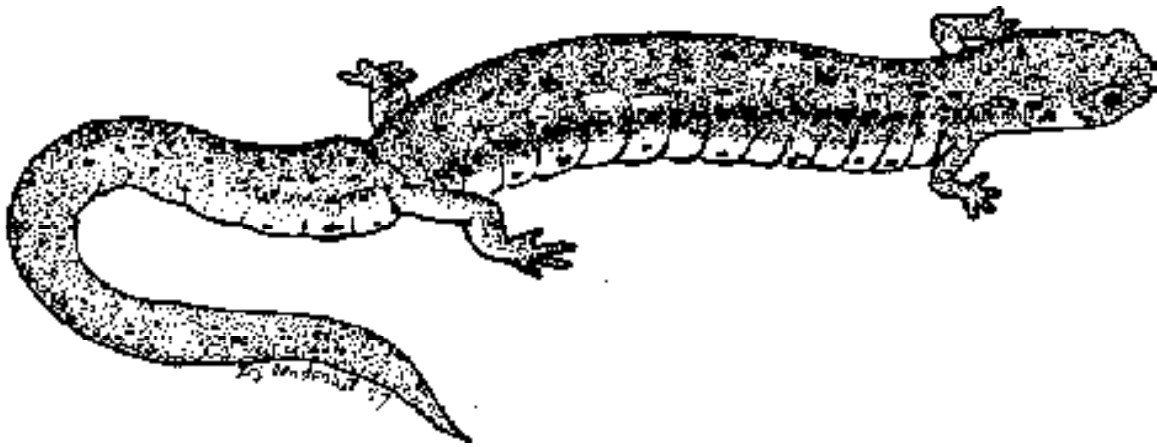


Missouri Herpetological Association



Newsletter

Number 11

1998

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MISSOURI HERPETOLOGICAL ASSOCIATION NEWSLETTER NO. 11

CONTENTS

INTRODUCTION 2

THANK YOU TO JOSEPH T. COLLINS (KEYNOTE SPEAKER) 2

ANNOUNCEMENT OF THE TWELFTH ANNUAL MHA MEETING 2

ABSTRACTS OF PAPER PRESENTED AT THE ELEVENTH ANNUAL MHA MEETING 3

Keynote Address: The evolutionary species concept in practice, with an emphasis on amphibians and reptiles from Missouri. **J. T. Collins.**

Amphibian and reptile management guidelines. **T. R. Johnson.**

Effects of temperature on the potency of carbaryl for survival of Green Frog tadpoles, *Rana clamitans*. **M. D. Boone and C. M. Bridges.**

Genetic variation in *Rana sphenocephala* in response to an agricultural chemical: implications for amphibian conservation. **C. M. Bridges.**

Effects of nutrition on the reproductive biology of the Brown Tree Snake (*Boiga irregularis*). **R. D. Aldridge.**

A comparison of current and historic populations of Missouri Hellbenders: preliminary analyses. **E. Prosen, B. Wheeler, and R. F. Wilkinson, Jr.**

Size-dependent responses by larval Ringed Salamanders to chemical stimuli from predatory newts. **A. Mathis and K. Murray.**

Comparative toepad morphology in anurans: arboreal versus ground-dwelling species. **L. Solberg.**

Demography and reproductive ecology of the Lesser Siren, *Siren intermedia*: preliminary data and analyses. **A. Sullivan and R. F. Wilkinson, Jr.**

Effects of dehydration on jumping performance of parental and hybrid genotypes in the *Rana pipiens* complex. **N. Mills and M. J. Parris.**

Wetland conservation: biological delineation of terrestrial buffer zones for pond-breeding salamanders. **R. D. Semlitsch.**

NEW AND PREVIOUSLY UNREPORTED RECORDS OF AMPHIBIANS AND REPTILES
IN MISSOURI FOR 1998. R.E. Daniel, B.S. Edmond, and T.R. Johnson 8

NOTES 18

Natural history notes on two reptiles from Lincoln County, Missouri. **B. Schuette.**

Early summer courtship and mating observations of Eastern Collared Lizards,

Crotaphytus collaris collaris, in Reynolds County, Missouri. **A. Salveter and C. Overby.**

ADDITIONS TO THE BIBLIOGRAPHY OF AMPHIBIANS AND REPTILES IN MISSOURI
R. Powell 19

MHA DIRECTORY OF EMAIL ADDRESSES 20

Cover art: *Hemidactylum scutatum* by A J. Hendershott.

INTRODUCTION

The Eleventh Annual Meeting of the **Missouri Herpetological Association** took place on 26 September 1998 at the Runge Conservation Nature Center, Jefferson City, 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.

THANK YOU

The **Missouri Herpetological Association** thanks **JOSEPH T. COLLINS**, Center for North American Amphibians and Reptiles, for his keynote address entitled: "The Evolutionary Species Concept in Practice, with an Emphasis on Amphibians and Reptiles from Missouri." We appreciate his contribution to the 11th Annual Meeting and for the spirited discussion that ensued.

ANNOUNCEMENT

12th Annual Meeting of the Missouri Herpetological Association

The 12th Annual Meeting of the **Missouri Herpetological Association** will be held on 25 September 1999 at the **Lay Field Station** near Louisiana, Pike County, Missouri. A "call for papers" and registration packet will be sent in mid-July. For more information please contact **Dr. Robert F. Wilkinson, Jr.** at:

Department of Biology
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**Abstracts of Papers presented at the Eleventh Annual Meeting
of the
Missouri Herpetological Association**

26 September 1998

**KEYNOTE ADDRESS:
THE EVOLUTIONARY SPECIES CONCEPT IN PRACTICE,
WITH AN EMPHASIS ON AMPHIBIANS AND REPTILES FROM MISSOURI**

Joseph T. Collins

Center for North American Amphibians and Reptiles, Lawrence, KS 66047

No abstract provided.

AMPHIBIAN AND REPTILE MANAGEMENT GUIDELINES

Tom R. Johnson

Missouri Department of Conservation, Jefferson City, MO 65102

To protect the natural biodiversity of Missouri, wildlife managers require as much information as is available on how habitats can be improved for Missouri's amphibians and reptiles. In general, habitat improvements for native amphibians and reptiles are most effective if they are tied to natural community management, such as ephemeral pool restoration in a stream floodplain or on a native prairie site. Papers with specific methods on how managers can improve habitats for herpetofauna are not commonly published in herpetological journals. Habitat improvement methods discussed in this paper used information extrapolated from native species' natural history. Some examples include: prairie, savanna and glade prescribed burns, fishless pond construction, ephemeral pool restoration, brush piles, basking logs for semi-aquatic turtles, and artificial snake overwintering dens (large, buried rock piles). Color slides showing specific examples of habitats that have been improved as well as target species are shown.

