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INTRODUCTION

The Twenty-eighth Annual Meeting of the Missouri Herpetological Association was held 19-20 September 2015 at, Reis Biological Station, 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 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

29th Annual Meeting of the Missouri Herpetological Association

The Twenty-ninth Annual Meeting of the Missouri Herpetological Association will be held 17-18 September 2016. Next year we will return to the Bull Shoals Field Station, Taney County near Forsyth, Missouri. A “call for papers” and registration materials will be sent electronically in mid-July. For additional information, please check the official MHA site or contact Jeff Briggler at:

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P.O. Box 180
Jefferson City, MO 65102-0180
(573) 751-4115
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MHA on the Net


Cover: Northern Italian Wall Lizard (Podarcis siculus campestris). Gravid female from introduced population in Joplin, Jasper County, Missouri. See page 12 this issue.
THE TALE OF TWO HEADS, THE NATURAL OCCURRENCE OF A TWO-HEADED TURTLE

Glenn J. Manning
College of Mathematical and Natural Science, University of Arkansas at Monticello, Monticello, AR

On 12 April 2014, a two-headed turtle was discovered at the Greenhill United Methodist Church, Wilmar, AR. In addition to being two-headed, the turtle had two sets of front legs and only one pair of back legs. The turtle was confirmed to be an Eastern River Cooter (*Pseudemys concinna concinna*). The turtle was retained in the lab to observe behavior and to investigate anatomical structures. The right head was observed to be the dominant during feeding trials. An X-ray revealed that the split in the two individuals was approximately the sacral region. Due to complication of the polyccephaly the turtle did drown due to not being able to right itself after flipping over in the shallow water of its enclosure.

PHYLOGEOGRAPHY AND ECOLOGICAL NICHE MODELING OF THE QUEENSNAKE (*Regina septemvittata*)

Derek Filipek
Biology Department, University of Central Arkansas, Conway, AR

Allopatric speciation is driven by a restriction of gene flow due to geographic isolation of populations and is considered the most common geographic mode of speciation. A significant barrier to gene flow in eastern North America is the Mississippi River which has been implicated in causing lineage divergence in a wide range of taxa groups. The Queensnake (*Regina septemvittata*) has a large contiguous range in eastern North America except for a geographically isolated population in Arkansas which represents the only population west of the Mississippi River. I hypothesize that the Arkansas population of *R. septemvittata* represents an evolutionary lineage distinct from eastern *R. septemvittata* due to the Mississippi River acting as a barrier to gene flow and the great extent of spatial separation between the two range segments. I am currently
performing phylogenetic analyses to determine if the Arkansas population represents a distinct monophyletic group (clade) compared to the eastern population using samples from throughout the distribution of the species. I am also looking at the historical demography of this species as well as making ecological niche models to test hypotheses about range-limiting factors, past range dynamics, and niche evolution. Sequencing results so far indicate little sequence divergence between the range segments (~1%) which suggests the two range segments were separated relatively recently. Ecological niche models suggest that the two range segments are currently separated by unsuitable habitat and that the species had a contiguous distribution in the Gulf Coast region during the Last Glacial Maximum (~22,000 years ago).

CONVERGENT EVOLUTION OF BRAIN MORPHOLOGY AND COMMUNICATION MODALITIES IN LIZARDS

Christopher D. Robinson, Michael S. Patton, Brittney M. Andre, and Michele A. Johnson
Department of Biology, Trinity University, San Antonio, TX

