9W); 6 July 1940; L. Hubricht (UMMZ 95755).

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\* Johnson (2000) used the name *E. multiplicata* for this salamander. Thornhill (1990) examined SW Missouri populations of *Eurycea multiplicata griseogaster* and *E. tynerensis* and found them to be biochemically indistinguishable. Further investigation is needed to sort out the relationship between these salamanders. Until such time, *E. tynerensis* has nomenclatural priority and should be applied to populations of both "species" in Missouri.

OZARK ZIGZAG SALAMANDER

*Plethodon angusticlavius*

**Wright Co:** Cedar Gap (S22 T28N R16W); 15 March 1973; Herpetology Class (SMSU 850-852).

WESTERN LESSER SIREN

*Siren intermedia*

**St. Charles Co:** 3 mi. S Old Monroe (S30 T48N R3E); 21 March 1986; W.L. Plieger (UMC 6944).

**Amphibia: Anura**

AMERICAN TOAD

*Bufo americanus*

**Barton Co:** Rt. F, 2 mi. S Rt. C (S35 T33N R29W); 6 October 1990; R.P. Seibolt (BWMC 4357) (Powell *et al.* 1990).

**Pettis Co:** Sedalia (S21 T45N R21W); 13 August 1990; M.A. Rogers (KU 218642-3) (Powell *et al.* 1990).

FOWLER'S TOAD

*Bufo fowleri*

**Audrain Co:** 10.9 mi. N Mexico, CR 367 X Young's Creek (S 34 T53N R9W); 5 August 2000; R. Daniel (UMC 7063).

**Boone Co:** Columbia, University of Missouri campus (S36 T48N R13W); 15 April 1998; R. Daniel (UMC 6397).

**Callaway Co:** Mokane Rd. S of Jefferson City Airport (S15 T44N R11W); 24 April 1998; R. Daniel (UMC 6400).

**Howard Co:** CR 444, 0.5 mi. S Jct. US 40 (S6 T48N R15W); 25 June 1997; R. Daniel, J. Daniel, C. Shelton (UMC 6245-6) (Powell *et al.* 1997).

**Reynolds Co:** Jct. Mo 21 X MO 34 (S35 T28N R1E); 18 April 1934; A.A. Heinze (FMNH 93723).

**St. Francois Co:** 2 mi. S Farmington (T35N R5/6E); 25 April 1935; D.A. Boyer, A.A. Heinze (UMMZ 77777).

WOODHOUSE'S TOAD

*Bufo woodhousii*

**Cooper Co:** MDC Wooldridge Access, Petite Saline Creek (S23 T48N R15W); 21 June 2000; R. Daniel (UMC 7044).

COPE'S GRAY TREEFROG

*Hyla chrysoscelis*

**Clay Co:** 3 mi. W Missouri City (S28 T42N R31W); 15 June 1982; S.A. Maxey, S.S. Duer (BWMC 2657) (Johnson and Powell 1988).

EASTERN GRAY TREEFROG

*Hyla versicolor*

**Cooper Co:** Prairie Home Conservation Area, 2.1 mi. SSW Prairie Home (S32 T47N R15W); 1 July 2000; R. Daniel, J. Daniel (UMC 7060) (verified by call).

SPRING PEEPER

*Pseudacris crucifer*

**Cooper Co:** Prairie Home Conservation Area, 2.1 mi. SSW Prairie Home (S5 T46N R15W); 29 February 2000; R. Daniel (UMC 6869).

**Laclede Co:** Rt. OO, 0.25 mi. SE Jct. CR OO-888 (S18 T34N R17W); 30 April 2000; R. Daniel, J. Daniel, B. Edmond (UMC 6904).

