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

ISSN 1540-773X

Journal of Kansas Herpetology

Number 30 — June 2009

TABLE OF CONTENTS

KHS BUSINESS

OF INTEREST

GEOGRAPHIC DISTRIBUTION

NOTES

ARTICLES

KHS BUSINESS

RESULTS OF THE KHS 2009 SPRING FIELD TRIP

A record-setting 184 KHS members and their friends, families, and colleagues drove in droves to Bloody Creek Ranch and the Flint Hills grasslands of east-central Kansas to spend the weekend of 24–26 April 2009 turning rocks, lifting logs, and searching the streams for snakes, lizards, turtles, and assorted amphibians in Chase County, Kansas. And they were a signal success, as the following list attests:

Species	Number
Amphibians	
Barred Tiger Salamander	4
Smallmouth Salamander	4
American Toad	2
Woodhouse's Toad	87
Blanchard's Cricket Frog	108
Boreal Chorus Frog	110
Gray Treefrog complex	81
Bullfrog	4
Plains Leopard Frog	67
Great Plains Narrowmouth Toad	5
Reptiles	
Eastern Collared Lizard	84
Lesser Earless Lizard	3
Texas Horned Lizard	10
Great Plains Skink	119
Northern Prairie Skink	13
Eastern Racer	48
Prairie Kingsnake	7
Common Kingsnake	33
Milk Snake	13
Great Plains Rat Snake	12
Gopher Snake (aka Bullsnake)	8
Western Rat Snake	4
Flathead Snake	70
Ringneck Snake	67
Western Worm Snake	4
Plainbelly Water Snake	5
Northern Water Snake	1
Graham's Crayfish Snake	1
Brown Snake	3
Western Ribbon Snake	2
Common Garter Snake	23
Lined Snake	22
Copperhead	3
Massasauga	39
Turtles	
Common Snapping Turtle	1
Northern Painted Turtle	6
Eastern River Cooter	1
Ornate Box Turtle	34
Slider	4
Total	
39 species	1,112 specimens

Participants for spring 2009 were: Ted Abel, Kathy Acuff, Laura Acuff, Rob Acuff, Dallas Adams, Dan Adams, Barb Adams, Kacy Adams, Steve Adams, Harold Anderson, Laura Baldwin, Mary Kate Baldwin, Will Baldwin, John Banks, Johnny Banks, Neil Bass, Tori

A panorama by pen and ink of the Flint Hills by John Lokke, esteemed and well-known artist and former KHS president. The view is typical of the habitat encountered during the KHS Spring Field Trip to Bloody Creek Ranch in Chase County, Kansas, on 24–26 April 2009.

Bass, Sarah Bays, Don Becke, Stasya Berber, Peter Berg, Hillary Bernhardt, Hank Bishop, Miles Bishop, Warner Blackburn, Caleb Bond, Brad Bott, Terry Bott, Wes Bouska, Mike Brown, Andrew Brungardt, Gerard Brungardt, Luke Brungardt, Tom Brungardt, Ann Bush, Jack Bush, Mark Butt, Larry Caldwell, Dan Carpenter, Shelbi Carpenter, Harold Casey, Owen Casey, Linda Clarke, Keith Coleman, Joseph T. Collins, Suzanne L. Collins, Cara Cowger, Olivia Cowin, Jim Cox, Cindy Cummings, Mark Dalton, Patty Delmott, Joe Delnero, Rosie Delnero, Mark Denney, Andy Durbin, Kathy Ellis, Mark Ellis, Lindsey Fender, Daniel Fogell, Mari-Jayne Fox, Rene Gloshen, Tyler Gloshen, Mike Graham, James Gubanyi, Julian Gubanyi, Marla Gubanyi, Caleb Hardin, Dave Hardin, Richard Hatfield, Emily Hooser, Deb Horne, William House, John Howard, Rebecca Howard, Scott Huettenmueller, David Humenczuk, Paul Ingram, Dan Johnson, Danica Johnson, Grace Anne Johnson, Troy Johnson, Keane Kearney, Steve Kearney, Bob Keller, Gary Keller, Jacob Keller, Levi Kinder, Eric Kessler, Owen Kessler, Shelby Klima, Dana Kottman, Gavin Lake, Karl Larson, Max Larson, Olaf Larson, Emmy Lieser, Jill Lokke, John Lokke, Maria Lopez, Brandon Low, Judy Low, Jerry Lowry, Dalton McCloud, Sharon McCue, Stephen McCue, Chris McMartin, Sarah McMartin, Josh Marshall, Steve Marshall, Dietrich Mast, Justin Michels, Kellie Molone, Carol Mammoliti, Chris Mammoliti, Kirk Mammoliti, AvNell Mayfield, Alex Miller, Arlyn Miller, Carolyn Miller, Daniel Miller, Laura Miller, Loretta Miller, Larry L. Miller, William Miller, Bill Munholland, Daniel Murrow, Steven Nagle, Tyler Nagle, Kristie Nall, Brandy Nance, Beau Nissley, Rose Nissley, David Oldham, Robin Oldham, Tag Oldham, Robert Otto, Bonnie R. Perido, Erica Peterson, Jacob Phillippi, Jeff Phillippi, Mike Pingleton, Eric Priest, Nathan Priest, Carrie Remillard, Bill Ried, Jane Schlapp, Michael Schlapp, Curtis J. Schmidt, Derek Schmidt, Lisa Schmidt, Caitlin Seals Schwanke, Amanda Sevite, Ryan Shofner, Greg Sievert, Aaron Slife, Susan Slife, H. G. Spencer, John Stephens, Peg Stephens, Travis W. Taggart, Gus Tomlinson, Bennett Tuel, Hadley Tuel, Josh Tuel, Kelley Tuel, John Ulrey, Linda Ulrey, David Velasquez, Tino Velasquez, Doug Waller, Chris Waller, Bill Welch, Chad Whitney, Garrett Wilkinson, Victor Wilkinson, Claire Williams, and Dan Williamson.

