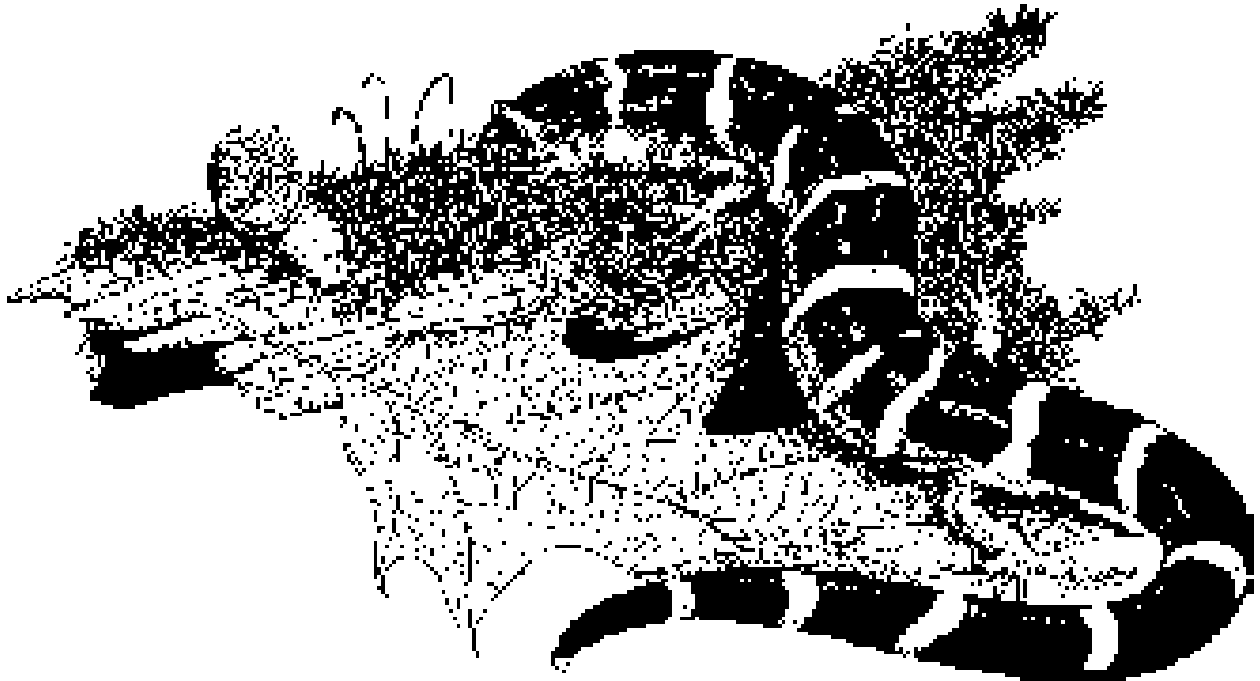


Missouri Herpetological Association Newsletter



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INTRODUCTION

The Fifth Annual Meeting of the **Missouri Herpetological Association** took place on 26-27 September 1992 at the Reis Biological Station near Steelville in Crawford County, Missouri. 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 distributional and size 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.

At this time the Association would again like to acknowledge the contribution of Dr. Nevin Aspinwall, of the Reis Biological Station, for allowing us the use of the Station's excellent facilities.

ANNOUNCEMENT

Sixth Annual Meeting of the Missouri Herpetological Association

The Sixth Annual Meeting of the **Missouri Herpetological Association** will be held on 25-26 September 1993 at the Reis Biological Station. Registration forms and calls for papers will be mailed at a later date. For more information please contact Tom R. Johnson at (314) 751-4115 or write:

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**Abstracts of Papers presented at the Fifth Annual Meeting
of the
Missouri Herpetological Association
26-27 September 1992**

**COMPARISON OF THE ARRIVAL TIMES AND TENURE AT THE CHORUS
OF TWO POPULATIONS OF GRAY TREEFROGS
(*Hyla chrysoscelis* AND *Hyla versicolor*)**

S. Tanner

University of Missouri, Columbia, MO 65211

Arrival times at the chorus and chorus tenure of male treefrogs (*Hyla chrysoscelis* and *H. versicolor*) were compared in two populations. The *H. chrysoscelis* population near Lawrence, Kansas had a mean chorus tenure of 4.2 nights, while the *H. versicolor* population near Ashland, Missouri had a mean chorus tenure of 2.1 nights. Females were present on 56% and 28% of the nights in the Kansas and Missouri populations, respectively. The Ashland population is also characterized by a few nights during which the majority of matings occurred, whereas the Lawrence population had matings spread over the season. These differences in average tenure suggest different strategies in dealing with the distribution of females at the two sites. Mating success in the Ashland population is a function of timing arrival at the pond to coincide with the few nights of maximum mating. Mating success in the Kansas population entails showing up on as many nights as possible.

CHORUS TENURE IN THE BARKING TREEFROG IS ENERGY-LIMITED

K. Murphy

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In all species of anuran amphibians studies to date, male mating success is positively correlated with mating tenure (the number of nights during which a male is present in breeding aggregations), yet males spend only a small portion of the total breeding season in choruses. One hypothesis that might explain abbreviated chorus tenure is that males are unable to obtain enough energy to fuel calling for the entire breeding season. I tested this hypothesis in Barking Treefrogs (*Hyla gratiosa*), a species whose chorus tenure is very abbreviated (median chorus tenure = 3 nights out of a 4-month breeding season). The conditions of males declined during chorus tenure, and males with longer chorus tenures had higher initial conditions, slower rates of decline in condition, and lower final conditions than males with shorter chorus tenures. I fed males crickets to increase their energy budgets. Males fed crickets returned to the chorus sooner and for more nights than control males.

