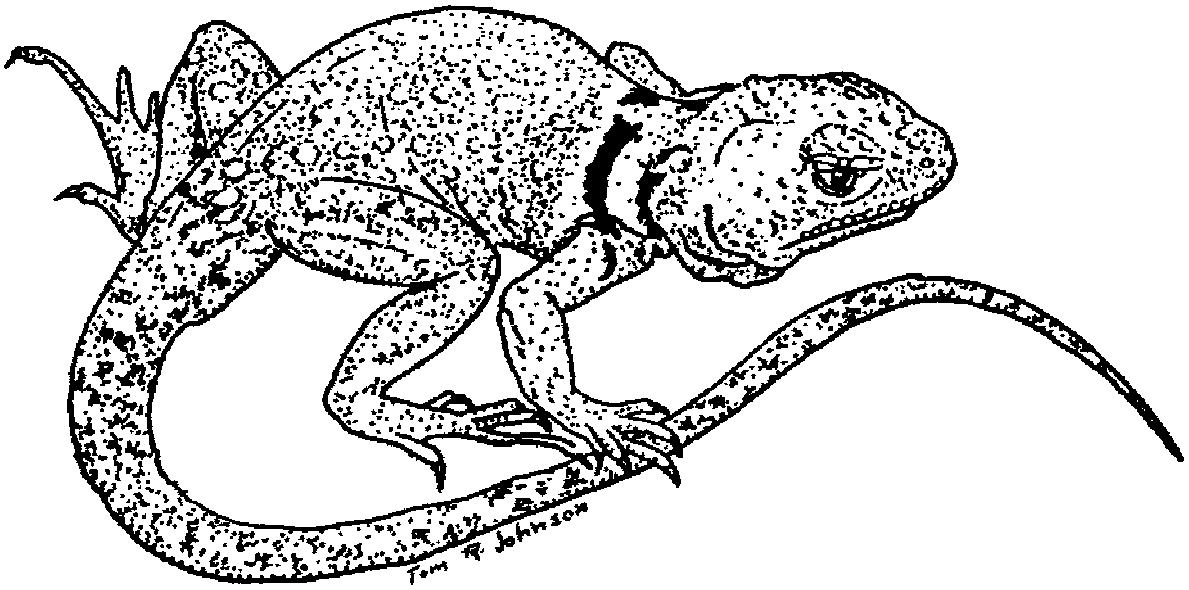
Missouri Herpetological Association

Newsletter



Number 3

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INTRODUCTION

The Third Annual Meeting of the **Missouri Herpetological Association** took place on 29-30 September 1990 at the Reis Biological Station near Steelville in Crawford County, Missouri. This organization is designed to provide herpetologists in Missouri and surrounding states with an opportunity to meet and exchange ideas regarding current efforts in research and other professional activities. High on the list of priorities is to provide students, involved in research at either the graduate or undergraduate levels, 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, it will inform the herpetological community of new distributional and size records of Missouri's herpetofauna and serve to provide an outlet for the publication of short notes dealing with the state's amphibians and reptiles.

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

ANNOUNCEMENT

Fourth Annual Meeting of the Missouri Herpetological Association

The Fourth Annual Meeting of the **Missouri Herpetological Association** will be held on 28-29 September 1991 at the Reis Biological Station. Registration forms and calls for papers will be mailed at a later date. For more information please contact Tom R. Johnson at (314) 751-4115 or write:

Mr. Tom R. Johnson
Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65102

Abstracts of Papers presented at the Third Annual Meeting of the Missouri Herpetological Association

29-30 September 1990

PRELIMINARY DATA ON THE REPRODUCTIVE BIOLOGY OF THE DIAMONDBACK WATER SNAKE (*NERODIA RHOMBIFER*) FROM VERACRUZ, MEXICO.