Most importantly, the KHS wishes to sincerely thank Tim Hickok, the owner of Bloody Creek Ranch, for permission to conduct the herpetofaunal count on his beautiful land, and also give our appreciation to Bill Ried, the ranch manager, and Andy Durbin, the resident herpetologist, for the many kindnesses and courtesies they extended to the Society during its greatest spring field trip ever.

Submitted by Daniel Murrow, KHS Field Trip Chairperson, 8129 Perry, No. 37, Overland Park, Kansas 66204.

IMAGES FROM THE KHS 2009 SPRING FIELD TRIP

One of the more unusual finds on Bloody Creek Ranch was this Lesser Earless Lizard *(Holbrookia maculata).* Bill Ried, BCR manager, pointed out that these reptiles have a very disjunct distribution on the property and are not often encountered unless you find habitat suitable for them. He furthered explained that such habitat was usually free of large predatory reptiles such as the Eastern Collared Lizard *(Crotaphytus collaris).* There is concern that the Lesser Earless Lizard may be disappearing from much of its range in Kansas. Photograph by Suzanne L. Collins, CNAH.

There is always an adrenalin rush when a rock is lifted to reveal a living animal. Using this search technique, these two students found a lizard and were carefully examining and admiring their discovery. The popularity of herpetofaunal counts is based, to large extent, on the hands-on experience that participants enjoy. It is much more personal than walking around in bitter cold temperatures chanting “there goes a flock of them.” Photograph by Larry L. Miller, Kansas Heritage Photography.

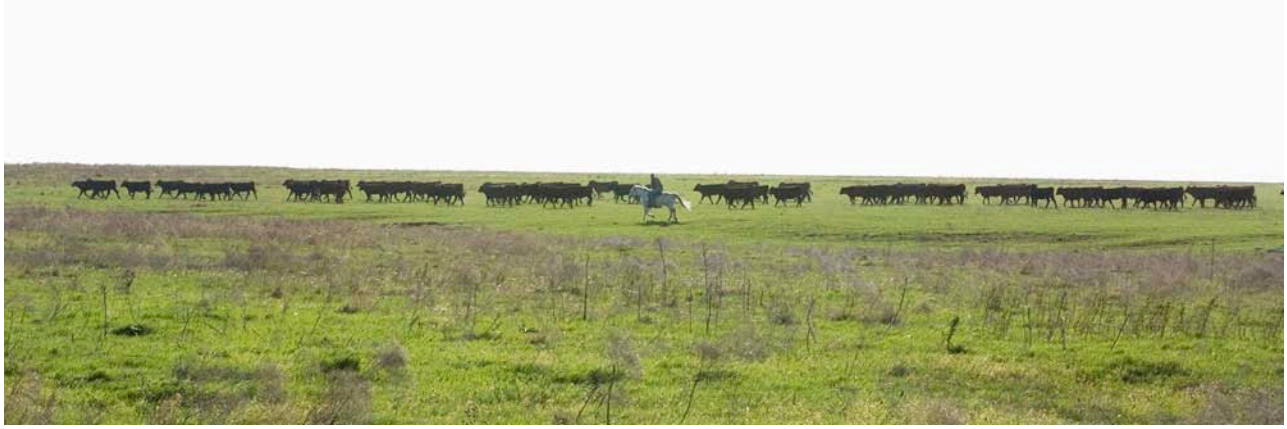
Gus Tomlinson (rear) watches to see if the Bullsnake will bite Tag Oldham. It didn't. Photograph by Robin Oldham, Oswego, Kansas.

But shortly thereafter, Tag wrapped the Bullsnake around the neck of Claire Williams and ran off to search for more reptiles, as Jerry Lowry from Maine looked on in amazement. Photograph by Roy Wenzl, Wichita, Kansas.

Four Sliders *(Trachemys scripta)* were discovered during the KHS herpetofaunal count. They have a very distinctive lower shell that makes them easy to identify. Photograph by Suzanne L. Collins, CNAH.

Western Worm Snakes were discovered at nearby YMCA Camp Wood, just prior to the excellent chicken dinner prepared by the Camp Wood staff. Photograph by Suzanne L. Collins, CNAH.