**Polk Co:** Pleasant Hope Conservation Area (S12 T31N R22W); 8 March 2000; B. Edmond (color slide, UMC 205P).

UPLAND CHORUS FROG

*Pseudacris feriarum*

**Butler Co:** Keeners (S10 T26N R5E); 10 April 1935; J.R. Bailey (UMMZ 77402) (Daniel *et al.* 1998).

ILLINOIS CHORUS FROG

*Pseudacris illinoensis*

**Bollinger Co:** Duck Creek Conservation Area (S32 T28N R9E); 7 May 1967; SMSU Herpetology Class (SMSU 1416).

WESTERN CHORUS FROG

*Pseudacris triseriata*

**Jasper Co:** MO 171 at Jct. Rt. M (S31 T30N R34W); 10 May 2000; B. Edmond (UMC 6915).

PLAINS LEOPARD FROG

*Rana blairi*

**Audrain Co:** CR 356, 1.7 mi. E Jct. MO 15 (S18 T52N R9W); 27 May 2000; R. Daniel, J. Daniel (UMC 6933).

**Monroe Co:** Mark Twain State Park (S33 T55N R8W); 2 August 2000; B. Schuette (color slide, UMC 282P).

GREEN FROG

*Rana clamitans*

‡**Douglas Co:** Indian Creek (S24 T27N R11W); 30 August 2000; J. Briggler (UMC 7105).

‡**Callaway Co:** CR 449 X CR 428 (S17 T46N R8W); 16 May 2000; R. Daniel (UMC 6912-6913).

**Ripley Co:** Little Black Conservation Area (S12 T24N R2E); 4 October 2000; J. Briggler (UMC 7106).



SOUTHERN LEOPARD FROG

*Rana sphenoccephala*

**Barton Co:** Rt. C X Horse Creek (S29 T33N R29W); 6 October 1990; R.P. Seibolt (BWMC 4358) (Powell *et al.* 1990).

**Clay Co:** Rush Creek (S10 T51N R31W); 26 April 1962; M.K. Wright (WJCTC 6237).

**Holt Co:** Little Tarkio Creek (exact locality unknown); 13 July 1941; H. Makoh (UMMZ 95508) (Daniel *et al.* 1998).

WOOD FROG

*Rana sylvatica*

**Crawford Co:** Locality unknown; August 1980; E. Katesenberger (UMC 6942).

**Reptilia: Squamata: Sauria**

PRAIRIE RACERUNNER

*Cnemidophorus sexlineatus*

‡**Maries Co:** Rt. A at Spring Creek bridge (S1 T39N R9W); 1 October 2000; coll.- unknown (UMC 7072).

SOUTHERN COAL SKINK

*Eumeces anthracinus*

**Cape Girardeau Co:** 3 mi NW of Trail of Tears State Park; 13 March 1981; coll.- unknown (KU 195006).

FIVE LINED SKINK

*Eumeces fasciatus*

**Randolph Co:** CR 232, 0.65 mi. S Jct. CR 257 (S18 T52N R13W); 7 June 2000; R. Daniel (UMC 7057).

BROAD-HEADED SKINK

*Eumeces laticeps*

**Christian Co:** Clever (S20 T27N R23W); 6 April 1967; R.D. Stringham (SMSU 1649).

WESTERN SLENDER GLASS LIZARD

*Ophisaurus attenuatus*

**Webster Co:** Elkland (S4 T32N R19W) (Rt. 1, Box 77); 14 October 1987; R. Bailey, K. Trejo (UMC 6943).

NORTHERN FENCE LIZARD

*Sceloporus undulatus*

**Randolph Co:** Rudolf Bennitt Conservation Area, CR 229, 0.95 mi. E Jct. CR 250 (S36 T52N R14W); 18 May 2000; R. Daniel (color slide, UMC 212P).

**Warren Co:** Massas Creek Rd, 4.55 mi. N Jct. MO 94 (S1 T46N R4W); 5 June 2000; R. Daniel (UMC 6934).

**Reptilia: Squamata: Serpentes**

OSAGE COPPERHEAD

*Agkistrodon contortrix*

**Gentry Co:** 2.0 mi NW Gentryville (S26 T62N R31W); 23 August 2000; P. Frese (color slide, UMC 253P).

WESTERN COTTONMOUTH

*Agkistrodon piscivorus*

**Oregon Co:** Alton (S33/34 T24N R4W); 30 April 1956; W.F. Rushton (ARK 68-0735-0713).

WESTERN WORM SNAKE

*Carphophis vermis*

**Laclede Co:** CR WW-963, 2.1 mi. SW Jct. CR AA-928 (S23 T35N R17W); 20 May 2000; B. Edmond, R. Daniel (UMC 6923).

EASTERN YELLOWBELLY RACER

*Coluber constrictor*

**Gentry Co:** 0.5 mi. W Gentryville (S35 T62N R31W); 29 September 2000; P. Frese (UMC 7084).

**Harrison Co:** Rt. W, 1.5 mi. W Brooklyn (S29 T65N R28W); 14 September 2000; P. Frese, R. Morrow (color slide, UMC 270P).