Robert Aldridge
St. Louis University) St. Louis, MO 63103

Snakes were collected on the Papaloapan River and nearby lagoons, near Tlacotalpan, Veracruz, Mexico (18°40' N, 95°45' W). Females reach maturity at a snout-vent length of 670 mm. Reproduction is aseasonal, with some females undergoing vitellogenesis at any time of the year, however, the majority of females ovulate in May and June. Litter sizes, (i= 17.1,8-36) based on vitellogenic follicles (n = 12) and embryos (n= 2) are highly correlated with snout-vent length (n = 14, r2 = .401, p = 0.02). Based on sperm in the vas deferens, males reach maturity at a snout-vent length of ca. 600 mm. The spermatogenic cycle appears to be seasonal, however, since the female cycle is aseasonal this may represent an ancestral pattern. In the majority of snakes spermatogenesis begins in March and progresses to the spermatid stage by September. Peak spermatogenesis occurs in November and December. Hypertrophy of the sexual segment of the kidney begins in January and it remains hypertrophied into early June. This study was conducted under Permit No.303300, La Secretaria de Relaciones Exteriores.

OVERWINTERING OF AMERICAN ALLIGATORS AT THE ST. LOUIS ZOO

Norm Haskell
Herpetarium, St. Louis Zoo, Forest Park, St. Louis, MO 63110

For the past three years, the St. Louis Zoo has successfully over-wintered American Alligators in what were formerly considered to be only warm weather exhibits. Slides and descriptions will provide information on housing/pool dimensions, temperature, and behavioral activity.

FRESHWATER AND TERRESTRIAL TURTLE RESEARCH AT TORTUGUERO, COSTA RICA

Don Moll
Southwest Missouri State University, Springfield, Missouri 65804

The third season of research concerning the ecology and status of six freshwater and terrestrial turtles along the Caribbean coast of Costa Rica near Tortuguero will commence in the spring 1991 semester. The reproductive ecology of the slider *Trachemys scripta* is of particular interest as it is one of only two freshwater species known to utilize sea beaches for nesting. Telemetry techniques will be employed this season to track adult movements and nest, egg, and hatchling characteristics will be monitored. Sliders and two species of *Rhinoclemmys* (one aquatic, one terrestrial) eat large amounts of fruits and seeds from forest and riverbank trees and the latter pass through their digestive tracts undigested. Investigations into these turtles' possible role in seed germination and dispersal will also be emphasized this season at Tortuguero.

SYSTEMATIC RE-EVALUATION OF MIDWESTERN *AGKISTRODON CONTORTRIX*

Jeff Ettling
Herpetarium, St. Louis Zoo, Forest Park, St. Louis, MO 63110

Gloyd and Conant (1943) pointed out that the copperhead, *Agkistrodon contortrix*, is homogeneous in structural characters, but subspecies are distinguishable on the basis of color and pattern differences. I have been re-evaluating midwestern (Illinois, Missouri, and Kansas) *Agkistrodon contortrix* populations by examining 14 morphological characters. The focus of my research is a relict population of *Agkistrodon c. contortrix* in west-central Illinois and the Kansas-Missouri subspecies *Agkistrodon c. phaeogaster*.

EFFECTS OF DENSITY AND ORAL MORPHOLOGY ON THE GRAZING OF ANURAN TADPOLES

Cindy L. Taylor and Ronald Altig
Mississippi State University, Mississippi State, MS 39762

Effects of grazing anuran tadpoles on algal characteristics (chl a, chl b, chl c, and dry biomass) were studied experimentally in stainless steel troughs inoculated with filamentous algae and periphyton scraped from plant material from a local pond. After establishment of algal populations on ceramic tiles on the floor of the troughs, seven treatments were randomly assigned to seven different units of each trough. Treatments consisted of the following anuran tadpoles with their respective densities (*Bufo woodhousii*: 5,10, 15; *Hyla chrysoscelis*: 5,10; *Rana palustris*: 5,10). Two remaining units served as fixed controls (no tadpoles) in each trough. Weekly sampling of ceramic tiles was made to measure chlorophyll and dry biomass of each unit. Within a week after the introduction of tadpoles, algal characteristics of control units were significantly different than units containing tadpoles. No significant differences were found between densities or among specific oral morphologies (e.g., broad jaw sheath vs. narrow jaw sheath and cusped teeth vs. non-cusped teeth) of tadpoles in this experiment.