Dallas Adams edges closer and closer to the wary Eastern Collared Lizard. She made a successful grab. Photograph by Larry L. Miller, Kansas Heritage Photography.



Like a scene out of the Old West, cowboys herded cattle across the prairie on Bloody Creek Ranch, only a short distance from the KHS Spring Field Trip campsite. Photograph by Suzanne L. Collins, CNAH.

. . . and Prairie Kingsnakes *(Lampropeltis calligaster)* watched with unblinking gaze as the cattle made their way across the prairie. Seven of these snakes were found over the weekend. Photograph by Suzanne L. Collins, CNAH.

Dan (one of many) Murrow (left) discusses with (L–R) Mark Ellis (former KHS president), Robin Oldham (KHS Media Chairperson), Kathy Ellis (KHS President-elect), and David Oldham (former KHS president) where they can possibly house all these people if it rains. Photograph by Suzanne L. Collins, CNAH.

Suzanne Collins (KHS Historian) goes over the registration list with Troy Johnson (a teacher from Cottonwood Falls) as they both begin to realize that the KHS was about to make history with over 180 participants at the Spring Field Trip to Bloody Creek Ranch. Photograph by Larry L. Miller, Kansas Heritage Photography.

Cindy Cummings instructs students (and the dog) in the best ways to find critters. Photograph by Suzanne L. Collins, CNAH.

Common Kingsnakes were common; 33 were found during the KHS Spring Field Trip to Bloody Creek Ranch in Chase County, Kansas. Photograph by Suzanne L. Collins, CNAH.

Many in KHS have the same name. Presumably the Dan DNA differs. Photograph by Suzanne L. Collins, CNAH.

A paltry few of the 184 participants in the 2009 KHS Spring Field Trip gathered for the traditional Sunday morning group photograph. Notice how alert they are . . . excessive orange juice will do that. Photograph by Suzanne L. Collins, CNAH.

KHS ANNUAL MEETING CALL FOR PAPERS

The program for the KHS 36th Annual Meeting will be held at MidAmerica Nazarene University, Olathe, Kansas, on 7–8 November 2009. Participants wishing to present a talk should contact Dan Johnson with their title, institutional address, and abstract at gdj102356@hotmail.com no later than 1 October 2009. Copies of the title and institutional address should also be sent to Joe Collins (jcollins@ku.edu) for posting on the KHS web site meeting program. Individuals using US mail should send this information to both Johnson and Collins (see inside front cover). Presenters wishing to be considered for *The Suzanne L. & Joseph T. Collins Award for Excellence in Kansas Herpetology* (to be awarded in 2010) should so indicate with their submission; the award is $1000.00. Students wishing to be considered for *The George Toland Award* of $200.00 should also indicate with their submission. Details about lodging and the program are shown on the KHS web site.

CALL FOR KHS 2009 HERPETOFAUNAL COUNTS

KHS members are reminded to send their spring and summer (1 April to 30 June 2009) herpetofaunal counts to the associate editor (see below) as soon as possible. All such counts will be published in the September issue of the Journal of Kansas Herpetology. Counts must have been conducted during April, May, and June of 2009 only, and must list locality, date, participants, and complete address of the author. Additional data such as time span and weather can be submitted, and will be included as space permits. Counts should be sent as email text to

jcollins@ku.edu

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 Dan Fogell, Chairperson of the KHS Awards Committee (see inside front cover). Both the scholarship and grant awards are $300.00 each this year.

KHS FALL FIELD TRIP TO LINCOLN COUNTY IN OCTOBER

The 2009 Annual Fall KHS Field Trip will be held at Sylvan Park 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 fourteen restaurants in Russell (24 miles from Sylvan Park), four restaurants in Lincoln, and two restaurants in 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.

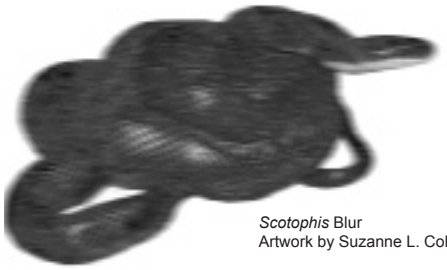
When arriving, look for the large KHS sign at Sylvan Park. Herpetofaunal counts begin at 9:00 am at the designated campsite on Saturday and Sunday, 3-4 October 2009. The field trip adjourns at noon on Sunday, 4 October 2009.

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)



Scotophis Blur
Artwork by Suzanne L. Collins

KHS DONORS

Few tributes are so lasting or honor individuals so well as donations. The Kansas Herpetological Society is privileged to carry on the aims and goals of the Society through its grants, scholarships, and other programs. This list recognizes donations received through 1 June 2009.

