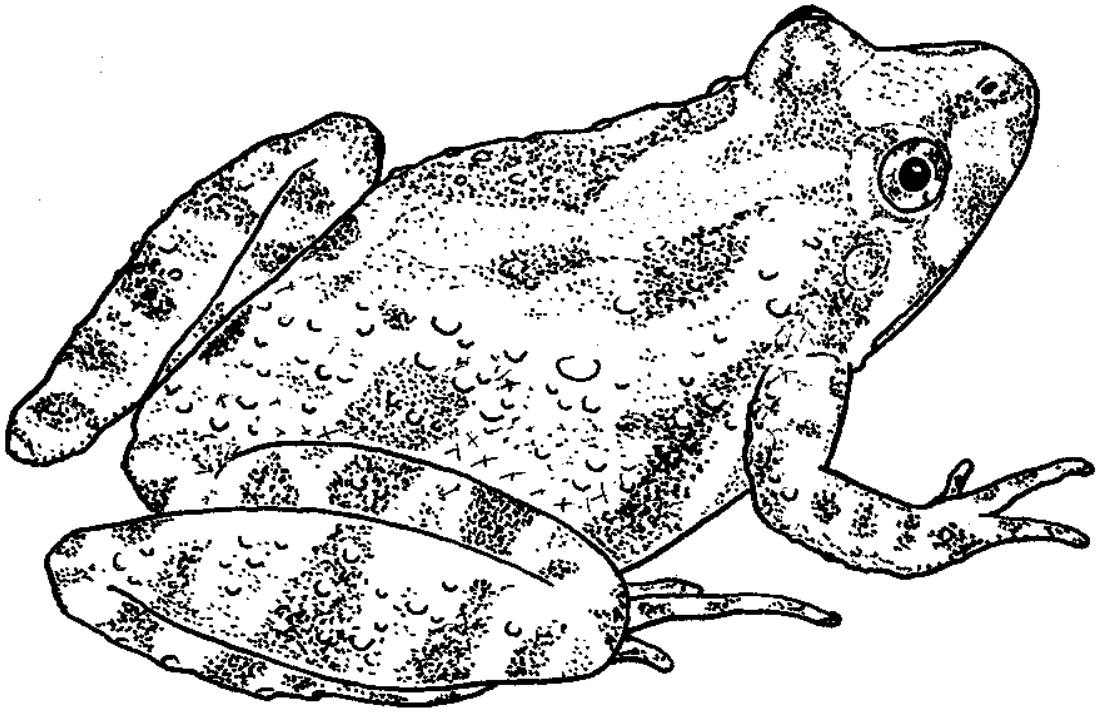
Missouri Herpetological Association



Newsletter

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MISSOURI HERPETOLOGICAL ASSOCIATION NEWSLETTER NO. 21

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Cover art: *Acris blanchardi* by Tom R. Johnson. The type specimen of *Acris gryllus blanchardi* was collected from a meadow near Smallen's Cave in Ozark County [Harper (1947) A new cricket frog (*Acris*) from the middle western states. Proc. Biol. Soc. Washington 60: p. 39-40]. McCallum and Trauth (2006) [An evaluation of the subspecies *Acris crepitans blanchardi* (Anura: Hylidae). Zootaxa 1104: 1-21.], based on morphological data, recommended that this subspecies not be recognized. Based on nucleic and mitochondrial DNA, Gamble, *et al*. (2008) [Species limits and phylogeography of North American Cricket Frogs (*Acris*: Hylidae). Mole. Phylo. Evol. 48: 112-125.] provided evidence that this taxon should be considered a full species.

INTRODUCTION

The Twenty-first Annual Meeting of the **Missouri Herpetological Association** was held 27-28 September 2008 at **Reis Biological Station**, 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 distribution records of Missouri's herpetofauna, additions to the bibliography dealing with the state herpetofauna and provide an outlet for the publication of short notes dealing with the natural history of Missouri amphibians and reptiles.

ANNOUNCEMENTS

22nd Annual Meeting of the Missouri Herpetological Association

The Twenty-second Annual Meeting of the **Missouri Herpetological Association** will be held on 26-27 September 2009 at Missouri State University **Bull Shoals Field Station**, Taney County, Missouri. A "call for papers" and registration materials will be sent electronically 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
E-mail: briggj@mdc.mo.gov

MHA Spring Field Trip

The 2009 spring field trip will be held the weekend of May 9-10 at Taum Sauk State Park in northern Reynolds County. Information about the field trip will be sent to MHA members and posted on the MHA website in early April. The field trip is open to any one with an interest in amphibians and reptiles.

MHA on the Net

The Association has an official site on the Internet. Point your browser to http://www.moherp.org/ for copies of current and past publications and to view photos and information from past field trips and meetings. Send ideas, suggestions, comments, and content to the Webmaster (webmaster@moherp.org).