**EFFECTS OF TEMPERATURE ON THE POTENCY OF CARBARYL FOR SURVIVAL
OF GREEN FROG TADPOLES, *RANA CLAMITANS***

Michelle D. Boone and Christine M. Bridges

Division of Biological Sciences, University of Missouri, Columbia, MO 65211

This study assessed the effect of temperature on the potency of carbaryl using tadpoles of *Rana clamitans*. Temperature, chemical concentration, and the interaction of temperature and chemical significantly affected survival. Generally, increased temperatures resulted in lower survival. This study suggests that a range of temperatures realistically reflecting conditions likely to be encountered by a particular species should be used in developing and administering toxicity tests.

**GENETIC VARIATION IN *RANA SPHENOCEPHALA* IN
RESPONSE TO AN AGRICULTURAL CHEMICAL:
IMPLICATIONS FOR AMPHIBIAN CONSERVATION**

Christine M. Bridges

Division of Biological Sciences, University of Missouri, Columbia, MO 65211

The amount of genetic variability present may indicate a species' ability to adapt to a stressful environment and can be examined in a quantitative genetic analysis. Currently, numerous conservation efforts are being devoted to determining whether amphibian species are declining at alarming rates, as many studies would suggest. Therefore, because amphibians are amenable to quantitative genetic analyses and because they may be declining in numbers due to changes in their environment, these organisms serve as excellent models for examining a relationship between the amount of genetic variability present in populations and adaptability in changing environments. Using tadpoles of a single Southern Leopard Frog (*Rana sphenoccephala*) population, I examined the amount of genetic variability among full- and half-sib families with respect to their sensitivity to both lethal (time-to-death) and sublethal (change in activity) levels of the agricultural chemical, carbaryl. Analyses of both time-to-death and activity data indicate significant differences among full-sib families, suggesting a great deal of variability, genetic or environmental, present in the responses to this environmental stressor. No significant differences existed among half-sib families with respect to time-to-death, nor in the degree to which activity was reduced by sublethal carbaryl levels, indicating that little additive genetic variability exists for pesticide sensitivity within this population. Consequently, the ability of this population to adapt to environmental stressors may be limited.

**EFFECTS OF NUTRITION ON THE REPRODUCTIVE BIOLOGY OF
THE BROWN TREE SNAKE (*BOIGA IRREGULARIS*)**

Robert D. Aldridge

Department of Biology, Saint Louis University, St. Louis, MO 63103-2010

I compared the snout-vent length (SVL), coelomic fat mass, occurrence of spermatogenesis, and development of the sexual segment of the kidney in 20 male Brown Tree Snakes (*Boiga irregularis*) collected in 1996 with a sample of 20 males collected in 1985. The 1985 sample of snakes were significantly longer and the coelomic fat mass significantly greater. The mean testis tubular diameter and the mean sexual segment of the kidney tubule diameter were also significantly greater in the 1985 sample compared to the 1996 sample. Although many of the snakes in the 1996 sample were above the threshold SVL to be adults, only those males with greater than 2 gm of coelomic fat had spermatogenesis occurring. From these data I would conclude that males ca. 950 mm in SVL are potentially adult but that puberty is delayed because of a lack of energy in the form of stored fat.

A COMPARISON OF CURRENT AND HISTORIC POPULATIONS OF MISSOURI HELLBENDERS: PRELIMINARY ANALYSES

Ethan Prosen, Ben Wheeler, and Robert F. Wilkinson, Jr.

Department of Biology, Southwest Missouri State University, Springfield, MO 65804

Hellbenders, *Cryptobranchus alleganiensis*, are habitat specialists that prefer swift, cold streams with rocky bottoms. We collected data on body size (length and mass) of hellbenders from populations in five Missouri rivers and compared them to historic data from the same rivers (1971, 1977–1978, 1980–1982). Both mean total length and mass of 1998 individuals were greater than those of historic individuals for all five rivers. Historic and current size distributions also were different for all five rivers. The largest 1998 individuals were similar in size to the largest historic individuals. However, the larger size classes were relatively more abundant in the 1998 samples. Several size classes that were present in historic data were rare or absent in the 1998 sample. The observed increase in body size appears to be due to an increase in the relative number of large individuals and the loss of one or more smaller size classes.

SIZE-DEPENDENT RESPONSES BY LARVAL RINGED SALAMANDERS TO CHEMICAL STIMULI FROM PREDATORY NEWTS

Alicia Mathis and Kevin Murray

Department of Biology, Southwest Missouri State University, Springfield, MO 65804

Larval Ringed Salamanders (*Ambystoma annulatum*) occupy small ephemeral ponds where they are subject to predation by a wide variety of vertebrate and invertebrate predators. Because visibility in the ponds often is obscured by vegetation or by sediments in the water, use of chemical cues for predator recognition may be especially important. Adult newts (*Notophthalmus viridescens*) are gape-limited predators of *Ambystoma* larvae, so only smaller larvae are vulnerable to predation. In a laboratory experiment with pond-caught larvae, fright responses to chemical stimuli from adult newts were negatively correlated with body size of the larvae: only small larvae gave fright responses to chemical stimuli from adult newts. In an additional experiment, fright responses of small larvae to chemical stimuli from newts were present in lab-reared larvae, suggesting that the response is not dependent on experience. Therefore, fright responses are present in newly-hatched larvae without experience with newt predators, but disappear when larvae reach a size at which they no longer are vulnerable to predation by newts.

COMPARATIVE TOEPAD MORPHOLOGY IN ANURANS: ARBOREAL VERSUS GROUND-DWELLING SPECIES

Lisa Solberg

Department of Biology, Southwest Missouri State University, Springfield, MO 65804

Toepad morphology was examined in arboreal *Hyla chrysoscelis*, semiarboreal *Pseudacris crucifer*, terrestrial *P. triseriata*, semiaquatic *Rana catesbeiana*, and fossorial *Gastrophryne*

carolinensis using scanning electron microscopy. The arboreal and semiarboreal species have expanded digital pads with a more or less rounded shape and a well-developed circumferal groove and ridge. The microstructure of the pad cells consists of columnar epithelium with free apices. The terrestrial species has an elongated pad with proximal extensions into the normal epithelia, and is bound on either side by indistinct folds rather than a groove and ridge. The semiaquatic species also had an elongated pad, but the epithelium was cuboidal rather than columnar, and no other toepad surface morphology was found. The fossorial species also has an elongated pad the the epithelium is squamous, as is the rest of the toe surface. The arboreal specis have significantly larger toepad epidermal cells than the terrestrial and fossorial species. Although *R. catesbeiana* has larger toepad cells than *P. triseriata* and *G. carolinensis* ($P = 0.002$, for all species).