Animals can send and receive information using several types of communication modalities, including visual, chemical, auditory, and tactile. Although we understand that communication behaviors are linked to certain brain regions, we don’t yet know if cellular morphology in these regions has evolved in conjunction with the use of a modality. To address this, we investigated the relationship between communication modalities and neural morphology in six lizard species. We chose two species (Anolis carolinensis and Leiocephalus carinatus) that use mainly visual forms of communication, two species (Aspidoscelis gularis and Scincella lateralis) that use mainly chemical forms of communication, and two species (Sceloporus olivaceus and Hemidactylus turcicus) that use both of these modalities to communicate. For each species we performed focal observations to quantify communications behaviors, collected 9-10 males of each species, and cryosectioned their brains to measure soma size and density in the lateral geniculate nucleus, nucleus rotundus (two areas associated with visual behaviors), and the nucleus sphericus (associated with chemical behaviors). Using phylogenetically informed statistics, we found that density of neurons in the lateral geniculate nucleus was positively correlated with rate of visual behaviors and that the size of neurons in the nucleus sphericus was positively correlated with proportion of chemical behaviors. These relationships suggest convergent evolution of neural morphology among species that use similar communication modalities.

ADAPTIVE DIFFERENTIATION IN MORPHOLOGY AFTER COLONIZATION OF NOVEL ENVIRONMENTS

Ian T. Clifton, Jeremy D. Chamberlain, and Matthew E. Gifford
Biology Department, University of Central Arkansas, Conway, AR

Colonization of a novel environment by a species is often associated with a divergence in phenotype from the "ancestral" population in response to the new
environmental pressures such as prey availability. Morphology associated with feeding is likely influenced by prey size, especially in gape-limited predators. We studied the response of diamond-backed watersnakes (*Nerodia rhombifer*) to new environments with different prey regimes than "ancestral" environments. While *N. rhombifer* generally inhabit natural areas, they have also colonized fish farms. These farms frequently specialize in the types of fish they produce with some raising large-bodied fish and others raising small-bodied fish. We found that snakes inhabiting environments with large fish have relatively larger heads than snakes inhabiting small-prey environments. We also provide evidence that cranial traits are significantly heritable thus differences are unlikely to be greatly influenced by phenotypic plasticity.

**THE INFLUENCE OF PREY TYPE AND SIZE ON FORAGING BEHAVIOR IN THE COTTONMOUTH, *Agkistrodon piscivorus***

*Kari Spivey and Brian Greene*
*Biology Department, Missouri State University, Springfield, MO*

Studies of pitviper foraging behavior have revealed that the duration of fang contact and the amount of venom expended during an envenomating strike vary across foraging contexts. Some of the variation in strike behavior appears to be explained by adaptive responses to prey type and size. For example, mammalian prey are usually released and trailed by rattlesnakes after envenomation whereas birds are held until immobilized. Similarly, rattlesnakes typically inject larger quantities of venom into larger prey which are more difficult to subdue and digest than smaller prey. To provide an ecological contrast to rattlesnakes, we used staged foraging trials to study the effects of prey body size and prey type on latency to strike and prey time to death in ten cottonmouths (*Agkistrodon piscivorus*). Two separate experiments were conducted. We evaluated the effects of prey type by comparing response variables for three common types of ecologically relevant cottonmouth prey species: five-lined skinks (*Plestiodon fasciatus*), leopard frogs (*Lithobates pipiens*) and mice (*Mus musculus*). The mean latency to strike was not significantly different across all five prey types; however, skinks survived significantly longer than any other prey type. Snakes also struck and held skinks significantly more often than other prey types. This result suggests that cottonmouths may be compensating for increased immobilization latencies in skinks to increase foraging success. Ongoing parallel studies of venom expenditure across prey types and sizes are incomplete but predictions will be discussed.

**A COMPARISON OF TURTLE COMMUNITIES IN NATURAL AND ARTIFICIAL WETLANDS***

*Joshua R. Harmon and Day B. Ligon*
*Department of Biology, Missouri State University, Springfield, MO*

The construction of artificial wetlands is a common means of mitigating the loss of natural wetland. Although such wetlands are often specifically managed for particular
taxa, such as waterfowl, other species may reap unintended benefits. While waterfowl and amphibian communities in artificial wetlands have been well-studied, research regarding the utilization of these artificial wetlands by aquatic and semi-aquatic turtles is limited. Using a mark-recapture approach to conduct population censuses, we compared the turtle communities of two naturally-made beaver ponds with two artificially constructed wetlands that are managed for waterfowl. We detected several turtle species using both natural and artificial wetlands, but turtle community structure and size differed among locations. The differences in the turtle communities is dependent on many factors but is most likely influenced by vegetation, depth, resource availability, and seasonality of water availability. Our results highlight the relative effectiveness of constructed wetlands as a resource for freshwater turtles. Additional work is needed to determine management prescriptions that will benefit waterfowl and aquatic turtles alike.