Wanted

We still need artwork for future cover illustrations. Any species native to the state is acceptable; however, species described from Missouri type specimens and state species of conservation concern are particularly desirable. The species described from Missouri type specimens that haven't appeared on past

covers are: *Eurycea spelaea*, *Nerodia fasciata confluens*, *Carphophis vermis*. Anyone wishing to contribute drawings for future issues can send submissions to **Richard Daniel** at:

Division of Biological Sciences
114 Lefevre Hall
University of Missouri
Columbia, MO 65211
E-mail: danielr@missouri.edu

Abstracts of Papers Presented at the 21st Annual Meeting of the Missouri Herpetological Association

Reis Biological Station
27-28 September 2008

COLUBRID SNAKES OF NORTH AMERICA

Robert D. Aldridge
Department of Biology, Saint Louis University, St. Louis, MO 63103

Snakes in the family Colubridae are diverse and widespread. In temperate North America, the reproductive cycles of the three subfamilies considered here, Colubrinae, Natricinae and Xenodontinae, are similar in both sexes. Females begin vitellogenesis in the spring and ovulate in late spring to early summer. In both oviparous and viviparous species, the young are hatched/born in the summer. Estrus, the period of time when females are sexually attractive and receptive, occurs in the spring (unimodal) in all species and in the summer/fall (bimodal) in some species. The age of the sperm at fertilization is identical in both mating patterns. The major difference between snakes with the unimodal and bimodal patterns is where the sperm are stored during the winter; in the vas deferens in unimodal snakes and in the oviduct in bimodal snakes. A phylogenetic analysis of the occurrence of the unimodal and bimodal patterns suggests that these traits are phylogenetically plastic, however, the bimodal pattern is more prevalent in small semifossorial species. Elevated plasma testosterone levels coincide or immediately precede the mating seasons. In most colubrids spermatogenesis begins after the spring mating season, a pattern described as post-nuptial spermatogenesis. There are, however, several species of snakes in which spermatogenesis begins before mating, a pattern termed pre-nuptial spermatogenesis.

PRELIMINARY OBSERVATIONS OF A TIMBER RATTLESNAKE (*Crotalus horridus*) AND OSAGE COPPERHEAD (*Agkistrodon contortrix*) TELEMETRY STUDY IN EAST CENTRAL MISSOURI

Ryan Turnquist[1], Wayne Drda[2], Jeff Ettling[3], Jason Knouft[1]
[1]Saint Louis University, St. Louis, MO; [2]Tyson Research Center, Eureka, MO; [3]St. Louis Zoo, St. Louis, MO

Since 2006, our research team in collaboration with the Saint Louis Zoo and the Missouri Department of Conservation has conducted radio telemetry research on the timber rattlesnake (*Crotalus horridus*) and Osage copperhead (*Agkistrodon contortrix*) in east central Missouri. Our primary study site is the 1000-acre Hilda Young Conservation Area located in northern Jefferson County; however, we also to a lesser extent radio track snakes at Rockwoods Reservation and Tyson Research Center both of which are in the vicinity of our primary study area. While our results are preliminary we have made some interesting observations on both species over the past three years at Hilda Young Conservation Area. A significant habitat feature in our study area is a 35 m wide powerline cut. It appears that both species have spent a significant amount of time in this area especially on the southwest-facing slope of the powerline cut. In addition to the powerline cut, both species spend a considerable amount of time in the field habitats in the study area. Currently the analysis to what extent the species used the powerline cut and field habitat is being undertaken. Preliminary hibernation data demonstrates a difference in minimum body

temperature and egress between the species even though both species often share hibernacula. Further analysis is currently being conducted on the three years of telemetry data.

DISTRIBUTION OF GARTER SNAKES (*Thamnophis sirtalis*) IN MISSOURI

Richard B. Morrow and Robert Powell
Department of Biology, Avila University, Kansas City, MO 64145

Historically, the two subspecies of Common Garter Snakes (*Thamnophis sirtalis*) that occur in Missouri were thought to meet along a narrow zone of intergradation that essentially bisected the state along a line extending from the northeastern to the southwestern corners of the state, with Eastern Garter Snakes (*Thamnophis sirtalis sirtalis*) to the east and Red-sided Garter Snakes (*T. s. parietalis*) to the west. However, field observations and some preliminary data showing that litters contain individuals that could be assigned to both subspecies suggest that this historically accepted trinomial distinction is not warranted. Instead, observed color variations appear to exhibit a clinal change across the state.

IS NEW MEXICO *Aspidoscelis tesselata* PATTERN CLASS D A SPECIES, YOU DECIDE?

Glenn J. Manning
University of Arkansas, Monticello

Several distinctive color pattern variants have been identified in the diploid parthenogenetic species *Aspidoscelis tesselata* over its extensive geographic range in Chihuahua, Texas, New Mexico, Oklahoma, and Colorado. It has become customary to reference these variants in the literature as color pattern classes. Although a single variant is present in most areas of the range of *A. tesselata*, syntopic pattern classes occur in Otero County, Colorado, and in San Miguel and De Baca counties, New Mexico. From 2000 through 2004, several areas in San Miguel County were sampled for whiptail lizards to clarify the distributional, morphological, and ecological relationships between pattern classes C and D of *A. tesselata*. Pattern classes C and D were collected only in the immediate vicinity of Conchas Lake and 19 kilometers southeast of Conchas Lake, both sites being south of the lake and the Canadian River. Overall. *A. tesselata* C (n = 115) was significantly more abundant in most local samples than D (n = 33). New Mexico pattern class D has been shown to be produced true to type each generation. In San Miguel County ontogenetic variation was apparent in each pattern class; however, juveniles, subadults, and adults of pattern class D were easily distinguished from those of pattern class C. Up to four generations (i.e., age classes) of both C and D were present in annual samples. Hatchlings of pattern class D were produced in August and they did not attain reproductive maturity until the third year of life. The two arrays of D were not significantly different for seven of eight meristic characters analyzed. Pattern class D from San Miguel Co. New Mexico is diagnosable from pattern class D from Otero Co. Colorado.

A STUDY OF RELOCATED THREE-TOED BOX TURTLES (*Terrapene carolina triunguis*) FROM DIFFERENT ECOREGIONS

Alex Heeb
Chaffee, MO

Relocation studies on box turtles have been relatively few and have had varying success ranging from very successful (T. o. ornata, Wisconsin) to very unsuccessful (T. c. carolina,

Pennsylvania). Even fewer studies have examined how turtles taken from different habitats adapt to new areas.