**Laclede Co:** Rt. OO, 0.25 mi. SE Jct. CR OO-888 (S18 T34N R17W); 30 April 2000; R. Daniel, J. Daniel, B. Edmond (UMC 6898).

**Perry Co:** Rt. O near Biehle (S29 T34N R11E); 8 October 1995; R. Essner (SEMSU 436).

**Worth Co:** Rt. C, 1.5 mi. N Jct. Rt. M (S28/29 T65N R30W); 29 September 2000; P. Frese (UMC 7085).

TIMBER RATTLESNAKE

*Crotalus horridus*

**Gentry Co:** ca. 3 mi. SW Gentryville (S15/16 T61N R31W); 30 August 2000; P. Frese (color slide, UMC 269P).

WESTERN WORM SNAK

*Carphophis vermis*

**Dade Co:** 7.0 airmiles N Greenfield (S13 T32N R27W); 1 June 1999; N. Bass (color slide, UMC 277P).

PRAIRIE RING-NECKED SNAKE

*Diadophis punctatus*

**Maries Co:** Spring Creek Gap Conservation Area (S4 T39N R8W); 1 October 2000; R. Daniel, B. Edmond, M. Van Boening (UMC 7073).

#### GREAT PLAINS RATSNAKE

*Elaphe emoryi*

**Dallas Co:** Berry Bluff Conservation Area (S12 T36N R18W); 20 May 2000; B. Edmond, R. Daniel (color slide, UMC 226P).

#### BLACK RATSNAKE

*Elaphe obsoleta*

**Audrain Co:** CR 368, 0.5mi. W Jct. CR 335 (S7 T52N R8W); 14 June 2000; R. Daniel (color slide, UMC 243P).

**Dallas Co:** Rt. OO, 1.65 mi S Jct. MO 64A (S1 T34N R18W); 26 July 2000; B. Edmond, B. Churchwell (UMC 7078).

**Gentry Co:** Albany, MO (S24 T63N R31W); 1 October 2000; P. Frese, H. Frese (color slide, UMC 264P).

**Maries Co:** Bell Chute MDC Access (S26 T39N R9W); 27 April 2000; R. Daniel (color print, UMC 245P).

**Randolph Co:** CR 15, 1.6 mi. SW Jct. CR 17 (S17 T55N R14W); 11 May 2000; R. Daniel (UMC 6911).

#### EASTERN HOGNOSE

*Heterodon platirhinus*

**Dade Co:** 4.8 airmiles N Greenfield (S30 T32N R26W); 8 May 2000; N. Bass (color slide, UMC 281P).

**Greene Co:** Springfield, Ritter Spring City Park (S34 T30N R22W); 19 October 2000; B. Edmond (UMC 7102).

#### PRAIRIE KINGSNAKE

*Lampropeltis calligaster*

**Monroe Co:** CR 759, 0.1 mi. S Jct. CR 710 (S28/29 T53N R9W); 14 September 2000; R. Daniel (UMC 7069).

#### SPECKLED KINGSNAKE

*Lampropeltis getula*

**Barton Co:** Prairie State Park (S16 T32N R33W); 16 October 1998; P. Frese, A. Sullivan (color slide, UMC 093P) (Daniel *et al.* 1999).