LANDING IN BASAL FROGS: EVIDENCE OF SALTATIONAL PATTERNS IN THE EVOLUTION OF ANURAN LOCOMOTION

Richard L. Essner, Jr.
Department of Biological Sciences, Southern Illinois University, Edwardsville, IL

All frogs are assumed to jump in a similar manner by rapidly extending hindlimbs during the propulsive phase and rotating the limbs forward during flight in order to land forelimbs first. However, studies of jumping behavior are lacking in frogs of the family Leiopelmatidae which diverged from all other frogs (Lalagobatrachia) over 200 mya. These semi-aquatic or terrestrial anurans retain a suite of plesiomorphic morphological features and are unique in using an asynchronous (trot-like) rather than synchronous "frog-kick" swimming gait of other frogs. We compared jumping behavior in leiopelmatids to more derived frogs and found that leiopelmatids maintain extended hindlimbs throughout flight and landing phases and do not land on adducted forelimbs. These "belly-flop" landings limit the ability for repeated jumps and are consistent with a riparian origin of jumping in frogs. The unique behavior of leiopelmatids shows that frogs evolved jumping before they perfected landing. Moreover, an inability to rapidly cycle the limbs may provide a functional explanation for the absence of synchronous swimming in leiopelmatids.

A TALE OF TWO SALAMANDERS: COMPARING BEHAVIOR AND METABOLIC RATES

Ben Dalton, Travis Reeder, Rachel Bortosky and Alicia Mathis
Biology Department, Missouri State University, Springfield, MO

If two closely-related species share the same niche, you could expect them to not only converge on a common phenotype, but to behave similarly in when presented with similar, naturally-occurring situations. Salamanders of the genus Plethodon are diverse in form and wide-ranging across the eastern US. Two Missouri salamanders, Plethodon angusticlavius and Plethodon serratus, are virtually identical and, while they share the
same habitat type, they have been evolutionarily separated for approximately 25mya. When presented with an exploratory experiment, in which the time to enter an unfamiliar area was recorded, the two species showed two very different responses: *P. angusticlavius* explored farther and more quickly than *P. serratus*. In an attempt to identify the underlying cause of this difference in exploratory behavior, basal metabolic rates of the two species were quantified via oxygen consumption across three temperatures. No differences between species were recorded, although temperature had a very significant effect on metabolic rate. In light of this difference in exploratory behavior, yet no difference in basal metabolism, other hypotheses must be explored.

**BEHAVIORAL RESPONSES OF RINGED AND SPOTTED SALAMANDERS WHEN EXPOSED TO CUES FROM PREDATORS WITH DIFFERENT DIETS.**

*Kayla Shelton and Alicia Mathis*

Biology Department, Missouri State University, Springfield, MO

Multiple species of *Ambystoma* can sometimes coexist in ponds, creating the potential for intra-guild predation. In the Ozarks, ringed salamanders (*Ambystoma annulatum*) can coexist with marbled salamanders (*A. opacum*) and spotted salamanders (*A. maculatum*). Ringed and marbled salamanders lay their eggs in ponds in the fall and overwinter as larvae, whereas spotted salamanders breed in the spring. Ringed and marbled salamander larvae can be cannibalistic and can prey upon larvae of the other two species. Larvae should experience increased survival if they can discriminate between predators that have recently consumed another salamander (high risk) versus those that have not (low risk). We exposed two life stages of ringed and spotted salamanders to chemical cues from marbled salamanders that had consumed different diets and quantified their responses. Embryos of spotted salamanders showed increased gill pulses in response to cues from predators that had consumed congeneric *Ambystoma* than predators that had consumed worms. Larval ringed salamander showed increased movements in response to predators that had consumed a conspecific versus a worm. Therefore, predator diet influences responses of both embryonic and larval ambystomatid salamanders.