SPATIAL NICHE PARTITIONING IN A HISPANIOLAN LIZARD COMMUNITY

Robert Powell, Donald D. Smith, John S. Parmerlee, and Martin L. Jolley
Avila College, Kansas City. MO 64145

We investigated spatial niche partitioning at a study site near Bani, Peravia Province, Dominican Republic, el. ~130 m. The site is characterized by a (generally) dry river bed running through a predominately Acacia scrub/woodland. Six distinctly different microhabitats were identified. Over five years, 108 lizards (6 species in 3 genera and 3 families) were taken and/ or observed at the site. Preliminary investigations of food habits indicate that all of these species are opportunistic feeders, leading to the hypothesis that resources must be partitioned spatially. Spatial relationships were vertical (where possible) or horizontal (by area) between forms with similar vertical niches. Where two species' habitat selections overlapped, size or foraging strategy appeared to effectively partition food resources. As a result, this area, seemingly deficient in food resources, is capable of supporting a rather diverse lizard community.

ADDITIONS AND CHANGES TO MISSOURI'S RARE AND ENDANGERED SPECIES LIST: AMPHIBIANS AND REPTILES

Tom R. Johnson
Missouri Department of Conservation, Jefferson City, Missouri 65102

No abstract submitted.

NEW RECORDS OF AMPHBIANS AND REPTILES IN MISSOURI FOR 1990

Robert Powell[1], Tom R. Johnson[2], and Donald D. Smith[3]

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

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

The following acronyms apply to institutional collections in which specimens are deposited: BWMC -Bobby Witcher Memorial Collection, Avila College, Kansas City, MO 64145; KU- University of Kansas Museum of Natural History, Lawrence, K566045; MDC -Missouri Department of Conservation, Jefferson City, MO 65102.

NEW COUNTY RECORDS

Amphibia: Caudata

SPOTTED SALAMANDER (*Ambystoma maculatum*)
WASHINGTON CO: S5 T36N R2E, 14 July 1990, K. Toal (KU 217157) (larvae).

MARBLED SALAMANDER (*Ambystoma opacum*)
MARIES CO: S22 T40N R7W, 25 October 1990, T .R. Johnson and T. Smith (KU cat. pend). **WASHINGTON CO**: S5 T36N R2E, 29 September 1990, K. Toal (KU 217170).

MOLE SALAMANDER (*Ambystoma talpoideum*)
BUTLER CO: Corkwood Natural History Area S16 T22N R5E, 12 October 1990, S. Hudson (KU cat. pend.).

FOUR- TOED SALAMANDER (*Hemidactylium scutatum*)
CARTER CO: Peck Ranch Wildlife Area S30 T28N R2W, 19 April 1990, T .R. Johnson and J .B. Pasley (KU cat. pend.). **DENT CO**: Mark Twain National Forest 9 mi NW Bunker S25 T32N R4W, 20 April 1990, T.R. Johnson (KU cat. pend.). **SHANNON CO**: Indian Creek State Forest S29 T29N R2W, 19 April 1990, T.R. Johnson and J.B. Pasley (KU cat. pend.).

Amphibia: Anura

BLANCHARD'S CRICKET FROG (*Acris crepitans blanchardi*)
HICKORY CO: HW BB 1 mi S HW 54 S26 T37N R20W, 30 September 1990, CA. Cunningham (BWMC 04353).

EASTERN AMERICAN TOAD (*Bufo americanus americanus*)
CLARK CO: Fox Valley State Forest S27 T66N R8W, 24 April 1990, T .R. Johnson (KU cat. pend.).

DWARF AMERICAN TOAD (*Bufo americanus charlesmithi*)
BARTON CO: HW F 2 mi S HW C S35 T33N R29W, 6 October 1990, R.P. Seibolt (BWMC 04357). **PETTIS CO**: Sedalia S21 T45N R21W, 13 August 1990, M.A. Rogers (KU cat. pend.).

FOWLER'S TOAD (*Bufo woodhousii fowleri*)
HICKORY CO: HW BB 1 mi S HW 54 S26 T37N R20W, 30 September 1990, R. Powell and S.S. Duer (BWMC 04354).