DEMOGRAPHY AND REPRODUCTIVE ECOLOGY OF THE LESSER SIREN, *SIREN INTERMEDIA*: PRELIMINARY DATA AND ANALYSES

Aaron Sullivan and Robert F. Wilkinson, Jr.

Department of Biology, Southwest Missouri State University, Springfield, MO 65804

Siren intermedia is a large aquatic salamander that comprises a large portion of vertebrate biomass in many ponds, swamps, and ditches. Despite their ecological importance, little natural history data are available for this species. We delineated the breeding season of a population in Southeast Missouri by using a gonosomatic index as an estimate of gonadal activity. Testicular activity peaked in February and steeply declined in March. Ovarian activity peaked in January and February and also steeply declined in March. Gamete maturation thus appears to be synchronous, which is typical for salamanders with external fertilization. We estimated body condition of adults by mass/length regression analyses. Males tended to be in poorer body condition during the breeding season when compared to the nonbreeding season. This difference in body condition suggests the hypothesis that intense competition may occur between breeding males for females and/or other resources. Analysis of data for females revealed an unexpected pattern. Smaller females weighed less during the breeding season despite the presence of ova than nonbreeding females of the same length. Larger females weighed more during the breeding season. Future studies include determination of age specific growth rates and skeletochronological analyses to determine longevity and age at sexual maturity.

EFFECTS OF DEHYDRATION ON JUMPING PERFORMANCE OF PARENTAL AND HYBRID GENOTYPES IN THE *RANA PIPIENS* COMPLEX

Nathan Mills and M. J. Parris

Division of Biological Sciences, University of Missouri, Columbia, MO 65211

Abstract was lost and could not be replaced in time for publication;
this occurred through no fault of the authors.

WETLAND CONSERVATION: BIOLOGICAL DELINEATION OF TERRESTRIAL BUFFER ZONES FOR POND-BREEDING SALAMANDERS

Raymond D. Semlitsch

Division of Biological Sciences, University of Missouri, Columbia, MO 6521-7400

Many semi-aquatic organisms, such as salamanders, depend on both aquatic and terrestrial habitats to complete their life cycles and maintain viable populations. However, current federal and state regulations protect only the wetland itself or arbitrarily defined portions of terrestrial habitat. Part of the reason terrestrial habitats adjacent to wetlands are not protected is the lack of a clear understanding of the biologically relevant distances from shorelines that are utilized by wetland fauna. Such information is critical for delineation of terrestrial “buffer zones” and for the conservation of semi-aquatic organisms. I summarize data from the literature on terrestrial habitat use by one group of pond-breeding salamanders, especially distances that individuals traveled away from ponds. The results provide terrestrial buffer zones based on actual habitat use by adult and juvenile salamanders. The mean distance salamanders were found from the edge of aquatic habitat was 125.3 m for adults of six species and 69.6 m for juveniles of two of these species. Assuming the mean distance encompasses 50% of the population, a buffer zone encompassing 95% of the population would extend 164.3 m from a wetland’s edge into adjacent terrestrial habitat. Data from other amphibians suggest that this buffer zone is applicable to a range of species, but caution should be taken for taxa suspected to be more vagile. Wetland managers and policy makers obviously must recognize the special needs of semi-aquatic organisms during their entire life cycle and not just during the breeding season. In order to maintain viable populations and communities of salamanders, attention must be directed to the terrestrial areas peripheral to all wetlands. Data from salamander and other semi-aquatic species make it increasingly apparent that maintaining a connection between wetlands and terrestrial habitats will be necessary to preserve the remaining biodiversity of our vanishing wetlands.

NEW AND PREVIOUSLY UNREPORTED RECORDS OF AMPHIBIANS AND REPTILES IN MISSOURI FOR 1998.

Richard E. Daniel¹, Brian S. Edmond,² and Tom R. Johnson³

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² 2500 E. Kearney, Springfield, MO 65801

³ Missouri Department of Conservation, Jefferson City, MO 66103

The new county and maximum size records listed below are those accumulated or brought to our attention since previous updates (Johnson and Powell 1988; Powell 1994; Powell and Daniel 1997; Powell et al. 1989, 1990, 1991, 1992, 1993a, 1993b, 1994, 1995, 1996, 1997) of the records listed in Johnson (1987). In addition, many previously unreported records were obtained from institutional collections. Specimens believed to represent valid distributional records are presented here. Powell and Daniel (1997) inadvertently omitted some distributional records and these are included in this list along with original citations.

Publication of this list allows us to acknowledge contributions by many individuals who have provided information or specimens. Also, recipients of this list have the opportunity to update checklists, range maps, and listings of size maxima. Finally, the publication of these records extends our knowledge of amphibians and reptiles native to Missouri.

The specimens listed below are the first records for the given county and are based on preserved, catalogued voucher specimens or photographs deposited in a public institution. New distribution records are presented in the standardized format of Collins (e.g., 1989): common and scientific name, county, specific locality (unless withheld for species of special concern), legal description, date of collection, collector(s), institution and catalogue number where the specimen is deposited. If the record was published elsewhere, the citation is given.

New maximum size records are presented in the standardized format of Powell et al. (1982). Sizes are expressed in both metric and English units; however, the metric value is the more precise measure. Size records must be documented by a voucher specimen that is preserved, catalogued, and deposited in an institutional collection. Size maxima reports are to include the institutional collection and catalogue number of the voucher specimen.

The following acronyms indicate the institutional collections where specimens are deposited: AMNH—American Museum of Natural History, New York, NY; BWMC—Bobby Witcher Memorial Collection, Avila College, Kansas City, MO; CA—Chicago Academy of Science, Chicago, IL; CM—Carnegie Museum, Pittsburgh, PA; CU—Cornell University, Ithaca, NY; 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; LSUMNS—Museum of Natural Science, Louisiana State University, Baton Rouge, LA; MCZ—Museum of Comparative Zoology, Harvard University, Cambridge, MA; MDC—Missouri Department of Conservation, Jefferson City, MO; MPM—Milwaukee Public Museum, Milwaukee, WI; SEMSU—Southeast Missouri State University, Cape Girardeau, MO; SIUC—Southern Illinois University, Carbondale, IL; UGAMNH—Museum of Natural History, University of Georgia, Athens, GA; UIMNH—Museum of Natural History, University of Illinois, Champaign, IL; UMC—University of Missouri, Columbia, MO; UMMZ—University of Michigan, Museum of Zoology, Ann Arbor, MI; USNM—National Museum of Natural History, Washington, DC.