**POPULATION LEVEL DIFFERENCES IN THERMAL SENSITIVITY OF ENERGY ASSIMILATION.**

¹Timothy A. Clay and ²Matthew E. Gifford

¹Department of Biology, University of Arkansas at Little Rock, Little Rock, AR
²Biology Department, University of Central Arkansas, Conway, AR

Previous work has shown that among species of terrestrial salamanders, thermal performance metrics are correlated with average environmental conditions. Species with large ranges usually encompass a wide range of environmental gradients as a result of variations in elevation or latitude. Given a large range of environmental conditions, we
could expect to see population level adaptations to local environmental conditions. We explored the thermal sensitivity of energy assimilation within two species of Plethodon to answer: are there local adaptations to environmental conditions and are these consistent with theoretical predictions? We examined populations at the extremes for each species, with respect to latitude, populations that were separated by 500km and with respect to elevation, populations that were separated by 900m. Controlled feeding trials were conducted at ecologically relevant temperatures to produce thermal performance curves for each population. Preliminary work suggests that elevation and latitude affect thermal sensitivity of energy assimilation. Specifically, populations from warmer environments, low elevation or low latitude, may have higher assimilation rates than populations from cooler environments, high elevation and high latitudes. These preliminary observations are consistent with a pattern of co-gradient variation.

VARIABILITY IN FUNCTIONAL RESPONSE CURVES AMONG LARVAL SALAMANDERS: COMPARISONS ACROSS SPECIES AND SIZE CLASSES

Tom Anderson, Cristina Ramirez, Katelyn Dodson and Ray Semlitsch
Division of Biological Sciences, University of Missouri, Columbia, MO

Predator species and body size represent critical factors that have differential effects on prey populations, as well as overall community structure. However, investigations of how morphologically-similar predator species, simultaneous to variation in predator body size, influence lower trophic levels are infrequently performed. We tested whether predator species and body size influenced the functional response curve of three larval ambystomatid salamanders (Ambystoma annulatum, A. opacum and A. maculatum) while eating congeneric prey. We combined larval salamanders of varying body sizes with up to six prey densities within experimental microcosms. We tested for the shape of the functional response curve, and obtained parameter estimates for attack rate and handling time for each predator size-species combination. We found variability among both species and size classes, with a combination of Type I and Type II functional response curves. Large size classes of predators had higher attack rates than smaller size classes, but equivalently sized larvae of different species exhibited differences in attack rates and handling time. Our study shows that predation risk varies depending on the size structure and diversity of predators present in a food web, and that grouping predators by either species or size class may reduce the ability to predict changes in community structure resulting from such interactions.

DETERMINANTS OF DISPERSAL PATTERNS IN THE STREAM SALAMANDER, Desmognathus brimleyorum

Amber L. Anderson and Matthew E. Gifford
Biology Department, University of Central Arkansas, Conway, AR

Dispersal is fundamental to evolution, population demography, and community assembly. Understanding the mechanisms that influence dispersal is especially important
in the context of landscape fragmentation and global climate change. An individual’s propensity to disperse is dependent on a variety of both extrinsic and intrinsic factors. A spatially explicit mark recapture study is being conducted to better understand the multiple factors influencing dispersal and population dynamics in the stream salamander, *Desmognathus brimleyorum*. The aim of this study is to effectively make population level predictions about factors influencing dispersal and how it contributes to population dynamics of *D. brimleyorum* within a stream corridor. There is an observed upstream dispersal bias; future investigations intend to determine the factors that influence upstream dispersal. We predict that there will be an association between survival rates and habitat variation along the stream corridor and that the traits of individuals will correlate with dispersal phenotypes.

