

# ***JOURNAL OF* KANSAS HERPETOLOGY**

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<http://www.cnah.org/khs>

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*Front Cover:* An adult Smooth Earth Snake (*Virginia valeriae*) from Jefferson County, Kansas. Photograph by Suzanne L. Collins, Lawrence, Kansas.

# ***Journal of Kansas Herpetology***

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## KHS BUSINESS

KANSAS HERPETOLOGICAL SOCIETY  
36th Annual Meeting  
6–8 November 2009  
*Smith Hall*  
MidAmerica Nazarene University  
2030 East College Way, Olathe, Kansas 66062

Meeting Sponsors  
*The McPherson Family Trust*  
*JTC Enterprises*

Note to speakers: Please plan your talks for no more than 12 minutes with an additional 3 minutes for questions from the audience. The lecture room has a computer for powerpoint presentations only (if you plan to use 35 mm slides, please bring your own projector). Please bring your visuals on a CD. Speakers should load their talk onto the computer no later than the break session before their talk. Any questions about equipment or meeting facilities should be emailed to [gdj102356@hotmail.com](mailto:gdj102356@hotmail.com).

Venue and Lodging: All scientific paper sessions for the KHS 36th Annual Meeting will be held in Room 123 in Smith Hall on the MidAmerica Nazarene University campus, Olathe, Kansas, on 7-8 November 2009. There are many motels in Olathe – access them on the internet. KHS members are encouraged to patronize the Hampton Inn (12081 South Strang Line Road, Olathe, Kansas; call 913-393-1111), which is in close proximity to MidAmerica Nazarene University. We have arranged a room rate of only \$85.00 per night at the Hampton Inn, but you must make your reservations no later than 10 October 2009 to get that rate. Lodging arrangements cannot be made by the KHS.

Registration: Register in Smith Hall at MidAmerica Nazarene University with the KHS Treasurer on Saturday and Sunday: Students (9th Grade through 12th Grade) \$5.00 per person; all others \$10.00 per person. K through 8th Grade are admitted free.

KHS AUCTION. The annual KHS auction will be held on Saturday night (7 November) in the Hampton Inn, 12081 South Strang Line Road, Olathe, Kansas. All proceeds from the auction go to the KHS. BEER, SOFT DRINKS, and SNACKS WILL BE FREE.

PHOTOGRAPHY COMPETITION. The KHS Awards Committee will select the recipient of The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology from photographic prints on display in Room 118, Smith Hall, MidAmerica Nazarene University, from 10:00 am to 2:00 pm on Saturday, 7 November 2009. Participants in the competition should set up their photographs between 8:00 am and 10:00 am. Participants must be KHS members.

ZOO BOOK SALES. The well-known and highly esteemed book seller, Eric Thiss, will display his tremendous diversity of herpetological titles in Room 205 of Smith Hall, MidAmerica Nazarene University. Buy your favorite books, new and old. Eric is a generous contributor to the KHS auction.

ART EXHIBIT. A retrospective exhibit of herpetological artwork by the esteemed and well-known artist and former KHS president, Eva A. Horne, will be on display in Room 205 of Smith Hall. Come and view the artistic achievements of one of our own.

LIVE EXHIBIT. A live exhibit of native Kansas herpetofauna will be assembled and available in Room 208 of Smith Hall for viewing and photography.

FRIDAY, 6 NOVEMBER 2009

7:00 pm to 11:00 pm: KHS SOCIAL at the Pickering's Pub at 11922 Strang Line Road, Olathe, Kansas. Come talk to other herpetologists and discuss the creatures with which we are so obsessed. Tell us about them. Drink beer. Eat. Sing. Kiss. Boogie. Humor is appreciated.

SATURDAY, 7 NOVEMBER 2009

8:00 am to 4:00 pm Registration for both days: Mary Kate Baldwin (KHS Secretary) and Eric Kessler (KHS Treasurer) in Smith Hall on the MidAmerica Nazarene University campus. Free coffee, juice, and donuts.

9:00 am Opening remarks by Dan Johnson, KHS President  
Welcome by Dr. Ed Robinson, President of MidAmerica Nazarene University

Scientific Paper Session 1 in Room 123, Smith Hall, MidAmerica Nazarene University  
Moderator: Dwight R. Platt, Bethel College, North Newton, Kansas (KHS Distinguished Life Member)

9:15 am KEYNOTE SPEAKER: R. Alexander Pyron, College of Staten Island, City University of New York  
9:45 am to 10:15 am Presentations

Scientific Paper Session 2 in Room 123, Smith Hall, MidAmerica Nazarene University  
Moderator: Mindy Walker, Rockhurst University, Kansas City, Missouri  
10:30 am to 11:30 am Presentations followed by Group Photo (by former KHS President Larry L. Miller)

LUNCH: 11:45 am to 1:15 pm (at the restaurant of your choice)

Scientific Paper Session 3 in Room 123, Smith Hall, MidAmerica Nazarene University  
Moderator: George R. Pisani, Kansas Biological Survey, Lawrence (KHS Distinguished Life Member)  
1:15 pm to 2:45 pm Presentations

Scientific Paper Session 4 in Room 123, Smith Hall, MidAmerica Nazarene University  
Moderator: Dan Carpenter, Derby, Kansas (KHS Past President)  
3:00 pm to 4:15 pm Presentations

4:15 pm KHS General Business Meeting with KHS President Dan Johnson presiding in Room 123, Smith Hall, MidAmerica Nazarene University campus

Introduction of current KHS officers by Dan Johnson  
KHS Treasurer's Report for 2008 by Eric Kessler  
KHS Secretary's Report for 2008 by Mary Kate Baldwin  
KHS Editor's Report for 2008 by Travis W. Taggart  
KHS Historian's Report for 2008 by Suzanne L. Collins  
KHS President-Elect Kathy Ellis: Report on the 37th Annual KHS Meeting at the Topeka Zoo in 2010

Election of KHS Officers for 2010. The KHS Nominating Committee is composed of Joseph T. Collins (Kansas Biological Survey, Lawrence), and David Oldham (Pittsburg State University), and Eva Horne (Kansas State University), and offers the following slate of candidates:

For President  
Kathy Ellis, Wakarusa, Kansas  
Serving as president-elect during 2009, and automatically assumes the KHS presidency on 1 January 2010.

For President-Elect (unopposed)  
Derek Schmidt, Overbrook, Kansas

For Treasurer (unopposed)  
Eric Kessler, Blue Valley North High School, Overland Park

For Secretary (unopposed)  
Mary Kate Baldwin, Topeka Collegiate School

Announcement of the results of the KHS election by the Elector, Mary Kate Baldwin.

KHS Business Meeting adjourns sometime between 4:30 and 5:00 pm. Take a dinner break at the restaurant of your choice. Then proceed to the Hampton Inn, 12081 South Strang Line Road, Olathe, Kansas (doors open at 6:30 pm) where the kegs of free beer will be tapped. Soft drinks and snacks are also free.

SATURDAY EVENING, 7 NOVEMBER 2009

Hampton Inn, 12081 South Strang Line Road, Olathe, Kansas  
6:30 pm KHS Awards Ceremony

Presentation of the Howard Kay Gloyd-Edward Harrison Taylor Scholarship for 2008 by Dan Johnson (KHS President).

Presentation of the Alan H. Kamb Grant for Research on Kansas Snakes for 2007 by Dan Carpenter (KHS Past-President).

Presentation of The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology for 2009 by Daniel D. Fogell (KHS Awards Committee). The recipient of The Collins Award receives a commemorative certificate and a check for \$1000.00.

7:00 pm, the KHS Auction will be conducted at the Hampton Inn by Joseph T. Collins and Daniel D. Fogell, ably assisted by KHS Secretary Mary Kate Baldwin and KHS Treasurer Eric Kessler, and featuring many breath-taking books and other goodies. The KHS takes cash, credit cards, and checks. Get a bidding number before the auction commences. Bid vigorously, and support the KHS.

SUNDAY, 8 NOVEMBER 2009

8:00 am Registration for participants that did not register on Saturday: Mary Kate Baldwin (KHS Secretary) and Eric Kessler (KHS Treasurer) in Smith Hall on the MidAmerica Nazarene University campus. Free coffee, juice, and donuts will be available.

Scientific Paper Session 5 in Room 123, Smith Hall, MidAmerica Nazarene University  
Moderator: Curtis J. Schmidt, Sternberg Museum of Natural History (former KHS President)  
8:30 am to 10:15 am Presentations

Break 10:15 am

Scientific Paper Session 6 in Room 123, Smith Hall, MidAmerica Nazarene University  
Moderator: Dan Johnson, Overland Park, Kansas (KHS President)  
10:30 am to 11:45 am Presentations

KHS Award Ceremony: Presentation of the second George Toland Award for 2009 by S. Ross McNearney, representing one of our esteemed meeting sponsors, the McPherson Family Trust, and KHS President Dan Johnson. This award will be given for the best paper presented at the meeting by a KHS student member on the ecology of North American amphibians, reptiles, and/or turtles. The KHS Awards Committee will select the winner. The recipient must be present to receive the commemorative certificate and a check for \$200.00, co-sponsored by the KHS and The Center for North American Herpetology.

ADJOURNMENT

Have a safe trip home. See you on 5-7 November 2010 at the Topeka Zoo, Kansas, for the 37th Annual KHS Meeting.

36TH ANNUAL MEETING COMMITTEE  
Dan Johnson (Chairperson)  
Suzanne L. Collins & Joseph T. Collins

Note: The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology will be given at this KHS 36th Annual Meeting at MidAmerica Nazarene University in Olathe, Kansas, to the KHS member judged to have taken the best photograph of a native species of the Kansas herpetofauna. The KHS Awards Committee (Daniel D. Fogell, Travis W. Taggart & Walter E. Meshaka, Jr.) will select the recipient from photographs displayed at the meeting. During odd-numbered years (photography competition), only KHS members are eligible. During even-numbered years (scientific presentations or publications), candidates are strongly encouraged to join the KHS, because preference will be given to KHS members.



## KHS FALL FIELD TRIP TO LINCOLN COUNTY IN OCTOBER

The 2009 Annual Fall KHS Field Trip will be held at Sylvan Park below Wilson Reservoir Dam on the Russell-Lincoln county line in north-central Kansas. KHS members and any other interested individuals will gather as early as Friday evening, 2 October 2009, at Sylvan Park. Electric hookups (for a daily fee) and heated showers are available. Camping is available for a daily fee. There are restaurants in Bunker Hill and Wilson (both excellent eateries), Russell (24 miles from Sylvan Park), Lincoln, and Sylvan Grove (between the campsite and Lincoln). Closest motels are available in Lincoln (25 miles from Sylvan Park) and Russell. Participation in KHS field trips is free to anyone interested in amphibians, reptiles, and turtles.

When arriving, look for the large KHS sign at Sylvan Park. Herpetofaunal counts begin at 9:00 am at the designated campsite on Saturday and Sunday, 3-4 October 2009. The field trip adjourns at noon on Sunday, 4 October 2009.