We would like to extend our appreciation to the following individuals who generously supplied information or access to specimens: Frank Burbrink, John Cadle, Gary Casper, Ellen Censky, Charles Dardin, Darrel Frost, Steve Gotte, A.J. Hendershott, Robert Henderson, Mary Hennen, Arnold Kluge, Peter Lowther, Amy McClure, Roy McDiarmid, Christine Mayer, Elizabeth McGhee, Chris Phillips, Robert Powell, Alan Resetar, Douglas Rossman, Greg Schneider, T. Trombone.

NEW COUNTY RECORDS

Amphibia: Caudata

RINGED SALAMANDER

Ambystoma annulatum

DOUGLAS CO: Rt. AM (S12 T27N R11W), 14 September 1998, coll. B. Edmond (UMC 6547–6548).

ST LOUIS CO: Allenton Six Flags Rd, 0–3.1 mi. S Jct. Melrose Rd (S16/21/28 T44N R3E), 13 September 1982, coll. R.E. Preston (UMMZ 174046–174066).

TEXAS CO: Rt. AD (S16 T28N R11W), 14 September 1998, coll. B. Edmond (UMC 6540–6541).

WRIGHT CO: Jct. Rt. E and Rt. N (S19 T29N R13W), 14 September 1998, coll. B. Edmond (UMC 6546).

MOLE SALAMANDER

Ambystoma talpoideum

NEW MADRID CO: New Madrid (T23N R14E), date unknown, coll. R. Kennicott (USNM 270330–270332).

SMALLMOUTH SALAMANDER

Ambystoma texanum

SHELBY CO: Rt. N, 0.2 mi. N Salt River (S5 T57N R11W), 26 February 1998, coll. C. Shelton (UMC 6361–6362).

WAYNE CO: Mingo NWR (S30 T27N R8E), 10 October 1998, coll. B. Edmond and R. Daniel (UMC 6561).

TIGER SALAMANDER

Ambystoma tigrinum

CARTER CO: Rt. V just N of Jct. Rt. N (S33 T27N R3E), 3 February 1997, coll. C. Shelton (UMC 6219).

ST CLAIR CO: Rt. B, 0.4 mi. W Jct. MO 13 (S8 T38N R25W), 21 April 1976, coll. R.A. Sajdak (MPM 13256–13257).

SHELBY CO: Gravel road near Clarence (S19 T57N R12W), 9 May 1998, coll. C. Bickhan (UMC 6434).

LONGTAIL SALAMANDER

Eurycea longicauda

BUTLER CO: Keeners (S10 T26N R5E), 10 April 1935, coll. J.R. Bailey (UMMZ 77392).

LACLEDE CO: Rt. E, 6 mi. W Eldridge (S17 T36N R17W), 27 March 1961, coll. J.A. Fowler (CM 138876–138880).

CAVE SALAMANDER

Eurycea lucifuga

BUTLER CO: Keeners (S10 T26N R5E), 10 April 1935, coll. J.R. Bailey (UMMZ 77389).

FOUR-TOED SALAMANDER

Hemidactylium scutatum

HICKORY CO: Mule Shoe Conservation Area (S2 T37N R20W), 2 April 1998, coll. T.R. Johnson (KU cat. no. pending).

RED RIVER MUDPUPPY

Necturus louisianensis

IRON CO: Stouts Creek (S5 T33N R2E), August 1997, coll. R. DiStefano (larva photographed and released)(photo on file with MDC) (Powell et al. 1997).

RIPLEY CO: Ditch no. 3, 1 mi. S and 2 mi. E Naylor (S13 T22N R4E), 15 April 1970, coll. B.E. Dietsche (MPM 13852).

COMMON MUDPUPPY

Necturus maculosus

FRANKLIN CO: Bourbeuse River, 10 September 1942, coll. unknown (UMMZ 92337).

PIKE CO: Locality unknown, 3 April 1900, coll. J. Hurter (USNM 57036).

CENTRAL NEWT

Notophthalmus viridescens louisianensis

TANEY CO: Hercules Glade, near fire tower (S12 T23N R18W), Spring 1971, coll. UMC Herpetology Class (UMC 1539, 5408).

WESTERN LESSER SIREN

Siren intermedia nettingi

WAYNE CO: Rt. P at Jct. Rt. TT, in stream (S20 T28N R8E), 8 April 1973, coll. UMC Herpetology Class (UMC 1541, 1543).

Amphibia: Anura

AMERICAN TOAD

Bufo americanus

PERRY CO: Rt. O, 2 mi. E of Jct. MO 51 (S28 T34N R10E), 2 August 1994, coll. C. Huntington and R. Powell (BWMC 5552)(Powell et al. 1994).

FOWLER'S TOAD

Bufo fowleri

MONITEAU CO: Plowboy Bend Conservation Area (S26 T47N R14W), 9 June 1998, coll. R. Daniel and J. Daniel (UMC 6459).

WOODHOUSE'S TOAD

Bufo woodhousii

CALLAWAY CO: Jefferson City Regional Airport Terminal (S15 T44N R11W), 24 April 1998, coll. R. Daniel (UMC 6402).

HOWARD CO: Franklin Island Conservation Area (S3 T48N R16W), 7 May 1998, coll. R. Daniel (UMC 6416–6417).

EASTERN NARROWMOUTH TOAD

Gastrophryne carolinensis

TEXAS CO: MO 32, ~ 1.0 mi. W Big Piney River (S11 T32N R10W), 9 June 1998, coll. C. Gerhardt (UMC 6467).

COPE'S GRAY TREEFROG

Hyla chrysoscelis

MERCER CO: Natural marsh on the Chloe Lowry Marsh Conservation Area (S16 T65N R24W), 25 June 1998, coll. T.R. Johnson (KU cat. no. pending)(verified by call).

MONITEAU CO: Plowboy Bend Conservation Area (S23 T47N R14W), 9 June 1998, coll. R. Daniel and J. Daniel (UMC 6464)(verified by call).

GRAY TREEFROG

Hyla versicolor

RAY CO: MO 13, 2.4 mi. N Jct. Rt. B (S25 T53N R28W), 10 July 1992, coll. K.R. Toal and C. Sheil (KU 220519)(Powell et al. 1992).

SPRING PEEPER

Pseudacris crucifer

OREGON CO: MO 99, N edge Thomasville (S32 T25N R5W), 16 April 1965, coll. unknown (LSUMNS 66600).

SHELBY CO: Rt. N, 0.2 mi. N Salt River (S5 T57N R11W), 17 March 1998, coll. C. Shelton (UMC 6363–6364).

WESTERN CHORUS FROG

Pseudacris triseriata

BUTLER CO: Keeners (S10 T26N R5E), 10 April 1935, coll. J.R. Bailey (UMMZ 77402).

CARTER CO: Pinewoods Lake Rec. Area (S12 T26N R2E), 25 April 1970, coll. B.E. Dietsche (MPM 9651).