**Maries Co:** MO 28, 1.8 mi. SSW Jct. Rt. E (S8 T38N R10W); 27 April 2000; R. Daniel (UMC 6890).

#### RED MILK SNAKE

*Lampropeltis triangulum*

**Cedar Co:** Rt. B, 1.2 mi. E Horse Creek (S25 T34N R29W); 9 July 2000; B. Edmond, P. Frese (UMC 7075).

**Clay Co:** Excelsior Spring; 1 October 1923; R. Phillips (WJCTC 1761).

**Dade Co:** 4.8 airmiles N Greenfield (S30 T32N R26W); 8 May 2000; N. Bass (color slide, UMC 280P).

‡**Laclede Co:** Rt. OO, 0.25 mi. SE Jct. CR OO-888 (S18 T34N R17W); 30 April 2000; R. Daniel, J. Daniel, B. Edmond (color slide, UMC 217P).

**Randolph Co:** CR 257, 0.5 mi. ESE Jct. CR 232 (S8 T52N R13W); 7 June 2000; R. Daniel (UMC 6937).

#### EASTERN COACHWHIP

*Masticophis flagellum*

**Christian Co:** Clever (S20 T27N R23W); 16 April 1967; R.D. Stringham (SMSU 2192).

**Dade Co:** 1.0 airmiles SW South Greenfield (S1 T30N R27W); 1 June 1999; N. Bass (color slide, UMC 279P). Rt. K, just W of Turnback Creek (S22 T30N R26W); 15 March 2000; B. Edmond, P. Frese (color slide, UMC 204P).

#### YELLOW-BELLIED WATERSNAKE

*Nerodia erythrogaster*

**Oregon Co:** US 63, 12 mi. N Thayer (S19 T23N R6W); 1 October 1974; R. Wiggs, J. Wiggs (SMSU 2123).

#### NORTHERN WATERSNAKE

*Nerodia sipedon*

**Audrain Co:** Rt. T, 1.0 mi. W Jct. Rt. E (S22 T52N R10W); 4 May 2000; R. Daniel (UMC 6907).

**Laclede Co:** Rt. OO, 0.25 mi. SE Jct. CR OO-888 (S18 T34N R17W); 30 April 2000; R. Daniel, J. Daniel, B. Edmond (UMC 6895).

#### DIAMONDBACK WATERSNAKE

*Nerodia rhombifer*

**Wayne Co:** Mingo National Wildlife Refuge, 3.6 mi. NE Wappapello (S20 T27N R8E); 7 October 2000; B. Edmond, R. Daniel (UMC 7080).

#### ROUGH GREEN SNAKE

*Ophedrys aestivus*

**Cape Girardeau Co:** (S32 T31N R14E); July 1993; John Scheibe (SEMSU 291) (Essner and Hendershott 1996).

**Maries Co:** CR 508, 1.9mi. N Stickney (S20 T39N R9W); 1 October 2000; R. Daniel (color slide, UMC 256P).

#### MIDLAND BROWN SNAKE

*Storeria dekayi*

**Christian Co:** Linden (S9 T27N R20W); 21 March 1973; K. Barke, T. Donovan, R.F. Wilkinson (SMSU 2215).

**Henry Co:** 5 mi. S Urich (S34 T42N R28W); 13 September 1992; K.R. Toal, C.A. Sheil (KU 220538) (Powell *et al.* 1992).

**Montgomery Co:** CR 278, 1.7 mi. S Jct. Rt. N (S4 T47N R6W); 12 October 2000; R. Daniel (UMC 7081).

**Phelps Co:** CR 7220, 3.0 mi. WSW Vida (S18 T36N R8W); 26 October 2000; R. Daniel (UMC 7097).

#### REDBELLY SNAKE

*Storeria occipitomaculata*

**Dallas Co:** Lead Mines Conservation Area CR YY-144-4, 1.9 mi. N Jct. CR YY-144 (S26 T36N R18W); 30 April 2000; B. Edmond, R. Daniel, J. Daniel (UMC 6902).

**Laclede Co:** CR OO-888, 1.75 mi. E Jct. Rt. OO (S17 T34N R17W); 26 February 2000; B. Churchwell, C. Vesper (color slide, UMC 207P).