NORTHERN SPRING PEEPER (*Pseudacris crucifer*)
CLARK CO: Fox Valley State Forest S27 T66N R8W, 24 April 1990, T .R. Johnson (KU cat. pend.).

PICKEREL FROG (*Rana palustris*)
COLE CO: Tim French's Cave along W bluff of Osage River S18 T42N R11W, 31 August 1990, T.R. Johnson (KU cat. pend.). **HICKORY CO**: HW BB 1 mi S HW 54 S26 T37N R20W, 30 September 1990, D.L. Howard and D.J. Pflanz (BWMC 04355-6).

SOUTHERN LEOPARD FROG (*Rana utricularia utricularia*)
BARTON CO: HW C at Horse Creek S29 T33N R29W, 6 October 1990, R.P. Seibolt (BWMC 04358). **WASHINGTON CO**: S5 T36N R2E, 14 July 1990, K. Toal (KU 217159).

Reptilia: Testudines

COMMON SNAPPING TURTLE (*Chelydra serpentina serpentina*)
CEDAR CO: Cedar Creek at HW K S26 T35N R27W, 29 May 1990, S.A. Maxey (BWMC 04274). **COOPER CO**: I-70 1 mi W HW K, 28 September 1990, K. Toal (KU 217171). **CRAWFORD CO**: Meramec River at HW 8 S6 T37N R5W, 30 September 1990, D.L. Howard and C.A. Cunningham (BWMC 04347).

WESTERN PAINTED TURTLE (*Chrysemys picta bellii*)
CASS CO: HW 71 at Tennessee Creek S4 T43N R31W DOR, 30 May 1990, S.A. Maxey (BWMC 04279).

MISSOURI RIVER COOTER (*Pseudemys concinna metteri*)
MARIES CO: HW 63 at Gasconade River S1 T39N R9W DOR, 15 September 1990, R. Powell (BWMC 04345).

THREE- TOED BOX TURTLE (*Terrapene carolina triunguis*)
WASHINGTON CO: HW P 2 mi SW HW 8 S23 T37N R2E, August 1990, K. Toal (KU 217160).

RED-EARED SLIDER (*Trachemys scripta elegans*)
BATES CO: HW71 0.5 mi S Possum Branch S8 T39N R31W DOR, 30 May 1990, S.S. Duer (BWMC 04278).

MIDLAND SMOOTH SOFTSHELL (*Trionyx muticus muticus*)
BENTON CO: Cole Camp Creek Arm, Lake of the Ozarks S34 T41N R21 W, 1 July 1990, C.F. Meinz (BWMC 04281).

Reptilia: Squamata: Sauria

EASTERN COLLARED LIZARD (*Crotaphytus collaris*)
PERRY CO: S14 T35N R9E, 23 June 1990, P. Minx (observation only, photo on file at MDC).

FIVE-LINED SKINK (*Eumeces fasciatus*)
BARTON CO: HW F 2 mi S HW C S35 T33N R29W, 6 October 1990, R. Powell (BWMC 04360).

GREAT PLAINS SKINK (*Eumeces obsoletus*)
NEWTON CO: south Joplin S26 T27N R33W, 4 July 1989, T.W. Taggert (KU 211593).

WESTERN SLENDER GLASS LIZARD (*Ophisaurus attenuatus attenuatus*)
WASHINGTON CO: S30 T40N R1W, B.J. Wilcox (KU cat. pend.).

NORTHERN FENCE LIZARD (*Sceloporus undulatus*)
BARTON CO: HW F 2 mi S HW C S35 T33N R29W, 6 October 1990, R. Powell (BWMC 04361).

GROUND SKINK (*Scincella lateralis*)
BARTON CO: HW F 2 mi S HW C S35 T33N R29W, 6 October 1990, R.P. Seibolt (BWMC 04359). **LACLEDE CO**: 2 mi NW Eldridge 521 T36N R17W, 30 September 1990, J .S. Parmerlee (BWMC 04350).

Reptilia: Squamata: Serpentes

OSAGE COPPERHEAD (*Agkistrodon contortrix phaeogaster*)
FRANKLIN CO: Meramec State Park entrance to Fisher Cave, 7 July 1990, D. Dreese (KU cat. pend.).