MADISON CO: Locality unknown, 17 March 1900, coll. J. Hurter (USNM 58070).

OREGON CO: 4 mi. SSE Riverton (S34 T23N R2W), 27 August 1961, coll. unknown (LSUMNS 50317).

SHANNON CO: Eaton Ford (S12 T28N R2W), 22 August 1961, coll. unknown (LSUMNS 50316).

SHELBY CO: Pin Oak Conservation Area (S5 T57N 11W), 30 April 1998, coll. C. Shelton (UMC 6409)

BULLFROG

Rana catesbeiana

HARRISON CO: From small creek on Pawnee Prairie Conservation Area (S14 T66N R29W), 24 June 1998, coll. T.R. Johnson (KU cat. no. pending).

NEW MADRID CO: New Madrid (T23N R14E), 7 May 1932, coll. A.A. Heinze (USNM 93180).

GREEN FROG

Rana clamitans clamitans

CHRISTIAN CO: Finley River at MO 125 (S16 T27N R20W), 11 September 1998, coll. R. Daniel and B. Edmond (UMC 6532).

CLAY CO: Wales Lake, Excelsior Spring (T52/53N R30W), 21 September 1917, coll. M. Winslow (UMMZ 49791).

OZARK CO: Locality unknown, 3 October 1902, coll. J. Hurter (USNM 57992).

ST CHARLES CO: Locality unknown, 29 May 1903, coll. J. Hurter (USNM 57991).

SOUTHERN LEOPARD FROG

Rana sphenocephala

CARTER CO: Big Spring (S15 T26N R1E), 11 June 1931, coll. unknown (USNM 93179).

GREENE CO: Bois D'Arc Conservation Area (S25 T30N R24W), 26 March 1998, coll. B. Edmond (UMC 6379–6380)

HOLT CO: Little Tarkio Creek, 13 July 1941, coll. H. Makoh (UMMZ 95508).

MORGAN CO: Gravois Mills (S17 T41N R17W), 28 August 1939, coll. E.G.J. Falck (FMNH 33853).

SHELBY CO: Rt. N, 0.2 mi. N Salt River (S5 T57N R11W), 17 March 1998, coll. C. Shelton (UMC 6355–6356).

Reptilia: Testudines

MIDLAND SMOOTH SOFTSHELL

Apalone mutica mutica

DAVISS CO: Grand River, 1 mi. S of Jameson (S24 T60N 28W), 14 July 1941, coll. H. Makoh (UMMZ 95505).

WAYNE CO: St. Francis River, 15 July 1937, coll. C.P. Brown (UMMZ 82823).

SPINY SOFTSHELL

Apalone spinifera

GASCONADE CO: Bourbeuse River at MO 19 (S11T40N R5W), 18 July 1941, coll. H. Makoh (UMMZ 95900).

HARRISON CO: Rt. EE at Panther Creek (S19/20 T64N R29W), 8 July 1993, coll. J.W. Grace (DOR, photo on file with MDC).

JEFFERSON CO: Glaize Creek (T42N R5E), 20 July 1932, coll. C.E. Burt (USNM 95405).

MCDONALD CO: Big Sugar Creek at Rt. E (S21 T22N R30W), 11 July 1990, coll. T. Smith (photo on file with MDC) (Powell et al. 1991).

RIPLEY CO: (S29 T25N R1W), 1 August 1941, coll. C. Obrecht (UMMZ 90435).

STODDARD CO: Duck Creek Conservation Area (T27N R9E), date unknown, coll. unknown (USNM 323178).

COMMON SNAPPING TURTLE

Chelydra serpentina serpentina

SHELBY CO: Rt. T, 0.8 mi. N Jct. MO 36 (S6 T56N R9W), 11 May 1998, coll. C. Shelton (UMC 6433).

WARREN CO: Treloar, near Missouri River (S19 T45N R2W), 30 May 1974, coll. M.A. Ewert (CM 87034).

WAYNE CO: 1.5 mi. SW Shook (S5 T27N R7E), 3 May 1939, coll. E.G.J. Falck (FMNH 33592).

WESTERN PAINTED TURTLE

Chrysemys picta belli

CALLAWAY CO: Whetstone Creek

Conservation Area (S8 T48N R7W), 12 June 1993, coll. B. Edmond (color slide, UMC 014P).

HARRISON CO: From small pond on Pawnee Prairie Conservation Area (S14 T66N R29W), 24 June 1998, coll. T.R. Johnson (KU cat. no. pending).

SHELBY CO: Rt. FF, 1.75 mi. N jct. MO 36 (S24 T57N R11W), 6 June 1997, coll. R. Carrick (UMC 6348).

COMMON MAP TURTLE

Gratemys geographica

BARRY CO: White River, 5 mi. N Golden btw. MO 86 & MO 39 (S33/34 T22N R25W), date unknown, coll. unknown (UGAMNH 3879).

LACLEDE CO: Gasconade River at Rt. AD (S28 T33N R13W), 17 June 1978, coll. J.P. Ward (USNM 326221).

ST CHARLES CO: St. Charles, date unknown, coll. M. Talbot (CA 6129).

WAYNE CO: Lost Creek IS4 T27N R7E), 2 June 1939, coll. E.G.J. Falck (FMNH 33643).

OUACHITA MAP TURTLE

Gratemys ouachitensis

BUTLER CO: Black River at US 67(S13/14 T26N R5E), 6 October 1996, coll. Serb, Near, Sabaj, Armbruster (INHS 12577).

ST CHARLES CO: Ellis Bay at US 67, Ellis Island (T48N R7E), Upper Mississippi Conservation Area, 5 June 1993, coll. J.K. Tucker (INHS 12088).

FALSE MAP TURTLE

Gratemys pseudogeographica

STONE CO: (S13 T26N R23W), date unknown, coll. unknown (AMNH 35450).

WARREN CO: Treloar, near Missouri River (S19 T45N R2W), 20 June 1972, coll. M.A. Ewert (CM 87552–87553).

ALLIGATOR SNAPPING TURTLE

Macrochelys temminckii

DUNKLIN CO: St. Francis River, Ben Cash Conservation Area (S28 T18N R8E), 28 July 1993, coll. S. Santhuff and T.R. Johnson (photo on file with MDC).

EASTERN RIVER COOTER

Pseudemys concinna

LACLEDE CO: Gasconade River at Rt. AD, 3 mi. SE Nebo (S28 T33N R13W), 17 June 1978, coll. J.P. Ward (USNM 323035).

REYNOLDS CO: Black River arm of Clearwater Lake (T29N R2/3E), date unknown, coll. unknown (UGAMNH 4155).