**WHY STOP CALLING?
A STUDY OF CYCLICAL CALLING IN A NEOTROPICAL TREEFROG**

J. J. Schwartz

University of Missouri, Columbia, MO 65211

Chorusing males of the Neotropical treefrog *Hyla microcephala* call in distinct bouts punctuated by periods of silence. This pattern is known as unison bout singing. Previous studies of the calling energetics of frogs do not support the idea that males periodically stop calling because of high muscle lactate levels. Three additional hypotheses of why calling periodically ceases were tested. A two-stimulus female choice experiment failed to support the hypothesis that females prefer males which

call cyclically. Playback experiments with males in the field rejected the hypothesis that males stop calling because of high ambient noise. Rather, data indirectly supported the hypothesis that males quiet down to save energy. With Steve Ressel and Cathy Robb (University of Connecticut), I directly tested this energy conservation hypothesis. We collected samples of males early in the evening when chorusing commenced and later at night when chorusing had subsided. Data on calling behavior were obtained for the late evening samples. Trunk muscles (internal and external oblique) were dissected, frozen, and their glycogen content measured. Contraction of the trunk muscles is responsible for the airflow associated with note production. The biochemical assays supported the energy conservation hypothesis. Unless chorusing is punctuated by pauses, most males would be unable to sustain high rates of calling for an entire evening without exhausting glycogen reserves in their trunk muscles.

REPRODUCTIVE CHARACTER DISPLACEMENT ON THE WEIGHTING OF ACOUSTIC PROPERTIES USED IN MATE CHOICE IN THE GRAY TREEFROG (*Hyla chrysoscelis*)

H. C. Gerhardt

University of Missouri, Columbia, MO 65211

Reproductive character displacement is the accentuation of differences in the courtship behavior of closely-related species in sympatric populations relative to differences in allopatric populations. Nearly all previous studies focused on the courtship signals of the male, and few well-documented examples of character displacement were found. Here I show that females of the Gray Treefrog (*Hyla chrysoscelis*) from sympatric populations, where a genetically-incompatible sibling species (*Hyla versicolor*) also occurs, were much more likely to prefer sounds with properties typical of conspecific males than were females from remote allopatric populations. More specifically, when given a choice between synthetic calls that differed in two acoustic properties, females from sympatric populations weighted a species-specific cue (pulse rate) much more strongly than a property (call duration) that mediates intraspecific mate choice. Females from allopatric populations gave about equal weight to the two properties.

DISTRIBUTION AND GENETIC INTERACTIONS AMONG MISSOURI LEOPARD FROGS (*Rana pipiens* COMPLEX)

R. D. Sage

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This work examines the genetic nature of interactions between three species of leopard frogs in Missouri. *Rana pipiens* lives in extreme northern Missouri, where it potentially occurs sympatrically with *R. blairi*. The ranges of *R. blairi* and *R. sphenoccephala* overlap in much of central Missouri. Starch-gel electrophoresis was used to determine the genotypes at diagnostic loci of 289 animals collected at 16 localities within the state.

Results show that the one known population of *R. pipiens* in Mercer Co. shows evidence of low levels of hybridization with *R. blairi*. No genetic evidence was found for the presence of *R. pipiens* in a pond in extreme northwestern Missouri where they had occurred in the past. In central Missouri a mosaic distribution of *R. blairi* and *R. sphenoccephala* exists. Within this region I found populations of genetically pure *R. blairi* and *R. sphenoccephala*, populations showing low levels of hybridization and introgression, and populations in which both species occur together.

The studies in northern Missouri support the restricted distribution of *R. pipiens* within the state, and suggest that these populations may be threatened by genetic swamping' from the more abundant

R. blairi. The interactions between *R. blairi* and *R. sphenoccephala* are varied, and range from coexistence to hybridization and introgression. These data differ from those generated by a similar study in Texas, where these two species meet and form a narrow zone of hybridization.

**THE MISSOURI OZARK FOREST ECOSYSTEM PROJECT (MOFEP):
AN INFORMAL PRESENTATION ON THE HERPETOFAUNAL STUDY**

B. Christman, T. Fobes, K. Ricke, T. Wills, E. Wallace
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A cooperative study between the Missouri Department of Conservation and the University of Missouri began in 1991 to examine the effects of forest management practices on Ozark plant and animal communities on MDC areas. Little is known about effects of forest management practices on amphibians and reptiles. The herpetofaunal study is an experiment to determine the immediate and long-term effects of forest management on species composition, species richness, and relative abundance of herptile populations. Data are being collected from 126 Jones drift fence arrays on nine study sites. Three sites are controls (no cutting), three are designated for clear-cutting, and three are to be select-cut. Twelve arrays are in each site, and six additional arrays are located outside each of the clear-cut sites.

Between 22 March and 6 June 1992 eight salamander, seven anuran, one turtle, six lizard, and 14 snake species totalling 2,093 individuals were collected. Data will be collected for a total of three years before cutting, three years after, and then every 5-10 years to evaluate long-term effects.

BIOGEOGRAPHY OF HELLBENDERS, *Cryptobranchus alleganiensis*

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Hellbenders, including specimens of *Cryptobranchus alleganiensis alleganiensis* and *C. a. bishopi*, were sampled from a variety of rivers in Pennsylvania, Indiana, Illinois, Missouri, Arkansas, Tennessee, and Virginia. Restriction mapping of mtDNA revealed a high level of between-population variation. A phylogenetic analysis of the mtDNA haplotypes suggests the following biogeographic conclusions: 1) hellbenders from south-flowing tributaries of the Ohio River have a close relationship to hellbenders from north-flowing Missouri Ozark rivers; 2) *C. a. bishopi* from the North Fork of the White and Spring rivers are most closely related to hellbenders from the Tennessee River drainage; 3) *C. a. bishopi* from the Current and Eleven Point rivers are extremely different from all other sampled hellbender populations. I conclude that both *C. a. alleganiensis* and *C. a. bishopi* are paraphyletic population groups, and that the current distribution of hellbenders is the result of both Pleistocene and pre-Pleistocene events.

PREDATION ON RINGED SALAMANDER LARVAE

T. J. Wilson and R. F. Wilkinson
Southwest Missouri State University, Springfield, MO 65804

Predation on larval *Ambystoma annulatum* was examined. The following predators, which are normally present in *A. annulatum* breeding ponds during larval development, were studied: dragonfly nymphs (*Anax* and *Tramea*), waterbugs (*Belostoma*), backswimmers (*Notonecta*), water scorpions (*Ranatra*), diving beetles (*Dytiscus*), and newts (*Notophthalmus*). Five larvae and one predator were placed into each of 35 containers. Five containers without predators served as controls. Containers were checked every 24 h for 5 days. The number of larvae eaten each day was recorded, the number of larvae

present brought back up to 5/container, and the old predator was replaced with a new one. This procedure was initiated in September (larval SVL = 7-8 mm) and repeated in October (SVL = 13-15 mm), November (SVL = 21-23 mm), and March (SVL 28-30 mm). No mortality occurred in the control or March groups. A 3-way ANOVA of the treatments for September, October, and November showed highly significant effects of predator ($P < 0.0001$), prey size ($P < 0.0001$), day ($P < 0.0001$), and the interaction of predator and prey size ($P < 0.001$).