A radio telemetry study was conducted on relocated box turtles (n = 16) from July of 2006 to June 2008 in Scott County. Of these, 12 were successfully tracked for over one year and ten were accounted for at the end of the study. Relocated turtles were obtained from three turtle races in Franklin (n = 6) and Scott (n = 10) Counties. Both of these counties are in ecoregions which are significantly different. Several undisturbed turtles were from a nearby site in Scott County were tracked as controls.

Statistically significant results for movement were found between the controls and both groups of relocated turtles, and between the two relocated groups showing that box turtles from different ecoregions react differently to relocation. Relocated groups were also more likely to develop respiratory issues, leave the site or die. Overall, the relocated groups preformed poorly when compared to the control group.

POPULATION ECOLOGY OF THE GREATER SIREN, *Siren lacertina*: THE ENIGMATIC GIANT SALAMANDER OF NORTH AMERICA

Thomas M. Luhring and Brian D. Todd
University of Missouri, Columbia, MO

Greater siren, *Siren lacertina*, population ecology is poorly known despite their relatively high abundance and large size. We used passive integrated transponder (PIT) tags to conduct a 13 month mark-recapture study at Dry Bay, a 5ha herbaceous bay wetland in Aiken, South Carolina. Trapping at Dry Bay resulted in 470 *S. lacertina* captures. Of 271 marked animals, 83 (30.6%) were recaptured 174 times. Robust design top model estimates in program MARK estimated that 248.4 (202.2 – 318.5, 95% CI) *S. lacertina* were in Dry Bay during the study period. Monthly survival rates were 0.88 (0.77-0.94, 95% CI) and 0.80 (0.74-0.85, 95% CI) for Robust design and Cormack-Jolly Seber top model estimates, respectively. Density was estimated to be 0.005 sirens/m^2 and biomass concentrations 1.5 g/m2 (average mass of all animals equal to 297.8g). Greater sirens demonstrated a switching point when they reached 350-400mm snout-vent length (SVL), whereupon growth rate in mm/day (for SVL) decreased and the variability in mass gained or lost per day increased. Growth in mm/day was negatively correlated with SVL whereas growth in g/day was positively correlated with SVL. Seasonal peaks of activity in January and May/June were attributed to breeding and foraging activity, respectively. Body-condition varied by month with peaks in June and July.

PREDATOR-RECOGNITION LEARNING BY LARVAL HELLBENDERS (*Cryptobranchus alleganiensis*)

Adam Crane and Alicia Mathis
Missouri State University, Springfield, MO

One cause of hellbender declines in Missouri may be the introduction of non-native trout, which are not recognized as predators by larval hellbenders. Head-starting programs involving captive-rearing and subsequent release are a part of conservation measures to increase the number of hellbenders in the wild. For animals raised in captivity, it might be possible to train young hellbenders to recognize that trout represent a threat. In this study we trained larval hellbenders using a classical conditioning technique. Hellbender larvae were trained by exposing them to the scent of trout paired with secretions released by distressed hellbenders. Approximately 36 hours after training, we observed responses of larvae to the trout scent alone. Larvae of all ages were able to learn that trout represent a threat. However, the nature of the response differed among age groups; younger larvae tended to freeze and older larvae tended to increase activity

(apparently searching for hiding places). We suggest that trout-recognition training be included as part of captive-rearing protocols with a goal of increasing post-release survival.

USING GIS AND SPECIES DISTRIBUTION MODELING TO INVESTIGATE THE ENVIRONMENTAL FACTORS REGULATING AMPHIBIAN DISTRIBUTIONS IN MISSOURI

Daryl Trumbo, Amber Burgett, Elizabeth Biro, Jon Chase, Jason Knouft
Saint Louis University, Saint Louis, MO

A significant challenge in understanding patterns of biodiversity is determining the degree to which the distributions of organisms are regulated by either broad-scale environmental factors (e.g., climate) or local interactions (e.g., competition, microhabitat availability). We are investigating the effects of broad and local-scale abiotic factors on the distributions of ten pond-breeding amphibians in eastern Missouri. Maximum entropy (Maxent) species distribution models have been developed for each species using temperature and precipitation data, as well as georeferenced locality data. We are testing the predictive ability of these species distribution models using recently-collected field survey data from amphibian breeding ponds in eastern Missouri. Field surveyors utilize calling adult anuran surveys, egg mass surveys, and larvae surveys to detect amphibians. We are also comparing the accuracy of the species distribution model predictions to local-scale variables (e.g., pond hydroperiod, canopy cover) that have been demonstrated to be important in regulating amphibian community structure. Finally, we are comparing the accuracy of species distribution models built with locality data from across the continental range of each species to models built with locality data from the species' ranges within Missouri only. Initial results indicate that, for most species, the species distribution models do not predict species presence as well as the local environmental variables at the scale of the study area. However, species distribution models built with locality data from Missouri are generally better predictors of species presence than models built with broad-scale locality data from across the continental ranges of the species. This study may have broader implications in the field of conservation biology, as accurate species distribution models can be important tools to help focus conservation efforts on priority areas for threatened species.