COMMON MUSK TURTLE

Sternotherus odoratus

FRANKLIN CO: Meramec State Park (S5 T40N R1W), 11 August 1997, coll. K. Lohraff (photo on file with MDC).

TANEY CO: Lake Taneycomo (T23N R20/21W), date unknown, coll. unknown (UGAMNH 4276–4277).

WAYNE CO: Mingo NWR (S9 T27N R8E), 10 October 1997, coll. R. Daniel (UMC 6521).

ORNATE BOX TURTLE

Terrapene ornata ornata

MONROE CO: Jct. MO 15 & MO 154 (S14 T54N R10W), 11 May 1998, coll. C. Shelton (UMC 6432).

HELPS CO: Rt. P, 1.0 mi. E Jct. Rt. J (S11 T36N R10W), 26 April 1998, coll. B. Edmond and J. Edmond (UMC 6403).

SHANNON CO: Bartlett (S17 T27N R4W), 2 June 1932, coll. C.E. Burt (USNM 86429).

WARREN CO: (S7 T45N R1W), 4 June 1976, coll. M.A. Ewert (CM 88390).

RED-EARED SLIDER

Trachemys scripta elegans

BOONE CO: Columbia (S15 T48N R13W), June 1998, coll. J. Imlay (UMC 6526).

HOWELL CO: US 63, 6 mi. S Willow Spring (S16 T26N R9W), 20 June 1983, coll. J.P. Ward (USNM 326435).

LEWIS CO: Deer Ridge Conservation Area (T62N R8/9W), 22 May 1997, coll. A. Burilla and E. Hooper (KU slide no. pending). US 61, 1 mi. S Canton (S3 T61N R6W), 2 April 1978, coll. M. Nickerson (MPM 16304).

REYNOLDS CO: Warner Bay Spring (S9 T31N R2E), 18 June 1940, coll. D.M. Kemp (FMNH 35391).

WEBSTER CO: Niangua (S20 T31N R17W), date unknown, coll. S.E. Meek (FMNH 2197).

Reptilia: Squamata: Sauria

SOUTHERN COAL SKINK

Eumeces anthracinus pluvialis

STODDARD CO: Mingo NWR (T27N R8E), 4 July 1975, coll. UMC Herpetology Class (UMC 5436)(Powell et al. 1996).

FIVE-LINED SKINK

Eumeces fasciatus

MARION CO: 0.25 mi. E Jct. Co Rd 233 & 231 (S21 T59N R8W), 13 August 1991, coll. R. Milas (photo on file with MDC)(Powell et al. 1991).

BROADHEAD SKINK

Eumeces laticeps

BENTON CO: Lakeview Heights (S8T40N R20W), 2 April 1932, coll. unknown (FMNH 98514).

CRAWFORD CO: Leasburg (S18 T39N R3W), 1933, coll. R.T. Neville (FMNH 19222).

FRANKLIN CO: near New Haven (T45N R3W), 1 June 1970, coll. J.P. Ward (USNM 321337).

MONTGOMERY CO: Graham Cave State Park (S 27 T48N R6W), 16 May 1998, coll. R. Krager and S. Katcham (UMC 6577).

WESTERN SLENDER GLASS LIZARD

Ophisaurus attenuatus attenuatus

DAVISS CO: (S32 T59N R29W), 10 May 1997, coll. P. Derks (photo on file with MDC)(Powell et al. 1997).

GROUND SKINK

Scincella lateralis

CEDAR CO: Bluff Springs Conservation Area, 6.8 mi. NNE Stockton (S23 T35N R26W), 19 September 1998, coll. R. Daniel and B. Edmond (UMC 6551).

IRON CO: MO 21 SW Arcadia (Tip Top Roadside Park)(S11/12 T33N R3E), 13 April 1971, coll. R. Highton (USNM 479492–479493).

Reptilia: Squamata: Serpentes

WESTERN COTTONMOUTH

Agkistrodon piscivorus leucostoma

RIPLEY CO: 3.25 mi. S of Naylor (S26 T22N R4E), 27 May 1939, coll. L.P. Woods and E.G.J. Falck (FMNH 35036).

TANEY CO: Beaver Creek at US 160 (S15 T23N R19W), 7 May 1971, coll. UMC Herpetology Class (UMC 4874).

WESTERN WORM SNAKE

Carphophis vermis

RALLS CO: 1.75 mi. SSW Saverton (S30 T56N R3W), May 1983, coll. R. Lawson (LSUMNS 44374–44375).

NORTHERN SCARLET SNAKE

Cemophora coccinea copei

HELPS CO: Rolla (T37N R8W), date unknown, coll. E. Laly (CA 11239).

YELLOWBELLY RACER

Coluber constrictor flaviventris

LINN CO: Pershing State Park (S23 T57N R21W), 5 May 1984, coll. R. Daniel, C. Baysinger-Daniel, and D. Combs (UMC 4689)(Powell et al 1996).

TIMBER RATTLESNAKE

Crotalus horridus

STE GENEVIEVE CO: Locality unknown, 18 May 1902, coll. J. Hurter (USNM 56738).

PRAIRIE RINGNECK SNAKE

Diadophis punctatus aryni

LINN CO: Pershing State Park (S23 T57N R21W), 5 May 1984, coll. R. Daniel, C. Baysinger-Daniel, and D. Combs (UMC 4690)(Powell et al. 1996).

OREGON CO: MO 19, NNE Greer (T25N R3/4W) 26 March 1973, coll. R. Highton (USNM 470469).

WEBSTER CO: 16 mi. E Springfield, 14 May 1960, coll. L.A. Copeland (CM 91711).

BLACK RAT SNAKE

Elaphe obsoleta obsoleta

BARTON CO: Rt. C, just E of Jct. Rt. F (S23/26 T33N R29W), 1 May 1987, coll. Avila Herpetology Class (BWMC 2858)(Johnson and Powell 1988).

CALLAWAY CO: Rt. J, 2.5 mi. WNW of Carrington (S30 T47N R10W), 16 October 1998, coll. R. Daniel (UMC 6564).

MARION CO: Rt. E, 3.25 mi. N Jct. MO 36 (S19/20 T57N R6W), 16 June 1989 (photo on file with MDC) (Powell et al. 1991).

PIKE CO: CR 1, 0.5 mi. W Jct. CR 2 (S12 T54N R5W), 12 August 1994, coll. B. Edmond and J. Edmond (color slide, UMC 015P).

WARREN CO: Katy Trail State Park, 0.75 mi. SE of Dutzow (S2 T44N R1W), March 1998, coll. D.J. Bruns (photo on file with MDC).

WESTERN FOX SNAKE

Elaphe vulpina vulpina

GENTRY CO: Elam Bend Conservation Area (S22 T61N R30W), 28 August 1997, coll. J.W. Grace (photo on file with MDC)(Powell et al. 1997).

