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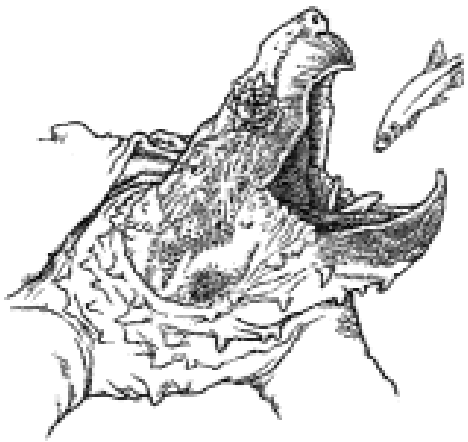

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Front Cover: An Alligator Snapping Turtle *(Macrochelys temminckii)*. Illustration by Marty Capron, Oxford.

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KHS BUSINESS

THE KANSAS HERPETOLOGICAL SOCIETY 38TH ANNUAL MEETING

The Kansas Herpetological Society held its 38th Annual Meeting at the Great Plains Nature Center in Wichita, Kansas, on 5-6 November 2011. Over 116 participants attended the six scientific paper sessions and listened to 28 oral presentations on amphibians, reptiles, and turtles by scientists and students from across the nation.

After welcomes from Derek Schmidt (KHS president) and Bob Gress (Director of the Great Plains Nature Center), George Pisani of the Kansas Biological Survey in Lawrenc e introduced the Society's keynote speaker, Dr. Richard Kazmaier (West Texas A&M, Canyon, Texas). Dr. Kazmaier started the meeting on a high note, giving an outstanding presentation on the ecology of sympatric Western Indigo Snakes and Western Diamondback Rattlesnakes in southern Texas. His talk was very well received and generated much interest about these creatures.

Other speakers for the scientific paper sessions on Saturday morning included (in order of presentation): J. Daren Riedle on the *Conservation Status of the Sonoyta Mud Turtle at Organ Pipe Cactus National Monument, Arizona*; Kyle O'Connell on *Prey Selection by the Northern Water Snake* Nerodia sipedon *in Nebraska*; Pablo Delis on *Female Reproductive Biology of the Eastern Box Turtle (*Terrapene c. carolina*) in Letterkenny Army Depot, Franklin County South Central Pennsylvania*; Bill Welch on *Temperature Influences on Anuran Calling at the Great Plains Nature Center: An Analysis Using a Songmeter Digital Recorder and Bioaucoustics Software*; Dwight Platt on *Some Morphological and Population Characteristics of the Prairie Lizard* Sceloporus consobrinus *in a Sand Prairie in Western Harvey County, Kansas*; and Curtis J. Schmidt on *Reproductive Biology of the Eastern Collared Lizard (*Crotaphytus collaris*) at the Northern Limits of its Range*.

Speakers of the scientific paper sessions on Saturday afternoon included Walter E. Meshaka on *The Exotic Herpetofauna of Florida: How Times are Changing*; Denise M. Thompson on *Rocky Raccoon Must Die: Nest Predation Patterns in a Population of Reintroduced Alligator Snapping Turtles*; David Jewell on *Animal Identification and Maintenance of a Large Whiptail Lizard Colony*; Nick Hettrick on *Update on the Eastern Newt,* Notophthalmus viridescens*, in Miami County, Kansas*; Pablo Delis on *The Hurricane Toad: Activity Patterns and Reproduction of the Eastern Spadefoot (*Scaphiopus holbrookii*) in West Central Florida*; Jennifer M. Singleton on *Winter Thermal Profiles of Northern Painted Turtles (*Chrysemys picta*) in Eastern Kansas*; Walter E. Meshaka on *Snake Assemblage Structures in the Letterkenny Army Depot in South Central Pennsylvania*; Eva A. Horne on *I Can Kick Higher Than You: An Update on Blanchard's Cricket Frog Visual Displays*; David Bender on *Distribution Modeling and Direction of Herpetological Management, A State's Perspective*; Matt Nordgren on *Preliminary Surveys of Two Sky Islands in the Madrean Archipelago of Sonora, Mexico*; and Stephanie Kelly on *Finding Frogs in Ecuador*.

After the final talk of the afternoon, the KHS General Business meeting was held, with KHS President Derek Schmidt presiding. During its business meeting, the KHS elected its slate of officers for the upcoming year. Daniel Murrow (Hutchinson) was elected President-elect for 2012, David Oldham (Pittsburg State University) was voted Treasurer, and Eva Horne (Kansas State University) was voted Secretary. Travis W. Taggart (Fort Hays State University) currently is president-elect and takes office as president on 1 January 2012. Derek Schmidt will serve on the KHS Executive Council in 2012 as past-president.

The KHS Business meeting concluded with the 2011 awards ceremony. Joseph T. Collins served as moderator as the members of the Awards Committee looked on. First, the Henry S. Fitch-Dwight R. Platt Award for Field Herpetology was presented to Eddie Stegall (Wichita, Kansas). Eddie received a commemorative certificate and a check for $200.00 in honor of two of Kansas' premier field herpetologists. Jennifer M. Singleton (Emporia State University) was this year's recipient of the Howard Kay Goyd-Edward Harrison Taylor Scholarship. The scholarship of $300.00 honors the memory of two great herpetologists (and KHS Distinguished Life Members) with strong ties to Kansas. Gloyd was born in Ottawa, Kansas, and attended both Kansas State University and the University of Kansas, and Taylor graduated from Garnett High School and was a faculty member for decades at the University of Kansas. Next, the Alan H. Kamb Grant for Research on Kansas Snakes was awarded to Dexter Mardis (Friends University). The $300.00 grant honors the memory of longtime KHS member Al Kamb of Lawrence. The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology for 2011 was given to Gregory A. Sievert (Emporia State University) for his exceptional photograph of a Coachwhip. For his excellence in photography, Greg was given a commemorative certificate and a check

for $1,000.00 by KHS President Derek Schmidt. The Collins Award is the largest biological award given annually in the state of Kansas. The awards ceremony concluded with two very special awards. Both Eric Kessler (Kansas City, MO) and Mary Kate Baldwin (Topeka) were given the Bronze Salamander Award for distinguished service. The Bronze Salamander is presented to those individuals whose efforts and dedication to the KHS go far beyond normal bounds.