WESTERN WORM SNAKE (*Carphophis amoenus vermis*)
CEDAR CO: 0.25 mi NW Cedar Creek S26 T35N R27W, 29 May 1990, K.D. Raaf (BWMC 04270).

BLACK RAT SNAKE (*Elaphe obsoleta obsoleta*)
CEDAR CO: 0.25 mi NW Cedar Creek S26 T35N R27W, 29 May 1990, R. Powell (BWMC 04273). **LAFAYETTE CO**: Bates City S35 T49N R29W, 23 September 1990, D.J. Howard {BWMC 04346).

PRAIRIE KING SNAKE (*Lampropeltis calligaster calligaster*)
CEDAR CO: 0.25 mi NW Cedar Creek S26 T35N R27W, 29 May 1990, S.S. Duer, S.A. Maxey (BWMC 04271).

SPECKLED KING SNAKE (*Lampropeltis getula holbrooki*)
CEDAR CO: 0.25 mi NW Cedar Creek S26 T35N R27W, 29 May 1990, T. Alderman (BWMC 04269).
DAVIES CO: Jamesport City Lake S22 T60N R26W, 2 June 1990, D.J. Howard (BWMC 04280).

RED MILK SNAKE (*Lampropeltis triangulum syspila*)
CLARK CO: Fox Valley State Forest S27 T66N R8W, 25 April 1990, T .R. Johnson (KU cat. pend.).

EASTERN COACHWHIP (*Masticophis flagellum flagellum*)
CEDAR CO: 0.25 mi NW Cedar Creek S26 T35N R27W, 29 May 1990, S.S. Duer (BWMC 04272). **WARREN CO**: HW 94 3 mi W Treloar S10 T45N R3W, 19 July 1984, S. Davis and P. Davis (observation only, photo on file at MDC).

MIDLAND WATER SNAKE (*Nerodia sipedon pleuralis*)
HICKORY CO: HW BB 1 mi S HW 54 S26 T37N R20W, 30 September 1990, R. Powell (BWMC 04351). This specimen extends the zone of intergradation with Nerodia sipedon sipedon into Hickory County.

ROUGH GREEN SNAKE (*Opheodrys aestivus*)
VERNON CO: 0.25 mi W HW 71 at HW E S3 T34N R31W DOR, 29 May 1990, R. Powell (BWMC 04266).

BROWN SNAKE (*Storeria dekayi*)
BARTON CO: HW F 2 mi S HW C S35 T33N R29W, 6 October 1990, R.P. Seibolt (BWMC 04362). **CEDAR CO**: 0.25 mi NW Cedar Creek S26 T35N R27W, 29 May 1990, R. Powell (BWMC 04268).

WESTERN RIBBON SNAKE (*Thamnophis proximus proximus*)
HICKORY CO: HW BB 1 mi S HW 54 S26 T37N R20W, 30 September 1990, R. Powell and S.S. Duer (BWMC 04352).

ROUGH EARTH SNAKE (*Virginia striatula*)
LACLEDE CO: 2 mi NW Eldridge S21 T36N R17W, 30 September 1990, R. Powell (BWMC04348). **MONITEAU CO**: HW PP 3 mi N McGirk S17 T45N R14W, 21 April 1990, J. Street (KU cat. pend.).

WESTERN EARTH SNAKE (*Virginia valeriae elegans*)
GENTRY CO: N Albany Grace Farm S5 T63N R30W, 29 April 1989, J.W. Grace (KU cat. pend.). **LACLEDE CO**: 2 mi NW Eldridge S21 T36N R17W, 30 September 1990, D.J. Howard (BWMC 04349).

NEW MAXIMUM SIZE RECORDS

Amphibia: Caudata

MARBLED SALAMANDER (*Ambystoma opacum*)
WASHINGTON CO: S5 T36N R2E, 29 September 1990, K.Toal (KU217170). Snout-vent length: 77 mm (3.0 in), total length 128 mm (5.0 in). This specimen exceeds the maximum length of 127 mm reported by Conant (1975) and represents a new U.S. record for the species.