HABITAT PARTITIONING BY TWO SPECIES OF BOX TURTLES (*Terrapene* spp.): SOME PRELIMINARY FINDINGS

Daniel Sammartano

Southwest Missouri State University, Springfield, MO 65804

Preliminary results of a study on resource partitioning by two species of box turtles (*Terrapene* spp.) on the Penn-Sylvania Prairie in Dade County (160 acres) is described. Radio-tracking and sampling by dog capture was performed from April - October 1992. Mapping of capture points will continue through November. Results are reported quantitatively. Three-toed Box Turtles outnumber Ornate Box Turtles 3:1, and occur in open hydric lowlands, riparian woods, and the forest/field ecotone. Ornate Box Turtles occur in open xeric uplands. Diet, electivity of nest sites and hibernacula, and temporal habitat partitioning will be quantified. Populations of *Terrapene* spp. on Osage Prairie in Vernon County will be studied in 1993.

STUDIES OF A LIZARD COMMUNITY IN ALTERED HABITAT IN THE DOMINICAN REPUBLIC

R. Powell and J. S. Parmerlee, Jr.

Avila College, Kansas City, MO 64145

We have investigated aspects of natural history in six of twelve species in five families of lizards inhabiting the grounds of the Hotel Guarocuya in Barahona, Dominican Republic. The occupation of a relatively small area by this many species suggests that some form of niche partitioning is operative. All species appear to be dietary generalists/opportunists. In the absence of substantial dietary differences, considerable and consistent spatial and temporal partitioning was operative among most of the species present. In all but two instances in which resource allotment was not obvious, differences in the sizes of these lizards or in foraging modes were evident. In the two pairs of species among which resource partitioning could not be ascertained, one of the two species involved was extremely rare.

COMPARISON OF EXTERNAL AND INTERNAL MORPHOLOGY IN AN INVESTIGATION OF HETEROCHRONY IN THE BLACK SALAMANDER (*Aneides flavipunctatus*)

D. J. Meinhardt

University of Kansas, Lawrence, KS 66045

Heterochrony, the evolutionary alteration of developmental timing, is introduced as a potential source of morphological variation and novelty. The rate and timing of ossification was examined in five populations of the Black Salamander, *Aneides flavi-punctatus*, in an attempt to reveal the heterochronic mechanism responsible for geo-graphic variation within the species. Analysis of covariance revealed no differences in rates, but significant differences in timing were found between populations. The data obtained for two skeletal elements were compared to those of Lynch (1981). No significant correlation was found between data from internal and external characters.

NEW RECORDS OF AMPHIBIANS AND REPTILES IN MISSOURI FOR 1992

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² Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102

³ University of Kansas Medical Center, 39th & Rainbow Blvd., Kansas City, KS 66103

The new county or maximum size records listed below are those accumulated or brought to our attention since previous updates (Johnson and Powell 1988, Powell et al. 1989, 1990, 1991) of records listed in Johnson (1987). Publication of this list allows us to express appreciation to the many individuals who contributed specimens or information. Further, recipients of this list have the opportunity to update range maps and listings of size maxima. Finally, these new records represent information that extends our knowledge of these animals in Missouri.

The specimens listed represent the first records for the given county based on preserved, cataloged voucher specimens (unless indicated as observations only). Size records require the deposition of the specimen in an institutional collection. All specimens collected must be taken under the auspices of a valid state permit. All new records listed here are presented in the standardized format of Collins (1989, 1990): common and scientific name, county, specific locality (when available or unless withheld for rare or endangered species), date of collection (when available), collector(s), and place of deposition and catalog number (if available or applicable). If the record was published elsewhere, the citation is given. New size maxima are presented in accordance with criteria established by Powell et al. (1982) and are expressed in both metric and English units, but the metric value is the precise measure (the English equivalent is only an approximation).

The following acronyms apply to institutional collections in which specimens are deposited: BWMC - Bobby Witcher Memorial Collection, Avila College, Kansas City, MO 64145; KU - University of Kansas Museum of Natural History, Lawrence, KS 66045; MDC - Missouri Department of Conservation, Jefferson City, MO 65102.

NEW COUNTY RECORDS

Amphibia: Caudata

MARBLED SALAMANDER (*Ambystoma opacum*)

CARTER CO: Big Spring Park at cave opening, date unknown, A. Bush (sight record only, specimen photographed and released, photograph on file with MDC). **CRAWFORD CO:** S27 T37N R2W, 27 September 1992, K.R. Toal, C. Sheil, and R.S. Reiserer (KU 220511).

EASTERN TIGER SALAMANDER (*Ambystoma tigrinum tigrinum*)

CLAY CO: HW 92 1.0 mi W HW C S30 T53N R31W, 9 July 1992, K.R. Toal and C. Sheil (KU 220509). **GENTRY CO:** S21 T62N R32W, 29 July 1992, K.R. Toal, C. Sheil, and J. Toal (KU 220510). **JOHNSON CO:** Warrensburg, April 1961, P. Anderson (KU 89195)(reported by K.R. Toal); extends the range of the species ca. 50 mi S of the range mapped by Conant and Collins (1991). **WRIGHT CO:** HW 5 8 km N Mansfield S24 T29N R15W, 11 March 1988, T. Titus and D. Danley (KU 219662)(reported by K.R. Toal).

CAVE SALAMANDER (*Eurycea lucifuga*)

LACLEDE CO: Howell Cave Vernon Bounds Farm S8 T32N R15W, 11 March 1992, K.R. Toal and R.S. Reiserer (KU 219999).

FOUR-TOED SALAMANDER (*Hemidactylium scutatum*)

RIPLEY CO: 3.9 mi N HW Y and HW 160 S2 T23N R2E, 25 September 1990, R. Cox (KU cat. no. pending); extends known range ca. 30 mi SE (Johnson, 1987).