ESCAPE RESPONSES BY OZARK ZIGZAG SALAMANDERS (*Plethodon angusticlavius*) EXPOSED TO ARMADILLO STIMULI

Carly McGrane, Adam Crane and Alicia Mathis
Missouri State University, Springfield, MO

Amphibians often exhibit innate recognition of odors from sympatric predators. When new predators invade a habitat, either through range extensions or introductions, prey individuals may be at a high risk because they do not recognize the predators as dangerous. The armadillo forages by searching through soil and leaf litter, and so it is likely a predator of forest salamanders, including Ozark zigzag salamanders (*Plethodon angusticlavius*). We tested whether these salamanders exhibit escape behavior in the presence of armadillo chemical cues and whether they can discriminate between armadillos and a nonpredatory sympatric mammal. We conducted a laboratory experiment where salamanders were exposed to stimuli from feces of armadillos, feces from a nonpredator (white-tailed deer) and a blank control. Salamanders appeared to recognize armadillos as a threat because they increased edge behavior in the presence of armadillo stimuli relative to the two controls. Whether this result is due to chemical cues that are specific to the armadillo or based on cues in the predators' diet will require further testing.

AMPHIBIAN CHYTRID FUNGUS (*Batrachochytrium dendrobatidis*) IN AMPHIBIAN POPULATIONS IN MISSOURI

Jeffrey T. Briggler
Missouri Department of Conservation

Amphibian chytrid fungus (*Batrachochytrium dendrobatidis-Bd*) is known to infect and cause death in amphibian populations worldwide. It is believed that this disease originated in South Africa and likely spread by the international trade of *Xenopus laevis*. With the recent attention that this fungus has received and potential threat to native amphibian populations, Missouri Department of Conservation began testing for this disease in Missouri in 2006. Primarily focus for *Bd* testing was aquatic species in streams and ponds as well as species found in caves ecosystems. All amphibians encountered during field surveys were swabbed over the ventral surface of each foot, the belly, and around the thigh and vent area. Swabs were immediately placed in 2.0 ml tubes with 1 ml of 70% ethanol and shipped to Pisces Molecular, Boulder Colorado, for PCR assays. *Bd* was found on six species of amphibians (*Cryptobranchus alleganiensis*, *Notophthalmus viridescens, Eurycea longicauda*, *Eurycea spelaea*, *Lithobates catesbeianus*, and *Lithobates palustris*). This fungus was found on *C. alleganiensis* in five of eight rivers surveyed with a frequency of infection between 2% to 25%. Seventy-two percent of *Notophthalmus viridescens* tested in two counties tested positive, and at least one amphibian in cave ecosystems tested positive in 7 of 8 caves surveyed in the Ozark Highlands. *Bd* appears to more widespread in Missouri then previous believed. In order to decrease the spread of this fungus, cleaning and disinfecting equipment between field trips is recommended.

NEW HERPETOLOGICAL RECORDS FROM MISSOURI FOR 2008

Richard E. Daniel[1], Brian S. Edmond[2] and Jeffrey T. Briggler[3]

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[2]Computer Services, Missouri State University, Springfield, MO 65897

[3]Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102

The following list represents new county records accumulated or brought to our attention since the publication of Johnson (2000), Daniel and Edmond (2000, 2001) and Daniel *et al*. (2002, 2003, 2004, 2005, 2006, 2007). 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 distribution 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. 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), institution and catalogue number where the specimen is deposited.

The following acronyms indicate the institutional collections where specimens reported in this note have been deposited: SIUE- Southern Illinois University, Edwardsville, IL; UMC- Dean E. Metter Memorial Collection, University of Missouri, Columbia, MO. Unless otherwise indicated, all distribution records are documented by post-metamorphic/hatchling fluid preserved or dried specimens.

We would like to extend our appreciation to L. Greenwood, A. Heeb, J. Hubert, B. Krager, K. Lohraff, L. Mecham, C. Montgomery, D. Newman, K. Stohlgren for generously providing information and photos or specimens included in this note.

AMPHIBIA: CAUDATA

SPOTTED SALAMANDER
Ambystoma maculatum
Scott Co.: (S1 T28N R12E); date unknown; A. Heeb (digital photo, UMC 1466P); General Watkins Conservation Area (S28 T28N R13E); 23 April 2008; J. Briggler, M. Bowyer, R. Hayes (digital photo, UMC 1539P).

MARBLED SALAMANDER
Ambystoma opacum
Douglas Co.: Grundy Conservation Area (S20 T26N R17W); 3 September 2008; B. Edmond, M. Bowe (digital photo, UMC 1573P).
St. Francois Co.: St. Francois State Park (S25 T38N R4E); 26 April 2008; R. Daniel, K. Cannon, A. Heeb (larvae, UMC 8056).

DARK-SIDED SALAMANDER
Eurycea longicauda
Moniteau Co.: 3.5 mi SE Jamestown (S22 T46N R14W); 21 October 2008; R. Krager, G. Pinson, J. Pinson (digital photo, UMC 1479P).

MUDPUPPY
Necturus maculosus
Carter Co.: Current River (S24 T27N R1W); 28 August 2008; J. Briggler, K. Kelly, V. Grant, M. Gossett (digital photo, UMC 1649P).

CENTRAL NEWT
Notophthalmus viridescens
Henry Co.: Rt. Z, 4.5 mi. E Jct. Rt. ZZ (S24 T40N R24W); 6 September 2008; B. Edmond (UMC 8148).

Perry Co.: 3.3 air mi. NNW Biehle (S18 T34N R11E); 2 September 2006; R. Essner, P. Brunkow, R. Patel, D. Huff, J. Robins (larva-SIUE 2949) (Essner, et al. 2008). Red Rock Landing Conservation Area (S13 T35N R12E); 24 April 2008; J. Briggler, M. Bowyer, M. Keeley, B. Gillispie (digital photo, UMC 1642P).