After adjourning for dinner, the ever-popular KHS Social and Auction was held at the Sedgwick County Zoo. Due in part to the charm and wit of the KHS auctioneers Dan Fogell, Eric Thiss, and Walter Meshaka, the auction garnered $1103.00 for the Society treasury.

Speakers for the scientific paper session on Sunday included Wichita North High School Students on a *Preliminary Turtle Survey of the Great Plains Nature Center*, Travis Anthony on *Freshwater Turtle Community Composition in Three Rivers of Northeastern Oklahoma*, Katherine M. Talbott on *Sexual Selection Dynamics in a High Plains Population of* Crotaphytus collaris, Todd Pierson on Urspelerpes brucei: *Discovery, Natural History, and a Warning for Amphibian Conservation*, William Humbert on *Ecology of the American Toad (*Anaxyrus americanus*) in a Northern Allegheny Forest in Pennsylvania*, Jess Magana on *Metabolic Response of* Anolis carolinensis *to Visual Contact with Predator and Prey*, Drew E. Dittmer on *Variations in Sexual Size Dimorphism in the* Sceloporus undulatus *complex*, Charles R. Tucker on *Can Automated Telemetry Quantify Ornate Box Turtle (*Terrapene ornate*) Activity and Nesting Patterns?*, Troy Wieberg on *Establishment of Long-term Herpetological Research on an Urban Green Area, Jefferson City, Missouri*, and Daniel J. Martin on *What about neonates? Using Natural Marks to Track Individuals for Mark-recapture Studies*, Chris Dexter on *Character Variation in the Colubrid Snake Genus Virginia and Implications for the Taxonomy of the Group*.

Upon completion of the final scientific paper session, the fourth annual George Toland Award was given by KHS President Derek Schmidt. The award was given for the best paper presented at this meeting by a KHS student member on the ecology of North American amphibians, reptiles, turtles, and/or crocodilians. This year's recipient was Denise M. Thompson (Missouri State University, Springfield) for her talk on Alligator Snapping Turtle nest predation (see above).

Meeting chairperson and KHS President Derek Schmidt deserves the generous thanks and appreciation of the KHS membership for putting together a fantastic meeting. Derek was aided in his tasks by a local committee consisting of himself, Dan Carpenter, Suzanne L. Collins, Joseph T. Collins, and Travis W. Taggart. Kudos to them for an outstanding job.

- Curtis J. Schmidt,
Sternberg Museum of Natural History

Participants of the 2011 KHS Annual Meeting held at the Great Plains Nature Center in Wichita, Kansas.

Early Saturday morning a small group of KHS notables could be found at a nearby Starbucks, almost as if they knew what the weekend would bring. Photograph courtesy Suzanne L. Collins (CNAH).

Greg Sievert of Emporia State University became the 14th recipient of the Suzanne L. and Joseph T. Collins Award for Excellence in Kansas Herpetology. (Photograph courtesy Suzanne L. Collins (CNAH).

KHS President Derek Schmidt and Awards Committee Chairperson Dan Fogell present both Mary Kate Baldwin and Eric Kessler the prestigious Bronze Salamander Award for Distinguished Service to the Society. Photograph courtesy Suzanne L. Collins (CNAH).

The second annual Fitch-Platt award for excellence in field herpetology was given to Eddie Stegall of Wichita for the initial discovery of Strecker's Chorus Frog in Kansas. Eddie received a certificate and check for $100.00. Photograph courtesy Suzanne L. Collins (CNAH).

The 2011 Gloyd-Taylor Scholarship went to Jennifer M. Singleton (Emporia State University). KHS President Derek Schmidt, together with Awards Committee Chairperson Dan Fogell presented Jennifer with a certificate and a check for $300.00. Photograph courtesy Suzanne L. Collins(CNAH).

Dexter Mardis is tickled pink, as he was chosen for the 2011 Alan H. Kamb Grant for Research on Kansas Snakes. Along with a certificate, Dexter was awarded $300.00 to further his studies. Photograph courtesy Suzanne L. Collins (CNAH).

Denise M. Thompson (Missouri State University, Springfield) proudly accepts the George Toland Award for Ecological Research from KHS President Derek Schmidt. The Toland Award is given annually to the best student presentation. Photo courtesy Suzanne L. Collins (CNAH).

Long-time KHS members Dwight Platt and Eddie Stegall reminisce about the "good 'ol days" while anticipating the keynote presentation. Photograph courtesy Suzanne L. Collins (CNAH).

KHS auctioneer Walter Meshaka and Dexter Mardis kindly point out that itching one's ear does indeed constitute a valid bid. Photo courtesy Suzanne L. Collins (CNAH).

Grace Anne Johnson and Evan Thiss were instrumental in showcasing the wide variety of herp related goods. No animals were harmed during this auction. Photo courtesy Suzanne L. Collins (CNAH).

KHS President Derek Schmidt prepares to introduce the keynote speaker, Dr. Richard Kazmaier (West Texas A&M University). Photo Courtesy Suzanne L. Collins (CNAH).

Eva Horne (Kansas State University) discusses the completion of her first year as KHS Secretary. Photo courtesy Suzanne L. Collins (CNAH).

KHS Treasurer David Oldham (Pittsburg State University) relays the good news as he presents the KHS budget for 2011 during the business meeting. Photo courtesy Suzanne L. Collins (CNAH).