MUDPUPPY (*Necturus maculosus*)

DOUGLAS CO: S21 T26N R14W, 21 August 1985, A.C. Buchanan and K.L. Kaufman (KU 211202); specimen was misidentified as *Cryptobranchus alleganiensis* (reported by K.R. Toal).

CENTRAL NEWT (*Notophthalmus viridescens louisianensis*)

DALLAS CO: Bennett Springs Wildlife Area (larvae), 20 June 1992, K.R. Toal and C. Sheil (KU 220512).

Amphibia: Anura

BLANCHARD'S CRICKET FROG (*Acris crepitans blanchardi*)

AUDRAIN CO: HW 15 1 mi N Mexico S14 T51N R9W, 3 May 1992, J.S. Tulloch (BWMC 04813).

CHARITON CO: S12 T52N R19W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending).

MACON CO: HW 156 AT CR 537 2 mi W HW 3 S12 T60N R16W, 2 May 1992, J.S. Tulloch (BWMC 04796). **MONROE CO:** HW D at South Fork River/Salt Creek Santa Fe Access S16 T53N R8W, 3 May 1992, C.A. Cunningham (BWMC 04812).

EASTERN AMERICAN TOAD (*Bufo americanus americanus*)

ATCHISON CO: HW 275 6.6 mi N HW T S2 T66N R42W DOR, 6 June 1992, C.B. Cohick and D.D. Smith (BWMC 04921). **GENTRY CO:** S21 T62N R32W, 29 July 1992, K.R. Toal, C. Sheil, and J. Toal (KU 220513). **MACON CO:** Long Branch State Park S1 T57N R15W, 1 May 1992, K.J. Parsons (BWMC 04792). **SHELBY CO:** HW 15 0.4 mi N HW P S4 T58N R10W, C.A. Cunningham (BWMC 04806). **WORTH CO:** East Fork Grand River HW 46 1.4 mi W HW C in Allendale S32 T66N R30W, 6 June 1992, C.B. Cohick and D.D. Smith (BWMC 04922).

GREAT PLAINS TOAD (*Bufo cognatus*)

LAFAYETTE CO: S23 T51N R24W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending).

WOODHOUSE'S TOAD (*Bufo woodhousii woodhousii*)

CHARITON CO: 2.6 mi S Jct HW MM & J S36 T53N R19W, 15 June 1992, K.R. Toal and C. Sheil (KU 220029).

EASTERN NARROWMOUTH TOAD (*Gastrophryne carolinensis*)

DALLAS CO: HW E 1.6 mi from county line S1 T36N R18W, 20 June 1992, K.R. Toal and C. Sheil (KU 220524). **SHANNON CO:** Carr's Creek State Forest S27 T29N R1W DOR, 5 May 1992, B. Christman and T. Fobes (BWMC 04948).

COPE'S GRAY TREEFROG (*Hyla chrysoscelis*)

ANDREW CO: S7 T58N R34W, 28 July 1992, K.R. Toal and C. Sheil (KU 220515). **ATCHISON CO:** Hoot Owl River Access, 4 May 1992, K.R. Toal and C. Sheil (KU 220010). **BUCHANAN CO:** HW 116 3.1 mi W HW MM S30 T55N R34W, 20 May 1992, K.R. Toal and C. Sheil (KU 220030). **CASS CO:** 0.4 mi S Lisle city limits on HW D S2 T21N S33W, 16 April 1992, K.R. Toal and R.S. Reiserer (KU 220003). **GENTRY CO:** S21 T62N R32W, 28 July 1992, K.R. Toal and C. Sheil (KU 220514). **HENRY CO:** S29 T43N R27W, 9 April 1992, K.R. Toal and R.S. Reiserer (KU 220005). **HOLT CO:** Bob Brown Wildlife Area, 4 May 1992, K.R. Toal and C. Sheil (KU 220009). **McDONALD CO:** HW K 0.6 mi E HW 71 S8 T43N R33W, 23 August 1991, K.R. Toal and R.S. Reiserer (KU 220006). **NEWTON CO:** S6 T26N R30W, 3 July 1992, K.R. Toal, C. Sheil, and A. Schmidt (KU 220516). **PLATTE CO:** Little Bean Marsh Wildlife Area, 8 May 1992, K.R. Toal and C. Sheil (KU 220008).

GRAY TREEFROG (*Hyla versicolor*)

CASS CO: Bittern Bottoms Wildlife Area, 28 April 1992, K.R. Toal and C. Sheil (KU 220004).

HICKORY CO: Pomme de Terre lake road 0.6 mi N HW 254 S35 T36N R22W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending). **JASPER CO:** S15 T30N R32W, 3 July 1992, K.R. Toal, C. Sheil, and A. Schmidt (KU 220518). **JOHNSON CO:** Hazel Hill Community Lake, 20 June 1992, K.R. Toal and C. Sheil (KU 220517). **MACON CO:** Long Branch State Park S1 T57N R15W, 1 May 1992, C.A. Cunningham (BWMC 04789). **McDONALD CO:** S28 T22N R30W, 17 July 1992, K.R. Toal and D.A. Kizirian (KU 220520). **MONITEAU CO:** S33 T47N R15W, 15 May 1992, K.R. Toal and C. Sheil (KU 220011). **RAY CO:** W side of HW 13 2.4 mi N HW B S25 T53N R28W, 10 July 1992, K.R. Toal and C. Sheil (KU 220519). **ST. CLAIR CO:** S14 T37N R24W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending).

NORTHERN SPRING PEEPER (*Pseudacris crucifer crucifer*)

BATES CO: Settle's Ford Wildlife Area, 5 April 1992, K.R. Toal and R.S. Reiserer (KU 220012). **CASS CO:** Bittern Bottoms Wildlife Area, 3 April 1992, K.R. Toal, C. Sheil, and R.S. Reiserer (KU 220014). **DALLAS CO:** Bennett Springs Wildlife Area (larvae), 20 June 1992, K.R. Toal and C. Sheil (KU 220521). **HENRY CO:** Urich Wildlife Area, 5 April 1992, K.R. Toal and R.S. Reiserer (KU 220013). **JASPER CO:** S15 T30N R32W, 3 July 1992, K.R. Toal, C. Sheil, and A. Schmidt (KU 220522). **MONITEAU CO:** S2 T47N R15W, 15 May 1992, K.R. Toal and C. Sheil (KU 220015).