AMPHIBIA : ANURA

COPE'S GRAY TREE FROG
Hyla chrysoscelis
Carter Co.: Peck Ranch Conservation Area (S4 T27N R2W); 26 May 2008; K. Stohlgren (verified by call)(digital photos, UMC 1427-1428P).
Reynolds Co.: (S4 T27N R2W); 25 June 2008; D. Newman, K. Stohlgren (digital photo, UMC 1439P).
St. Francois Co.: St. Francois State Park (S36 T38N R4E); 25 April 2008; K. Stohlgren, D. Newman (verified by call)(digital photo, UMC 1511P).

GRAY TREE FROG
Hyla versicolor
Bates Co.: Settle's Ford Conservation Area (S10 T42N R29W); 25 May 2008; B. Edmond (verified by call)(UMC 8153).
Scott Co.: (S6 T28N R13E); date unknown; A. Heeb (verified by call)(digital photo, UMC 1468P).

EASTERN NARROW-MOUTHED TOAD
Gastrophryne carolinensis
Douglas Co.: 2.5 mi. S. Smallet (S32 T25N R16W); 18 April 2008; R. Krager, G. Pinson, J. Pinson (digital photo, UMC 1481P).
Howell Co.: Co. Rd. 8400 (S26 T24N R7W); 10 May 2008; B. Summers (digital photo, UMC 1513P).

GREEN FROG
Lithobates clamitans
Scott Co.: (S6 T28N R13E); date unknown; A. Heeb (digital photo, UMC 1467P).

PICKEREL FROG
Lithobates palustris
Henry Co.: Rt. Z, 4.5 mi. E Jct. Rt. ZZ (S24 T40N R24W); 6 September 2008; B. Edmond (UMC 8146-7).
Knox Co.: (S32 T61N R10W); 22 May 2008; E. Hooper, C. Montgomery (UMC 8152).

REPTILIA: SQUAMATA (LIZARDS)

SIX-LINED RACERUNNER
Aspidoscelis sexlineatus
St. Charles Co.: Klondike Park, nr. Defiance (S8 T44N R2E); 7 June 2008; M. Ormsby, C. Larocca (digital photo, UMC 1542P).

WESTERN SLENDER GLASS LIZARD
Ophisaurus attenuatus
Carter Co.: Peck Ranch Conservation Area (S7 T27N R2W); date unknown; S. Lillie (digital photo, 1426P).
Ripley Co.: Rt. K, ~1 mi. N Jct. N-30 (S20 T24N R3E); 28 May 2008; L. Greenwood (digital photo, UMC 1429P).

COAL SKINK
Plestiodon anthracinus
St. Francois Co.: St. Francois State Park (S36 T38N R4E); 26 March 2008; B. Glorioso, R. Daniel, J. Hubert (digital photo, UMC 1416P).

COMMON FIVE-LINED SKINK
Plestiodon fasiatus
Chariton Co.: (S27 T53N R17W); 10 June 2007; T. Nagel (digital photo, UMC 1111P)

BROAD-HEADED SKINK
Plestiodon laticeps
New Madrid Co.: JL and G Girvin Conservation Area (S28 T20N R14E); 4 October 2008; R. Daniel, B. Edmond (UMC 8119).
St. Francois Co.: St. Francois State Park (S36 T38N R4E); 25 April 2008; K. Stohlgren, D. Newman (digital photo, UMC 1509P).
Scott Co.: (S1 T28N R12E); 21 May 2008; A. Heeb (digital photo, UMC 1434P).

LITTLE BROWN SKINK
Scincella lateralis
Jasper Co.: Elvin Ummel Tech Bldg, MSSU Campus, Joplin (S6 T27N R32W); 19 May 2004; collector unknown (UMC 8040).
New Madrid Co.: JL and G Girvin Conservation Area (S28 T20N R14E); 4 October 2008; R. Daniel, B. Edmond (UMC 8120).
Perry Co.: Red Rock Landing Conservation Area (S13 T35N R12E); 24 April 2008; J. Briggler, M. Bowyer, M. Keeley, B. Gillispie (UMC 8151).
St. Charles Co.: AA Busch Conservation Area, lake 33 (S23 T46N R2E); 9 September 2007; M. Ormsby (digital photo, UMC 1530P).

REPTILIA: SQUAMATA (SNAKES)
COPPERHEAD
Agkistrodon contortrix
Dunklin Co.: Little River Lake Conservation Area (S34 T19N R10E); 4 October 2008; R. Daniel, B. Edmond (digital photo, UMC 1617P).

WESTERN COTTONMOUTH
Agkistrodon piscivorus
Scott Co.: (S30 T29N R13E); date unknown; A. Heeb (digital photo, UMC 17476P).

TIMBER RATTLESNAKE
Crotalus horridus
Perry Co.: Red Rock Landing Conservation Area (S13 T35N R12E); 24 April 2008; J. Briggler, M. Bowyer, M. Keeley, B. Gillespie (digital photo, UMC 1540P).

WESTERN WORMSNAKE
Carphophis vermis
Douglas Co.: 2.5 mi. S. Smallet (S32 T25N R16W); 22 April 2008; R. Krager, G. Pinson, J. Pinson (digital photo, UMC 1485P).

SCARLETSNAKE
Cemophora coccinea
Scott Co.: location withheld; 8 August 2008; B. Gillispie, B. Blechle (digital photo, UMC 1647P).

COACHWHIP
Coluber flagellum
Jasper Co.: Carterville (T28N R32W); 30 April 2004; collector unknown (UMC 8039).

RING-NECKED SNAKE
Diadophis punctatus
Perry Co.: Apple Creek nr. Biehle (S19 T34N R11E); 1 October 2006; R. Essner (SIUE 2948) (Essner and Axtell 2008).
Schuyler Co.: Rt. B Jct. Rt. K (S14 T64N R16W); 11 October 2008; R. Daniel (UMC 8125).