**Maries Co:** US 63, 1.0 mi. WNW Jct. MO 28 (S3 T39N R8W); 1 October 2000; B. Edmond (UMC 7071).

**Osage Co:** Cooper Hill (S36 T43N R7W); 26 April 1936; P.D. Evans (CA 8513).

#### FLAT HEADED SNAKE

*Tantilla gracilis*

**Dallas Co:** Berry Bluff Conservation Area (S12 T36N R18W); 20 May 2000; B. Edmond, R. Daniel (UMC 6925).

**Oregon Co:** Alton (S33/34 T24N R4W); 30 April 1956; W.F. Rushton (ARK 68-0735-0386).

#### WESTERN RIBBON SNAKE

*Thamnophis proximus*

**Gentry Co:** 0.5 mi W Gentryville (S35 T62N R32W); 23 August 2000; P. Frese (color slide, UMC 250P).

#### RED-SIDED GARTER SNAKE

*Thamnophis sirtalis*

**Cape Girardeau Co:** Cape Girardeau (S32 T31N R14E); September 1994; J. Scheibe (SEMSU 297) (Powell *et al.* 1995).

**Laclede Co:** Rt. OO, 0.25 mi. SE Jct. CR OO-888 (S18 T34N R17W); 30 April 2000; R. Daniel, J. Daniel, B. Edmond (UMC 6897).

**Lawrence Co:** 5 mi. SW Pierce City; 12 March 1967; S. Mills (SMSU 1862).

#### Reptilia: Testudines

##### MIDLAND SMOOTH SOFTSHELL

*Apalone mutica*

**Johnson Co:** Ralph and Martha Perry Memorial Conservation Area, Blackwater River 0.25 mi. NE MO 23 (S 33 T48N R24W); 26 October 1996; S.G. Thornhill, D.D. Smith (BWMC 6035) (Powell *et al.* 1996).

**St. Charles Co:** Mississippi River at West Alton Bay (S26 T48N R7E); 16 October 1999; R.J. Cosgriff, J.B. Towey (INHS 15389) (Tucker *et al.* 2000).

##### WESTERN SPINY SOFTSHELL

*Apalone spinifera*

**Audrain Co:** Youngs Creek X MO 15 (S5 T52N R9W); 14 September 2000; R. Daniel (color slide, UMC 244P).

**Callaway Co:** Reform Conservation Area; CR 459 just N Jct. MO 94 (S35 T46N R8W); 10 June 2000; R. Daniel, J. Daniel (UMC 6940).

**Maries Co:** Spring Creek at Rt. A (S1 T39N R9W); 27 April 2000; R. Daniel (UMC 6891).

##### COMMON SNAPPING TURTLE

*Chelydra serpentina*

**Buchanan Co:** 4 mi. SW St. Joseph; 3 June 1976; M.A. Ewert (CM 87044).

**Mississippi Co:** MO 77, 1 mi. N Jct. US 62 (S3 T26N R15E); 3 June 1988; K. Ray (SEMSU 172) (Essner and Hendershott 1996).

**Reynolds Co:** 4 mi. E Warner Bay Spring; 18 June 1940; D.M. Kemp (FMNH 35322).

##### WESTERN PAINTED TURTLE

*Chrysemys picta*

**Audrain Co:** CR 112, 4.0 mi. SW Saling (S36 T52N R12W); 11 July 1999; R. Daniel (UMC 6642) (Daniel *et al.* 1999).

##### COMMON MAP TURTLE

*Graptemys geographica*

**Gasconade Co:** Bourbeuse River at CR 634 (Glaser Hollow Rd) (S14 T40N R6W); 10 June 2000; R. Daniel, J. Daniel (color slide, UMC 236P).

##### OUACHITA MAP TURTLE

*Graptemys ouachitensis*

**Crawford Co:** Meramec River, 1 mi. N Rt. N (S16 T39N R2W); July 1995; M. Rueter (UMC 5707) (Powell *et al.* 1996).

**Franklin Co:** Bourbeuse River, Mayer's Landing MDC Access (S33 T43N R1W); 11 June 1991; R. Daniel, J. Brousse (UMC 2117).

**St. Charles Co:** Upper Mississippi Conservation Area, Ellis Bay at US 67, Ellis Island (T48N R7E); 5 June 1993; J.K. Tucker (INHS 12088) (Daniel *et al.* 1998).