EASTERN HOGNOSE SNAKE

Heterodon platirhinus

CEDAR CO: Bluff Springs Conservation Area, 6.8 mi. NNE Stockton (S23 T35N R26W), 19 September 1998, coll. J. Daniel, R. Daniel and B. Edmond (UMC 6571).

DENT CO: Locality unknown, date unknown, coll. J. Wallace (MPM 2255).

PIKE CO: MO 79, 0.5 mi. N Jct. Rt. YY (S6 T54N R2W), 19 June 1996, coll. B. Edmond (color slide UMC 018P).

PULASKI CO: Laquey (S18 T35N R12W), 13 June 1954, coll. A.W. Vazquez (USNM 141975).

PRAIRIE KINGSNAKE

Lampropeltis calligaster

CRAWFORD CO: MO 49, 1 mi. E Cherryville (S9 T36N R3W), date unknown, coll. unknown (UGAMNH 6087).

LEWIS CO: Deer Ridge Conservation Area (T62N R8/9W), 5 June 1997, coll. E Hooper (color slide, KU no. pending).

WEBSTER CO: 16 mi. E Springfield, 23 August 1960, coll., L.A. Copeland (CM 91746).

SPECKLED KINGSNAKE

Lampropeltis getula holbrooki

DOUGLAS CO: MO 181 near Jct. Rt. AP (S12 T26N R11W), 10 September 1993, coll. C.A. Phillips (INHS 11221) (Phillips and Petzing 1998).

GREENE CO: 6 mi. NE Springfield (T29N R20/21W), 3 November 1958, coll. L.A. Copeland (CM 91710).

MILLER CO: MO 17, 5 mi. N Iberia (S3 T39N R13W), 10 June 1970, coll. J.P. Ward (USNM 321340).

WAYNE CO: Sam A. Baker State Park (T30N R5E), 10 September 1980, coll. P.W. Smith and D.M. Smith (INHS 10626).

RED MILK SNAKE

Lampropeltis triangulum sypila

COOPER CO: 2 mi. W Boonville (T48N R17W), 31 March 1966, coll. unknown (UMC 4327)(Powell et al. 1996).

IRON CO: MO 49 & Black River (S32 T34N R1E), 11 October 1981, coll. C. Peterson (UMC 6351).

LEWIS CO: Deer Ridge Conservation

Area (T62N R8/9W), 6 June 1997, coll. A. Burilla and E. Hooper (color slide, KU no. pending)(Powell et al. 1997).

PERRY CO: 0.8 km E Yount (S34 T34N R9E), 16 July 1995, coll. J. Schulte and C. Cunningham (SEMSU 367)(Powell et al. 1995).

HELPS CO: Mill Creek Rec. Area, Mark Twain Nat. Forest (S4 T36N R9W), 26 September 1981, coll. R. Daniel, D.E. Metter, and B. Miller (color slide UMC 013P).

PIKE CO: CR 133, 1.4 mi SW Jct. Rt. AD (S30 T54N R2W), 12 October 1996, coll. B. Edmond (color slide UMC 017P).

RALLS CO: Crane Farm, ~5 mi. SW Hannibal, 25 June 1993, coll. C. Shulse (photo on file with MDC).

EASTERN COACHWHIP

Masticophis flagellum

COLE CO: (S31 T42N R13W), 19 April 1997, coll. B. Krager (photo on file with MDC)(Powell et al. 1997).

JACKSON CO: Atherton at Missouri River (S34 T51N R31W), 28 March 1937, coll. unknown (CA 10534).

REYNOLDS CO: Logan Creek at Black River, 5 mi. SW Piedmont (S36 T29N R2E), 28 April 1939, coll. P. Woods (FMNH 31960).

WARREN CO: MO 94, 3 mi. W Treloar (S10 T45N R3W), 19 July 1984, coll. S. Davis and P. Davis (photo on file with MDC)(Powell et al. 1990).

YELLOWBELLY WATER SNAKE

Nerodia erythrogaster flavigaster

LINCOLN CO: Near Oasis Lake (S25/26 T50N R2E), 4 May 1996, coll. R. King (photo on file with MDC).

SCOTT CO: 4.25 mi. N Diehlstadt (S4 T27N R15E), 4 July 1954, coll. P.W. Smith and L.J. Stannard (UIMNH 83507).

WAYNE CO: Mingo NWR (S9 T27N R8E), 10 October 1997, coll. R. Daniel (UMC 6565).

NORTHERN WATER SNAKE

Nerodia sipedon sipedon

FRANKLIN CO: Sullivan (T40N R2W), 1 July 1933, coll. J.H. Robinson (FMNH 19181–19183).

PERRY CO: 12.9 km E of Perryville (S9 T35N R12E), 15 October 1994, coll. B. Churchwell, J. Krejca, and S. Taylor (SIUC R-2807)(Taylor et al. 1998a).

ROUGH GREEN SNAKE

Opheodrys aestivus

LIVINGSTON CO: Chillicothe (T58N R24W), May 1992, coll. G. Pitchford (photo on file with MDC)(Powell et al. 1992).

BULLSNAKE

Pituophis catenifer sayi

BARRY CO: 1 mi. N Purdy (S31 T25N R28W), 4 August 1952, coll. P.W. Smith and S.A. Minton (UIMNH 28692).

GRAHAM'S CRAYFISH SNAKE

Regina grahamii

SHELBY CO: Pin Oak Conservation Area (S5 T57N 11W), 28 April 1998, coll. C. Shelton (UMC 6408).

MASSASAUGA

Sistrurus catenatus

NODAWAY CO: Maryville (T64N R35W), 1 September 1965, coll. W.T. Garrett (CA 18410).

ST LOUIS CO: St. Louis, date unknown, coll. G. Engelman (USNM 539).

MIDLAND BROWN SNAKE

Storeria dekayi wrightorum

DALLAS CO: Lead Mines Conservation Area (T36N R18W), 3 April 1992, coll. K.R. Toal and C. Sheil (KU 220049). Rt. T, 1.3 mi. SW Jct. Rt. YY (S36 T36N R19W), 9 May 1992, coll. R. Powell (BWMC 4900)(Powell et al. 1992).

HOWARD CO: Franklin Island Conservation Area (S2 T48N R16W), 27 October 1998, coll. R. Daniel (UMC 6570).

MERCER CO: DOR on gravel road into Chloe Lowry Marsh Conservation Area (S16 T65N R24W), 25 June 1998, coll. T. Knight (KU cat. no. pending).

NORTHERN REDBELLY SNAKE

Storeria occipitomaculata occipitomaculata

BOLLINGER CO: CR 802, 2.5 mi. NW Marble Hill (S25 T31N R9E), 12 April 1971, coll. R. Highton (USNM 470405–470406).