Donation
to KHS Field Trips

In Memory of

Marjorie Perry
(1915–2009)
&
A. Carroll Edwards
(1909–2009)

by

Suzanne L. & Joseph T. Collins

OF INTEREST

IN MEMORIAM
MARJORIE ELAINE ROWLAND PERRY
(1915–2009)

Marjorie Elaine Rowland Perry, charter member of the Kansas Herpetological Society, passed away on 28 March 2009 in Kerrville, Texas. Marge was born on 31 October 1915 in Manhattan, Kansas, the daughter of Frank and Mary Caudwell Rowland. She graduated from Lawrence High School and the University of Kansas, where she was a university librarian until her retirement. Marge served three years as Secretary-Treasurer of the Kansas Herpetological Society (1977 to 1979).

In addition to three other children, Marge was the mother of another well-known KHS member, Janice J. (Perry) Johnson, who served as the Society's editor from 1975 to 1979 and was the recipient (1990) of *The Bronze Salamander Award* for distinguished service to the KHS. Jan now resides in Tucson, Arizona.

Marge was a joy to be with on the KHS field trips, always patient and tolerant as her daughter, Jan, struggled (this is legend) to set up the family tent. She was a solid supporter of the KHS and served in so many ways. She was a good and gentle person. The KHS Executive Council extends its sincere sympathy to the Perry family and friends of Marjorie Perry. We will all miss her so very much.

The late Marjorie Perry (1915-2009), shown here on a KHS field trip in the 1970s. Standing behind Marge, with only large goldilocks showing, is longtime KHS member Rebecca Prosser. Photograph by Larry L. Miller, Kansas Heritage Photography.

THREE 2009 KANSAS HERPETOFAUNAL GRANTS FUNDED BY KDWP

The Kansas Department of Wildlife & Parks, through its State Wildlife Improvements Grants program, has funded the following three herpetological projects for the coming season:

A FOLLOW-UP EVALUATION OF TWO ANURAN REINTRODUCTIONS IN KANSAS to Joseph T. Collins, Suzanne L. Collins & Travis W. Taggart. Grant for $3995.00.

The purpose of this project is to follow up on two previous repatriations that were attempted in Kansas, one for Green Toads in Morton County (Taggart, 1994, 1997) and one for Pickerel Frogs in Cherokee County (Kirk, 2001a, 2001b). We will identify suitable breeding habitat for the Pickerel Frog *(Lithobates palustris)* and Green Toad *(Anaxyrus debilis)* in which to conduct active aural surveys by ear, maintain a transect of frog loggers to record calls passively, and to physically survey for tadpoles, metamorphosing young, and adults. The project will take place from March 2009 through September 2009.

Literature Cited

Kirk, J. D. 2001a. Reintroduction of the Pickerel Frog *(Rana palustris)* to Cherokee County, Kansas. Masters Thesis, Friends University, Wichita. vi + 45 pp.

Kirk, J. D. 2001b. Reintroduction of the Pickerel Frog in Cherokee County, Kansas. Abstract. Kansas Herpetol. Soc. Newsl. 123: 7.

Taggart. T. W. 1994. The natural history and distribution of the Green Toad *(Bufo debilis)* in Kansas, with a report on an effort to reintroduce the species into the Cimarron National Grasslands. Final Report Kansas Dept. Wildlife and Parks, Pratt, Kansas. 12 pp.

Taggart. T. W. 1997. Status of *Bufo debilis* (Anura: Bufonidae) in Kansas. Kansas Herpetol. Soc. Newsl. 109: 7–12.

RELOCATION OF AN URBAN POPULATION OF TIMBER RATTLESNAKES, *CROTALUS HORRIDUS* to Jennifer A. Dorr. Grant for $4330.00.

Beginning in 2007, and using a model for relocation that our team developed, we captured and relocated the apparent majority of an urban Lenexa population of *Crotalus horridus* from a den threatened with imminent destruction for development at Prairie Star Parkway and K-7. Results to date are summarized in Walker et al. (2008, 2009); essentially, this new model for relocation of this social species has resulted in a level of survival far above any previously applied model. This model, combined with suitable large tracts of land conserved through future conservation easements, could be applied to the conservation of other populations of this SINC-Kansas species threatened by urban development. Our success now must be monitored through at least one more season (and preferably two). With continued evidence of success, the model can be extended; for example, one aspect is future construction of an entirely new anthropogenic den for a different threatened population. This proposal is for funds to allow work through the 2009 field season. Research objectives are to track members of the relocated population through a 3rd activity season by telemetry, including the use of three temperature-sending transmitters recently acquired at no cost but that need to be refurbished, assess reproductive success within the relocated population, capture and move any snakes discovered at what remains of the old den site, conduct public awareness and education effort at Black Hoof Park, a newly developed Lenexa park and recreational lake, regarding *C. horridus.* There is strong indication that at least one other den is near the new lake, and we hope to use reports from human residents and lake visitors to locate it and assess its status and vulnerability, and locate and evaluate additional sites for potential relocations, with emphasis on location of secure habitat and construction of an anthropogenic new den.

Literature Cited

Walker, M. L., J. A. Dorr and G. R. Pisani 2008. Observation of Aberrant Growth in a Timber Rattlesnake *(Crotalus horridus).* Trans. Kans. Acad. Sci. 111: 156–158.