PRAIRIE KINGSNAKE
Lampropeltis calligaster
Ripley Co.: (20 T24N R3E); 30 April 2007; L. Greenwood (digital photo, UMC 1417P).

SPECKLED KINGSNAKE
Lampropeltis getula
Linn Co.: MO 139, 0.5mi. S Jct. MO 36 (S7 T57N R20W); 26 August 2004; M. Rochford, T. Crabill (UMC 7967).

RED MILKSNAKE
Lampropeltis triangulum
Ripley Co.: (S20 T24N 3E); 7 May 2007; L. Greenwood (digital photo, UMC 1418P); Wolf Mountain Glade (S18 T23N R1W); 3 October 2008; B. Edmond (digital photo, UMC 1611P).

ROUGH GREENSNAKE
Opheodrys aestivus
Gasconade Co.: Rt. A, 3.1 mi. N Jct. MO 28 (S32 T42N R6W); 17 May 2008; R. Daniel (UMC 8053).
Ripley Co.: Rt. DD, just NW Jct. Co. Rd. EE-2 (S5 T21N R1E); 3 October 2008; B. Edmond (digital photo, UMC 1609P).
St. Francois Co.: St. Francois State Park (S36 T38N R4E); 26 April 2008; J. Briggler, K. Stohlgren (digital photo, UMC 1505P).

BLACK RATSNAKE
Pantherophis obsoletus
Ozark Co.: (S30 T23N R11W); 23 July 2008; D. Newman, K. Stohlgren (digital photo, 1443P).

PIGMY RATTLESNAKE
Sistrurus miliarius
Ripley Co.: (S20 T24N R3E); 26 May 2008; L. Greenwood (digital photo, UMC 1430P).

DEKAY'S BROWNSNAKE
Storeria dekayi
Cape Girardeau Co.: Trail of Tears State Park (S14 T32N R14E); 21 October 2007; B. Glorioso (UMC 8099).
Dunklin Co.: Hornersville Swamp Conservation Area (S20 T16N R9E); 4 October 2008; B. Edmond, R. Daniel (digital photo, UMC 1614P).

RED-BELLIED SNAKE
Storeria occipitomaculata
Scott Co.: (S19 T29N R13E); date unknown; A. Horrell (digital photo, UMC 1475P).

WESTERN RIBBONSNAKE
Thamnophis proximus
Ozark Co.: (S30 T23N R11W); 31 July 2008; D. Newman, K. Stohlgren (digital photo, UMC 1445P).

COMMON GARTERSNAKE
Thamnophis sirtalis
Bollinger Co.: Duck Creek Conservation Area (S32 T28N R9E); 28 April 2008; J. Briggler, K. Cordell, T. Smith, M. Leahy, A. West (digital photo, UMC 1643P).
Dunklin Co.: Warbler Woods Conservation Area (S22 T16N R9E); 4 October 2008; R. Daniel, B. Edmond (UMC 8127).
Scott Co.: Co. Rd. 335, near Sand Prairie Conservation Area (S15 T28N R14E); 9 September 2007; B. Edmond, M. Bowe (digital photo, UMC 1181P). General Watkins Conservation Area (S22 T28N R13E); 30 May 2007; B. Glorioso (digital photo, UMC 1213P).
Taney Co.: US 160, entrance Mark Twain National Forest (S19 T23N R18W); 21 September 2008; B. Edmond, M. Bowe, R. Daniel, K. Cannon (UMC 8126).

ROUGH EARTHSNAKE
Virginia striatula
Dallas Co.: Industry Dr. (S12 T35N R18W); 10 May 2008; R. Daniel (UMC 8052).
St. Francois Co.: St. Francois State Park (S25 T38N R4E); 26 April 2008; R. Daniel (UMC 8050). St. Francois State Park (S19 T38N R5E); 27 April 2008; S. Lillie, B. Edmond (digital photo, UMC 1517P).

TESTUDINES
SPINY SOFTSHELL
Apalone spinifera
Marion Co.: S. Fabius River (S21 T59N R5W); 25 May 2006; R. Dames (digital photo, UMC 1079P).
Scott Co.: MO 77 nr. Chaffee (S25 T29N R12E); date unknown; A. Heeb (digital phot, UMC 1470P).

SNAPPING TURTLE
Chelydra serpentina
Carter Co.: Peck Ranch Conservation Area (S4 T27N R2W); 22 March 2008; J. Flinn, J. Layne (digital photo, UMC 1487P).
Scott Co.: (S36 T29N 12E); date unknown; A. Heeb (digital photo, UMC 1471P).

SOUTHERN PAINTED TURTLE
Chrysemys dorsalis
Wayne Co.: Duck Creek Conservation Area (S25 T28N R8E); 22 June 2008; J. Briggler (digital photo, UMC 1646P).

WESTERN PAINTED TURTLE
Chrysemys picta
Marion Co.: South Fabius River (S23 T59N R8W); 28 June 2006; R. Dames (digital photo, UMC 1080P).
Polk Co.: MO 123, just S Jct. Co. Rd. E-360 (S4 T34N R24W); 8 June 2008; B. Edmond, J. Edmond, A. Edmond (digital photo, UMC 1543P).

NORTHERN MAP TURTLE
Graptemys geographica
Audrain Co.: MO 15 X Young's Creek (S5 T52N R9W); 24 June 2008; R. Daniel (UMC 8128).

OUACHITA MAP TURTLE
Graptemys ouachitensis
Jefferson Co.: Big River (S23 T39N R3E); 13 August 2008; J. Briggler, K. Kelly (digital photo, UMC 1648P).