Reptilia: Testudines

COMMON SNAPPING TURTLE (*Chelydra serpentina serpentina*)
JACKSON CO: Kansas City, 1 June 1990, collector unknown (specimen donated to Jackson County Ranger Station) (BWMC 04275). Carapace length: 358 mm (14.1 in).

ORNATE BOX TURTLE (*Terrapene ornata ornata*)
JACKSON CO: Fleming Park Missouri Town T48N R31W, 13 October 1990, J. Niederschulte and T. Woolten (BWMC 04368). Carapace length: 140 mm (5.5 in).

RED-EARED SLIDER (*Trachemys scripta elegans*)
JOHNSON CO: HW 500.5 mi E HW 58 S13 T46N R27W, 23 May 1990, R. Powell (BWMC 04265). Carapace length: 275 mm (10.8 in).

MIDLAND SMOOTH SOFTSHELL (*Trionyx muticus muticus*)
BENTON CO: Cole Camp Creek Arm, Lake of the Ozarks S34 T41N R21W, 1 July 1990, C.F. Meinz (BWMC 04281). Carapace length: 305 mm (12.0 in).

Reptilia: Squamata: Sauria

NORTHERN FENCE LIZARD (*Sceloporus undulatus hyacinthinus*)
CEDAR CO: 1 mi WNW HW K 1.5 mi N Filley S3 T35N R27W, 29 May 1990, T. Cassidy (BWMC 04267). Snout-vent length: 81 mm (3.2 in), total length: 185 mm (7.3 in).

GROUND SKINK (*Scincella lateralis*)
ST. CLAIR CO: S10 T39N R24W, MA. Rogers (KU cat. pend.). Snout-vent length: 46 mm (1.8 in), total length: 132 mm (5.2 in).

Reptilia: Squamata: Serpentes

PRAIRIE RINGNECK SNAKE (*Diadophis punctatus arnyi*)
HOLT CO: Squaw Creek National Wildlife Refuge DOR, 19 October 1990, R. Seigel and N. Seigel (KU 217202). Snout-vent length: 395 mm (15.6 in), total length: 477 mm (18.8 in). The total length was measured prior to preservation, the snout-vent length after preservation. Since specimens shrink in preservative, the two measurements are not comparable. This specimen exceeds the maximum length of 419 mm reported by Conant (1975) and that of 456 mm reported by Collins (1990) in Kansas and represents a new U.S. record for this subspecies.

LINED SNAKE (*Tropidoclonion lineatum*)
JACKSON CO: South Kansas City, Ruskin Area T48N R33W, August 1989, L.D. Fish (BWMC 04250). Snout-vent length: 380 mm (15.0 in), total length: 438 mm (17.2 in).

ROUGH EARTH SNAKE (*Virginia striatula*)
MONITEAU CO: HW PP 3 mi N McGirk S17 T45N R14W, 21 April 1990, J. Street (KU cat. pend.). Snout-vent length: 262 mm (10.3 in), total length: 314 mm (12.3 in). The total length was measured prior to preservation, the snout-vent length after (the total length of the preserved specimen was 304 mm (12.0 in)).

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Notes

ADDITIONS AND CHANGES TO MISSOURI'S RARE AND ENDANGERED SPECIES LIST: AMPHIBIANS AND REPTILES

Tom R. Johnson
Natural History Section
Missouri Department of Conservation

The following species of amphibians have been added to Missouri's rare and endangered species list:

MOLE SALAMANDER (*Ambystoma talpoideum*)
Status: RARE
Comment: There are few known populations of this species in only three counties in southeastern Missouri.

EASTERN SPADEFOOT (*Scaphiopus holbrookii holbrookii*)
Status: RARE
Comment: Many records of this species are quite old (30-50 years or more) and agricultural activities in southeastern Missouri have eliminated much of the required low, sandy soil habitat.

ILLINOIS CHORUS FROG (*Pseudacris streckeri illinoiensis*)
Status: RARE
Comment: Agricultural practices have reduced the habitat for this amphibian. It may be locally abundant in a few counties, but no breeding sites are currently known on any state or federal lands.