Walker, M. L., J. A. Dorr, and G. R. Pisani. 2009. Successful relocation of a threatened suburban population of timber rattlesnakes *(Crotalus horridus)*—combining snake ecology, politics, and education. *Submitted Herpetological Conservation Biology.*

PROPOSAL TO DEVELOP A KANSAS CONSERVATION ACTION PLAN FOR *VIRGINIA VALERIAE* WITH SECONDARY EMPHASIS ON LOCATING POPULATIONS OF *STORERIA OCCIPITOMACULATA* to George Pisani. Grant for $1363.00.

This proposal is for 2009 mileage reimbursement funds to study *Virginia valeriae* in order to better describe seasonal habitat use of the species in northeast Kansas. An added goal in 2009 is to collect sufficient comparative spring data to allow an accurate estimate of the population size of the species, and added data on seasonal habitat use. The 2009 findings, together with previous data from the site, will allow me to draft a Conservation Action Plan for the species in northeast Kansas. Moreover, the data and results of this study will be beneficial in assessing the effectiveness of KBS/KSR's active habitat conservation and management efforts. Data from 2006 and 2007 already have been used in the KBS Research Management Plan (Kettle 2007).

An added dimension of the study will be to quantify and assess the microhabitat conditions (temperature and soil moisture) at sampling stations using data loggers obtained with funding from another source. My past work also has provided habitat use data on associated small snake species, with a total of ca 3,000 observation records in 2007 alone. The 2008 field season is expected to augment those data to allow me to define parameters of habitat partitioning by these ecologically similar small snakes *(Storeria dekayi, Carphophis vermis, Diadophis punctatus, V. valeriae).* Because data from 2006-2007 allow some habitat-use predictions to be made for *V. valeriae,* I also will establish sampling transects on land ca. 2 miles north of the present study area to assess the presence of this species in other localities. There also exists the possibility of locating *Storeria occipitomaculata* to the north and east. Somewhat surprisingly, this other Kansas-Threatened species was not seen on the tract described above. One possible explanation for this is the abundance of the other ecologically similar species collected thus far. However, competitive exclusion is just one possible reason, and added sampling of down-slope wooded areas (largely on the aforementioned private land) will allow better conclusions to be drawn. As my study to date has primarily been of grassland use by *V. valeriae,* wooded lowlands are underrepresented in my transects. Location of viable populations of *Storeria occipitomaculata* would enable me to begin to explore the poorly-known ecology of that species in Kansas also.

Literature Cited

Collins, J. T. and S. L. Collins 1993. Amphibians and Reptiles in Kansas, Third Edition. University Press of Kansas, Lawrence. xx + 397 pp.

Fitch, H. S. 1999. A Kansas snake community: composition and changes over 50 years. xii+165pp. Krieger Publishing, Malabar, Florida.

Fitch, H. S. 1992. Methods of sampling snake populatons and their relative success. Herp. Review 23(1): 17–19.
Kettle, W. D. 2007. Research Management Plan for the University of Kansas Field Station and Ecological Reserves. 20 pp.
Parmelee, J. and H. S. Fitch. 1995. An experiment with artificial shelters for snakes: Effects of material, age, and surface preparation. Herpetological Natural History 3(2): 187–191.
Pisani, G. R. 2005. A new Kansas locality for *Virginia valeriae.* Journal of Kansas Herpetology Number 16: 25.
Pisani, G. R. 2007. Snakes—in the Grass. A community of *Virginia valeriae* in tall CRP grass, Leavenworth Co, Kansas. Paper presented at 2007 KHS Meeting, Topeka, Kansas.

THE HONORABLE E. B. SCHERMERHORN

Hon. E. B. Schermerhorn, one of the leading citizens of Galena, Kansas, whose portrait is herewith shown [not available], is president of the Citizens' Bank, president of the Cornwall Mining Company, president of the Galena Development Company, treasurer of the Wyandotte Mining Company, secretary and treasurer of the John M. Cooper M. & M. Company, and since 1902 a member of the State Legislature. He was born in Will County, Illinois.

Mr. Schermerhorn's early educational opportunities did not extend beyond the public schools, but such was his ambition to succeed and to make as rapid progress as possible, that for six years after completing the course his text-books remained his best beloved companions. He secured a post office position at Greenville, Michigan, after the assassination of President Lincoln, in which he continued until January 1, 1866. He then entered a banking institution with which he remained until 1873, mastering every detail of this branch of business, and accumulating in these years a capital of $10,000. With this he went to Colorado, invested in mining properties and lost his money within two years.

In December, 1875, Mr. Schermerhorn came to Baxter Springs, Cherokee County, Kansas, to begin his business climb over again. Here he accepted a clerical position with John M. Cooper, the leading merchant, with whom he later became associated in business. In 1877 under the firm name of John M. Cooper & Company, they opened a large mercantile business in Galena, to which city Mr. Schermerhorn removed. With this enterprise he is still connected. He was and is identified with many of the successful corporate institutions of the city and county, and for a number of years has been president of the Citizens' Bank.