More information will be posted, as it becomes available, on the KHS web site at

<http://www.cnah.org/khs/FieldTripInfoFall.html>

For more details, contact:

Daniel G. Murrow, KHS Field Trip Chairperson  
(see inside front cover)

## KHS ANNUAL MEETING CALL FOR AUCTION ITEMS

The 36th annual meeting of the Kansas Herpetological Society will be held 6-8 November 2009 in Smith Hall at MidAmerica Nazarene University, Olathe, Kansas. KHS President Dan Johnson will preside over the meeting and the fund-raising auction to be held Saturday night (7 November) to support the Society.

Please bring herpetological items to the meeting for the auction. Hold them and bring them the auction on Saturday evening at the Hampton Inn (12081 South Strang Line Road, Olathe, Kansas). Give them to Dan Johnson, Suzanne Collins, Daniel Fogell, or Joe Collins at that time. We count on you to bring items about amphibians, turtles, or reptiles and other stuff oriented to herpetology. PLEASE DO NOT BRING NON-HERPETOLOGICAL ITEMS; these will simply be discarded. Experience has shown that herpetologists generally bid only on herpetological items.

For more information about the 2008 KHS annual meeting, visit the web site at

<http://www.cnah.org/khs/AnnualMeetingInfo.html>

## KHS SCHOLARSHIP & GRANT DEADLINES

Members are reminded that the deadline is 15 September 2009 for submission of applications for the *Howard K. Gloyd-Edward H. Taylor Scholarship* and the *Alan H. Kamb Grant for Research on Kansas Snakes*. Self-nominations for the *Gloyd-Taylor Scholarship* are encouraged. Submissions for both the scholarship and grant should be sent to Daniel Fogell, Chairperson of the KHS Awards Committee (see inside front cover). Both the scholarship and grant awards are \$300.00 each this year.

## KHS ANNUAL MEETING CALL FOR PAPERS

The 36th annual meeting of the Kansas Herpetological Society will be held 7-8 November 2009 in Smith Hall on the campus of MidAmerica Nazarene University in Olathe, Kansas. Effective immediately, the Society is accepting titles for talks to be presented at the meeting.

The KHS annual meeting provides a opportunity for herpetologists and other individuals who have an intellectual interest in amphibians, reptiles, and turtles to come together for scientific lectures and friendly intellectual discussion. There is ample opportunity for socializing in a collegial and supportive atmosphere. The keynote speaker for this year's meeting is Dr. R. Alexander Pyron (City University of New York, College of Staten Island). Registration is only \$10.00 and the beer and soft drinks are free.

Looking for an alternative to costly national herpetological meetings held in large cities with way too many non-herpetological registrants (and where you have only a cash bar)? Try the KHS. Regional meetings are the future and are great venues for graduate students.

Individuals wishing to present a paper at the KHS meeting should submit their title as an email no later than 1 October 2009 to Joe Collins ([jjcollins@ku.edu](mailto:jjcollins@ku.edu)) for posting on the KHS web site and inclusion in the program. Be sure to note whether your presentation is a candidate for The Collins Award (must be primarily about Kansas herpetofauna) and/or The Toland Award (must be a KHS student member). These will be flagged in the program and on the annual meeting web site.

To watch the 2009 KHS annual meeting program unfold before your very eyes (updated daily), visit the web site at

<http://www.cnah.org/khs/AnnualMeetingInfo.htm>

## KHS WEB SITE

KHS members should avail themselves of the Society web site, the most up-to-date state herpetological web site on the internet, worldwide. Take advantage of these gratis services:

A complete modern checklist of the herpetofauna of Kansas (updated daily)

Gratis downloads of the first 23 issues of the *Journal of Kansas Herpetology*

Watch as the annual meeting program evolves before your very eyes

Field trip information (updated daily)

Complete current contact information on all KHS officers and committee chairpersons. Go to

<http://www.cnah.org/khs/>

and keep up-to-date.

# HERPETOFAUNAL COUNTS

## ATCHISON/JEFFERSON COUNTY HERPETOFAUNAL COUNT

On 25 May 2009, James Gubanyi and Keith Coleman conducted herpetological fieldwork in Atchison and Jefferson counties, Kansas. We searched for reptiles, turtles, and amphibians while driving from Topeka to Atchison on the road along the Missouri River and also on the return to Topeka. Time: 4:30 pm to 7:30 pm. Temp: 78°F. Sky: Cloudy. Wind: 5–10 mph. The following species were observed:

### Jefferson County

Eastern Racer.....	1
Common King Snake.....	1
Western Rat Snake.....	1
Common Garter Snake.....	1
Common Snapping Turtle.....	3

### Atchison County

Blanchard's Cricket Frog.....	22
Plains Leopard Frog.....	1
Bullfrog.....	3
Western Rat Snake.....	3
Ringneck Snake.....	4
Redbelly Snake.....	1
10 species.....	±41 specimens

All species verified by Keith Coleman.

Submitted by **JAMES GUBANYI**, 2501 Burnett, Topeka, Kansas 66614.

## ATCHISON COUNTY HERPETOFAUNAL COUNT

On 5 June 2009, Larry Miller, Marla Gubanyi, Julian Gubanyi, and James Gubanyi conducted an herpetofaunal count along the river road and bluffs in Atchison County, Kansas, from 4:00 pm to 7:00 pm. The following species were observed or heard.

Blanchard's Cricket Frog (chorusing).....	±50
Boreal Chorus Frog (chorusing).....	2
Plains Leopard Frog.....	15
Bullfrog.....	12
Five-lined Skink.....	6
Ringneck Snake.....	3
Common Garter Snake.....	5
Western Ribbon Snake.....	1
Common Snapping Turtle.....	1
9 species.....	±95 specimens

All species verified by Larry L. Miller.

Submitted by **JAMES GUBANYI**, 2501 Burnett, Topeka, Kansas 66614.

## CHEROKEE COUNTY HERPETOFAUNAL COUNT

On 13–14 March 2009, Suzanne L. Collins, Travis W. Taggart, and Joseph T. Collins conducted an herpetofaunal count in Cherokee County, Kansas. Lifting rocks by day and listening at night, they observed or heard the following:

Longtail Salamander.....	6
Cave Salamander.....	1
Blanchard's Cricket Frog.....	4
Spring Peeper (chorusing).....	±50
Boreal Chorus Frog (chorusing).....	±50
Crawfish Frog (chorusing).....	±25
Bullfrog.....	6
Bronze Frog.....	9
Southern Leopard Frog (chorusing).....	±50
Coal Skink.....	1
Ground Skink.....	1
Ringneck Snake.....	2
Common Garter Snake.....	1
Slider.....	1
14 species.....	±202 specimens

All species verified by Joseph T. Collins

Submitted by **SUZANNE L. COLLINS**, The Center for North American Herpetology, 1502 Medinah Circle, Lawrence, Kansas 66047, **TRAVIS W. TAGGART**, Sternberg Museum of Natural History, Fort Hays State University, Hays, Kansas 67601, and **JOSEPH T. COLLINS**, Kansas Biological Survey, University of Kansas, Lawrence, Kansas 66045.

## COWLEY COUNTY HERPETOFAUNAL COUNT

On 24 May 2009, Samuel S. Abbott, Tara Abbott, Jaden Mayfield, Jay Gerety, and Sean Gerety conducted an herpetofaunal count in Cowley County, Kansas, at the Floyd & Edna Moore Biological Field Station. They observed the following:

Great Plains Narrowmouth Toad.....	2
Great Plains Skink.....	6
Ringneck Snake.....	2
Plainbelly Water Snake.....	1
4 species.....	11 specimens

All species verified by Samuel S. Abbott.

Submitted by **SAMUEL S. ABBOTT**, 9809 West Birch, Wichita, Kansas 67212.



## ELK COUNTY HERPETOFAUNAL COUNT

On 8 May 2009, Michael Pearce, Suzanne L. Collins, Travis W. Taggart, Joseph T. Collins and friends and colleagues conducted an herpetofaunal count in Elk County, Kansas. Lifting rocks and debris, they observed the following:

American Toad.....	1
Great Plains Narrowmouth Toad .....	±100
Eastern Collared Lizard .....	1
Five-lined Skink .....	2
Great Plains Skink .....	5
Ground Skink.....	±20
Common Kingsnake .....	1
Coachwhip.....	1
Western Rat Snake .....	1
Flathead Snake .....	±25
Western Worm Snake .....	3
Ringneck Snake .....	±20
Western Ribbon Snake.....	1
Copperhead.....	1

14 species ..... ±182 specimens

All species verified by Travis W. Taggart

Submitted by **MICHAEL PEARCE**, Wichita, Kansas, **SUZANNE L. COLLINS**, The Center for North American Herpetology, 1502 Medinah Circle, Lawrence, Kansas 66047, **TRAVIS W. TAGGART**, Sternberg Museum of Natural History, Fort Hays State University, Hays, Kansas 67601, and **JOSEPH T. COLLINS**, Kansas Biological survey, University of Kansas, Lawrence, Kansas 66047.

## FORT RILEY HERPETOFAUNAL COUNT

On 8 May 2009, the eighth annual Fort Riley herpetofaunal count was conducted. The following species were observed:

Woodhouse's Toad .....	2
Blanchard's Cricket Frog .....	180
Cope's Gray Treefrog .....	5
Boreal Chorus Frog .....	112
Plains Leopard Frog .....	53
Bullfrog .....	46
Great Plains Narrowmouth Toad .....	108
Eastern Collard Lizard .....	37
Great Plains Skink .....	63
Ground Skink.....	2
Six-lined Racerunner .....	27
Western Slender Glass Lizard .....	1
Eastern Racer.....	8
Prairie Kingsnake .....	2
Common Kingsnake .....	1
Milk Snake .....	11
Great Plains Rat Snake .....	17
Gopher Snake .....	1
Western Rat Snake .....	5

Common Garter Snake.....	3
Northern Water Snake .....	1
Brown Snake .....	1
Lined Snake.....	1
Ringneck Snake .....	552
Copperhead.....	6

Common Snapping Turtle.....	1
Northern Painted Turtle .....	5
Slider .....	6
Softshell sp. ....	2

29 species ..... 1259 specimens

Participants: Jeff Phillippi, Steve Nagle, Lois Brokmeier, Eva Horne, Emilie Throop, Sam Wisely, Gary Sprecker, Dustin Sprecker, Pat Silovsky, Shawn White, Kyle Ochs, Dan Krull, Sarah Beebe, Judy Low, Brandon Low, Dan Johnson, Michele McNulty, Vernon Tabor, Dan Mulhern, Victor Wilkinson, Gibran Suleiman, Danielle Suleiman, Matt Smith, Shawn Stratton, Mike Houck, Paula Urban, Steve Wahle, Brian Monser, Frank Rottinghaus, Jeff Keating, Brett Parsons, Megan Friedrichs, Josh Pease, Isaac Pease, Mackenzie Pease.