FALSE MAP TURTLE
Graptemys pseudogeographica
Stoddard Co.: Mingo National Wildlife Refuge Spillway (S32 T27N R8E); date unknown; A. Horrell (digital photo, UMC 1472P).

ORNATE BOX TURTLE
Terrapene ornata
St. Francois Co.: St. Francois State Park (S 36 T38N R4E); 26 April 2008; R. Daniel, K. Cannon, A. Heeb (digital photo, UMC 1450P)(possible released specimen).

RED-EARED SLIDER
Trachemys scripta
Perry Co.: Rt. B (S20 T34N R11E); 23 April 2008; J. Briggler, M. Bowyer (digital photo, UMC 1645P).

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Natural History Notes

SCAVENGING BEHAVIOR OF *Thamnophis sirtalis*

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On 25 March 2007 an adult *Thamnophis sirtalis* was observed attempting to consume a DOR adult *Anaxyrus (Bufo) americanus* approximately 3.8 miles WSW of Fredricktown in Madison County. *T. sirtalis* are generalist predators that consume a variety of invertebrate prey, fish, anurans, other reptiles, young birds and mammals, but primarily feed on toads (Fitch 1965, Trauth and McAllister 1995). Kephart and Arnold (1982) report the consumption of carrion by this species.

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NEW SIZE RECORDS FOR FOUR MISSOURI SNAKES

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Edmond and Daniel (2001) provided the most recent compilation of maximum size records for Missouri amphibians and reptiles. Here I present records of exceptionally large individuals of four snakes species that exceed the published size maxima for Missouri. Body size measurements were taken to the nearest mm using standard measurement techniques for snakes (snout-vent (SVL) and total length (TL)) given by Conant and Collins (1998). The snakes have been deposited in the Dean E. Metter Memorial Collection, University of Missouri-Columbia.

On May 22, 2008 Jason Bowers salvaged a large *Pantherophis obsoletus* (UMC 8097) southeast of Warrensburg on Co. Rd. SE600 in Johnson County. The specimen measured prior to preservation had a SVL of 164.6 cm and a TL of 194.1 cm. The previous size record (BWMC 2117) had a TL of 187.2 cm.

A large male *Sistrurus miliarius* (UMC 8114) was salvaged by Brian Edmond, Kaycee Cannon and the author on Rt. UU in southeast Christian County on September 20, 2008. It had a SVL of 49.1 cm and a TL of 55.5 cm. The previous size record for Missouri (KU 84590) was 55.0 cm.

On October 5, 2008 a male *Thamnophis proximus* (UMC 8121) was salvaged by the author on MO 94 in southern Montgomery County approximately 2.9 miles E of Bluffton. The SVL was 68.8 cm and the TL was 95.2 cm. The previous state size record was 92.7 cm (CMSU 1810).

The author salvaged a large *Thamnophis sirtalis* (UMC 8122) October 7, 2008 on Eagle Bluff Conservation Area in Boone County . It had a SVL of 81.2 cm and a TL of 102.7 cm. The previous record had a TL of 98.0 cm (BWMC 1103).

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ASSOCIATION EVENTS IN 2008

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Introduction

For the third year, the Missouri Herpetological Association sponsored three official events: the traditional annual meeting and two field trips. A total of 38 individuals, representing 12 organizations, attended at least one of these events. Ten scientific paper sessions were presented during the twenty-first annual meeting and countless conversations, anecdotes, tales, and plans were exchanged among the members attending the various events.

More than 662 individual reptiles and amphibians were observed on the two field trips, representing 39 species (8 salamanders, 9 anurans, 5 lizards, 11 snakes, 6 turtles). Individual animals collected or photographed were deposited in the University of Missouri's Dean E. Metter Memorial Collection and will thus be reported as new records where appropriate and used in future updates of the *Atlas of Amphibian and Reptiles of Missouri*. Furthermore, official field trip reports were provided to Department of Natural Resources officials at the state parks that sponsored the field trips.

Photos and details for all association events, past and future, can be found on the "Events" page of the Association's web site (http://www.moherp.org/).

Spring 2008 Field Trip: St. Francois State Park

The spring field trip was held the weekend of 25 - 27 April 2008 at St. Francois State Park, St. Francois County, Missouri. The purpose of the trip was a herpetological survey of select portions of the park.

Seventeen members, representing five different institutions, caught more than 543 individual reptiles and amphibians, representing a total of 32 species. Most collecting activity occurred on Saturday 26 April 2008, but some individual animals were caught on Friday or Sunday. The entire weekend was characterized by cool evening temperatures and warm and sunny daytime conditions. The high temperature on Saturday approached 70^{o}F. Habitats searched included roads, ponds, spring-fed streams, fens, rocky wooded hillsides, forest, grassy areas, and glades.

Several county records were documented with specimens from St. Francois State Park. One previously unvouchered county record (Cave Salamander (*Eurycea lucifuga*)) and six new county records: Marbled Salamander (*Ambystoma opacum*), Cope's Gray Treefrog (*Hyla chrysoscelis*), Broad-headed Skink (*Plestiodon laticeps*), Northern Rough Greensnake (*Opheodrys aestivus*), Rough Earthsnake (*Virginia striatula*), Ornate Box Turtle (*Terrapene ornata*). The total species list along with numbers of individuals can be seen in Table 1. Some amphibian species' numbers were augmented with eggs, larvae, or calling males (*e.g.*, Central Newt, Spotted Salamander, Marbled Salamander, Cricket Frog, Spring Peeper, Cope's Gray Treefrog, Green Frog, *etc.*). In these cases, actual counted individuals are represented in the count and an unknown number of additional animals are represented with an asterisk (*). For Spotted Salamanders (*Ambystoma maculatum*), the number listed is a count of egg *masses* (*not* individuals). DeKay's Brownsnake (*Storeria dekayi*) was represented by a single dead adult individual.