Out-of-staters Marisa Ishimatsu (left) and Maria Covell couldn't wait to meet up in Kansas to share stories with the KHS constituency. Photo courtesy Suzanne L. Collins (CNAH)

Nobody will ever know exactly what had Robin and David Oldham so entranced at the registration table Saturday morning. We are only left to guess. Photo courtesy Suzanne L. Colins (CNAH).

He's still got game! The infamous Joseph T. Collins fraternizes with the auction goers at the Segewick County Zoo, hoping to secure his spot in the VIP tour of the herpetarium. Photograph courtesy Pablo Delis.

As usual, the outstanding artwork of KHS Secretary Eva Horne helped make the KHS auction a huge success. so entranced at the registration table Saturday morning. Photo courtesy Suzanne L. Colins (CNAH).

KHS HERP COUNTS

Get out, count everything you find, and send those data to:

Curtis J. Schmidt, KHS Editor
Sternberg Museum of Natural History
3000 Sternberg Drive
Hays, Kansas 67601

Your reports will be published in the December of each year starting in 2012.

PAY YOUR 2012 DUES

If you have not already done so, send your calendar 2012 dues ($15.00 regular, $20.00 contributing) to:

Eva Horne, KHS Secretary
Division of Biology
Kansas State University
Manhattan, Kansas 66506

Your attention to this matter will ensure that delivery of the *Journal of Kansas Herpetology* will be uninterrupted.

WE WANT YOUR SUBMISSIONS

Field Reports: Tell us about your exploits and findings on field trips both inside and outside of Kansas.

Original Manuscripts: We are always looking for Articles, Notes, and Geographic Distribution submissions.

Artwork: Space is available in the Journal to feature the creative endeavors of KHS members.

Contact the Editor regarding your submissions.

KHS 2012 FIELD TRIPs

KHS 2012 SPRING, 27-29 April - Bourbon County State Fishing Lake.

KHS 2012 SUMMER, 20-22 July - Meade State Lake.

KHS 2012 'FALL', 7-9 September - Atchison/ Doniphan counties.

For information as it is posted, be sure to check the KHS web site regularly at:

www.cnah.org/khs/FieldTripSpringInfo.html
https://www.facebook.com/groups/268452655230/

For immediate information, contact:

Travis W. Taggart, Dan Murrow
KHS Field Trip Co-chairpersons
(see inside front cover of this issue)

GEOGRAPHIC DISTRIBUTION

ARIZONAELEGANS (Eastern Glossy Snake). KANSAS: Logan Co: 38.81498879°N, 100.9794148°W. 25 June 2011. Travis W. Taggart. FHSM 16092. Verified by Curtis J. Schmidt. New county record (Taggart, Collins, and Schmidt. 2011. Kansas Herpetofaunal Atlas; webcat.fhsu.edu/ksfauna/herps.)

Travis W. Taggart and Curtis J. Schmidt,
Sternberg Museum of Natural History,
3000 Sternberg Drive, Hays, Kansas 67601

ARIZONA ELEGANS (Eastern Glossy Snake). KANSAS: Kingman Co: Highway 42 on east side of Chickaskia River bridge. 37.446522°N, 98.200438°W. 30 May 2011. John Lokke. FHSM 15989. Verified by Curtis J. Schmidt. New county record (Taggart, Collins, and Schmidt. 2011. Kansas Herpetofaunal Atlas; webcat.fhsu.edu/ksfauna/herps.)

John Lokke, PO Box 3484
Wichita, Kansas. 67201

LAMPROPELTIS HOLBROOKI (Speckled Kingsnake). KANSAS: Finney Co: 38.200764°N, 100.883641°W. 3 September 2011. Chad Whitney. FHSM 16167. KANSAS: Hodgeman Co: 38.072517°N, 100.080817°W. 12 August 2011. Chad Whitney. FHSM 15818. Verified by Curtis J. Schmidt. New county records (Taggart, Collins, and Schmidt. 2011. Kansas Herpetofaunal Atlas; webcat.fhsu.edu/ksfauna/herps.)

Chad Whitney, Sternberg Museum of Natural History, 3000 Sternberg Drive, Hays, Kansas 67601

MASTICOPHIS FLAGELLUM (Coachwhip). KANSAS: Kingman Co: 0.25 mi. W Spivey on Highway 42. 37.445221°N, 98.171429°W. 30 May 2011. John Lokke. FHSM 15988. Verified by Curtis J. Schmidt. New county record (Taggart, Collins, and Schmidt. 2011. Kansas Herpetofaunal Atlas; webcat.fhsu.edu/ksfauna/herps.)

John Lokke, PO Box 3484
Wichita, Kansas. 67201

PLESTIODON SEPTENTRIONALIS (Northern Prairie Skink). KANSAS: McPherson Co: 38.581018°N, 97.485363°W. 23 April 2011. Ryan Shofner and Sara Unruh. FHSM 15937. Verified by Curtis J. Schmidt. New county record (Taggart, Collins, and Schmidt. 2011. Kansas Herpetofaunal Atlas; webcat.fhsu.edu/ksfauna/herps.)

Ryan Shofner and Sara Unruh,
Sternberg Museum of Natural History,
3000 Sternberg Drive, Hays, Kansas 67601

TROPIDOCLONION LINEATUM (Lined Snake). KANSAS: Finney Co: T23S, R27W, NE Sec.6. 3 May 1990. K. Powell. FHSM 15975. Verified by Curtis J. Schmidt. New county record (Taggart, Collins, and Schmidt. 2011. Kansas Herpetofaunal Atlas; webcat.fhsu.edu/ksfauna/herps.)