## A History of the Fort Riley Counts

2002	25 species	479 individuals	24 participants
2003	27 species	251 individuals	15 participants
2004	27 species	741 individuals	25 participants
2005	24 species	714 individuals	18 participants
2006	20 species	723 individuals	20 participants
2007	28 species	757 individuals	22 participants
2008	27 species	1038 individuals	28 participants
2009	29 species	1259 individuals	35 participants

Submitted by **MIKE HOUCK**, Threatened & Endangered Species Biologist, U.S. Army CIV - DPW Environmental Division, Building 407, Pershing Court, Fort Riley, Kansas 66442

## SUMNER COUNTY HERPETOFAUNAL COUNT

On 7–9 May 2009, the 33rd Annual Sumner County Herpetofaunal Survey was conducted. Boundaries of the survey were: west from the point where the Kansas Turnpike enters Oklahoma to the Harper County line and north from the Harper County line four miles and then east to the Kansas Turnpike and south back to the Oklahoma line. Most of the survey took place between Drury, Kansas, to the east and one mile west of Caldwell, Kansas, on the west, all within three miles of the Oklahoma line. Methods of observation included rock turning, road cruising, searching at old farm sites, searching around shallow pools at night, and walking through pastureland. Temperatures during the three days ranged from the 60's to the 80's F., with some rain early Friday morning. There had been several inches of rain during the week before the survey. Species observed were:

Plains Spadefoot .....	4
Great Plains Toad .....	9
Woodhouse's Toad .....	3
Blanchard's Cricket Frog .....	21

Spotted Chorus Frog .....	7
Gray Treefrog .....	4
Plains Leopard Frog .....	4
Bullfrog .....	2
Plains Narrowmouth Toad .....	26
Lesser Earless Lizard .....	21
Prairie Lizard .....	14
Texas Horned Lizard .....	5
Southern Prairie Skink .....	6
Six-lined Racerunner .....	82
Eastern Racer .....	1
Prairie Kingsnake .....	2
Common Kingsnake .....	6
Milk Snake .....	1
Coachwhip .....	4
Bullsnake .....	2
Eastern Rat Snake .....	1
Ground Snake .....	80
Plains Blackhead Snake .....	17
Ringneck Snake .....	54
Plainbelly Water Snake .....	1
Diamondback Water Snake .....	3
Northern Water Snake .....	2
Brown Snake .....	3
Western Ribbon Snake .....	7
Common Garter Snake .....	2
Common Snapping Turtle .....	1
Ornate Box Turtle .....	4

Northern Painted Turtle .....	4
Slider .....	2
34 species .....	405 specimens

Participants: Troy Johnson, Gail Feely, Sandy Ray, Connie Ray, Maci Dvorak, Audrey Sprague, Cheryl Warner, Allison Castello, Layne Castello, Matthew Clark, Roberta Clark, Destiny Clark, Kolten Koerner, Robyn Kelley, Marci Bristor, Cooper Bristor, Dawson Bristor, Quinn Ward, Vicki Ward, Quinci Ward, Brae Halling, Derrick Kendrick, Kelsi Ward, Dalton Whaley, Weigand Guerra, Carli Ward, Christian Ward, Jaryn Halling, Cory Ward, Darin Ward, Colten Ward, Tylyn Ward, Nina Ward, Troy Brooke, Matthew Brooke, Justin Brooke, Brett Thomas, Kelsi Ward, Dalton Whaley, Tomas Baca, Lasse Randa-Boldt, Larry L. Miller, Joseph T. Collins, Suzanne L. Collins, Jayden Wodke, Kate Ruoff, Rachel Hutchings, Abbey Harrison Hailey Tucker, Anna Hutchison, Cindy Cummings, Devin Wittmaier, Arren Todack, Caitlyn Priddy, Garrett Greenwood, Krista Akers, Areli Bermudez, Melinda McNish, Tanner Foster, Lindsey Jones, Hannah Poort, Emily Struttman, Stan Williams.

Verified by: Larry L. Miller (Wakarusa), Cindy Cummings (Topeka), and Joseph T. Collins (Lawrence).

Submitted by **LARRY L. MILLER**, 840 SW 97th Street, Wakarusa, Kansas 66546.



Three students from the Seaman School District north of Topeka search for amphibians in Bluff Creek (near Drury, Kansas) during the 33rd Annual Herpetofaunal Survey of Sumner County, Kansas. They are (L–R) Jayden Wodke, Devin Wittmaier, and Caitlyn Priddy.



Quinci Ward, a high school student from Caldwell, holds a Bullsnake that was collected during the 33rd Annual Herpetofaunal Survey of Sumner County, Kansas. Quinci has participated in every Sumner County survey since her first one as a pre-school student. She is also the person responsible for documenting the first Gray Treefrog in Sumner County.

# NOTES

## RECENT OBSERVATIONS OF THE HERPETOFAUNA OF A FORMER NATIONAL SUPERFUND SITE IN ERIE, PENNSYLVANIA

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The Millcreek Golf Course and immediate surrounding area (ca. 80 acres) formerly consisted of two softball fields and an unpermitted landfill, which was listed as a National Superfund site in 1984. A previous paper by the author (Gray, 2007) documented the occurrence of 15 amphibian and reptile (two salamander, six frog, three turtle, and four snake) species, observed between 1995 and 1999. The current paper provides significant observations made at the site during 2007 and 2008. Recent data, including capture rates (CRs) for the four snake species are compared with former data.

During the 2007 and 2008 field seasons, I spent 20.5 and 23.3 hours, respectively, searching for snakes along the southern portion of the former landfill, north of the CSX RR tracks (lat./lon.: N42.09000° W80.15000° [WGS 84]). Snakes were found by turning natural and manmade cover objects. Incidental observations of turtles and amphibians were also documented.

Table 1 is a summary comparison of species observed during the two survey periods. All four species of snake (*Lampropeltis t. triangulum*, *Storeria d. dekayi*, *S. o. occipitomaculata*, and *Thamnophis s. sirtalis*) previously reported to occur at the site were observed during the present survey. Overall snake numbers have decreased in the immediate vicinity of the flood retention basin and the golf course; however, snakes in the "untouched" habitat to the south of the golf course and east of the flood retention basin appear to be doing well, at least in relation to the numbers observed during the 1995–1999 period. Young-of-the-year individuals of *L. t. triangulum*, *S. d. dekayi*, and *T. s. sirtalis* were observed during the 2007–2008 period.

The Shorthead Garter Snake, *Thamnophis brachystoma*, a species not formerly reported from the site, was observed on 14 May 2007, under a board in old field habitat. The specimen was a female (400 mm SVL; 120 mm tail L; 34 grams wt.). No other *T. brachystoma* were observed at the site; however, an individual was found nearby, ca. 1.5 mi. east of the site along the CSX RR tracks (Mark Lethaby, pers. comm., 2008). This species has also been reported from Presque Isle State Park (McKinstry et al., 1991), ca. 6.2 mi NE of the present site. The author has spent considerable time (almost 20 years) searching for amphibians, reptiles, and turtles at the Harper Drive site and has never observed this species there before. Although it is possible that *T. brachystoma* has occurred at the Harper Drive site, albeit in very low numbers and until recently overlooked, it seems more likely that this specimen was either an escaped captive or intentionally released at the site. It is also possible that it was a recent colonizer from populations to the east in the City of Erie, where this species is assumed to have been introduced (Price, 1978; Engelder, 1988). It

has been speculated that this species may have been introduced into some sites via the balled roots of plants (Netting cited in Conant, 1950). Plants used in the landscaping of the golf course and flood retention basins may have served this purpose if they were from a nursery within the native range of this species.

The CRs of *Lampropeltis t. triangulum* and *S. o. occipitomaculata* were similar to those previously reported. *Thamnophis s. sirtalis* CRs for 2007 and 2008 were lower than those previously reported for the combined period 1995–1999, but similar to those for the individual years 1995 (0.33) and 1996 (0.41). *Storeria d. dekayi* CRs were more than twice as high as the highest CR (0.68) reported for this species for the 1997 season.

During the 1995–1999 survey, the entire area, including the landfill that is now the golf course, was searched. However, during 2007 and 2008, only the area south of the golf course and north of the CSX RR tracks was surveyed. It is almost certain that these snake species are no longer found in significant numbers on the golf course, as all of the artificial cover (e.g., debris and shingle piles, tin, etc.) has been removed. The actual golf course is essentially a well-manicured lawn, providing little suitable habitat for snakes.

Table 1. Comparison between sampling periods 1995–1999 and 2007–2008. *n* = number of individuals of each listed species observed during each respective sampling period.

Species	Observed during 1995–1999	Observed during 2007–2008
Salamanders		
<i>Ambystoma maculatum</i>	Yes ( <i>n</i> = 04)	Yes ( <i>n</i> = 02)
<i>Notophthalmus viridescens</i>	Yes ( <i>n</i> = 01)	Yes ( <i>n</i> = 01)
Frogs and Toads		
<i>Anaxyrus americanus</i>	Yes ( <i>n</i> = 03)	Yes ( <i>n</i> = 03)
<i>Hyla versicolor</i>	Yes ( <i>n</i> = 04)	Yes ( <i>n</i> = 01)
<i>Pseudacris crucifer</i>	Yes ( <i>n</i> = 22)	Yes ( <i>n</i> = 12)
<i>Lithobates clamitans</i>	Yes ( <i>n</i> = 44)	Yes ( <i>n</i> = 19)
<i>Lithobates palustris</i>	Yes ( <i>n</i> = 08)	Yes ( <i>n</i> = 01)
<i>Lithobates sylvaticus</i>	Yes ( <i>n</i> = 01)	No
Turtles		
<i>Chelydra serpentina</i>	Yes ( <i>n</i> = 10)	Yes ( <i>n</i> = 02)
<i>Chrysemys picta</i>	Yes ( <i>n</i> = 71)	Yes ( <i>n</i> = 22)
<i>Clemmys guttata</i>	Yes ( <i>n</i> = 05)	No
<i>Trachemys scripta</i>	No	Yes ( <i>n</i> = 01)
Snakes		
<i>Lampropeltis triangulum</i>	Yes ( <i>n</i> = 20)	Yes ( <i>n</i> = 04)
<i>Storeria dekayi</i>	Yes ( <i>n</i> = 57)	Yes ( <i>n</i> = 79)
<i>Storeria occipitomaculata</i>	Yes ( <i>n</i> = 01)	Yes ( <i>n</i> = 01)
<i>Thamnophis brachystoma</i>	No	Yes ( <i>n</i> = 01)
<i>Thamnophis sirtalis</i>	Yes ( <i>n</i> = 184)	Yes ( <i>n</i> = 14)





Figure 1. This photograph is of the swamp along the southern edge of the golf course, facing north. *Chelydra serpentina*, *Chrysemys picta*, and *Clemmys guttata* have been reported from this wetland.

It is likely, however, that snakes, especially *S. d. dekayi* and *T. s. sirtalis*, may traverse the course in search of food.

The increase in CRs for *S. d. dekayi* during 2007 and 2008 may be an indication that this species has been able to increase in numbers at the site, despite the major alteration of habitat to the north. *Storeria d. dekayi* has long been known as a species that does well in urban environments (Ditmars, 1936; Hulse et al., 2001). Fowler (1907) stated that "most examples which I have noted were found near towns where they do not appear to be especially disturbed by the encroachment of civilization." More recently, Gaul (2008) found that *S. d. dekayi* were more abundant at an urban site than at a nearby rural site.