In politics this prominent citizen has always been a firm supporter of the Republican party. In 1902, he was elected to the State Legislature, where his public acts have proved him as wise a legislator as he is a financier and private citizen.

Mr. Schermerhorn married Mrs. Abbie Simpson, a lady who is well fitted to preside over one of the most elegant and attractive homes in Galena. It is beautifully situated on a natural elevation, 65 feet above the street, and is adorned with the most elaborate of modern furnishings, a fit theater for many delightful social functions. Mr. Schermerhorn owns probably more valuable land than any other citizen of Cherokee County, the greater part of it being rich in mineral deposits

Mr. Schermerhorn is a Knight Templar and a 32d degree Scottish Rite Mason. He is also a member of the Ancient Order of United Workmen, Knights of Pythias and the Elks, being treasurer of the lodge of the last-named society. He also has membership in the Commercial Club.

Mr. Schermerhorn has accumulated a large fortune and he knows how to enjoy it, taking kindly to the good things of life and giving generous assistance to those who have been less fortunate. Both in his business and political life, he has gained the friendship and esteem of those who adequately represent the highest standards.

. . . *taken from* History of Cherokee County Kansas and its Representative Citizens, ed. & comp. by Nathaniel Thompson Allison, 1904, transcribed by Carolyn Ward, instructor from USD 508, Baxter Springs Middle School, Baxter Springs, Kansas, 1/27/97.

KHS Editor Note: The herpetologically famous Schermerhorn Cave in Schermerhorn Park, just south of Galena (Cherokee County) in extreme southeastern Kansas, is named in memory of E. B. Schermerhorn. Schermerhorn Cave contains populations of three sensitive species of amphibians, the Longtail Salamander *(Eurycea longicauda),* the Cave Salamander *(Eurycea lucifuga),* and the Grotto Salamander *(Eurycea spelaea).*

KODACHROME KEPT ALIVE IN KANSAS

The last Kodak-certified Kodachrome processing laboratory in the United States is Dwayne's Photo in Parsons, Kansas (population 11,514) where about 100 employees process the 35 mm color slide film introduced in 1935 by Kodak. Herpetological photographers clinging to tradition get a reprieve.

Drop in on Dwayne for some local color.

. . . modified from *American Profile,* March 2009

GEOGRAPHIC DISTRIBUTION

HYLA CHRYSOSCELIS (Cope's Gray Treefrog). Kansas: Harper Co: 37.05254°N, 97.83806°W. 7 May 2009. Larry L. Miller and participants of the 33rtd Annual Herpetofaunal Survey of southern Sumner County. MHP 14297. Verified by Joseph T. Collins. New county record (Collins and Collins. 1993. Amphibians and Reptiles in Kansas. Third Edition. University Press of Kansas, Lawrence. xx + 397 pp.).

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

LAMPROPELTIS TRIANGULUM (Milk Snake). Kansas: Marion Co: 38.429442°N, 96.856584°W. 25 April 2009. Travis W. Taggart, Curtis J. Schmidt & Dan Fogell. MHP 14301. Verified by Chad Whitney. New county record (Collins and Collins. 1993. Amphibians and Reptiles in Kansas. Third Edition. University Press of Kansas, Lawrence. xx + 397 pp.).

Submitted by **DANIEL FOGELL**, Southeast Community College, 8800 -O- Street, Lincoln, Nebraska 68520.

LAMPROPELTIS GETULA (Common Kingsnake). Kansas: Morris Co: 38.574152°N, 96.517186°W. 26 April 2009. Curtis J. Schmidt & Travis W. Taggart. MHP 14304. Verified by Charlie Stieben. New county record (Taggart, Collins and Schmidt. 1999–2009 et seq. Kansas Herpetofaunal Atlas: An Online Reference. http://webcat.fhsu.edu/ksfauna/herps).

Submitted by **TRAVIS W. TAGGART**, Sternberg Museum of Natural History, Fort Hays State University, 3000 Sternberg Drive, Hays, Kansas 67601.

NERODIA SIPEDON (Northern Water Snake) Kansas: Morris Co: 38.573451°N, 96.856584°W. 26 April 2009. Curtis J. Schmidt & Travis W. Taggart. MHP 14305. Verified by Charlie Stieben. New county record (Taggart, Collins and Schmidt. 1999–2009 et seq. Kansas Herpetofaunal Atlas: An Online Reference. http://webcat.fhsu.edu/ksfauna/herps); Ness Co: N38.44024, W99.67522. 23 May 2009. Curtis J. Schmidt. MHP 14298. Verified by Joseph T. Collins. New county record (Collins and Collins. 1993. Amphibians and Reptiles in Kansas. Third Edition. University Press of Kansas, Lawrence. xx + 397 pp.).

Submitted by **CURTIS J. SCHMIDT**, Sternberg Museum of Natural History, Fort Hays State University, 3000 Sternberg Drive, Hays, Kansas 67601.