Ryan Shofner and Sara Unruh,
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NOTES

Smooth Green Snakes (*Liochlorophis vernalis*) in Kansas: A History and Rediscovery

Ryan M. Shofner
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600 Park Street, Hays, Kansas 67601

History

The Smooth Green Snake (*Liochlorophis vernalis*) is a diminutive snake with a colorful history in the state of Kansas. This species was first reported from the state in 1883, based on a specimen collected by B. F. Gross in 1861, which was later re-identified as a Rough Green Snake (*Opheodrys aestivus*), and subsequently lost (Rundquist, 1974). The next report of this snake was in Branson's "Snakes of Kansas" in 1904. Branson described the species as "occurring throughout the state," and listed six counties from which he examined specimens (Neosho, Barber, Montgomery, Pottawatomie, Franklin, and Douglas). However, Branson did not retain any voucher specimens, so his identifications cannot be verified, and it is possible that they were based on misidentified Rough Green Snakes (*Opheodrys aestivus*) or Eastern Racers (*Coluber constrictor*)

Figure 1. The two Smooth Green Snakes collected near the Republican River on the Fall KHS Field Trip to Jewell County, Kansas. Photo by Suzanne L. Collins (CNAH).

(Collins, Collins, and Taggart 2010).

In 1928, the first fully documented voucher specimen (UMMZ 67021) was collected by Wilbur Doudna in Franklin County (Gloyd 1928). Two further specimens, one from Riley County (Smith 1931) and from Crawford County (Hall and Smith 1947) were reported from Kansas, but these specimens have not been found or verified (Collins, Collins, & Taggart 2010). Collins (1974) considered this species a member of the Kansas herpetofauna, but omitted it from more recent publications (Collins 1982; Collins and Collins 1993; Collins, Collins, and Taggart 2010) due to a subsequent lack of additional evidence that this species occurred in the state. However, Collins, Collins, and Taggart (2010) retained that the Smooth Green Snake might yet be discovered in Kansas in the north-central part of the state, due to the persistence of populations in adjacent Franklin and Webster counties, Nebraska.

Rediscovery

On the weekend of 16-18 September, 2011, the Kansas Herpetological Society gathered in Jewell County for its fall field trip, with the specific goal in mind of finding a Smooth Green Snake (Taggart, 2011). The weather for the weekend was cool and drizzly, with overcast skies and daytime temperatures in the upper 50s to lower 60s (°F). On Sunday, 18 September, the group gathered in the northeast corner of the county to check turtle traps that were set the previous day in the Republican River. Upon arrival, a freshly killed specimen (FHSM 16050) was found on the road by Zach Byrne and William Weeks (Friends University) on the Jewell side of the Jewell/Republican county line. The specimen was approximately 200 m south of the Republican River, and about 1 mile S of Hardy, Nebraska (39.992044°, -97.932151°). Moments later, the author found an additional dead specimen (FHSM 16049) approximately 100 m south of the first (39.991513°, -97.932185°). The specimens were verified by Joseph T. Collins and were deposited in the Sternberg Museum of Natural History at Fort Hays State University (FHSM). These two specimens represent the first verified records of Smooth Green Snakes in 83 years.

The surrounding habitat was primarily riparian woodland associated with the Republican River, with dense grasses along of the periphery of the woodland and in the roadside ditches. Beyond the grassy edge habitat were mainly cultivated agricultural fields.

Because the specimens were found on the county line, I expect the Smooth Green Snake to be present throughout much of Jewell and Republic Counties. There appears to be a large amount of contiguous, similar habitat between this site and populations to the north, as well as throughout much of these two counties.

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Breeding Episodes of the Eastern Spadefoot, *Scaphiopus holbrookii* (Harlan, 1835), in Central Pennsylvania

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The Eastern Spadefoot, *Scaphiopus holbrookii* (Harlan, 1835) is an inhabitant of southeastern United States whose geographic range extends northward into parts of Indiana, Ohio, Pennsylvania, and terminates along the northeastern coast in Massachusetts (Conant and Collins, 1991; Hulse et al., 2001; Meshaka and Collins, 2010; Palis, 2005). In Pennsylvania, the species has been reported from Cumberland, Franklin and Northumberland County in the central part of the state (Hulse et al., 2001; Meshaka and Collins, 2010). As long as temperatures are not too cold, breeding can occur throughout much of the year, especially in the South, in association with heavy rains (Palis, 2005). In Pennsylvania, breeding has been reported for April, July, and August in association with heavy rains (Hulse et al., 2001). Few specimens and little information exist for this species in Pennsylvania. Here, we provide body sizes and clutch characteristics from specimens associated with two breeding congresses in Pennsylvania.

The first episode was on the evening of April 14, 1974, breeding pairs were observed along the Walnut Bottom road, Cumberland County, Pennsylvania (Figure 1). During June, 1974, several dozen metamorphoslings were observed along the dam breast of the CCC Dam, near Cleversburg, Cumberland County. During the 1970s and 1980s, numerous adults were observed along the western base of South Mountain in Cumberland and Franklin Counties. On 14 May 1989, also at Waltnut Bottom, 27 males were seen calling on a sandy patch that had been flooded by heavy rains. The single male collected from that congress measured 52.1 mm snout-vent length (SVL). No fat or food was present. No females were seen that night.

Soon thereafter, several dozen metamorphoslings were seen on the earthen dam breast of the CCC Dam, located northeast of Shippensburg in Cumberland County, not far from the Walnut Bottom site during the third week of June 1974 (Figure 2).

An episode of breeding was also observed on 5 May 1989 in a vernal pond located in South Mountain, west of Dillsburg, 750 ft. elevation, in York County. Nine adult Eastern Spadefoots were counted on that nigh, and individuals were observed in inguinal amplexus throughout the vernal pool (Figure 3). Voucher specimens were collected to document this site and population. A voucher specimen (AMNH 162775) to document the population was deposited in the American Museum of Natural History. This voucher represents a new county record for the species in the state.

A breeding episode occurred on 29 March 1993 in Lewisburg, Union County, Pennsylvania (Figure 4), a new Pennsylvania county for this species. Males were calling from a flooded section of field with sand and gravel substrate.