NORTHERN LEO PARD FROG (*Rana pipiens*)
Status: RARE
Comment: This species was first discovered in Atchison County in 1985. One additional population was found in Mercer County in 1987. This frog is known only from these two locations in northwestern Missouri.

The following species of reptiles have been added to Missouri's rare and endangered species list or their status has been changed:

TEXAS HORNED LIZARD (*Phrynosoma cornutum*)
Status: RARE
Comment: This species is known from only four southwestern counties and some of the records are over 30 years old. Only two populations are known to be extant and neither is on state or federal lands.

NORTHERN SCARLET SNAKE (*Cemophora coccinea copei*)
Status: RARE
Comment: This species is known from only four scattered counties and only one record is recent. Populations are obviously small and isolated.

MISSISSIPPI GREEN WATER SNAKE (*Nerodia cyclopion*)
Status: EXTIRPATED
Comment: No specimens of this species have been collected in Missouri since the 1950's. Swampy habitat required by this snake has been greatly reduced in the Bootheel.

POSSIBLE EFFECTS OF TEMPERATURE ON INCUBATION PERIOD AND HATCHLINGS IN EGGS FROM A ROUGH GREEN SNAKE, OPHEODRYS AESTIVUS

Donald D. Smith
Division of Allergy and Rheumatology
University of Kansas Medical Center

A gravid Rough Green Snake (*Opheodrys aestivus*) was captured 4 July 1989 4.5 km N Kingsville, Johnson County, Missouri. On 9 July she delivered 11 eggs with mean measurements= 21.6 x 11.0 mm and mean mass= 1.94 g. The female's snout-vent length (SVL) = 538 mm, caudal length (CL) = 210 mm, and mass = 33.0 g.

The eggs were divided into two groups and placed on paper towels moistened with distilled water inside two zip-fastening plastic bags. One bag was maintained in a room without air conditioning, mean temperature = 27.8 ± 0.42°C (23.0-33.5°C, n = 35), the other was kept in an air-conditioned room, mean temperature = 24.4 ± 0.16°C (20.6-27.3°C, n = 67). Both rooms had subdued lighting. Air temperature adjacent to the egg containers was usually recorded in the morning and in the evening, except on weekends. Hatchlings of both groups were weighed, measured, and sexed (by eversion of hemipenes) and preserved one day after hatching. They were deposited in the Bobby Witcher Memorial Collection (BWMC 04155-04165) at Avila College, Kansas City, MO.

Eggs kept in the un-air-conditioned room hatched on 16 August, 38 days after delivery, eggs in cooler room hatched on 4 September, 57 days after deposition. Based on the dates of hatching, and within limits of the observed average room temperatures, incubation period was increased by ca. 5.5 days for each decrease of 1°C. Characteristics of the two groups of hatchlings are given in Table 1. Neither mass nor SVL between the two groups differed significantly. Females, as expected, has significantly lower CL, CL/SVL ratios, and subcaudal counts than males ($p \leq 0.05$). Although the sample size was small, the five males produced in the group maintained at higher ambient temperatures differed significantly from a 1: 1 ratio in a test of binomial probability ($p < 0.05$). Also, males hatched from eggs incubated a cooler temperatures had significantly longer tails, larger CL/SVL ratios, more ventrals, and fewer subcaudals than did siblings incubated at warmer temperatures ($p \leq 0.05$).

Temperature-dependent sex determination (TSD) has been found in crocodilians, most families of turtles, and two families of lizards. In contrast, genotypic sex determination (GSD) is considered the norm for snakes, a few species of turtles, and most species of lizards (for reviews see: Deeming and Ferguson 1988, Packard and Packard 1988). Colubrid snakes typically exhibit sex-chromosome heteromorphism, and the coexistence of TSD and GSD is considered unlikely (Bull 1980). The results of this incubation experiment, however, are suggestive of TSD, and the sex (male) produced in the room with higher temperatures corresponds to the sex produced by high temperatures in the two saurian families exhibiting TSD (the reverse is true in turtles).