WESTERN CHORUS FROG (*Pseudacris triseriata*)

BUCHANAN CO: S18 T56N R35W, 12 July 1992, K.R. Toal and D.A. Kizirian (KU 220523). **CALDWELL CO:** S11 T55N R29W, 26 April 1992, K.R. Toal and C. Sheil (KU 220019). **CLINTON CO:** S7 T54N R31W, 26 April 1992, K.R. Toal and C. Sheil (KU 220018). **LAWRENCE CO:** S24 T26N R28W, 18 April 1992, K.R. Toal and C. Sheil (KU 220017). **MONITEAU CO:** S24 T47N R14W, 15 May 1992, K.R. Toal and C. Sheil (KU 220020).

NORTHERN CRAWFISH FROG (*Rana areolata circulosa*)

BATES CO: S18 T42N R33W, 16 April 1992, K.R. Toal and R. S. Reiserer (KU 220022). **CASS CO:** S30 T43N R33W, 16 April 1992, K.R. Toal and R.S. Reiserer (KU cat. no. pending). **DADE CO:** S35 T31N R28W, 18 April 1992, K.R. Toal and C. Sheil (KU 220021).

PLAINS LEOPARD FROG (*Rana blairi*)

CLAY CO: HW 92 1.0 mi W HW C S30 T53N R31W, 9 July 1992, K.R. Toal and C. Sheil (KU 220526). **MONITEAU CO:** S24 T47N R14W, 15 May 1992, K.R. Toal and C. Sheil (KU 220023).

BULLFROG (*Rana catesbeiana*)

CHARITON CO: S12 T52N R19W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending). **GENTRY CO:** S28 T61N R32W, 29 July 1992, K. R. Toal, C. Sheil, and J. Toal (KU 220527). **HICKORY CO:** Pomme de Terre lake road 0.6 mi N HW 254 S35 T36N R22W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending). **MACON CO:** Long Branch State Park S1 T57N R15W, 1 May 1992, J.S. Tulloch (BWMC 04790). **ST. CLAIR CO:** S14 T37N R24W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending).

GREEN FROG (*Rana clamitans melanota*)

MONITEAU CO: S2 T47N R15W, 15 May 1992, K.R. Toal and C. Sheil (KU 220024). **MONROE CO:** HW D at South Fork River/Salt Creek Santa Fe Access, 3 May 1992, J.S. Tulloch (BWMC 04811).

PICKEREL FROG (*Rana palustris*)

MONITEAU CO: S5 T46N R14W DOR, 15 May 1992, K.R. Toal and C. Sheil (KU 220025).

SOUTHERN LEOPARD FROG (*Rana sphenoccephala*)

CASS CO: Bittern Bottoms Wildlife Area, 3 April 1992, K.R. Toal, C. Sheil, and R.S. Reiserer (KU 220026). **DADE CO:** S35 T31N R28W, 18 April 1992, K.R. Toal and C. Sheil (KU 220027). **HICKORY CO:** Pomme de Terre lake road 0.6 mi N HW 254 S35 T36N R22W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending); Pomme de Terre Lake S12 T36N R22W, 3 July 1992, V.D. von Frese (BWMC 04935). **MACON CO:** Long Branch State Park S1 T57N R15W, 1 May 1992, M.N. Trask (BWMC 04791). **MONITEAU CO:** S25 T47N R14W, 15 May 1992, K.R. Toal and C. Sheil (KU 220028). **MONROE CO:** Mark Twain State Park campground, S16 T54N R8W, 2 May 1992, J.S. Tulloch (BWMC 04808).

PLAINS SPADEFOOT (*Spea bombifrons*)

CHARITON CO: HW 453 0.9 mi E HW J S7 T52N R18W, 11 July 1992, K.R. Toal and C. Sheil (KU 220525).

Reptilia: Testudines

WESTERN SPINY SOFTSHELL (*Apalone spinifera hartwegi*)

HICKORY CO: Hermitage Pomme de Terre River S23 T37N R22W, 3 July 1992, V.D. von Frese (BWMC 04933).

COMMON SNAPPING TURTLE (*Chelydra serpentina serpentina*)

CARROLL CO: HW 10 at HW FF S33 T52N R25W, 6 July 1992, C.B. Cohick (BWMC 04940). **CLAY CO:** HW 169 2.1 mi S HW 92 S11 T52N R33W salvage, 12 April 1992, C.B. Cohick, S.L. Cohick, and J.A. Cohick (BWMC 04898). **DEKALB CO:** HW J 3.3 mi N HW O S6 T58N R31W DOR, 6 June 1992, C.B. Cohick and D.D. Smith (BWMC 04924). **HICKORY CO:** Hermitage Pomme de Terre River at HW 64 bridge S23 T37N R22W, 3 July 1992, V.D. von Frese (BWMC 04931). **LACLEDE CO:** HW 5 0.3 mi N HW E S28 T36N R16W, 20 June 1992, K.R. Toal and C. Sheil (KU 220541). **POLK CO:** HW 64 0.5 mi W Dallas County line S25 T35N R21W DOR, 8 May 1992, R. Powell and M.S. Schreiber (BWMC 04899). **WORTH CO:** Jct HW 46 & 246 S24 T66N R33W DOR, 6 June 1992, C.B. Cohick and D.D. Smith (BWMC 04923).

WESTERN PAINTED TURTLE (*Chrysemys picta bellii*)

CARROLL CO: W.L. Schifferdecker Memorial Wildlife Area HW D at HW E S27 T53N R25W, 6 July 1992, C.B. Cohick (BWMC 04941). **KNOX CO:** Edina City Lake S12 T62N R12W DOR, 2 May 1992, K.J. Parsons (BWMC 04803). **LAWRENCE CO:** S13 T27N R26W, 13 September 1992, K.R. Toal and C. Sheil (KU 220546).

COMMON MAP TURTLE (*Graptemys geographica*)

HICKORY CO: Hermitage Pomme de Terre River S23 T37N R22W, 3 July 1992, V.D. von Frese (BWMC 04933).