Two males measured 62.4 and 68.5 mm SVL and both contained traces of fat and food in the lower gastrointestinal tract only. Two females were also captured that evening. The first (60.7 mm SVL) appeared to be in the early stages of

Figure 1. The breeding site (Right) on 15 April 1974 at Walnut Bottom Road, Cumberland County, Pennsylvania, USA. Photograph by E. Wingert.

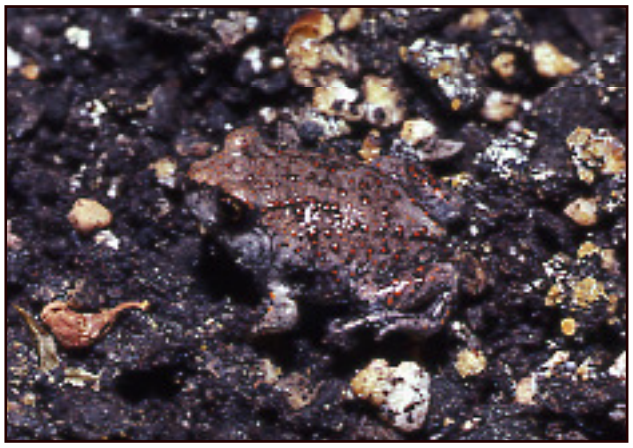

Figure 2. Metamorphosling of the Eastern Spadefoot, *Scaphiopus holbrookii*, from the CCC Dam near Walnut Bottom, Cumberland County, Pennsylvania, found during the third week of June, 1974. Photographs by G. Wingert.

yolking and contained neither fat nor food. The second female (66.5 mm SVL) was not yet gravid but her clutch was further developed than the first female. She contained no fat and food was present only in the lower gastrointestinal tract.

Eggs were collected on 31 March 1993, and a series of tadpoles and metamorphoslings with tails were collected during 31 March 1993-28 April 1993. Metamorphoslings (mean = 15.7 + 2.12 mm; range = 12.2-17.5; n = 7) were similar in body size to the two-legged tadpoles of Gosner stage of at least 37 (mean= 14.5 mm; 12.8, 16.1 mm). Tadpoles with poorly developed and at a Gosner stage of < 37 ranged 3.6-13.1 mm (mean = 7.2 + 3.22 mm; n = 20).

Indirect evidence exists of recent breeding in the species at Letterkenny Army Depot, Chambersburg, Franklin County, Pennsylvania. On the afternoon of 5 August 2009, we captured what appeared to be a recently metamorphosed individual (SMP No. H-3728) that measured 17.1 mm SVL (Figure 5). Its small body size and absence of any tail remnant suggested to us that this individual had transformed very recently, perhaps less than two weeks. In this scenario, breeding would have taken place sometime in July. This timing would also be consistent with the activity patterns of this species recorded from the site in earlier years. Since May of 2003, this site has been part of an ongoing long-term field study of the herpetofauna of south-central Pennsylvania (Delis et al., 2010). During a multifaceted and intensive survey, including pit fall trapping, funnel trapping, day time transects, and night surveys, 11 individuals were captured: Four in funnel traps and seven in pit fall traps. All individuals were trapped in 2003 at three different locations within the site and more than 1000 m from each other Spadefoots were captured during 19-22 July and 1-10 August. Three adult females (mean = 57.7 + 6.65 mm SVL; range = 52.0 – 65.0 mm), one male (53.0 mm SVL), and seven juveniles, which varied greatly in body size (mean = 31.4 + 8.95 mm SVL; range = 22 – 42 mm) were captured from the site. The habitat of all of the findings is northern deciduous forest lightly managed for timber, within 1000 m

Figure 3.Amplexing pair of the Eastern Sapdefoot, *Scaphiopus holbrookii*, in Dillsburg, York County, Pennsylvania on the evening of 5 May 1989. Photograph by J. Cassell.

Figure 4. Eggs of the Eastern Spadefoot, *Scaphiopus holbrookii*, during a breeding congress on 29 March 1993 at Lewisburg, Union County, Pennsylvania. Photographs by E. Wingert.

Figure 5. Ventral view of a juvenile Eastern Spadefoot, *Scaphiopus holbrookii*, captured in July 2003 at Letterkenny Army Depot, Franklin County, Pennsylvania. Photographs by P.R. Delis.

Figure 6. Habitats views of the Eastern Spadefoot, *Scaphiopus holbrookii*, from Letterkenny Army Depot, Franklin County, Pennsylvania. Left side is a 400 m elevation. Right photograph is of an 80 m elevation site. Photographs by P.R. Delis.

of agricultural lands, and with elevation ranging from 80 m (the newly metamorphosed) to 400 m (juveniles and adults) (Figure 6).

Rangewide, this species breeds episodically in association with heavy rains throughout the year in the South and during fewer months in the North (March- August) (Palis, 2005). To that end, breeding has been reported during March-Summer in Maryland (Harris, 1975), April-July in southern New England (Klemens, 1993) and Indiana (Minton, 2001), and April, July, and August in Pennsylvania (Hulse et al., 2001). Our data from central Pennsylvania likewise conform to the findings of spring and summer breeding of northern populations of this otherwise predominantly southern species. Metamorphosling body sizes of our sample were similar to the range of those presented for Illinois (14.8-15.3 mm) (Palis, 2005).

Although the breeding of this species is episodic, ranges of acceptable air temperatures and rainfall (see Palis, 2005 and citations therein) provide some level of predictability regarding the likelihood of breeding. Our findings and the status of this species in Pennsylvania as that of High-Level Concern (Urban and Gipe, 2010) underscore the importance of long-term population monitoring and acquisition of specimens for collections, which together can provide the sorts of information necessary to formulate and carry through meaningful conservation plans of such scarcely studied species as the Eastern Spadefoot in Pennsylvania.