REGINA GRAHAMII (Graham's Crayfish Snake). Kansas: Chase Co: Bloody Creek Ranch, 38.30209°N, 96.43573°W. 25 April 2009. Max Larson and Karl Larson. MHP 14300. Verified by Travis W. Taggart. New county record (Collins and Collins. 1993. Amphibians and Reptiles in Kansas. Third Edition. University Press of Kansas, Lawrence. xx + 397 pp.).

Submitted by **JOSEPH T. COLLINS**, Kansas Biological Survey, The University of Kansas, Lawrence, Kansas 66047 and **SUZANNE L. COLLINS**, The Center for North American Herpetology, 1502 Medinah Circle Lawrence, Kansas 66047.

RHADINAEA FLAVILATA (Pine Woods Snake). A correction. Pyron (2004. Journ. Kansas Herpetol. 9: 7) reported a specimen of *Rhadinaea flavilata* (MHP 7423) from within the city limits of Mexico Beach, Florida. This specimen was reported as having originated from Gulf County, Florida. Mexico Beach is actually in Bay County, Florida. The ca. GPS coordinates of the specimen are 29.941336°N, 85.406361°W. The specimen is ca. 75 miles from the closest reported record to the west (KU 220921, Walton County, Florida) and ca. 100 miles from the nearest reported occurrence to the east (FLMN 68123, Jefferson County, Florida).

Submitted by **R. ALEXANDER PYRON**, Department of Biology, The College of Staten Island, The City University of New York, 2800 Victory Boulevard,

TROPIDOCLONION LINEATUM (Lined Snake). Kansas: Marion Co: 38.429442°N, 96.856584°W. 25 April 2009. Travis W. Taggart, Curtis J. Schmidt & Dan Fogell. MHP 14302. Verified by Chad Whitney. New county record (Taggart, Collins and Schmidt. 1999–2009 et seq. Kansas Herpetofaunal Atlas: An Online Reference. http://webcat.fhsu.edu/ksfauna/herps).

Submitted by **CURTIS J. SCHMIDT**, Sternberg Museum of Natural History, Fort Hays State University, 3000 Sternberg Drive, Hays, Kansas 67601.

TRACHEMYS SCRIPTA (Slider). Kansas: Chase Co: 38.18.805°N, 096.41.533°W. 25 April 2009. Derek Schmidt and Lisa Schmidt. MHP 14299. Verified by Curtis J. Schmidt. New county record (Taggart, Collins and Schmidt. 1999–2009 et seq. Kansas Herpetofaunal Atlas: An Online Reference. http://webcat.fhsu.edu/ksfauna/herps).

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NOTES

AN ELEVATION RECORD FOR *CROTALUS LEPIDUS LEPIDUS* (KENNICOTT, 1861) IN THE DAVIS MOUNTAINS OF WEST TEXAS

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The Mottled Rock Rattlesnake, *Crotalus lepidus lepidus,* is a relatively small-bodied serpent found from western Texas, westwards through southern New Mexico to southeastern Arizona, and south to the Mexican state of Jalisco (Stebbins, 1985). *Crotalus l. lepidus* is generally restricted to rocky habitats such as talus slopes, gorges, boulder fields, and steep ledges, and often occurs in isolated populations separated from others by lowland desert terrain (Price, 1998). In western Texas, *C. l. lepidus* is reported from most mountain ranges, including the Guadalupe, Chisos, Sierra Vieja, and Davis Mountains (Price, 1998; Werler and Dixon, 2000). The Davis Mountains are the largest mountain range in Texas, occupying 3900 square kilometers in Jeff Davis and Brewster counties. The Davis Mountains are characterized by rugged topography and a number of high peaks, the highest being Mount Livermore, which rises to an elevation of 2555 meters (Powell, 1998).

At 16:15 hours CST on 27 September 2008 we encountered an adult *C. l. lepidus* at the summit of Blue Mountain (30°33'54.7"N, 104°01'22.2"W), a promontory on the southern rim of the Davis Mountains located 13 kilometers west of Fort Davis in Jeff Davis County. The snake was basking on a large rock partially shaded by scattered oak (*Quercus* spp.) trees and the air temperature at the time of our sighting was approximately 24°C. According to the USGS topographical map (Blue Mountain Quadrangle), the elevation at the summit of Blue Mountain is 7286 feet (2220 meters). Our observation on Blue Mountain exceeds the previously reported elevation records for *C. l. lepidus* in both the Davis (2073 meters on Mount Locke) and Chisos Mountains (2134 meters) by 147 and 86 meters, respectively (Werler and Dixon, 2000). Because most property in the Davis Mountains is privately owned and closed to biological prospecting, the fauna remains imperfectly known (Chipley et al., 2003), and it is possible that *C. l. lepidus* occurs at even greater elevations in this mountain range. In the Guadalupe Mountains of Texas, *C. l. lepidus* occurs as high as 2600 meters (Price, 1998).