THREE-TOED BOX TURTLE (*Terrapene carolina triunguis*)

HICKORY CO: HW AA 1 mi E HW 54 S33 T37N R23W DOR, 9 May 1992, R. Powell and D.J. Pflanz (BWMC 04901).

ORNATE BOX TURTLE (*Terrapene ornata*)

MONITEAU CO: S9 T43N R15W, 15 May 1992, K.R. Toal and C. Sheil (KU 220547).

RED-EARED SLIDER (*Trachemys scripta elegans*)

CAMDEN CO: HW 7 6.3 mi E county line DOR S20 T39N R18W, 20 June 1992, K.R. Toal and C. Sheil (KU 220540). **CHARITON CO:** HW 5 3 mi N HW O S33T55N R18W, 15 June 1992, K.R. Toal and C. Sheil (KU 220066). **DADE CO:** S35 T31N R28W, 18 April 1992, K.R. Toal and C. Sheil (KU 20545). **DALLAS CO:** HW K 4.9 mi N HW 32 S12 T34N R19W, 20 June 1992, K.R. Toal and C. Sheil (KU 220543). **HICKORY CO:** S8 T36N R21W, 12 May 1992, R.S. Reiserer and T.D. Smith (KU cat.

no. pending); Hermitage Pomme de Terre River S23 T37N R22W, 3 July 1992, V.D. von Frese (BWMC 04934). **VERNON CO:** Wah-Sha-She Prairie, 3 July 1992, K.R. Toal, C. Sheil, and A. Schmidt (KU 220544).

Reptilia: Squamata: Sauria

SIX-LINED RACERUNNER (*Cnemidophorus sexlineatus*)

SHANNON CO: Paint Rock State Forest S27 T29N R1W DOR, 23 June 1992, B. Christman and T. Fobes (BWMC 04949).

FIVE-LINED SKINK (*Eumeces fasciatus*)

DALLAS CO: Lead Mines Wildlife Area, 3 April 1992, K.R. Toal and C. Sheil (KU 220035). **MACON CO:** HW 156 at Chariton River S9 T60N R16W, 2 May 1992, C.A. Cunningham (BWMC 04797). **MONITEAU CO:** S19 T46N R14W, 15 May 1992, K.R. Toal and C. Sheil (KU 220036). **RALLS CO:** HW J at CR 184 0.2 mi N Lick Creek crossing S16 T54N R7W, R. Powell (BWMC 04810). **SHELBY CO:** HW 15 0.4 mi N HW P S4 T58N R10W, J.S. Tulloch (BWMC 04805).

BROADHEAD SKINK (*Eumeces laticeps*)

RIPLEY CO: 2.2 mi N HW Y and HW 160 S10 T23N R2E, date unknown, R. Cox (KU cat. no. pending).

SOUTHERN PRAIRIE SKINK (*Eumeces obtusirostris*)

BARTON CO: Prairie State Park, 10 April 1992, K.R. Toal and R.S. Reiserer (KU 219997); first record of this species in the state (Toal and Reiserer 1992).

WESTERN SLENDER GLASS LIZARD (*Ophisaurus attenuatus attenuatus*)

ADAIR CO: Thousand Hills State Park S16 T62N R16W DOR, R. Powell (BWMC 04799). **MACON CO:** HW M at HW 63 S33 T59N R14W DOR, 2 May 1992, R. Powell (BWMC 04794). **MONITEAU CO:** S36 T44N R16W DOR, 15 May 1992, K.R. Toal and C. Sheil (KU 220031).

NORTHERN FENCE LIZARD (*Sceloporus undulatus hyacinthinus*)

MONITEAU CO: S19 T46N R14W, 15 May 1992, K.R. Toal and C. Sheil (KU 220032).

GROUND SKINK (*Scincella lateralis*)

BATES CO: Harmony Mission Wildlife Area, 10 April 1992, K.R. Toal and R.S. Reiserer (KU 220033).

Reptilia: Squamata: Serpentes

OSAGE COPPERHEAD (*Agkistrodon contortrix phaeogaster*)

ANDREW CO: S26 T59N R36W, 5 May 1992, K.R. Toal and C. Sheil (KU 220058).

WESTERN WORM SNAKE (*Carphophis vermis*)

CASS CO: S29 T43N R23W, 14 May 1992, K.R. Toal and C. Sheil (KU 220038). **DALLAS CO:** Lead Mines Wildlife Area, 3 April 1992, K.R. Toal and C. Sheil (KU 220037). **SHANNON CO:** Paint Rock State Forest S27 T29N R1W DOR, 28 April 1992, T. Fobes and B. Christman (BWMC 04945).

EASTERN YELLOWBELLY RACER (*Coluber constrictor flaviventris*)

MONITEAU CO: S29 T46N R14W, 15 May 1992, K.R. Toal and C. Sheil (KU 220039).

TIMBER RATTLESNAKE (*Crotalus horridus*)

ANDREW CO: S26 T59N R36W, 5 May 1992, K.R. Toal and C. Sheil (KU 220064). **SHANNON CO:** Paint Rock State Forest S27 T29N R1W DOR, 15 May 1992, T. Fobes and B. Christman (BWMC 04946).

PRAIRIE RINGNECK SNAKE (*Diadophis punctatus arnyi*)

ADAIR CO: HW 157 100 m S HW 6 S36 T63N R16W, 2 May 1992, M.N. Trask (BWMC 04798).

CALDWELL CO: HW 13 0.6 mi S HW F S3 T55N R28W, 6 July 1992, C.B. Cohick (BWMC 04938).

BLACK RAT SNAKE (*Elaphe obsoleta obsoleta*)

HARRISON CO: Bethany Jct HW 69 & 13 S14 T63N R28W DOR, 6 June 1992, C.B. Cohick and D.D. Smith (BWMC 04925). **NEWTON CO:** S33 T24N R30W, 17 July 1992, K.R. Toal and D.A. Kizirian (KU 220531).

EASTERN HOGNOSE SNAKE (*Heterodon platirhinos*)

CASS CO: Lake Winnebago S9 T46N R31W, June 1990, R. Breedlove (BWMC 04942). **REYNOLDS CO:** Deer Run State Forest S5 T29N R1E DOR, 9 April 1992, T. Fobes and B. Christman (BWMC 04943).