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ARTICLES

Dear Enemy Recognition in Captive Brown Anoles (*Anolis sagrei*)

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Abstract - Six male *Anolis sagrei* were paired so that we had three sets of familiar lizards with adjacent cages and visual contact with only the male in the adjacent cage. After a minimum of seven days to habituate to the new neighbor, the test lizard had a cardboard partition placed between his cage and his neighbor's cage. The neighbor was either left in place or replaced with an unfamiliar lizard and its cage. The partition was left in place for six hours and then removed. The test lizard was observed for 15 minutes and display behaviors tallied. Each lizard was observed with his neighbor and with an unfamiliar male. We hypothesized that males would exhibit fewer display behaviors toward familiar individuals than toward unfamiliar individuals even if the lizards were confined in cages. We determined that male brown anoles could distinguish between familiar and unfamiliar conspecific males without having physical contact with the other male. Anoles displayed significantly more total aggressive behaviors ($P = 0.02$; $df = 5$) and dewlap extensions ($P = 0.02$; $df = 5$) at unfamiliar males than at familiar males.

Introduction

Brown anoles, *Anolis sagrei*, are small, diurnal lizards (Vigil, 2006) that are polygynous, and sexually dimorphic (Kaiser and Mushinsky, 1994). The males are seasonally territorial (Calsbeek and Marnocha, 2006) with territorial behavior coinciding with the breeding season (Vigil, 2006; Partan et al., 2011). This species inhabits the trunk-ground niche, is a sit-and-wait predator (Tokarz et al., 2003), and is found in the southeastern U.S. and the Caribbean (Simon, 2011).

Anole species employ a number of visual displays to communicate with conspecifics (Orrell and Jenssen, 1998). Brown anoles use combinations of headbobs, pushups, dewlap extensions, and infrequently, dorsal crest extensions to make themselves look bigger (Vigil, 2006). Headbobs are often the most frequent display used to communicate to other males (Paterson and McMann, 2004) and may include oscillations of just the head or the head and front part of the body (Simon, 2011). Pushups involve movement of the head and forelegs and sometimes all four legs (Partan et al., 2011). Pushups may be a more aggressive display than headbobs (McMann and Paterson, 2003a; Partan et al., 2011). Dewlap extensions perform a number of functions including species recognition, communication to conspecifics, display used during competition for territories, female mate choice, and predator defense (Tokarz et al., 2003). Dorsal crest extensions are normally reserved for use in highly escalated aggressive bouts with other males (Paterson and McMann, 2004). The displays performed by a particular male vary with the length of time the male has held his territory, the signaler's location within his home range, and the male's familiarity with his rival (McMann and Paterson, 2003b).

Several hypotheses exist to explain differential aggression toward familiar and nonfamiliar individuals. Unfamiliar lizards may pose a greater threat to the territory holder and thus elicit more aggression from the resident or the resident may have more information about a neighbor and vice versa (Paterson and McMann, 2004). The resident would not need to waste effort displaying to assess the neighbor, but would need to gain information about an unfamiliar lizard.

The dear enemy effect explains the change in aggression levels that occur when neighboring lizards recognize each other. Initially, when a new male takes a territory it must expend much energy displaying and defending its territory from other male brown anoles. After boundary lines between adjacent territories have been settled both lizards can reduce their display effort saving their energy for other endeavors. Once the borders are agreed upon it is much less costly for neighbors to maintain their relationship than to have to establish a new relationship with an unknown lizard (Alcock, 2009).

Male brown anoles are able to recognize the difference between a familiar and an unfamiliar male conspecific when both are placed in a natural area that belongs to neither male (Paterson, 2002). When assessing rivals, territory holding male brown anoles view threats from non-territory holders as more serious than threats from neighboring territory holders (Paterson and McMann, 2004). In addition, male brown anoles perceive intrusion into some parts of their territories as more threatening than intrusion into other, possibly less valuable, portions of their territories (Calsbeek and Marnocha, 2006).

Territory defense is common in insectivorous lizards that are sit-and-wait foragers (Pough et al, 2004). The benefits include an increase in mate and food acquisition and access to a retreat safe from predators. Costs of territoriality include physical harm done to the lizard because of its behavior and loss of time that could be devoted to other behaviors (Calsbeek and Marnocha, 2006).

Previous studies to test if male brown anoles could distinguish between familiar and unfamiliar conspecifics involved natural or semi-natural arenas, where males could have physical contact with each other (Paterson, 2002; Paterson and McMann, 2004). Our objective was to determine if captive males without the ability to physically contact each other would still exhibit dear enemy recognition. In spite of being housed within an artificial environment we felt this information was valuable because lizards are kept as research animals for lab experiments, by zoos and nature centers, in classroom settings and by individuals at home. Even if lizards are physically separated they may still have visual contact with other individuals and simply moving cages and exposing lizards to different neighbors could affect their stress levels. We hypothesized that even in an unnatural setting, male brown anoles would exhibit fewer display behaviors toward familiar individuals than toward unfamiliar individuals.

Materials and Methods

We purchased six adult, male brown anoles (*Anolis sagrei*) (Strictly Reptiles, Hollywood, FL.). Each lizard was placed in a 16 x 16 x 20 inch (20 x 20 x 50 cm) ReptiBreeze cage (Zoo Med, San Luis Obispo, CA.) upon arrival, allowed access to water ad lib., fed sub-adult crickets every other day, and maintained on a 14:10 L:D photoperiod with a 50W Reptile Basking Bulb (Zoo Med, San Luis Obispo, CA.). Each cage had a small repti hammock (Zoo Med, San Luis Obispo, CA.) for basking and artificial vegetation that could be sprayed with water for an additional source of water.

Lizard cages were positioned in pairs so that we had three sets of familiar individuals. Their cages were positioned next to each other without anything blocking the view between the cages. During this time a lizard could see only the lizard in the cage next to it, other cages were not visible. The cages were not moved and the lizards were not handled during our study.