The MHA would like to thank the Missouri Department of Natural Resources for providing permission to use state park property for the field trip. Special appreciation is extended to Jamie Hubert for her hospitality and for leading the hikes to the glade and fen.

Annual Meeting: Reis Biological Station

The 21st Annual Meeting of the Missouri Herpetological Association was held on 27 - 28 September 2008 at Reis Biological Station near Steelville, Crawford County, Missouri.

A total of 29 members, representing 11 institutions, attended the meeting. Ten paper sessions were presented during the regular meeting. A short business meeting followed the last regular presentation. Business meeting discussion topics included the date and location of the 2009 fall meeting. After dinner, the keynote presentation, entitled *Some things we have learned while chasing lizards in paradise* was given by Bob Powell, Professor in the Department of Biology, Avila University. Abstracts of the presentations are provided elsewhere in this newsletter.

The Association would like to extend a special appreciation to Bob Aldridge and Saint Louis University for graciously hosting the meeting and allowing members to stay overnight *gratis* at the field station.

Fall 2008 Field Trip: Onondaga Cave State Park

The fall field trip was held on Sunday 28 September 2008 at Onondaga Cave State Park, Crawford County, Missouri. The purpose of the trip was a brief survey of select portions of the park.

Eleven members, representing five different institutions, caught more than 119 individual reptiles and amphibians, representing a total of 17 species. Warm temperatures (80^{o}F+) and sunny conditions characterized the weekend. The total species list along with numbers of individuals can be seen in Table 1. The ratsnake was represented solely by a freshly shed skin. Spring peepers were heard calling at most sites. Eastern Gray Treefrogs were also heard calling near the Meramec River. Finally, many of the "Cave Salamanders" (*Eurycea lucifuga*) seen in the cave were hybrids with Long-Tailed Salamanders (*Eurycea longicauda*).

The MHA would like to thank the Missouri Department of Natural Resources and Tara Flynn for providing permission to use state park property for the field trip. Special appreciation is extended to Greg Hanson, our contact at the park, and Daniel Gruhn, our guide for the glade and cave portions of the trip.

Table 1. List of species captured or observed during the Association's 2008 field trips. An asterisk (*) indicates that the number represents a minimum count for that species.

Species	Common Name	No	St Francois SP	Onondaga Cave SP
Salamanders (Caudata)				
Notophthalmus viridescens	Central Newt	48*	+	
Ambystoma maculatum	Spotted Salamander	106*	+	
Ambystoma opacum	Marbled Salamander	9*	+	
Eurycea longicauda	Long-tailed Salamander	12	+	
Eurycea lucifuga	Cave Salamander	13	+	+
Eurycea spelaea	Grotto Salamander	4		+
Plethodon albagula	Western Slimy Salamander	82	+	+
Plethodon serratus	Southern Red-backed Salamander	37	+	
Frogs and Toads (Anura)				
Anaxyrus americanus	American Toad	3	+	
Acris crepitans	Cricket Frog	20*	+	+
Hyla chrysoscelis	Cope's Gray Treefrog	5*	+	
Hyla versicolor	Gray Treefrog	2		+
Pseudacris crucifer	Spring Peeper	11*	+	+
Lithobates catesbeianus	American Bullfrog	3	+	+
Lithobates clamitans	Green Frog	84*	+	
Lithobates palustris	Pickerel Frog	13		+
Lithobates sphenocephalus	Southern Leopard Frog	4	+	
Lizards (Lacertilia)				
Plestiodon fasciatus	Common Five-lined Skink	9	+	
Plestiodon laticeps	Broad-headed Skink	1	+	
Scincella lateralis	Little Brown Skink	16	+	+
Crotaphytus collaris	Eastern Collared Lizard	4	+	
Sceloporus consobrinus	Prairie Lizard	97*	+	+
Snakes (Serpentes)				
Carphophis vermis	Western Wormsnake	1	+	
Coluber constrictor	North American Racer	2	+	
Diadophis punctatus	Ring-necked Snake	24	+	+
Lampropeltis triangulum	Red Milksnake	1		+
Nerodia sipedon	Northern Watersnake	1	+	
Opheodrys aestivus	Northern Rough Greensnake	1	+	
Pantherophis obsoletus	Texas Ratsnake	1		+
Storeria dekayi	DeKay's Brownsnake	2	+	
Thamnophis sirtalis	Common Gartersnake	2	+	
Virginia striatula	Rough Earthsnake	2	+	
Virginia valeriae	Western Smooth Earthsnake	1	+	

Turtles (Testudines)				
Chelydra serpentina	Eastern Snapping Turtle	1	+	
Graptemys geographica	Northern Map Turtle	4		+
Terrapene carolina	Three-toed Box Turtle	14	+	+
Terrapene ornata	Ornate Box Turtle	1	+	
Trachemys scripta	Red-Eared Slider	16		+
Apalone spinifera	Spiny Softshell	5	+	+

ADDITIONS TO THE BIBLIOGRAPHY OF REFERENCES ON THE HERPETOFAUNA OF MISSOURI

Compiled by

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The following is a list of references dealing with the biology of amphibians and reptiles from Missouri that have been brought to my attention since the publication of Johnson (2000), Powell and Daniel (2000), and Daniel (2001, 2002, 2003, 2004, 2005, 2006, 2007). Readers are requested to notify the author of any additional references that should be included in future compilations.

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