PRAIRIE KINGSSNAKE (*Lampropeltis calligaster calligaster*)

ADAIR CO: Thousand Hills State Park S1 T62N R16W DOR, R. Powell (BWMC 04800). **DADE CO:** S25 T31N R28W DOR, 18 April 1992, K.R. Toal and C. Sheil (KU 220040). **DALLAS CO:** HW K 3.4 mi N HW 32 S10 T34N R19W, 20 June 1992, K.R. Toal and C. Sheil (KU 220533). **HICKORY CO:** HW 264 0.5 mi E HW 64 S16 T36N R21W DOR, 1 July 1992, V.D. von Frese (BWMC 04930). **MACON CO:** HW 3 3.5 mi S HW 156 S32 T60N R14W DOR, 2 May 1992, R. Powell (BWMC 04795). **SALINE CO:** Miami Riverfront Park Access, 12 June 1992, K.R. Toal and C. Sheil (KU 220041). **SHANNON CO:** Paint Rock State Forest S5 T29N R1W DOR, 28 April 1992, T. Fobes and B. Christman (BWMC 04944). **SHELBY CO:** HW 15 0.4 mi N HW P S4 T58N R10W, J.S. Tulloch (BWMC 04807).

SPECKLED KINGSSNAKE (*Lampropeltis getula holbrooki*)

MONTEAU CO: S31 T46N R14W DOR, 16 May 1992, K.R. Toal and C. Sheil (KU 220042). **SALINE CO:** S5 T48N R21W DOR, 12 June 1992, K.R. Toal and C. Sheil (KU 220043).

RED MILK SNAKE (*Lampropeltis triangulum sypila*)

ANDREW CO: S32 T60N R36W, 5 May 1992, K.R. Toal and C. Sheil (KU 220044).

EASTERN COACHWHIP (*Masticophis flagellum flagellum*)

DALLAS CO: HW E 1.6 mi from county line S1 T36N R18W, 20 June 1992, K.R. Toal and C. Sheil (KU 220532).

BLOTCHED WATER SNAKE (*Nerodia erythrogaster transversa*)

DADE CO: S25 T31N R27W DOR, 18 April 1992, K.R. Toal and C. Sheil (KU 220045). **LAFAYETTE CO:** S21 T48N R24W DOR, 16 May 1992, K.R. Toal and C. Sheil (KU 220046).

DIAMONDBACK WATER SNAKE (*Nerodia rhombifer rhombifer*)

CARROLL CO: HW 24 0.9 mi E HW V S28 T53N R21W DOR, 15 June 1992, K.R. Toal and C. Sheil (KU 220047).

NORTHERN WATER SNAKE (*Nerodia sipedon sipedon*)

RALLS CO: HW J at CR 184 0.2 mi N Lick Creek crossing S16 T54N R7W, C.A. Cunningham (BWMC 04809). **RANDOLPH CO:** HW 3 3.5 mi S HW U S35 T53N R16W, 1 May 1992, J.S. Tulloch (BWMC 04788). **SHELBY CO:** HW 15 0.4 mi N HW P S4 T58N R10W, R. Powell (BWMC 04804). **WORTH CO:** Middle Fork Grand River HW 46 1.6 mi W HW Y S34 T66N R31W DOR, 6 June 1992, C.B. Cohick and D.D. Smith (BWMC 04926).

ROUGH GREEN SNAKE (*Opheodrys aestivus*)

LAWRENCE CO: S6 T29N R25W, 13 September 1992, K.R. Toal and C. Sheil (KU 220535). **LIVINGSTON CO:** Chillicothe T58N R24W, May 1992, G. Pitchford (sight record only, specimen photographed and released, photograph on file with MDC); extends known range ca. 60 mi NW.

BULLSNAKE (*Pituophis catenifer sayi*)

LAFAYETTE CO: S20 T51N R25W DOR, 16 May 1992, K.R. Toal and C. Sheil (KU 220062). **RAY CO:** HW J 4.0 mi S HW 10 S17 T51N R26W DOR, 15 June 1992, K.R. Toal and C. Sheil (KU 220063).

GRAHAM'S CRAYFISH SNAKE (*Regina grahamii*)

BATES CO: HW J 0.2 mi S HW Y S28 T41N R33W DOR, 1 May 1992, K.R. Toal and C. Sheil (KU 220048). **MACON CO:** Long Branch State Park dam S18 T57N R14W DOR, 1 May 1992, R. Powell (BWMC 04793). **PLATTE CO:** HW 45 3.9 mi N HW H S33 T54N R36W, 5 July 1992, K.R. Toal and C. Sheil (KU 220534).

BROWN SNAKE (*Storeria dekayi*)

ANDREW CO: S5 T59N R34W DOR, 29 July 1992, K.R. Toal, C. Sheil, and J. Toal (KU 220537). **DADE CO:** S21 T32N R28W, 18 April 1992, K.R. Toal and C. Sheil (KU 220050). **DALLAS CO:** Lead Mines Wildlife Area, 3 April 1992, K.R. Toal and C. Sheil (KU 220049); HW T 1.3 mi SW HW YY S36 T36N R19W, 9 May 1992, R. Powell (BWMC 04900). **DEKALB CO:** HW 6 1.0 mi W HW C S30 T59N R30W DOR, 6 June 1992, C.B. Cohick and D.D. Smith (BWMC 04928). **HENRY CO:** S34 T42N R28W, 13 September 1992, K.R. Toal and C. Sheil (KU 220538). **HICKORY CO:** S22 T36N R22W, 27 September 1992, R.S. Reiserer (KU cat. no. pending). **LAFAYETTE CO:** HW 131 2.4 mi N HW 70 S23 T49N R28W DOR, 9 July 1992, K.R. Toal and C. Sheil (KU 220536). **WORTH CO:** East Fork Grand River HW 46 1.4 mi W HW C in Allendale S32 T66N R30W, 6 June 1992, C.B. Cohick and D.D. Smith (BWMC 04927).

REDBELLY SNAKE (*Storeria occipitomaculata*)

SHANNON CO: Paint Rock State Forest S27 T29N R1W DOR, 28 April 1992, T. Fobes and B. Christman (BWMC 04947).