Lizards were allowed seven days of habituation to the new cage and new neighbor before we started the first observation. The morning of an observation, a cardboard partition was placed between the test subject's cage and that of its visual neighbor. For the observations between the test lizard and a familiar conspecific the neighbor's cage was left in place. For observations between the test lizard and an unfamiliar conspecific the neighbor's cage was replaced with a cage containing an unfamiliar male. The partition was left in place for six hours at which time the partition was removed and the test lizard's behavior was recorded for 15 minutes. We recorded the number of headbobs, pushups, dewlap extensions, and dorsal crest extensions. After the test the original neighbor's cage and the neighbor were placed next to the test lizard, if they had been moved.

Each lizard was the test male for one trial involving a familiar male and one trial involving an unfamiliar male. A single lizard was used as either a test lizard or rival lizard only once during a 24-hour period. There is ambiguity in how authors have defined headbobs and pushups of *A. sagrei* (Partan et al., 2011). Therefore, we defined a headbob as movement involving only the head and a pushup as movement involving bending the forelegs (Calsbeek and Marnocha, 2006) or all four legs (Partan et al., 2001).

We used paired T-tests to analyze the mean frequency of dewlap extensions, headbobs, pushups, and total display behaviors toward familiar and unfamiliar males. Due to the low number of dorsal crest extensions observed, this behavior was not analyzed. Display behaviors are given as mean ± SE and values are considered significant at $P < 0.05$.

Results

Brown anoles displayed significantly more total aggressive behaviors at unfamiliar males than at familiar males ($P = 0.02$; $df = 5$). During a 15 min session males displayed 5.6 ± 2.1 times (range = 0 - 14) per session to familiar males and 69.0 ± 21.0 times (range = 11 - 151) per session to unfamiliar males.

The males extended their dewlaps significantly more at unfamiliar males than at familiar males ($P = 0.02$; $df = 5$). They ranged from 0 to 13 extensions toward familiar males and seven to 59 extensions toward unfamiliar males (Fig. 1). Our males performed headbobs marginally more to unfamiliar males than to familiar males ($P = 0.06$; $df = 5$). They performed a range of zero to five headbobs in 15 minutes to familiar males and from four to 59 headbobs in 15 minutes to unfamiliar males (Fig. 1).

The number of pushups displayed toward familiar and unfamiliar males was not significantly different ($P = 0.12$; $df = 5$), but the trend of fewer pushups toward familiar males was noticed here too. Males performed 0 or 1 pushup toward familiar males and 0 to 36 pushups per trial toward unfamiliar males (Fig. 1). We observed only two dorsal crest extensions during the entire study (both were directed at an unfamiliar

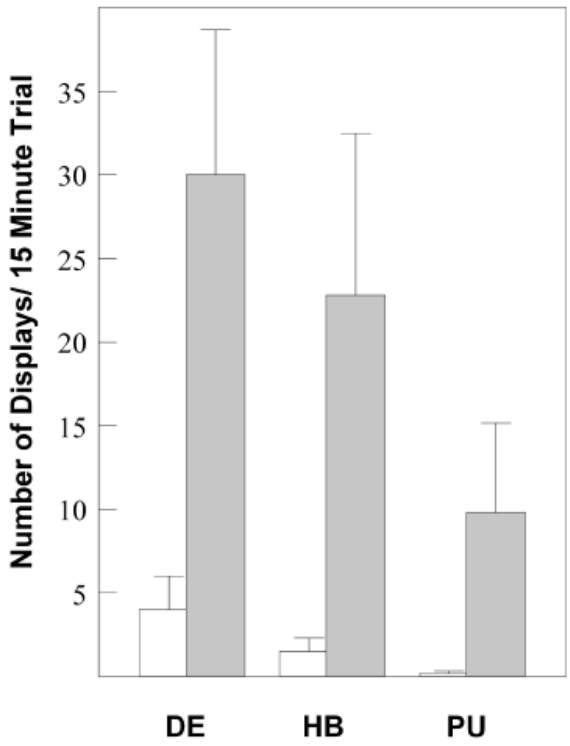

Figure 1. Agonistic behaviors displayed by male Anolis sagrei at familiar (open bars) or unfamiliar (filled bars) conspecifics. Values are mean ± SE, n = 6. DE = dewlap extensions, HB = headbobs, and PU = pushups.

male). Therefore, our sample size for these displays was insufficient for formal analysis.

Discussion

Despite being in a small, artificial habitat, the lizards still monitored and recognized their neighbors. They quickly assessed the adjacent cage when the partition between the cages was removed at the onset of the behavioral trials and if they did not recognize the individual in the cage, they responded much more aggressively than if they were familiar with the lizard. This difference is consistent with observations made on lizards in outdoor settings where the lizards could freely move and interact with other males (Paterson, 2002; Paterson and McMann, 2004). Even when the test lizard was placed in a neutral area outside of his territory and presented with either a former neighbor or non-neighbor the male could distinguish to which category the other male belonged and responded more aggressively to the non-neighbor (Paterson and McMann, 2004).

We observed aggressive behaviors in *A. sagrei* similar to those observed in past studies (Vigil, 2006; Paterson and McMann, 2004; Calsbeek and Marnocha, 2006). Dewlap extensions were the most frequently used visual display toward both familiar and unfamiliar lizards (Fig. 1). Males always extended their dewlaps in the presence of an unfamiliar lizard, but not always when presented with a familiar male. The purpose of extending the dewlap at a conspecific is not understood (Tokarz et al., 2003). No difference was found in behaviors between male *A. sagrei* presented with normal male rivals or with males that had been surgically altered to prevent dewlap extension (Tokarz et al., 2003). Although dewlap displays had no impact on a rival's display behavior, male *A. sagrei* extended their dewlaps more frequently when a rival was one m away than when it was three m away Tokarz et al. (2003). Additionally, the extension of the dewlap had no effect on a male's ability to get females to become receptive and copulate (Tokarz et al., 2005).