The increase in *S. d. dekayi* CRs may be due in part to the observed decrease (especially in the western portion of the site) of *T. s. sirtalis*. Juvenile *T. s. sirtalis* may be a possible competitor with *S. d. dekayi* for food, especially earthworms. It is also possible that the construction of the golf course, which included the removal of several collapsed shacks and numerous abandoned vehicles and trash piles, may have caused a reduction in the numbers of snake predators (e.g., birds, skunks, raccoons, and opossums).

Both salamander species (*Ambystoma maculatum* and *Notophthalmus viridescens*) documented in the previous report were observed during the recent searches. All the *A. maculatum* were recent metamorphs, indicating that successful reproduction is continuing in wetlands at the Harper Drive site.

Of the six frog species previously documented from

the site, only *Lithobates sylvaticus* was not seen or heard. However, as noted above, the present surveys focused specifically on snakes. Also, the site was not visited in early spring, when *L. sylvaticus* would be breeding and calling; therefore it is possible that individuals may still occur at the site but were overlooked.

Of the three turtle species formerly reported to occur at the site, only *Chrysemys picta* and *Chelydra serpentina* were observed. The Spotted Turtle, *Clemmys guttata*, may have been extirpated from the site, as no individuals have been observed since 4 June 1997, when a female was found in the swamp. At the time of the 1997 observation, only four other *C. guttata* had previously been observed. The author is aware of Spotted Turtles being collected from the site in the past, and this certainly could have contributed to the extirpation of this species here. Furthermore, an area of extensive sandy soil to the north of the swamp that was used for nesting by *Chrysemys picta*, and possibly by *C. guttata*, was covered with a 12-inch soil cap and seeded with grass and is now part of the golf course. However, staff at the education center reported that Common Snapping Turtles attempt to nest on the course, and it is likely that *C. picta* does so as well. Juveniles of both *C. serpentina* and *C. picta* have been seen south of the swamp, and are evidence that successful reproduction of these species is occurring at the site. With the exception of *C. guttata*, turtles at the site seem to have been little impacted by the construction of the golf course; the swamp and swamp forest were





Figure 2. A *Trachemys scripta elegans* was found in this small stream that drains the western most flood retention basin.

for the most part untouched (Figure 1). In light of the above, if Spotted Turtles are present and capable of reproducing, the golf course may still be suitable for nesting by them.

A Red-eared Slider, *Trachemys scripta elegans*—a species not native to Pennsylvania—was observed 6 May 2008, in a small stream that drains a flood retention basin (Figure 2). The observed specimen was definitely a released prior captive. The Red-eared Slider has also been reported from nearby Presque Isle State Park, where the species may already be established. Due to a lack of large permanent wetlands at the site it is unlikely that this species could become established at the Harper Drive site. Searches of the stream a few weeks after the initial sighting failed to locate the specimen. The stream where the turtle was observed is prone to flooding, and it is quite possible that the Red-eared Slider was washed downstream, possibly into Lake Erie, where the stream eventually drains.

Misfud and Misfud (2008) suggested that properly managed golf courses could provide vital habitat and serve as refugia for urban amphibians and reptiles. While the fairway of The Millcreek Township Golf Course may not be hospitable to herpetofauna, the wetlands on the course and immediate surrounding area still contain several habitats suitable for amphibians, reptiles, and turtles. These could serve as refugia in a landscape dominated by residential neighborhoods, and, to a lesser extent, moderate industrial development.

I wish to thank Jeff Beane for helpful comments and suggestions that improved the manuscript.

#### Literature Cited

- Conant, R. 1950. On the taxonomic status of *Thamnophis butleri* (Cope). Bull. Chicago Acad. Sci. 9: 71–77.
- Ditmars, R. L. 1936. The Reptiles of North America: A Review of the Crocodilians, Lizards, Snakes, Turtles and Tortoises inhabiting the United States and Northern Mexico. Doubleday & Company, Inc. Garden City, New York.
- Engelder, W. K. 1988. A study of the shorthead garter snake, *Thamnophis brachystoma* in New York State. Master's Thesis. St. Bonaventure University, New York. 72 pp.
- Fowler, H. 1907. The amphibians and reptiles of New Jersey. Ann. Rept. New Jersey State Mus. 1906: 24–250.
- Gaul, R. W., Jr. 2008. Ecological observations of the Northern Brown Snake (*Storeria dekayi*) in an urban environment in North Carolina, USA. In: Mitchell, J. C., R. E. J. Brown and B. Bartholomew (editors). Urban Herpetology. Herp. Conserv. 3: 361–363.
- Gray, B. S. 2007. The herpetofauna of a National Superfund Site in Erie, Pennsylvania. Bull. Maryland Herp. Soc. 43(3): 129–133.
- Hulse, A. C., C. J. McCoy, and E. J. Censky. 2001. Amphibians and Reptiles of Pennsylvania and the Northeast. Cornell University Press. Ithaca, New York.
- McKinstry, D. M., M. Lethaby, and H. Cunningham. 1991. Amphibians and Reptiles of Presque Isle State Park, Erie County, Pennsylvania. J. Pa. Acad. Sci. 65(1): 17–23.
- Misfud, D. A., and R. Misfud. 2008. Golf courses as refugia for herpetofauna in an urban river floodplain. In: Mitchell, J. C., R. E. J. Brown and B. Bartholomew (editors). Urban Herpetology. Herp. Conserv. 3: 303–310.
- Price, A. H. 1978. New locality records and range extensions for *Thamnophis brachystoma* (Reptilia: Serpentes) in Pennsylvania. Bull. Md. Herp. Soc. 14: 260–263.

## ARTICLES

### SEASONAL ACTIVITY, REPRODUCTIVE CYCLES, AND GROWTH OF THE BRONZE FROG (*LITHOBATES CLAMITANS CLAMITANS*) IN SOUTHERN LOUISIANA: AN ENDPOINT IN ITS GEOGRAPHIC DISTRIBUTION AND THE VARIABILITY OF ITS LIFE HISTORY TRAITS

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**Abstract:** We examined the seasonal activity, reproduction, and growth of the Bronze Frog (*Lithobates clamitans clamitans*) from southern Louisiana using 1372 museum specimens and calling data. Post-metamorphic individuals were active throughout the year, and metamorphosing individuals were captured during February–October. Males called, and females were gravid, over an extended time in southern Louisiana. Larval transformation occurred at small body sizes and sexual maturity was reached quickly and at small body sizes, with males being smaller in mean body size than females. Findings in this study were in general agreement with those from northern Louisiana with the exception of mean body size, which was smaller in both sexes in southern Louisiana. Among the life history traits we examined, body size appeared to have been the most variable at the southern edge of its geographic range.

#### Introduction

The Bronze Frog, *Lithobates clamitans clamitans* (La-treille, 1801), is one of two recognized subspecies of the eastern North American Bronze Frog, *L. clamitans* (La-treille, 1801). Occurring in the Southeast, it intergrades with the Green Frog, *L. c. melanotus* (Rafinesque, 1820) along the fall line in Georgia and Alabama, which in turn replaces the Bronze Frog north to southeastern Canada (Conant and Collins, 1998; Pauley and Lannoo, 2005). Less attention has been paid to the Bronze Frog in the literature than its nearest relative despite the ubiquity of this species in generally lentic aquatic systems in the South. Examination of this species in northern Louisiana corroborated findings of small body size of metamorphosing individuals (Wright and Wright, 1949) and adults (Wright and Wright, 1949; Mecham, 1954) of the Bronze Frog and found longer seasons of activity and reproduction and faster post-metamorphic growth to sexual maturity than in northern populations of the Green Frog (Meshaka et al., 2009). We undertook this study to compare these same parameters from the southernmost latitudes of

its geographic distribution to determine the endpoint in the geographic variation of these life history traits

#### Materials and Methods

One thousand three hundred and seventy-two specimens of Bronze Frogs (*Lithobates clamitans clamitans*) collected during 1920–2004 from southern Louisiana (Figure 1) were examined from the holdings of the California Academy of Science, Carnegie Museum of Natural History, Illinois Natural History Survey, Los Angeles County Museum, Louisiana State University, Mississippi Museum of Natural History, Museum of Comparative Zoology, Milwaukee Public Museum, Tulane University, University of California–Berkeley, University of Colorado, University of Texas–Austin, and University of Texas–El Paso. Body lengths of all size-classes and of tadpoles were measured in mm snout-vent length (mm SVL).

Sexual maturity was determined in males using a slightly modified version of the technique by Martof (1956a), whereby the ratio of tympanum diameter: body size corresponded



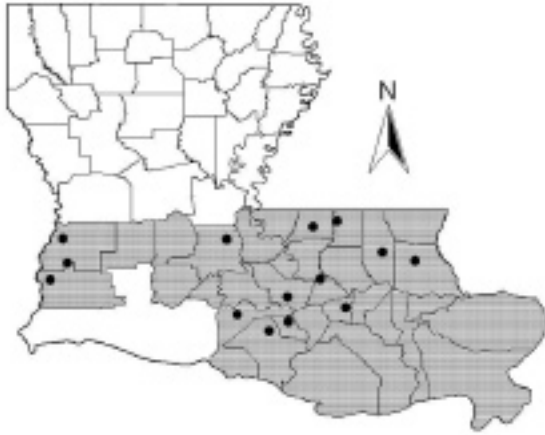


Figure 1. Louisiana parishes from which museum specimens of Bronze Frogs (*Lithobates clamitans clamitans*) were examined in this study (shaded) and individual sites at which calling surveys were conducted as part of the Louisiana Amphibian Monitoring Program (dots).

to enlarged testis, which signified sexual maturity. Martof (1956a) noted that the tympana generally were “nearly or quite round”. For most frogs Martof (1956a) measured the antero-posterior diameter of the left tympanum. If irregular in shape, the right tympanum was measured. If both were misshapen, Martof (1956a) took the average of the antero-posterior and dorso-ventral measurements. Irregularly shaped tympana from our sample were greater in length than in height. For consistency, we measured the dorso-ventral diameter of the left tympanum and used the right tympanum only if the left one appeared to have been damaged in some way. As per Martof (1956a), sex index = body length/ tympanum diameter. The sex index was generally below 10 for sexually mature males (Martof, 1956a).

The secondary sexual characteristic of enlarged thumbs was not easily ascertained. The yellow throat of mature males, which easily fades to varying degrees in preservative, was not apparent. The length and width of the left testis as a percent of the body size was used to measure seasonal differences in testis dimensions.