WESTERN RIBBON SNAKE (*Thamnophis proximus proximus*)

COOPER CO: S11 T46N R16W DOR, 16 May 1992, K.R. Toal and C. Sheil (KU 220052). **MONITEAU CO:** S19 T44N R15W DOR, 16 May 1992, K.R. Toal and C. Sheil (KU 220051). **RAY CO:** West side HW 13 2.4 mi N HW B S25 T53N R28W, 10 July 1992, K.R. Toal and C. Sheil (KU 220539). **SALINE CO:** Emma HW Y S6 T48N R23W, 14 June 1992, W.C. Bredehoft and D.D. Smith (BWMC 04929).

RED-SIDED GARTER SNAKE (*Thamnophis sirtalis parietalis*)

ANDREW CO: S32 T60N R36W, 5 May 1992, K.R. Toal and C. Sheil (KU 220053). **CALDWELL CO:** HW F 6.9 mi ENE HW 13 S29 T56N R27W, 6 July 1992, C.B. Cohick (BWMC 04939). **COOPER CO:** S36 T46N R16W DOR, 16 May 1992, K.R. Toal and C. Sheil (KU 220055). **HICKORY CO:** S22 T36N R22W, 4 October 1992, R.S. Reiserer and T.D. Smith (KU cat. no. pending). **KNOX CO:** Edina City Lake S12 T62N R12W, 2 May 1992, R. Powell (BWMC 04802). **MONITEAU CO:** S8 T47N R14W DOR, 15 May 1992, K.R. Toal and C. Sheil (KU 220054). **OSAGE CO:** 1.7 mi W Copper Hill S34 T43N R7W, 27 July 1992, G. Emich (KU cat. no. pending). **SALINE CO:** S10 T52N R21W DOR, 12 June 1992, K.R. Toal and C. Sheil (KU 220056).

ROUGH EARTH SNAKE (*Virginia striatula*)

HICKORY CO: Pomme de Terre State Park, 3 April 1992, K.R. Toal and C. Sheil (KU 220057).

WESTERN EARTH SNAKE (*Virginia valeriae elegans*)

ADAIR CO: Thousand Hills State Park S1 T62N R16W DOR, R. Powell (BWMC 04801) (Powell 1992).

NEW MAXIMUM SIZE RECORDS

Amphibia: Anura

EASTERN NARROWMOUTH TOAD (*Gastrophryne carolinensis*)

DALLAS CO: S1 T36N R18W, 20 June 1992, K.R. Toal and C. Sheil (KU 220524). Snout-vent length: 39 mm (1.5 in); this exceeds the maximum size reported by Conant and Collins (1991).

NORTHERN CRAWFISH FROG (*Rana areolata circumosa*)

BATES CO: S18 T42N R33W, 16 April 1992, K.R. Toal and R.S. Reiserer (KU 220022). Snout-vent length: 112 mm (4.4 in).

Reptilia: Squamata: Sauria

SOUTHERN PRAIRIE SKINK (*Eumeces obtusirostris*)

BARTON CO: Prairie State Park, 10 April 1992, K.R. Toal and R.S. Reiserer (KU 219997). Snout-vent length: 66 mm (2.6 in); total length: 177 mm (7.0 in).

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NOTES

A CLUTCH OF GROUND SKINK EGGS FROM CUIVRE RIVER STATE PARK

Bruce Schuette
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Troy, Missouri 63379

Only two clutches of Ground Skink (*Scincella lateralis*) eggs, both from the same female, have been reported from Missouri (Anderson, 1965; Johnson, 1987). Johnson (1987) states that "very little information is available on the reproductive biology of this secretive lizard." Herein I report an additional clutch that adds to our very limited knowledge of the life history of this common Missouri lizard.

An adult female (SVL 47 mm, TL 112 mm), caught under debris in the park's shop area by seasonal employee Bob Braden on 9 July 1992, laid three eggs on 16 July. Egg length ranged from 9.3-10.0 mm (\bar{i} = 9.7 mm), diameter from 5.3-5.5 mm (\bar{i} = 5.4 mm). Eggs were incubated on peat moss at room temperature. Two of the eggs hatched on 2 September, the third never did. Both hatchlings measured 20 mm SVL and 44 mm TL. The number of eggs per clutch and hatchling size fall within previously reported ranges, but these eggs were longer and laid later than those of the other Missouri clutches.

I wish to thank Tom R. Johnson for reviewing this manuscript.

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AN OBSERVATION OF MATING BEHAVIOR IN THE BROADHEAD SKINK (*Eumeces laticeps*)

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Cuivre River State Park
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Little has been reported about the courtship behavior of the Broadhead Skink (*Eumeces laticeps*) in Missouri (Johnson, 1987), but it is assumed to be similar to that of the Five-lined Skink (*Eumeces fasciatus*). On 28 May 1992 at approximately 1145 h in rocky, open upland forest in Graham Cave State Park, Montgomery County, Missouri we observed and for several minutes closely followed an adult male Broadhead Skink along a circular path to near the site where it had first been seen. Although we were very close and undoubtedly influenced its route, the lizard stayed on the ground and made no attempts to escape. We then noticed an adult female in the vicinity.

The male began rapidly flicking his tongue and approached the female. Upon an initial contact with his head and body, she moved a short distance. The male followed and this time used his left front foot to scratch or stroke the back of her neck. She held her position and mating occurred. The male's head and body were flat on her back and we saw no sign of biting, which is typical of Five-lined Skinks (Anderson, 1965). The male then quickly assumed the copulatory position. Coitus lasted ca. 5 min., during which the only observable movement was the twitching of his tail. After separation both individuals remained next to each other for about 10 min., after which the female began to move away and forage among the leaves. The male followed closely, placing his head and anterior body on her back whenever she stopped.

This continued for approximately 20 min. during which time no further efforts to mate were evident. This prolonged association continued until our departure.

We wish to thank Tom R. Johnson for reviewing this manuscript.

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ADDITIONS TO THE BIBLIOGRAPHY OF REFERENCES TO THE HERPETOFAUNA OF MISSOURI

Compiled by

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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 (1991. Bibliography of references to the herpetofauna of Missouri. Missouri Herpetol. Assoc. Newsl. (4):12-13) and Johnson (1987. The amphibians and reptiles of Missouri. Missouri Dept. Conservation, Jefferson City). Readers are requested to notify the author of any additional publications that should be included in future lists.

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