##### FALSE MAP TURTLE

*Graptemys pseudogeographica*

**McDonald Co:** Elk River at Noel (S15 T21N R33W); April 1945; coll.- unknown (KU 88745) (Daniel *et al.* 1999).

**Stone Co:** Unknown locality; date unknown; coll.- unknown (AMNH 35450) (Daniel *et al.* 1998).

**Taney Co:** Lake Taneycomo (S29 T23N R20W); May 1992; R.B. Thomas (MDC photo) (Powell *et al.* 1994).

**Wayne Co:** Mingo NWR; 10 December 1981; coll.- unknown (SEMSU 251).

#### MISSOURI RIVER COOTER

*Pseudemys concinna*

**Wayne Co:** Big Creek near Visitor Center at Sam A. Baker State Park (S21 T30N R5E); summer 2000; coll. unknown (color slide, UMC 257P).

#### THREE-TOED BOX TURTLE

*Terrapene carolina*

**Dallas Co:** MO 73, 7.2 mi. N Buffalo (S30 T35N R19W); 8 June 1955; R. Diener (ARK 68-0735-0323).

**Randolph Co:** CR D232, 1.6 mi. N Jct. Rt. T (S18 T52N R13W); 7 June 2000; R. Daniel (B&W photograph, UMC 231P).

#### ORNATE BOX TURTLE

*Terrapene ornata*

**Audrain Co:** Rt. T, 5.2 mi W Skinner (S25 T52N R11W); 14 June 2000; R. Daniel (color slide, UMC 241P).

**Dallas Co:** MO 73, 2.1 mi. N Buffalo (S14 T34N R20W); 8 June 1955; R. Diener (ARK 68-0735-0327).

#### RED-EARED SLIDER

*Trachemys scripta*

**Callaway Co:** Reform Conservation Area; CR 459 just N Jct. MO 94 (S35 T46N R8W); 10 June 2000; R. Daniel, J. Daniel (UMC 6939).

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‡ Reported as a county record by Johnson (2000) based on observation, but unsupported by voucher specimen.

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## Natural History Notes

### NEW *Lampropeltis getula holbrooki* SIZE RECORD FOR MISSOURI.

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The maximum documented size of *Lampropeltis getula holbrooki* in Missouri is 1.074m (Powell 1994). Anderson (1965) reported 1.522m as the state size record, however no specimen is available to support this record. On April 27, 2000 a large DOR male was salvaged from MO 28, just north of Shantytown in Maries County. This specimen (UMC 6890) had a snout-vent length of 1.036m and total length of 1.199m.

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### NOTES ON THE ECOLOGY OF THE NORTHERN CRAWFISH FROG (*Rana areolata circulosa*) IN SOUTHWEST MISSOURI

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The northern crawfish frog (*Rana areolata circulosa*) is listed as a species of special concern in Missouri and Kansas, endangered in Iowa and threatened in Indiana. These frogs are mostly limited to lowland prairie or lightly disturbed grassland and seem to favor shallow ephemeral wetlands for breeding. The loss of high quality grasslands and ephemeral wetlands has contributed to the decline of *R. areolata* in Missouri (Johnson 2000). The basic ecology of *R. areolata* is poorly known, which makes recovery or management efforts difficult (Redmer 2000). The following information may help future students of crawfish frog ecology in Missouri.

On 29 March 1999 at 1900 h, I surveyed an area of native prairie in northwestern Dade County, Missouri for calling *Rana areolata circulosa*. Weather was cool (temp. = ca. 12°C day and ca. 7°C night; clear skies, full moon; rain previous night). Approximately 8 crawfish frogs were calling from 3 small wetlands located on Niawathe Prairie Conservation Area (NP). Two of the wetlands were apparently man-made (largest = ca. 116 m<sup>2</sup>) while the third was a small pool in a small seasonal stream. All of the frogs were extremely wary and stopped calling as I approached the wetlands. The frogs submerged shortly after my flashlight beam hit the wetlands. Associated anurans heard calling at the same wetlands were the western chorus frog (*Pseudacris triseriata*), spring peeper (*Pseudacris crucifer*), and southern leopard frog (*Rana sphenoccephala*). I also stopped at Penn-Sylvania Prairie (PP), but crawfish frogs were not calling. However, *P. triseriata* and *R. sphenoccephala* were calling from flooded roadside ditches at PP.