MONITEAU CO: Red Bird Rd, 1.7 mi. N Jct. Rt. D (S16 T46N R15W), 7 June 1998, coll. R. Daniel (UMC 6447).

PETTIS CO: Heathís Creek (S26 T48N R21W), 11 September 1967, coll. L. Payton (MPM 11884).

FLATHEAD SNAKE

Tantilla gracilis

FRANKLIN CO: Meramec State Park (S5 T40N R1W), 7 October 1934, coll. P.D. Evans (CA 8456–8457).

WESTERN RIBBON SNAKE

Thamnophis proximus proximus

JASPER CO: Jones Creek, 0.25 mi. SE I-44 (S12 T27N R31W), 29 August 1979, coll. F. Kraus and G. Schuett (UMMZ 178228).

TEXAS CO: Big Piney river near Slabtown (S15 T33N R10W), date unknown, coll. unknown (UGAMNH 6012).

EASTERN GARTER SNAKE

Thamnophis sirtalis sirtalis

MONTGOMERY CO: Locality unknown, 1907, coll. J. Hurter (USNM 55888).

OZARK CO: (S18 T23N R13W), 1902, coll. J. Hurter (USNM 55889).

PERRY CO: 16 km E of Perryville (S26 T35N R12E and S23 T35N R12E), 16 October 1994, coll. B. Churchwell, J. Krejca, and S. Taylor (SIUC R-2805 and R-2806)(Taylor et al. 1998b).

SHANNON CO: Jacks Fork River, Eminence (S26 T29N R2W), 26 June 1977, coll. unknown (LSUMNS 40061).

WEBSTER CO: 16 mi. E Springfield, 21 May 1960, coll. L.A. Copeland (CM 91708).

WRIGHT CO: Mansfield (S21 T28N R15W), 23 August 1960, coll. L.A. Copeland (CM 91709).

WESTERN EARTH SNAKE

Virginia valeriae elegans

BOLLINGER CO: CR 802, 2.5 mi. NW Marble Hill (S25 T31N R9E), 12 April 1971, coll. R. Highton (USNM 470403–470404).

NEW MAXIMUM SIZE RECORDS

Amphibia: Caudata

MARBLED SALAMANDER

Ambystoma opacum

MONTGOMERY CO: Danville Conservation Area, 9 May 1994, coll. R. Daniel (UMC 2114). SVL = 75 mm (2.9 in), TL = 132 mm (5.2 in). This specimen exceeds the maximum size reported by Conant and Collins (1998) for this species by 5 mm. Powell (1994) reported a specimen from Washington Co. with SVL = 77 mm and TL = 128 mm.

MOLE SALAMANDER

Ambystoma talpoideum

BUTLER CO: UMC Forestry Camp; Rt. KK, 3.4 mi. SW Wappapello, 7 February 1987, coll. R. Daniel and D. Metter. Male (UMC 2085) SVL = 75.9 mm (3.0 in), TL = 132.6 mm (5.2 in). Female (UMC 2086) SVL = 76.9 mm (3.0 in), TL = 132.7 (5.2 in). Conant and Collins (1998) reported a maximum TL for this species of 122 mm. Powell et al. (1996) reported a Butler Co. specimen with SVL = 78 mm and TL = 120.5 mm.

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NOTES

NATURAL HISTORY NOTES ON TWO REPTILES FROM LINCOLN COUNTY, MISSOURI

Bruce Schuette

Cuivre River State Park, Troy, MO 63379

On 18 June 1998, a female Common Musk Turtle (*Sternotherus odoratus*), measuring 98 mm in carapace length, was captured by R. King in Lake Lincoln within Cuivre River State Park. It laid two eggs (25 x 16 mm) on 24 June; neither hatched.

In mid-July 1998, a female Brown Snake (*Storeria dekayi*), measuring 255 mm SVL and 320 mm TL, was caught by D. Hatcher near a residence on HW V, ca. 1 mi E Cuivre River State Park and 9 mi NE of Troy, Lincoln Co., Missouri. The snake was kept by R. King and, on 30 July, it gave birth to 18 young. Mean SVL of 11 neonates, measured on 1 August, was 79 mm (73–83 mm), mean TL was 104 mm (101–106 mm). The number of young was within the range reported by Johnson (1987), but sizes exceeded those cited.

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EARLY SUMMER COURTSHIP AND MATING OBSERVATIONS OF EASTERN COLLARED LIZARDS, *CROTAPHYTUS COLLARIS COLLARIS*, IN REYNOLDS COUNTY, MISSOURI

Amy Salveter and Charlotte Overby

Missouri Department of Conservation, Jefferson City, MO 65102

On 30 June 1998, while hiking the Taum Sauk section of the Ozark Trail through Proffit Mountain Conservation Area, Reynolds Co., Missouri, we spotted an adult male Eastern Collared Lizard in full breeding coloration at 1250 h near the edge of an expansive igneous glade at an elevation of approximately 500 m. Unconcerned over our presence, it began foraging in and around the crevices of surrounding pink granite boulders. Sitting down to make further observations, we found ourselves staring down the gaping mouth of the male less than 2 m away. He stood tall, completed a couple of quick pushups, closed one eye, then both simultaneously, and turned his head from side to side every few seconds. It watched us for at least 5 min. Suddenly, it ran about 20 m and perched on a large boulder. About 30 sec had elapsed when an adult female emerged from the far side of the rock on which the male was perched. The female had bright red lateral markings on body and neck. During the resulting face-off, the male gaped. The female approached, whereupon the male grasped her by the neck and twice swung over her body. Apparently unreceptive initially, a second attempt resulted in intromission. Copulation was repeated in a 3-min span. Subsequently, the female mounted the male, slid her head under his belly, and then crawled beneath him. Copulation this time lasted 1–2 min. Then the two

lizards, venters in contact, rolled over and engaged in what appeared to be a frenzied struggle. The male then grasped the female's neck and copulated for a fourth time. Total elapsed time was about 4 min when the pair ceased activity and layed side by side, but without contact. Then the male faced the female, both flicked their tongues, before the male disappeared behind a boulder.

In contrast to our observation, Noble and Bradley (1933) had described the female's role in mating as passive. Also, Fitch (1956) indicated that the female's period of receptivity ended 1 June, nearly a month earlier than our observation.

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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 (1991, 1992, 1993, 1994, 1995, 1996, 1997) and Johnson (1987). Readers are requested to notify the author of any additional publications that should be included in future lists.

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MHA DIRECTORY 1998

Following is a list of email addresses for those in attendance at the 11th Annual Meeting of the Missouri Herpetological Association. This list will be updated annually. Please notify the editor of any changes or additions.

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