The rate of headbobs was 15 times greater toward an unfamiliar male than toward a familiar male. Similar results occurred when *A. sagrei* was placed in a natural habitat that was unfamiliar to that lizard and then presented with either a familiar or unfamiliar male (Paterson and McMann, 2004). Our males always directed headbobs at unfamiliar lizards, but did not always perform them at familiar lizards.

Pushup displays were employed less frequently than dewlap extensions and headbobs. Despite a trend toward more pushups directed at unfamiliar males, during some observations males did not use pushup displays. Jenssen et al. (2000) compared headbob and pushup displays to a whisper and a shouted signal. The amplitude of a pushup is much greater than that of a headbob and because our lizards were in close proximity to each other they may not have needed to use pushup displays to communicate.

Only twice did we observe dorsal crest extensions in our test males and both were directed at an unfamiliar male. This behavior only occurs in sexually mature males during aggressive encounters (Tokarz et al., 2003). In a laboratory setting, males that could physically contact each other extended their dorsal crests while individuals who could only see each other did not (Tokarz et al., 2003).

Two of the test animals arrived with broken tails, but this had no noticeable effect on their behavior toward other males. A survey of 287 *A. sagrei* in central Florida found that about 38% of the wild anoles had broken and/or regenerated tails (Kaiser and Mushinsky, 1994). In a study where pairs of male brown anoles were brought to an outdoor enclosure one always became the dominant male, and removing part of the dominant male's tail did not change the lizard's dominance status or his aggressive behavior (Kaiser and Mushinsky, 1994).

We have no evidence that our presence during the experiment influenced the lizards' behaviors. How-

ever, some of the males paired with a familiar male spent part of the experimental period looking at the observer and not the other lizard. This was not the case with males paired with unfamiliar males. Male *A. sagrei* behaved similarly in the field if handled 1 - 2 hours before the study began or 1 - 2 days before the study began (McMann and Paterson, 2003b). We did not handle the lizards before or during the observation period and were careful to sit quietly before and during the time data were gathered. McMann and Paterson (2003a) saw no effect of observer presence on lizard behavior in the field.

Our lizards displayed a clear difference in their behavior toward familiar versus unfamiliar lizards despite being in an unnatural environment where they did not have physical contact with a rival male. Male *A. sagrei* performed dewlap extensions and aggressive behaviors significantly more frequently in response to unfamiliar males. These results have implications for housing brown anoles in laboratory or public display settings where cages may be moved frequently. Being confronted with new neighbors likely creates a more stressful situation and is energetically more costly to the lizard.

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About the Kansas Herpetological Society

The KHS is a non-profit organization established in 1974 and designed to encourage education and dissemination of scientific information through the facilities of the Society; to encourage conservation of wildlife in general and of the herpetofauna of Kansas in particular; and to achieve closer cooperation and understanding between herpetologists, so that they may work together in common cause. All interested persons are invited to become members in the Society. Membership dues per calendar year are $15.00 (U.S., Regular), $20.00 (outside North America, Regular), and $20.00 (Contributing) payable to the KHS. Send all dues to: KHS Secretary, (address inside the front cover)

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The KHS holds an annual meeting in the fall of each year. The meeting is, minimally, a two day event with lectures and presentations by herpetologists. All interested individuals are invited to make presentations. The annual meeting is also the time of the Saturday night social and fund-raising auction.

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The KHS hosts three field trips each year, one each in the spring, summer, and fall. Field trips are an enjoyable educational experience for everyone, and also serve to broaden our collective understanding of the distribution and abundance of the amphibians, reptiles, and turtles in Kansas. All interested persons are invited to attend.

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The Journal of Kansas Herpetology, currently issued quarterly (March, June, September, and December), publishes all society business.

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As space allows, *JKH* publishes all manner of news, notes, and articles. Priority of publishing is given to submissions of Kansas herpetological subjects and by KHS members; however all submissions are welcome. The ultimate decision concerning the publication of a manuscript is at the discretion of the Editor. Manuscripts should be submitted to the Editor in an electronic format whenever possible. Those manuscripts submitted in hard copy may be delayed in date of publication. Manuscripts should be submitted to the Editor no later than the 1st of the month prior to the month of issuance. All manuscripts become the sole possession of the Society, and will not be returned unless arrangements are made with the Editor. In the interest of consistency and comprehension, the standardized common names used in *JKH* will follow those used in *Amphibians, Reptiles, and Turtles in Kansas* (Collins, Collins, and Taggart, 2010).

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JKH publishes original peer-reviewed submissions under the Articles and Notes sections. Upon review, acceptance, and publication, Portable Document File (PDF) copies are provided gratis to the author on request. Figures and photographs submitted with manuscripts are welcome, but must be sized appropriately by authors for this journal's column sizes (i.e., 19.5 or 39 picas wide). Particular attention should be paid to reduction of text on the figures.

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This CNAH Award was established in 2008 in recognition of the scientific career of George Fredrick Toland, whose life-long interest in herpetology was passed on to so many of his students. The recipient of this award will be selected by the KHS Awards Committee. A minimum award of $200 is given annually at the end of the KHS meeting.

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This CNAH Award was established by Westar Energy in 1998 in recognition of the achievements of Suzanne L. Collins and Joseph T. Collins. In even years, the Award is bestowed upon an individual who, in the preceding two calendar years, had published a paper of academic excellence on native species of Kansas amphibians, reptiles, and/or turtles, and in odd years, the Award is given to an individual who, in a juried competition, took the best photograph of a Kansas amphibian, reptile, or turtle. *The Collins Award* is minimally $1,000.00, and is neither a grant nor a scholarship. No nominations or applications can be made for it.

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