On 2 April 1999 at ca. 2000 h, I returned to NP to survey the area again for *R. areolata*. Weather was mild (temp. = ca. 21°C; cloudy). This time over 12 crawfish frogs were calling underwater at the same site as on 29 March (Frese and Sullivan 2000). *Rana* egg masses were found, which may have been *R. sphenoccephala* or *R. areolata*. The western chorus frog, spring peeper, and southern leopard frog were also calling.

On 3 April 1999 at ca. 1300 h, I returned to NP to survey it during the daylight. Weather was mild (temp. = ca. 16°C; rainy). One crawfish frog was calling in an area separate from the 29 March and 2 April sites. The wetland was a small marshy area beneath the outflow of a constructed pond on NP. There were *Rana* egg masses and recently hatched tadpoles in the wetland. I also searched through the three small

wetlands previously surveyed and found approximately 20 globular *Rana* egg masses in the largest wetland. Many egg masses were attached to or supported by vegetation. Some of the eggs were beginning to hatch. The three wetlands ranged from 20-70 cm in depth and were heavily vegetated with sedges (*Carex*) and rushes (*Eleocharis*). The American toad (*Bufo americanus*), spring peeper, and western chorus frog were calling on or near NP.

On 5 June 1999 at 1000 h, an adult crawfish frog was found dead on Highway E that runs along the south border of NP. All three small wetlands at NP held water (ca. 20 cm) and were full of various *Rana* and *Pseudacris* tadpoles and smallmouth salamander (*Ambystoma texanum*) larvae. The wetlands had no standing water on 19 June 1999.

On 4 March 2000 at ca. 1900 h, I again surveyed northwest Dade County, MO. Temperature was ca. 11°C. No crawfish frogs were heard at any stops. Western chorus frogs and southern leopard frogs were heard at Horse Creek Prairie Conservation Area (HCP), PP, and NP.

On 9 March 2000 at 1900 h, I revisited the area and heard >12 crawfish frogs calling in the largest of the three wetlands at NP. Temperatures were warm the previous three days (ave. temp. = ca. 20°C day, ca. 10°C night) and rain had fallen two days before. However, temperatures were cool on 9 March (temp. = 15°C day, 8°C night). The frogs stopped calling soon after I approached the pond, but did not submerge when a flashlight beam hit them.

On 15 March 2000 at ca. 2100 h, Brian Edmond and I returned to NP and heard approximately 15 crawfish frogs calling in the largest wetland. Weather was mild (temp. = ca. 20°C day, ca. 15°C night; partly cloudy, moon; previous rain). The frogs allowed us to approach closely before becoming quiet. Over 20 crawfish frogs were seen in the wetland. *Rana areolata* choruses ranging from 4-12 males were heard at over 6 locations (including PP) south of NP along a gravel road leading to HCP. *Rana sphenoccephala*, *P. triseriata*, and *B. americanus* were heard calling along the same route.

On 31 March 2000 at 1830 h, I returned to NP and heard 5 crawfish frogs calling from the largest wetland. Weather was mild (temp. = ca. 12°C; cloudy; calm). *Rana* egg masses with extensive algae growth and recently hatched tadpoles were observed on 9 April 2000 in the largest wetland and the stream pool. The tadpoles were later confirmed through captive management to be *Rana areolata circulosa*.

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# ADDITIONS TO THE BIBLIOGRAPHY OF AMPHIBIANS AND REPTILES IN MISSOURI

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Following is a list of references addressing the biology of amphibians and reptiles in Missouri which have been brought to my attention since the publication of Powell (1999) and earlier updates since the publication of Johnson (1987). Please note that Johnson (2000) also contains many references that pertain to the species found in Missouri. Readers are requested to notify the compilers of any additional publications that should be included in future lists.

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## ADDENDUM: HERPETOLOGICAL THESES AT SOUTHWEST MISSOURI STATE UNIVERSITY

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