**USE OF ARTIFICIAL SHELTERS (NEST BOXES) TO SUPPLEMENT BREEDING HABITAT FOR HELLBENDERS (*Cryptobranchus alleganiensis*)**

1**Jeffrey T. Briggler and 2**John R. Ackerson

1Missouri Department of Conservation, Jefferson City, MO

2Missouri Department of Conservation, West Plains, MO

Currently, there are two recognized subspecies of hellbenders; the Ozark hellbender (*C. a. bishopi*) and the eastern hellbender (*C. a. alleganiensis*). Both subspecies are found in the Ozark Highlands of Missouri and have experienced severe population declines with limited evidence of recruitment. With the multitude of threats for this aquatic salamander, as well as the decline, considerable resources have been devoted to artificial propagation efforts to sustain and restore populations in Missouri. Part of these efforts is to collect eggs from the wild to hatch and head-start resulting larvae and juveniles at propagation facilities. Therefore, we designed and experimented with artificial shelters (i.e., nest boxes) in both wild and captive situations to increase our ability to obtain egg clutches. Three experimental prototypes were constructed and tested in the wild in 2008 and 2009 with some occupancy by adult hellbenders. Modifications of one of the original prototypes however, led to the first clutch of Ozark hellbender eggs deposited within a nest box in 2010. With this initial success achieved, additional nest boxes have been used throughout Missouri’s rivers for both Ozark and eastern hellbender populations resulting in >15 egg clutches in the last three years. The use of such artificial shelters has also advanced the knowledge and understanding of breeding behavior and phenology of this species. This innovative approach has played a vital role in the recovery of this species in Missouri and may be of benefit rangewide.
NEW HERPETOLOGICAL DISTRIBUTION RECORDS FOR MISSOURI IN 2015

Richard E. Daniel¹, Brian S. Edmond² and Jeffrey T. Briggler³

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²Computer Services, Missouri State University, Springfield, MO 65897
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The following list represents new county records accumulated or brought to our attention since the publication of Daniel and Edmond (2014) and Daniel, et al. (2014). Publication of these records extends our knowledge of the amphibians and reptiles found within the state of 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 contributed information or specimens.

The records listed below represent the first report 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), catalogue number and institution where the specimen is deposited.

Specimens reported in this note have been deposited in the Dean E. Metter Memorial Collection, University of Missouri, Columbia, MO (UMC) and Natural History Museum of Los Angeles County, Los Angeles, CA (LACM). Unless otherwise indicated, all distribution records are documented by post-metamorphic/hatchling fluid preserved specimens.

We would like to extend our appreciation to A. Braun, D. Brown, T. Carpenter, M. Cravens, J. Dawson, D. Hoisington, R. Krager, D. McKnight, A. Nicholson, D. Siegel, S. Snow, M. Stanley, S. Staten, G. Stoner, B. Swearingen, R. Thies, M. Tovar, and S. Tracy for contributing photographs that were used in this note.

AMPHIBIA: CAUDATA (SALAMANDERS)

SMALL-MOUTHED SALAMANDER
Ambystoma texanum
Gasconade Co.: 4.19km SSE Pershing (T44N R6W S28); March 2015; S. Staten (digital image, UMC 2866P).
Moniteau Co.: 3.58km NNW Latham (T44N R16W S9); May 2015; S. Staten (larva; digital image, UMC 2765P).

CENTRAL NEWT
Notophthalmus viridescens
Cole Co.: Scrivner Road Conservation Area (T43N R13W S7); 12 May 2015; J. Briggler (digital image, UMC 3030P).

AMPHIBIA: ANURA (FROGS AND TOADS)

GREAT PLAINS TOAD
Anaxyrus cognatus
Platte Co.: 3.09km SE Waldron (T51N R35W S25); 7 May 2015; M. Tovar (digital image, UMC 2762P)
FOWLER’S TOAD
*Anaxyrus fowleri*
**Osage Co.**: Painted Rock Conservation Area (T42N R11W S2); 13 May 2015; J. Briggler (digital image, UMC 3038P).