Sexually mature females were associated with one of four ovarian stages. In the first ovarian stage oviducts were thin and just beginning to coil, and the ovaries are somewhat opaque. In the second ovarian stage, the oviducts were larger and more coiled, and the ovaries contained some pigmented oocytes. In the third ovarian stage, oviducts were thick and heavily coiled, and the ovaries were in various stages of clutch development. In the fourth ovarian stage, oviducts were thick and heavily coiled, and the ovaries were full of polarized ova with few non-polarized ova, signifying a fully ripened clutch and gravid female (Meshaka, 2001). A subset of gravid females from southern Louisiana not containing food were patted to remove excess moisture and weight on a triple beam balance for body mass with clutch. These data were compared with an Analysis of Covariance (ANCOVA) with those associated with gravid females in figure 8 of Meshaka et al. (2009). Fat body development was scored as absent, intermediate in

volume in the body cavity, to extensive development that reached upwards in the body cavity. The latter amount was used as an estimation of monthly incidence of extensive fat relative to all females examined in each month.

Tadpoles were scored as per Gosner (1960). For practical purposes, tadpoles were categorized as either having poorly-developed hind legs (less than Gosner stage 37) or well-developed hind legs (Gosner stage of at least 37). Metamorphosing were distinguished from tadpoles by the presence of forelimbs (Gosner stage 42) and distinguished from juveniles by the presence of a tail. Means were followed by + 2 standard deviations, and significance was recognized at  $P < 0.05$ .

Calling records made by JB from across southern Louisiana during August 1992–January 2009 and data collected from the Louisiana Amphibian Monitoring Program (Figure 1) were used to determine calling season of the Bronze Frog across the southern portion of the state. The North American Amphibian Monitoring Program (NAAMP) protocols dictated three runs per year during three sampling windows of six weeks each. All NAAMP routes were in forested habitat, and the approximately 10 day windows (e.g., 1–10, 11–20, 21–31) for southern Louisiana were during 1 January–20 June.

## Results

**Seasonal activity.**— Bronze Frogs from southern Louisiana were collected in every month of the year (Figure 2). The highest incidence of captures of all individuals combined as well as that of only post-metamorphic individuals occurred during February–April, with the highest incidence of captures having occurred in February followed by a gradual decline thereafter (Figure 2).

**Seasonal changes in testis size.**— Measured as a percentage of male body size, testis size appeared to be large at least during February–August, having reached peak size during May–June and probably July (Figure 3). Although the seasonal decrease in testis size was not pronounced, it was apparent during September–January followed by a rapid increase during the following late winter–summer (Figure 3).

**Calling.**— Field notes indicated that the Bronze Frog called during March–September, with a peak in April and May (Figure 4). Calling activity gradually decreased thereafter. Earliest and latest dates on which males were heard calling were 4 March and 30 September, respectively. LAAMP data detected calling from early January when systematic calling surveys began for the year through mid-June when the surveys ended (Figure 5). During the surveys, calling became more noticeable in March and reached its peak intensity in May (Figure 5). The summary of call intensity varied with sampling period ( $R = 0.81$ ,  $F = 26.391$ ,  $df = 15227$ ,  $P < 0.000$ ;  $R^2 = 0.24$ ,  $F = 85.904$ ,  $df = 1271$ ,  $P < 0.000$ ).

During the LAAMP surveys, calling was heard in air temperatures that ranged 11.1–29.0°C, with peak intensity of calling at 22.0–23.9°C (Figure 6). The summary of call intensity varied with air temperature ( $R = 0.59$ ,  $F = 7.145$ ,  $df = 257$ ,  $P < 0.000$ ;  $R^2 = 0.14$ ,  $F = 45.182$ ,  $df = 1271$ ,  $P < 0.000$ ). A multiple regression plotting call intensity with air temperature and sampling period was significant ( $R^2 =$

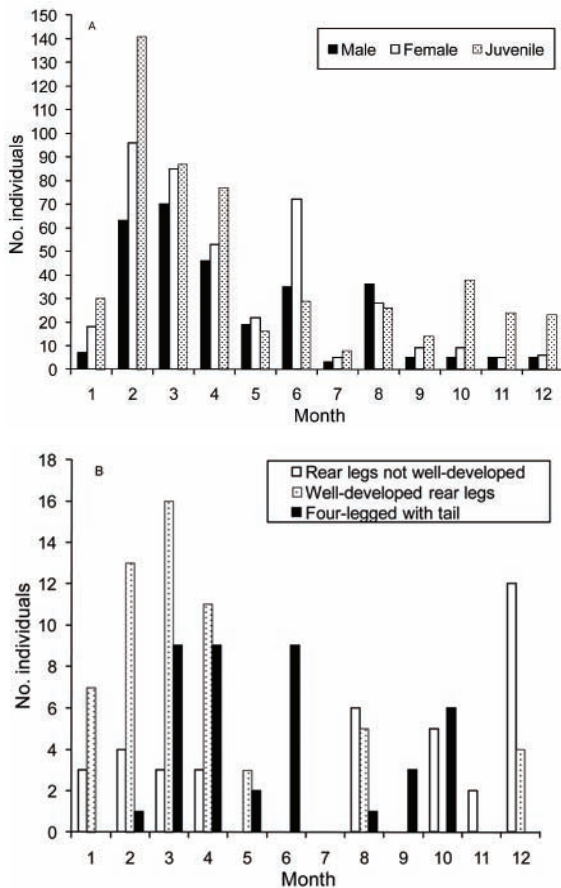


Figure 2a,b. Seasonal incidence of captures of 1357 Bronze Frogs (*Lithobates clamitans clamitans*) from southern Louisiana.

0.24,  $F = 42.825$ ,  $df = 2270$ ,  $P < 0.000$ ) such that calling intensity could be predicted by the equation, calling intensity =  $0.012(\text{air temp}) + 0.319(\text{sampling period})$ .

**Ovarian cycle.**— Gravid (stage 4) females were detected during January–September, with a rapid increase in frequency during April–August (Figure 7). Yolking-nearly gravid (stage 3) females were captured throughout the year (Figure 7). The presence of stage 3 females during September–December when the fewest females were captured precluded any determination that females were not gravid during that time. Stage 1 and 2 females were generally highest in frequency when gravid females were absent or in low frequencies, suggesting that gravid females, if present during September–December, would have been in low frequencies similar to those during January–March (Figure 7). Body mass of gravid females not containing food positively and significantly covaried with female body size (Figure 8).

**Female fat cycle and the presence of food.**— The extent to which fat bodies were well-developed in females varied across the months, whereby winter stores of fat were gradually depleted by July or August (Figure 9). It was during this time that the highest numbers of gravid females began to appear (Figure 7), many of which were depleted of their fat compared to their non-gravid counterparts (Figure 10).

The incidence of females containing food in their stomachs was relatively high through the year but generally highest during late summer–early winter (Figure 9). From

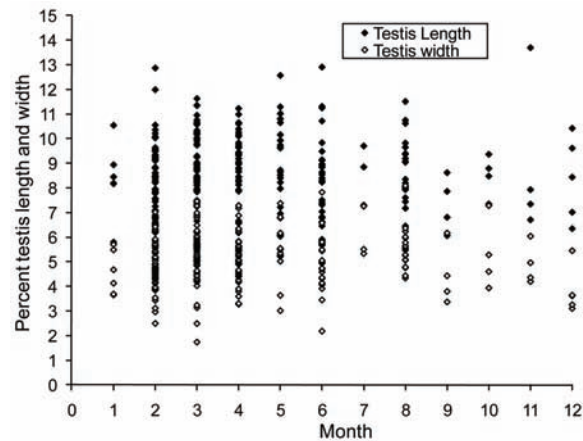


Figure 3. Monthly distribution of testis size of 259 Bronze Frogs (*Lithobates clamitans clamitans*) from southern Louisiana.

January onward, the incidence of females containing prey increased until breeding; however, the incidence of summer females containing food was still relatively high (Figure 9) as it was even in gravid females (Figure 10).

**Growth and sexual maturity.**— The monthly distribution of two size-classes of tadpoles was suggestive of a two-month larval period in southern Louisiana Bronze Frogs (Figure 11a). Metamorphosing were present during February–October (Figure 2a, 11a), and the distribution of body sizes was suggestive of a nearly, if not continuous, production of metamorphosing in southern Louisiana (Figure 11a). However, a seasonal amplitude in metamorphosis may have occurred during March–June, just as the preceding January–April amplitude in large tadpoles approaching metamorphosis waned (Figure 2).

Body size at transformation of 41 metamorphosing was small (mean =  $28.3 \pm 6.1$  mm SVL) and ranged 19.6–47.0 mm SVL. The modal whole number measurement for metamorphosing was 27 mm SVL. From these data, growth trajectories from the monthly distribution of body size indicated that male Bronze Frogs in southern Louisiana reached sexual maturity in three months of post-metamorphic age at 39.9 mm SVL (Figure 11b). Males attained their mean body size approximately three months after reaching sexual ma-

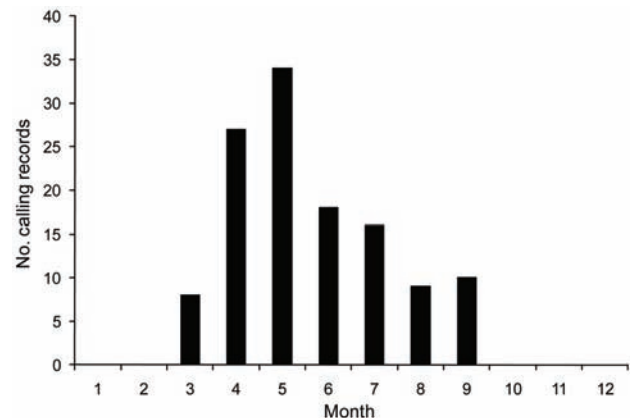


Figure 4. Monthly distribution of 122 calling records for Bronze Frogs (*Lithobates clamitans clamitans*) from southern Louisiana.

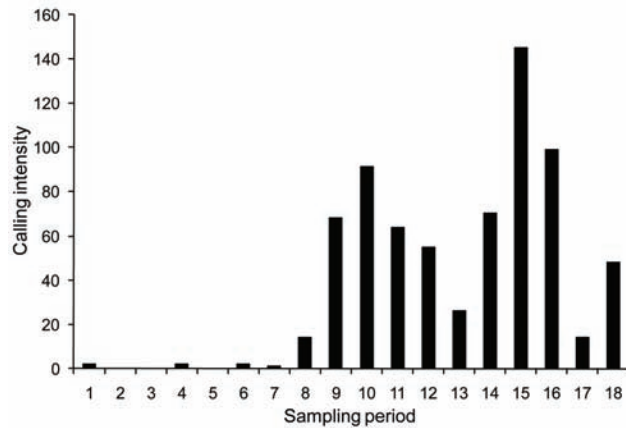


Figure 5. The sum of call intensity of Bronze Frogs (*Lithobates clamitans clamitans*) from monitored sites during each of 18 sampling periods (1 January-20 June) in southern Louisiana. Each sampling period is approximately 10 days.