Plummer (1984) found no significant difference from a 1: 1 sex ratio in a large sample (n = 141) of eggs of O. aestivus incubated in the laboratory at temperatures of ca. 28 ± 1°C (pers. comm.). In the present experiment, warm room temperatures ≥ 30°C were observed on days 1,4, 19-22, and 26. This exposure to warmer temperatures, possibly during a particularly sensitive developmental period, might have resulted in the expression of five males if TSD is operational in this species. Alternatively, extreme environmental conditions (in this case high temperatures) may have triggered a default selection of phenotype in a system normally characterized by heterogametic sex determination. Since hatching success in this clutch of eggs was 100%, sexually differential mortality as a function of incubation temperature as observed in *Pituophis melanoleucus* (Burger and Zappalorti 1988) was not a causal factor. Although these results are

Sex	SVL mm	CL mm	CL/SVL%	Mass g	Ventrals	Caudals
27.8°C = MEAN TEMPERATURE OF INCUBATION						
M	129	68	52.7	1.55	153	119
M	130	72	55.4	1.59	156	124
M	134	71	53.0	1.52	156	122
M	124	67	54.0	1.37	157	121
M	131	71	54.2	1.48	156	120
X	129.6	69.8	53.9	1.50	155.6	121.2
±	1.63	0.97	0.48	0.04	0.68	0.86
24.8°C = MEAN TEMPERATURE OF INCUBATION						
M	130	71	54.6	1.49	157	115
M	130	72	55.4	1.49	160	119
M	134	74	55.2	1.50	160	118
X	131.3	72.3	55.1*	1.49	159.0*	117.3*
±	1.34	0.88	0.24	0.01	1.00	1.20
F	130	60	46.2	1.50	160	106
F	128	58	45.3	1.55	157	93
F	140	64	45.7	1.61	158	104
X	132.7	60.7*	45.7*	1.55	158.3	101.0*
±	3.72	1.77	0.26	0.03	0.88	4.05

*- significantly different from the mean directly above ($p <= 0.05$)

Table 1. Characteristics of hatchling Rough Green Snakes (*Opheodrys aestivus*) incubated at two different temperatures (mean value +- one SEM).

not conclusive, as small sample size does not preclude the possibility of sampling error, it is hoped they will stimulate further interest and more experimentation into the phenomenology of sex determination in squamates.

Of equal interest is the variation in scalation observed between males incubated at different temperatures. The effects of temperature on development of meristic characters has been noted in viviparous snakes (Osgood 1978), but to my knowledge, has not been reported in oviparous species. Ventral and subcaudal counts are often used as taxonomic criteria, but if many ophidian species respond to temperature during development, these counts may not be satisfactory criteria of gene flow (or the lack thereof). Differences in such counts may reflect nothing more than eco-phenotypic variation.

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DEATH FEIGNING BY A COACHWHIP FROM MISSOURI

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Tucker (1989) reported death feigning (letisimulation) in *Masticophis flagellum* from Oklahoma and suggested that this behavior might be a defensive strategy associated with depressed body temperature and used as an alternative to more commonly observed aggression or flight. Smith (1975), reporting on coachwhips from West Texas, similarly implicated low ambient temperatures, although Gehlbach (1970) failed to associate low body temperatures and letisimulation, nor was it a factor in a specimen from Texas observed by Powell and others in 1980. Smith (1975) further indicated that this behavior was not observed in 13 animals with snout-vent lengths (SVL) under 350 mm. Death feigning has not been reported in coachwhips from Missouri, although Smith et al. (1983) cited an observation of death feigning in an ecologically similar *Coluber constrictor* from Cass County.

Here we report death feigning in a small (ca. 360 mm SVL) *Masticophis flagellum* found in eastern Barton County, Missouri (S35 T33N R29W) on 6 October 1990. The snake was found under cover and grasped, at which time it thrashed wildly but made no effort to bite. After being held in a bag for several minutes, it was released and letisimulation was observed. Behavior was much like that described by Tucker (1989). Ambient temperature was approximately 26°C. This observation would tend to refute the assumption that this form of behavior is associated solely with depressed temperatures and indicates that even small coachwhips may resort to death feigning.

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