WOODHOUSE’S TOAD
*Anaxyrus woodhousii*
**Boone Co.**: Eagle Bluffs Conservation Area (T47N R14W S13); 6 July 2015; R. Daniel (UMC 8907).

EASTERN NARROW-MOUTHPED TOAD
*Gastrophyne carolinensis*
**Montgomery Co.**: Grand Bluff Conservation Area (T46N R6W S33); 24 October 2015; R. Thies, K. Irwin (digital image, UMC 2995P).
**St. Charles Co.**: Weldon Springs Conservation Area (T45N R3E S4); 2 October 2015; R. Thies (digital image, UMC 2991P).

GREEN TREEFROG
*Hyla cinerea*
**Cape Girardeau Co.**: Cape Girardeau, Old Rt. V (T31N R14E S21); 19 June 2015; J. Davenport, D. Siegel (digital image, UMC 2804P) (Davenport and Siegel, 2015).
**Greene Co.**: Lake Springfield (T28N R21W S20); 1 May 2013; D. McKnight (digital image, UMC 2764P).

GRAY TREEFROG
*Hyla versicolor*
**Callaway Co.**: 6.66km SSW of Holts Summit (T44N R11W S15); 28 May 2015; R. Daniel (digital image, UMC 2791P).

AMERICAN BULLFROG
*Lithobates catesbeianus*
**Platte Co.**: 6.95km W Parkville (T51N R34W S31); 7 May 2015; D. Tovar (digital image, UMC 2761P).

WOOD FROG
*Lithobates sylvaticus*
**Iron Co.**: Taum Sauk Mountain State Park (T33N R3E S4); 30 September 2015; M. Cravens, D. Jones (digital image, UMC 2987P).

REPTILIA: SQUAMATA (LIZARDS)
MEDITERRANEAN HOUSE GECKO
*Hemidactylus turcicus*
**Newton Co.**: Joplin (T27N R33W S24); 3 August 2015; A. Braun (digital image, UMC 2982P).

WESTERN SLENDER GLASS LIZARD
*Ophisaurus attenuatus*
**Cedar Co.**: 14.86km WNW Stockton (T34N R28W S1/2); July 2015; B. Hesington (digital image, UMC 2986P).
ITALIAN WALL LIZARD  
*Podarcis siculus*  
**Jasper Co.**: Joplin (T27N R33W S3); 11 October 2013; J. Briggler, R. Rimer (UMC 8890-8892) (Briggler et al., 2015).

**REPTILIA: SQUAMATA (SNakes)**

COPPERHEAD  
*Agkistrodon contortrix*  
**Ralls Co.**: Mark Twain Lake (T55N R6W S9); 27 July 2015; B. Edmond, B. Lichtenberg (digital image, UMC 2930P).

WESTERN WORMSNAKE  
*Carphophis vermis*  
**Osage Co.**: Painted Rock Conservation Area (T42N R11W S2); 13 May 2015; J. Briggler (digital image, UMC 3031P).

TIMBER RATTLESNAKE  
*Crotalus horridus*  
**Benton Co.**: 4.12km NNE Hastain (T40N R20W S17); 1 September 2015; C. Lutjen (digital image, UMC 2988P).

PRAIRIE KINGSNAKE  
*Lampropeltis calligaster*  
**Putnam Co.**: 5.05km SSW Chariton (T66N R17W S15); 6 June 2015; R. Daniel (UMC 8906).

SPECKLED KINGSNAKE  
*Lampropeltis holbrooki*  
**Henry Co.**: Rt. C, 4.67km NNW of Leesville (T42N R24W S27/34); 9 April 2015; J. Briggler (digital image, UMC 3033P).

PLAIN-BELLIED WATERSNAKE  
*Nerodia erythrogaster*  
**Lawrence Co.**: 4.82km NW Monette (T26N R28W S24); 20 May 2015; R. Krager, J. Conner, A. Conner (digital image, UMC 2994P).