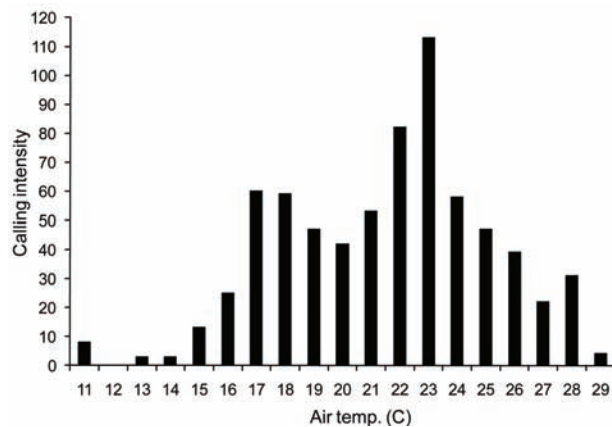


Figure 6. The sum of call intensity of Bronze Frogs (*Lithobates clamitans clamitans*) distributed across air temperatures in which calls were heard from monitored sites in southern Louisiana.

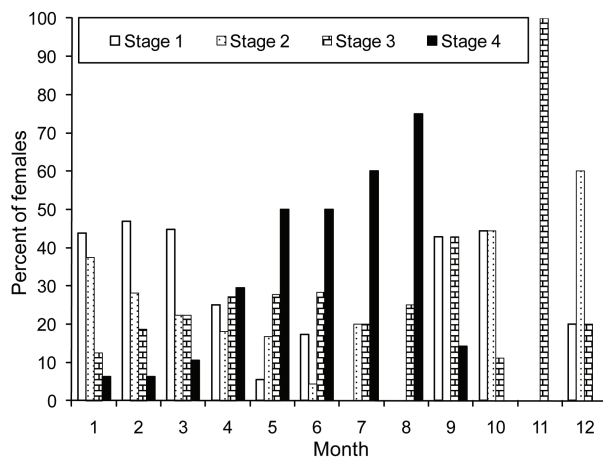


Figure 7. The annual ovarian cycle of 302 Bronze Frogs (*Lithobates clamitans clamitans*) from throughout southern Louisiana.

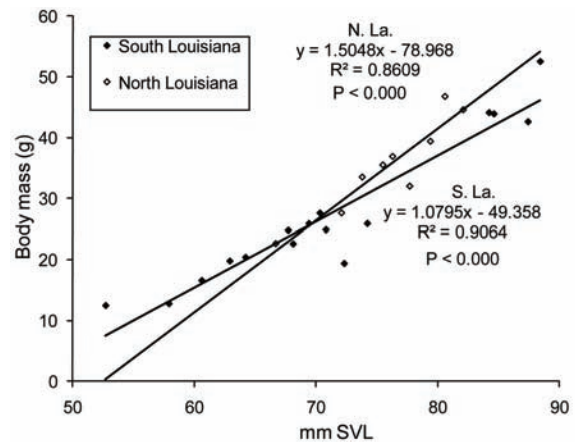


Figure 8. Relationship between body mass of gravid female Bronze Frogs (*Lithobates clamitans clamitans*) with clutches and female body size from south Louisiana (this study) and north Louisiana (Meshaka et al., 2009).

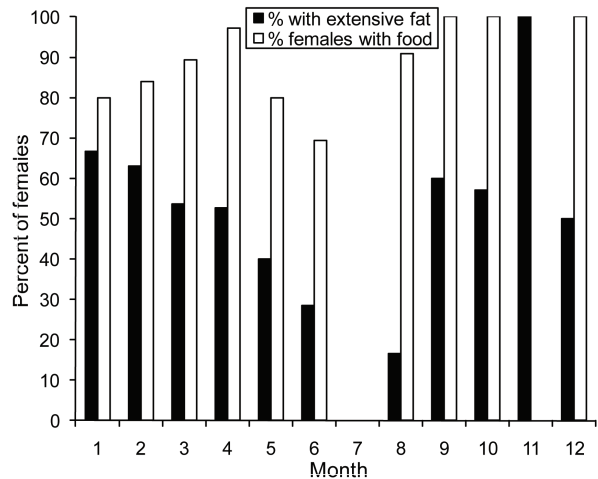


Figure 9. Monthly frequency of extensive fat (n = 230) and the presence of food (n = 238) in female Bronze Frogs (*Lithobates clamitans clamitans*) from southern Louisiana.

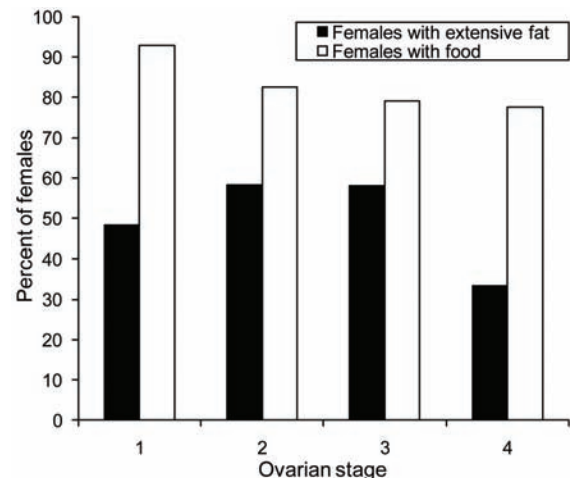


Figure 10. Frequency of extensive fat (n = 236) and the presence of food (n = 243) in each of the four ovarian stages of female Bronze Frogs (*Lithobates clamitans clamitans*) from southern Louisiana.



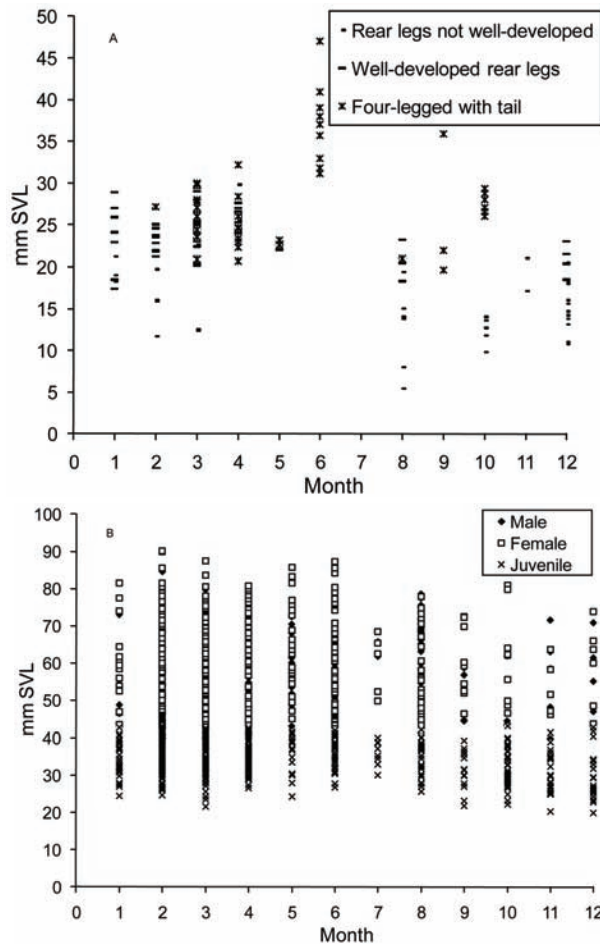


Figure 11a,b. Monthly distribution of body sizes of 1357 Bronze Frogs (*Lithobates clamitans clamitans*) from southern Louisiana. A = tadpoles and metamorphosing individuals. B = post-metamorphic individuals.

turity at  $56.8 \pm 9.8$  mm SVL; range = 39.9–84.5;  $n = 302$ ).

Mean sex index (body length/tympanum) for 296 male Bronze Frogs was  $8.0 \pm 1.1$  mm (range = 4.7–11.5). Values exceeding 10 were found in six males. The sex index negatively co-varied with male body size (Figure 12) because tympanum diameter, which co-varied with the body size of adult males (Figure 13), was relatively larger in large males.

The smallest gravid female (ovarian stage 4) reached sexual maturity at four months of post-metamorphic age at 43.1 mm SVL ( $n = 80$ ) (Figure 11b) and was smaller than the smallest females of ovarian stages 1 (44.5 mm SVL), 2 (48.0 mm SVL), and 3 (52.4 mm SVL). Mean body size for all sexually mature females was reached approximately two or three months after reaching sexual maturity at  $59.8 \pm 11.8$  mm SVL (range = 43.1–90.2;  $n = 416$ ) mm SVL and their body sizes differed significantly in variance ( $F = 0.6824$ ;  $P < 0.000$ ) and mean ( $T = -3.793$ ;  $df = 704$ ;  $P < 0.000$ ) from those of adult males.

Body sizes of gravid females (mean =  $69.9 \pm 10.8$  mm SVL; range = 43.1–90.2;  $n = 80$ ) differed significantly in mean ( $T = -7.018$ ;  $df = 307$ ;  $P < 0.000$ ) from those of non-gravid females (ovarian stages 1–3) (mean =  $60.9 \pm 9.2$  mm SVL; range = 44.5–85.5;  $n = 229$ ).

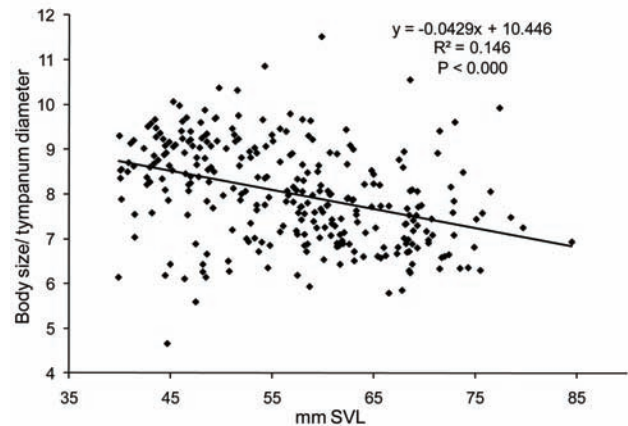


Figure 12. The relationship between sex index and body size of 296 male Bronze Frogs (*Lithobates clamitans clamitans*) from southern Louisiana.

## Discussion

The Bronze Frog is the southern form of two recognized subspecies of the Bronze Frog, a geographically widespread North American true frog (Conant and Collins, 1998). The two forms differ in color pattern (Mecham, 1954) and in the smaller body sizes of adults (Wright and Wright, 1949; Mecham, 1954) and metamorphosing (Wright and Wright, 1949). Bronze Frogs of northern Louisiana conformed to these earlier findings of adult and metamorphosing body size (Meshaka et al., 2009). Minimum and mean body size of male Bronze Frogs from northern Louisiana were smaller than those of females, and age at sexual maturity was earlier in males (Meshaka et al., 2009). Both male and female Bronze Frogs from northern Louisiana conformed to body size findings of this form by Wright and Wright (1949) and Mecham (1954). In addition to its being a smaller-bodied and earlier-maturing form than its northern relative, the breeding season was longer than in populations of the Green Frog (Meshaka et al., 2009).