ROUGH GREENSNAKE  
*Opheodrys aestivus*  
**Barton Co.**: Prairie State Park (T32N R33W S8/17); 15 October 2015; D. Hoisington (digital image, UMC 2993P).

WESTERN RATSNAKE  
*Pantherophis obsoletus*  
**Nodaway Co.**: Bilby Ranch Lake Conservation Area (T64N R38W S10); 27 May 2015; J. Briggler, G. Stephenson, B. Gordon (digital image, UMC 3036P).

**Saline Co.**: 5.76km W of Glasgow (T51N R18W S6); 6 June 2015; R. Daniel (digital image, UMC 2792P).

EASTERN FOXSNAKE  
*Pantherophis vulpinus*  
**St. Louis Co.**: location withheld; 1 October 2014; J. Dawson (digital image, UMC 3039P).
NORTHERN RED-BELLIED SNAKE  
*Storeria occipitomaculata*  
**Madison Co.:** Rt. D, 1.94km SW Oak Grove (T33N R6E S8); 21 March 2015; A. Nicholson (digital image, UMC 2755P).

WESTERN RIBBON SNAKE  
*Thamnophis proximus*  
**Nodaway Co.:** Bilby Ranch Lake Conservation Area (T64N R38W S15); 16 April 2015; J. Briggle, G. Stephenson, B. Gordon (digital image, UMC 3035P).  
**Pettis Co.:** 5.4km E Beaman (T46N R20W S13); 25 May 2015; R. Daniel (digital image, UMC 2788P).

COMMON GARTER SNAKE  
*Thamnophis sirtalis*  
**Nodaway Co.:** Bilby Ranch Lake Conservation Area (T64N R38W S22); 16 April 2015; J. Briggle, G. Stephenson, B. Gordon (digital image, UMC 3034P).  
**Putnam Co.:** MO 149, Graysville (T65N R17W S11); 11 October 2015; R. Daniel (digital image, UMC 2864P).

LINED SNAKE  
*Tropidoclonion lineatum*  
**Schuyler Co.:** 7.55km W of Lancaster (T66N R14W S14); 11 October 2015; R. Daniel (digital image, UMC 2859P).

REPTILIA: TESTUDINES (TURTLES)  
WESTERN PAINTED TURTLE  
*Chrysemys picta*  
**Newton Co.:** George Washington Carver National Monument (T26N R31W S7); 11 March 2015; B. Swearington (digital image, UMC 2767P).  
**Sullivan Co.:** 3.46km NE Humphreys (T62N R21W S29/30); 6 June 2015; R. Daniel (digital image, UMC 2798P).

NORTHERN MAP TURTLE  
*Graptemys geographica*  
**Newton Co.:** Shoal Creek (T25N R31W S7); 2 May 2015; D. McKnight, B. Edmond, D. Ligon (digital image, UMC 2898P).

FALSE MAP TURTLE  
*Graptemys pseudogeographica*  
**Atchison Co.:** Missouri River floodplain (T65N R42W S33); 10 September 2014; B. Hubbs (digital image, LACM PC 1860) (Hubbs, 2015).

RIVER COOTER  
*Pseudemys concinna*  
**Greene Co.:** Lake Springfield (T28N R21W S20); 29 May 2015; B. Swearingen (digital image, UMC 2766P).  
**Howell Co.:** 8.32km SW West Plains (T23N R9E S13); 2 April 2015; A. George (digital image, UMC 2756P).  
**Stone Co.:** James River (T26N R22W S8); 21 March 2015; D. McKnight, B. Edmond, D. Ligon (digital image, UMC 2875P).
EASTERN MUSK TURTLE
_Sternotherus odoratus_

**Franklin Co.:** Shaw Nature Reserve (T43N R2E S8); 22 June 2015; D. Brown (digital image, UMC 2818P).

**St. Clair Co.:** Bartle Scout Camp (T39N R24W S34); 9 August 2015; G. Stoner (digital image, UMC 3028P).

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**Literature Cited**


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Adult male _Podarcis siculus campestris_. Jasper County, MO.
SCAVENGING BEHAVIOR IN THE THREE-TOED BOX TURTLE (*Terrapene carolina*)

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On 30 August 2015, at approximately 1114 hours, I observed an adult female *Terrapene carolina* consuming a DOR Hackberry Butterfly, *Asterocampa celtis*, (Lepidoptera: Nymphalidae: Apaturinae) on Polk County road S-11 approximately 5.7 km southeast of Bona, Missouri (Figure 1).

Three-toed box turtles are dietary generalists and will consume nearly anything that is readily available. Scavenging behavior in box turtles has been widely reported (see Dodd 2002 for a summary for the genus), but most reports are of consumption of vertebrate carrion.

This is the first known report of a *T. carolina* consuming a butterfly species and the first report of a box turtle consuming roadkill.

![Figure 1. Female Terrapene carolina feeding on roadkill Asterocampa celtis (UMC 2940P).](image)

**Literature Cited**
TWO FIVE-LINED SKINK (*Plestiodon fasciatus*) CLUTCHES

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On 24 June 2015, Julian Edmond and I found and excavated two Five-Lined Skink (*Plestiodon fasciatus*) nests in a native plant garden 7.3 km northwest of Willard, Greene County, Missouri. The first nest was found after accidentally dislodging a flat rock. The second nest was discovered after we moved a second rock to excavate the first nest. The rocks were slabs of sandstone approximately 45 x 20 x 10 cm. Both nests initially contained attendant, guarding females, both of which escaped after the first encounter. The female from the second nest attempted to return to the site at least three times during the excavation.

The first nest contained twelve (12) eggs, with a mean mass 0.72 ± 0.06g (range, 0.6-0.8g), mean length 13.82 ± 0.47mm (range, 13.13-14.74mm), and mean width 9.95 ± 0.30mm (range, 9.44-10.50mm). The second nest contained eleven (11) eggs, with a mean mass 0.65 ± 0.05g (range, 0.6-0.7g), mean length 13.01 ± 0.35mm (range, 12.20-13.45mm), and mean width 9.77 ± 0.26mm (range, 9.44-10.32mm).

Both clutches were relocated to plastic containers, seated in moist, partially decomposed leaf and twig litter from the site, and allowed to incubate (Figure 1) out of direct sunlight. Twenty-two animals hatched on or about 14 July 2015 and were photographed (Figure 2) and released at the site on 15 July 2015.

Clutch sizes from this observation are consistent with other observations (Smith 1961, Trauth et al. 2004), though most nests were recovered from rotten logs. Individual egg sizes are comparatively small, but the eggs are known to expand somewhat as they age, particularly in the presence of moisture (Cagle 1940).

Other clutches observed in Missouri include four recovered from depressions in the soil under limestone rocks (Anderson 1965). Those clutches contained 8, 10, 12, and 13 eggs. On 30 June 2000, two clutches were observed in central Missouri (R. Daniel, pers. com.), one in Howard County under bark on a downed log with 10 eggs and another in Randolph County in a rotten log with 11 eggs. Both nests were found with attendant females, but the Howard County female escaped. Both clutches (UMC 7056, 7058) and the Randolph County female (UMC 7057) were deposited in the Dean E. Metter Memorial Collection at the University of Missouri.

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**Figure 1.** Relocated partial clutch of *P. fasciatus.*  
**Figure 2.** Hatchling *P. fasciatus.*

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**Literature Cited**


Cagle, F. R. 1940. Eggs and Natural Nests of *Eumeces fasciatus.* *American Midland Naturalist*
ADDITIONS TO THE BIBLIOGRAPHY OF HERPETOFAUNAL REFERENCES FOR MISSOURI

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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 the attention of the author since the publication of Daniel (2014). Readers are requested to notify the author of any additional references that should be included in future compilations.


**Literature Cited**


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