Our findings in southern Louisiana corroborated those

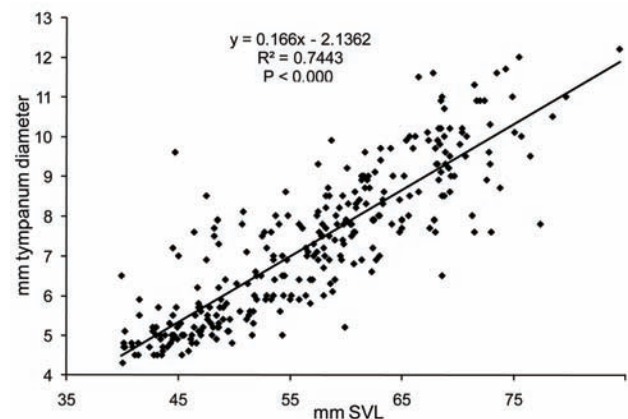


Figure 13. The relationship between tympanum diameter and body size of 296 male Bronze Frogs (*Lithobates clamitans clamitans*) from southern Louisiana.

of Meshaka et al. (2009) but also uncovered an endpoint in several life history traits from a region along the southern end of this species' geographic range. For example, although activity in both regions of Louisiana was continuous, notwithstanding a spring bias in herpetofaunal collecting in Louisiana generally, calling in southern Louisiana was heard two months earlier than in northern Louisiana; both regions shared a similar seasonal peak in calling. Females were gravid during January–September in southern Louisiana and during February–August, and probably September, in northern Louisiana (Meshaka et al., 2009). Consequently, southern Louisiana females may have been ready to breed slightly earlier than those in northern Louisiana, even if actual breeding seasons appeared to be similar. In this regard, north Louisiana is approximately 10 days behind south Louisiana in mean air temperature, such that a mean low of 11°C is reached on 23 March in Baton Rouge and on 2 April in Shreveport.

An unresolved question is to what extent the frequencies of early and late breeding differ between these regions. Clutch mass also did not differ between regions. Body masses of gravid females from northern Louisiana without traces of food and from which clutch sizes were estimated (Meshaka et al., 2009) did not differ significantly in an ANCOVA when compared to those of southern Louisiana.

Body size at transformation was comparable between regions with the smaller minimum metamorphosing body size having been found in southern Louisiana (Meshaka et al., 2009; this study). Likewise, post-metamorphic age at sexual maturity was comparable between both regions of Louisiana, and in both regions males reached sexual maturity sooner than females. Two of three measurements of adult body size were similar between regions. Minimum and maximum body sizes of sexually mature Bronze Frogs were similar between both regions in Louisiana, with males of both regions having the smaller values. However, mean body sizes of adult males and females were smaller in southern Louisiana, with males of both regions having the smaller value (Meshaka et al., 2009; this study).

Thus, Bronze Frogs in southern Louisiana were comparable in most respects to those of northern Louisiana, with the possible exception of breeding season and notably with the exception of mean body size. This latter trait, a result of differential mortality or growth rates among adults, appeared to have been the single life history trait, that we examined, not to have reached its endpoint in the northern portion of the state.

**Acknowledgments:** This study would not have been possible without the commitment of the aforementioned institutions to collect and preserve amphibians and reptiles or without the willingness and time taken by institutional staff to pack and ship these specimens for study. To that end, we wish to especially extend our gratitude to Harold A. Dundee for his single-handed efforts in packing and shipping an enormous lot of Bronze Frogs from Tulane University. In addition, on 8 July 2004, one of the authors (WEM) made the first email research request ever sent out by The Center for North American Herpetology. It asked for information on the life history traits of *Lithobates clamitans*. The response was overwhelming and the tremendous amount of data received through the CNAH request has added to the value of this contribution. The assistance of LAAMP volunteers provided data without which important comparisons could not have been made in the biology of this interesting frog.

#### Literature Cited

- Conant, R. and J. T. Collins. 1998. Peterson Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third edition expanded. Houghton Mifflin Company, Boston, Massachusetts.
- Dundee, H. A. and D. Rossman, 1989. The Amphibians and Reptiles of Louisiana. Louisiana State University Press, Baton Rouge, Louisiana.
- Gosner, K. L. 1960. A simplified table for staging anuran embryos and larvae with notes on identification. *Herpetologica* 16: 183–190.
- Martof B. 1956a. Factors influencing size and composition of populations of *Rana clamitans*. *American Midland Naturalist* 56: 224–244.
- Martof B. 1956b. Growth and development of the green frog, *Rana clamitans*, under natural conditions. *American Midland Naturalist* 55: 101–117.
- Mecham, J. S. 1954. Geographic variation in the green frog, *Rana clamitans* Latreille. *The Texas Journal of Science* 1: 1–25.
- Meshaka, W. E., Jr. 2001. The Cuban Treefrog in Florida: Life History of a Successful Colonizing Species. University Press of Florida, Gainesville, Florida.
- Meshaka, W. E., Jr., S.D. Marshall, L.R. Raymond, and L.M. Hardy. 2009. Seasonal activity reproduction, and growth of the Bronze Frog (*Lithobates clamitans clamitans*) in northern Louisiana: the long and short of it. *Journal of Kansas Herpetology*, 29: 12–20.
- Wright, A. H. 1931. Life-Histories of the Frogs of the Okefinokee Swamp, Georgia. The McMillan Company. Ithaca, New York.
- Wright, A. H. and A. A. Wright. 1949. Handbook of Frogs and Toads of the United States and Canada. Cornell University Press. Ithaca, New York.



ASPECTS OF THE NATURAL HISTORY OF *CROTAPHYTUS COLLARIS*  
FROM CHIHUAHUA AND COAHUILA, MEXICO

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The Eastern Collared Lizard, *Crotaphytus collaris*, occurs from Missouri to Arizona and southward between the western and eastern Sierra Madres to San Luis Potosí, Mexico (Lemos-Espinal and Smith, 2007). Most of our knowledge of its natural history comes from studies on populations in the United States, especially populations in Missouri and Oklahoma (e.g., see review of studies in Sexton et al., 1992). Given that some aspects of its biology are known to vary among populations (e.g., limb morphology and behavior, Husak and Rouse, 2006; sexual dimorphism, McCoy et al., 1994; Baird et al., 1997; growth rate, Sexton et al., 1992; sexual selection, Baird et al., 1997), it is important to study more populations of *Crotaphytus collaris*, particularly those populations in relatively understudied regions of its range (e.g., Mexico), to obtain a more complete understanding of its natural history and any possible geographic variation. Here we report on several aspects of the natural history of *C. collaris* from the Chihuahuan Desert in northern Mexico. In particular, we provide information on sexual dimorphism, microhabitat use, and temperature relationships.

Materials and Methods

**Study sites.**—*Crotaphytus collaris* were studied at four sites in the state of Coahuila [La Cuchilla, municipality of Parras (25°36'57.7"N, 102°53'46.8"W, 1104 m); proximities of Ocampo, municipality of Ocampo (27°1'33.7"N, 102°6'13.9"W, 804 m); El Rincón, municipality of San Pedro (26°42'27"N, 102°6'53"W, 980 m); 11 km N of San Miguel, municipality of Ocampo (28°41'37"N, 102°51'39.1"W, 1064 m)], and eight in the state of Chihuahua [Ojos de Santa María, municipality of Ascensión (31°9'31"N, 107°19'27"W, 1189 m); Las Lajas, municipality of Buenaventura (29°51'46.4"N, 107°4'32.3"W, 1561 m); Estación Guzman, municipality of Ascensión (31°13'1.2"N, 107°28'4.3"W, 1219 m); Ran-

cho La Viuda, municipality of Ascensión (31°23'32.3"N, 107°48'20"W, 1285 m); near Ejido Flores Magón, municipality of Buenaventura (29°58'34"N, 107°6'19"W, 1481 m); volcanic rocky hill km 5.5 hgw Flores-Magón/Casas Grandes, municipality of Buenaventura (29°58'34"N, 107°6'19"W, 1481m); Proximities of Rancho La Bamba, municipality of Coyame (30°20'54.1"N, 105°20'20.3"W, 1550 m); Canyon near Rancho El Saucito, municipality of Coyame (29°34'14"N, 105°11'27"W, 1382 m)]. All localities fall within the Chihuahuan Desert Region, which is dominated by xerophytic shrubs such as Creosote Bush (*Larrea tridentata*), American Tarwort (*Flourensia cernua*), Mesquite (*Prosopis glandulosa*), Texas Sotol (*Dasylirion texanum*) and Ocotillo (*Fouquieria splendens*), among other species. All study sites consisted of rocky foothills surrounded by wide valleys where these lizards found a suitable habitat.

**Methods.**—Lizards were captured with a noose from 0945 hrs to 1745 hrs from April to May 2007 and April to June 2008. We recorded the microhabitat where the lizard was first seen. Upon capture, we measured body temperature ( $T_b$ ) to nearest 0.1°C using a quick-reading cloacal thermometer. We measured air temperature ( $T_a$ ) to nearest 0.1°C one cm above substrate and substrate temperature ( $T_s$ ) to nearest 0.1°C at the spot where the lizard was first seen. We measured snout-vent length (SVL) and tail length to the nearest mm using a plastic ruler. Sex was determined by checking for the presence of enlarged jaw muscles in the rear of the head in males compared with the female, and by the presence in males of one or more jet black spots on the sides of the body, between axilla and groin.

We used ANOVAs to compare SVL,  $T_b$ ,  $T_a$ , and  $T_s$  between males and females. We used ANCOVA with SVL as the covariate to compare body mass and tail length between males and females (the interaction term was not significant, indicating homogeneity of slopes, and was removed from the analysis). Means are given  $\pm$  1 SE.



## Results and Discussion

**Sexual Dimorphism.**—Males of *Crotaphytus collaris* were larger than females in SVL (Table 1;  $F_{1,100} = 37.22$ ,  $P < 0.0001$ ). Males and females did not differ in body mass (Table 1;  $F_{1,31} = 2.26$ ,  $P = 0.14$ ). Body mass increased with SVL ( $F_{1,31} = 63.5$ ,  $P < 0.0001$ ). Tail length did not differ between males and females (Table 1;  $F_{1,94} = 1.0$ ,  $P = 0.31$ ). Tail length increased with SVL ( $F_{1,94} = 206.9$ ,  $P < 0.0001$ ).

Our results are consistent with previous reports that

Table 1. Means of several characteristics of male and female *Crotaphytus collaris* from northern Mexico (states of Chihuahua and Coahuila). Means are given  $\pm 1$  SE,  $n$  in parentheses.  $T_b$  = body temperature;  $T_a$  = air temperature;  $T_s$  = substrate temperature. All temperatures are Celsius.

	Males (63)	Females (39)
SVL (mm)	101.8 $\pm$ 0.81	94.6 $\pm$ 0.74
Body mass (g)	49.6 $\pm$ 1.2	32.4 $\pm$ 1.9
Tail length (mm)	316.3 $\pm$ 1.7	289.4 $\pm$ 2.3
$T_b$	38.0 $\pm$ 0.3	38.7 $\pm$ 0.3
$T_a$	27.8 $\pm$ 0.8	28.7 $\pm$ 0.9
$T_s$	35.3 $\pm$ 0.8	36.6 $\pm$ 1.1

males are larger than females in body size (Burt, 1928; Fitch, 1956; Best and Pfaffenberger, 1987; Sexton et al., 1992), suggesting that larger male body size is a general trait in *C. collaris*. However, the extent of the dimorphism may vary, even among geographically close populations. For example, McCoy et al. (1994) observed variation in the extent of sexual dimorphism among three populations of *C. collaris* in Oklahoma, although in all cases males were larger than females (see also Baird et al., 1997). Larger male size in *C. collaris* appears to be under intra-sexual selection (Baird et al., 1997), with male *C. collaris* defending territories from other males (Baird et al., 1996). Diet partitioning would appear unlikely to explain sexual dimorphism in *C. collaris* as males and females, while differing in diet composition, do not differ in the mean size or number of prey taken (Best and Pfaffenberger, 1987).

**Microhabitat Use.**—Most lizards were observed on rocks or rock piles (Table 2). Males and females used microhabitats in similar ways (Table 2). Mean SVL of lizards did not differ between microhabitats (Table 3;  $F_{5,96} = 0.77$ ,  $P = 0.57$ ).

Our observations are consistent with observations on *C. collaris* from other parts of their range. Fitch (1956) reviewed previous observations of habitat use of *C. collaris* and also reported observations of his own that indicate that rocky outcrops and rocks are important characteristics of *C.*

Table 2. Microhabitat use by *Crotaphytus collaris* from northern Mexico (states of Chihuahua and Coahuila).

Microhabitat	Total	Males	Females
Small rock	12	8	4
Medium rock	37	22	15
Large rock	29	20	9
Ground	6	2	4
Rock pile	16	9	7
Road	2	1	1

*collaris* habitats. *Crotaphytus collaris* in Missouri use rock perches throughout its activity season, with only rare use of other perches (Angert et al., 2002).

**Temperature Relationships.**—Mean  $T_b$  was  $38.3 \pm 0.2^\circ\text{C}$  ( $n = 102$ ). Body temperature increased with  $T_a$  ( $n = 102$ ,  $r^2 = 0.381$ ,  $P < 0.0001$ ;  $T_b = 31.5 + 0.239T_a$ ). Body temperature also increased with  $T_s$  ( $n = 102$ ,  $r^2 = 0.406$ ,  $P < 0.0001$ ;  $T_b = 30.4 + 0.22T_s$ ).

Males and females did not differ in  $T_b$  (Table 1;  $F_{1,100} = 1.90$ ,  $P = 0.17$ ),  $T_a$  (Table 1;  $F_{1,100} = 0.59$ ,  $P = 0.44$ ), or  $T_s$  (Table 1;  $F_{1,100} = 0.84$ ,  $P = 0.36$ ). Body temperature (Table 2;  $F_{5,95} = 0.80$ ,  $P = 0.55$ ),  $T_a$  (Table 3;  $F_{5,95} = 2.10$ ,  $P = 0.07$ ), and  $T_s$  (Table 3;  $F_{5,95} = 1.65$ ,  $P = 0.16$ ) did not differ among microhabitats. Body temperatures did not vary among months (Table 4;  $F_{2,99} = 1.34$ ,  $P = 0.27$ ). However,  $T_a$  (Table 4;  $F_{2,99} = 13.2$ ,  $P < 0.0001$ ) and  $T_s$  (Table 4;  $F_{2,99} = 3.2$ ,  $P = 0.044$ ) varied among months. This suggests that *C. collaris* are able to thermoregulate.

The range of  $T_b$ s we observed for *Crotaphytus collaris* in the Chihuahuan Desert matches the range of  $T_b$  (typically  $35\text{--}40^\circ\text{C}$ ) found for other populations of *C. collaris* in the field (Fitch, 1956; Angert et al., 2002) or in laboratory gradients or outdoor runways (Firth et al., 1988, 1989; Sievert and Hutchison, 1989, 1991). Taken together, these results suggest most populations of *C. collaris* have similar temperature requirements.

Table 4. Monthly variation in body temperature, air temperature, and substrate temperature for *Crotaphytus collaris* from northern Mexico (states of Chihuahua and Coahuila). Means are given  $\pm 1$  SE,  $n$  in parentheses.  $T_b$  = body temperature;  $T_a$  = air temperature;  $T_s$  = substrate temperature. All temperatures are Celsius.

	April (41)	May (58)	June (3)
$T_b$	38.1 $\pm$ 0.2	38.3 $\pm$ 0.4	40.3 $\pm$ 0.4
$T_a$	25.3 $\pm$ 0.7	29.7 $\pm$ 0.8	37.6 $\pm$ 0.6
$T_s$	34.1 $\pm$ 0.9	36.7 $\pm$ 0.9	41.6 $\pm$ 0.5

Table 3. Means of several characteristics of *Crotaphytus collaris* using different microhabitats. Means are given  $\pm 1$  SE,  $n$  in parentheses.  $T_b$  = body temperature;  $T_a$  = air temperature;  $T_s$  = substrate temperature. All temperatures are Celsius.

	Small rock (11)	Medium rock (37)	Large rock (29)	Ground (6)	Rock pile (16)	Road (2)
SVL (mm)	98.7 $\pm$ 2.5	98.8 $\pm$ 1.0	100.6 $\pm$ 1.3	95.0 $\pm$ 3.3	98.6 $\pm$ 1.8	99.5 $\pm$ 5.5
$T_b$	38.8 $\pm$ 0.6	38.0 $\pm$ 0.3	37.9 $\pm$ 0.4	39.4 $\pm$ 0.4	38.8 $\pm$ 0.8	37.3 $\pm$ 0.9
$T_a$	30.2 $\pm$ 1.4	27.6 $\pm$ 0.9	26.4 $\pm$ 1.0	27.5 $\pm$ 2.1	31.5 $\pm$ 1.8	25.3 $\pm$ 2.9
$T_s$	36.1 $\pm$ 1.8	35.9 $\pm$ 1.1	39.0 $\pm$ 1.0	39.5 $\pm$ 2.4	38.0 $\pm$ 2.2	28.4 $\pm$ 4.0

## Literature Cited

- Angert, A. L., D. Hutchison, D. Glossip, and J. B. Losos. 2002. Microhabitat use and thermal biology of the Collared Lizard (*Crotaphytus collaris collaris*) and the fence lizard (*Sceloporus undulatus hyacinthinus*) in Missouri glades. *Journal of Herpetology* 36: 23–29.
- Baird, T. A., M. A. Acree, and C. L. Sloan. 1996. Age and gender-related differences in the social behavior and mating success of free-living Collared Lizards, *Crotaphytus collaris*. *Copeia* 1996: 336–347.
- Baird, T. A., S. F. Fox, and J. K. McCoy. 1997. Population differences in the roles of size and coloration in intra- and intersexual selection in the Collared Lizard, *Crotaphytus collaris*: Influence of habitat and social organization. *Behavioral Ecology* 8: 506–517.
- Baird, T. A., J. M. Hranitz, D. K. Timanus, and A. M. Schwartz. 2007. Behavioral attributes influence annual mating success more than morphological traits in male Collared Lizards. *Behavioral Ecology* 18: 1146–1154.
- Best, T. L. and G. S. Pfaffenberger. 1987. Age and sexual variation in the diet of Collared Lizards (*Crotaphytus collaris*). *Southwestern Naturalist* 32: 415–426.
- Burt, C. E. 1928. The sexual dimorphism of the Collared Lizard, *Crotaphytus collaris*. *Papers of the Michigan Academy of Science, Arts, and Letters* 10: 417–421.
- Firth, B. T., R. E. Maudlin, and C. L. Ralph. 1988. The role of the pineal complex in behavioral thermoregulation in the Collared Lizard *Crotaphytus collaris* under seminatural conditions. *Physiological Zoology* 64: 176–185.
- Firth, B. T., J. S. Turner, and C. L. Ralph. 1989. Thermoregulatory behaviour in two species of iguanid lizards (*Crotaphytus collaris* and *Sauromalus obesus*): diel variation and the effect of pinealectomy. *Journal of Comparative Physiology B* 159: 13–20.
- Fitch, H. S. 1956. An ecological study of the Collared Lizard (*Crotaphytus collaris*). University of Kansas Publications, Museum of Natural History 8: 213–274.
- Husak, J. F. and M. N. Rouse. 2006. Population variation in escape behavior and limb morphology of Collared Lizards (*Crotaphytus collaris*) in Oklahoma. *Herpetologica* 62: 156–163.
- Lemos-Espinal, J. A. and H. M. Smith. 2007. *Anfibios y Reptiles del Estado de Chihuahua, México/Amphibians and Reptiles of the State of Chihuahua, México*. CONABIO, México, xiv + 628 pp.
- McCoy, J. K., S. F. Fox, and T. A. Baird. 1994. Geographic variation in sexual dimorphism in the Collared Lizard, *Crotaphytus collaris* (Sauria: Crotaphytidae). *Southwestern Naturalist* 39: 328–335.
- Sexton, O. J., R. M. Andrews, and J. E. Bramble. 1992. Size and growth rate characteristics of a peripheral population of *Crotaphytus collaris* (Sauria: Crotaphytidae). *Copeia* 1992: 968–980.
- Sievert, L. M. and V. H. Hutchison. 1989. Influences of season, time of day, light and sex on the thermoregulatory behaviour of *Crotaphytus collaris*. *Journal of Thermal Biology* 14: 159–165.
- Sievert, L. M. and V. H. Hutchison. 1991. The influence of photoperiod and position of a light source on behavioral thermoregulation in *Crotaphytus collaris* (Squamata: Iguanidae). *Copeia* 1991: 105–110.



## 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, 5438 SW 12th Terrace Apt. 4, Topeka, Kansas 66604.

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

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Established in 1987, this Award is presented to those individuals whose efforts and dedication to the Kansas Herpetological Society go far beyond the normal bounds. The recipients of this Award have given exemplary service to the KHS, and are presented with an elegant bronze sculpture of a Barred Tiger Salamander.

### *The Howard K. Gloyd - Edward H. Taylor Scholarship*

*The Gloyd-Taylor Scholarship* is present annually by the Kansas Herpetological Society to an outstanding herpetology student. The scholarship is a minimum of \$100.00 and is awarded on the basis of potential for contributing to the science of herpetology. Students from grade school through university are eligible.

### *The Alan H. Kamb Grant for Research on Kansas Snakes*

KHS members only are eligible to apply for *The Alan H. Kamb Grant for Research on Kansas Snakes*. The recipient of the grant will be selected by the KHS Awards Committee. A minimum award of \$100 is given annually.

### *The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology*

The Award is established in recognition of the scientific and photographic achievements of Suzanne L. Collins and Joseph T. Collins, whose life-long study and conservation of the native amphibians, reptiles, and turtles of Kansas is amply demonstrated in their extensive and excellent writings and photography, both academic and popular, about these animals. In even-numbered years, the Award is bestowed upon an individual who, in the preceding two calendar years, had published a paper of academic excellence on the native species of Kansas amphibian, reptile, and/or turtle and in odd-numbered years, the Award is bestowed upon an individual who was chosen the best in a juried competition featuring the art of photography in portraying amphibians, reptiles, and/or turtles. *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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