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ARTICLES

NATURAL HISTORY OF THE WESTERN MASSASAUGA *(SISTRURUS CATENATUS TERGEMINUS)* IN NEBRASKA

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Abstract: We studied the natural history of the state-threatened Western Massasauga *(Sistrurus catenatus tergeminus)* in Pawnee County, Nebraska at two Nebraska Game and Parks Commission (NGPC) properties. We sampled hibernation sites in spring 2004 and 2005 at both locations and conducted road searches around sites 2 to 3 days per week. Two years of searches resulted in 171 live encounters, 53 dead specimens, and 150 individuals marked with PIT tags for mark-recapture study. The population size for Burchard Lake WMA was estimated to be 116 snakes, and for the north and south areas of Pawnee Prairie WMA, it was 183 and 333 snakes, respectively. The sex ratio at Pawnee Prairie WMA was not significantly biased, however the Burchard Lake WMA sex ratio of 1.7:1 was significantly male-biased. Males were significantly longer in mean body length than females. Courtship was observed in snakes >500 mm SVL during spring emergence and during late summer. Parturition occurred in August with clutch sizes of 6, 7, and 11. The diet was composed of mammals (70%), snakes (20%), lizards (5%), and birds (5%). There were several causes of death: predation, vehicle tires, fire, and haying equipment. Road mortality was extensive and occurred during snake migration away from hibernation sites in the spring and toward hibernation sites in the fall. The results of this study provide baseline information about the Massasauga in Nebraska and contribute to a better understanding of this species throughout its range.

INTRODUCTION

The Western Massasauga is a state-threatened species that has declined because of tallgrass prairie alterations from urban development, fire suppression, and extensive agricultural development (Samson et al. 1998). Historically, the Western Massasauga probably inhabited a major portion of eastern and southeastern Nebraska (Hudson, 1941), but this distribution was never investigated before tallgrass prairie alterations. Prior to our study, sightings and reports existed for ten counties: Nemaha, Lancaster, Douglas, Gage, Pawnee, Saline, Filmore, Colfax, Dodge and Sarpy (Taylor 1891; Hudson 1941; Mike Fritz NGPC, pers. comm.). Although, museum vouchers were available for only four counties: Gage, Lancaster, Pawnee, and Filmore. Since this study began, extant populations have been verified in Gage and Pawnee Counties, and additional populations have been confirmed in Jefferson County. Recent observations indicate that populations may have been extirpated from Lancaster County, where most of the historic sightings occurred. In Colfax County, during August 2004, a landowner found two dead Massasaugas in a hay bale (Mike Fritz NGPC, pers. comm.), indicating that viable populations may exist north of the Platte River. Remnant populations may still exist in other southeastern counties, but we were unable to verify this during our study.

We chose to study the natural history of two populations that exist in Pawnee County on NGPC Wildlife Management Areas, where extensive land management occurs. Because this study was the first in-depth investigation of the Massasauga in Nebraska, baseline data were collected in order to gather natural history about the two populations within Nebraska's altered landscape.

MATERIALS AND METHODS

Study Site—Our study took place in southeastern Nebraska during March 2004–October 2005. Although our study encompassed all of southeastern Nebraska, extensive fieldwork occurred at two NGPC locations: Pawnee Prairie Wildlife Management Area (WMA) and Burchard Lake WMA, in Pawnee County. Pawnee Prairie, a 378 ha property, is open to fishing and hunting but, with no public vehicular access. The site is mostly untilled prairie, managed by haying and burn rotations for over 25 years. It consists of a mosaic of small man-made ponds, ditches with shrubs and trees, planted tree lines, and poorly drained soils within mesic and xeric prairie. Burchard Lake, a 263 ha property, is highly accessible to the public by gravel road, is open to fishing and boating, but closed to hunting. It consists of a 61 ha manmade lake, surrounded by poorly drained soils, shallow ditches containing trees or shrubs, and rolling mesic to xeric prairie. It is managed by haying and burn rotations and, recently, by cattle grazing.

Capturing and Processing—We located Massasaugas by performing visual searches near hibernation areas during spring emergence in March, April, and May. Massasaugas hibernate in crayfish burrows (Maple and Orr, 1968; Reinert, 1978; Johnson, 1995; Mauger and Wilson, 1999); therefore, we conducted searches around wetland areas, with poorly drained soil, that supported crayfish populations. We were able to locate numerous hibernation sites because prescribed fire occurred during the study period. Prescribed fire occurred at the north side of Pawnee Prairie in 2004, the south side in 2005, and along the shoreline of Burchard Lake in 2005 (Patten, 2006). We divided Pawnee Prairie into north and south sections, with search area locations encompassing 20.2 ha and 25.3 ha, respectively. The area of the search location was approximately 10.2 ha at Burchard Lake. All search areas were associated with wetlands or poorly drained soil and contained crayfish and crayfish burrows. We searched gravel and paved roads located between study sites 2 to 3 days per week to collect dead specimens and capture, mark, and release live Massasaugas. Latitudes and longitudes of live and dead snakes were recorded by using a hand held Global Positioning System unit (GPS, Garmin® eTrex personal navigator.)

All data collected from Massasaugas occurred in the field. Data collected from captured snakes included; snout-vent length (SVL), tail length (TL), mass, dorsal blotch counts, subcaudal scale counts, number of rattle segments, scale rows at midbody, sex (male or female) and, when applicable, reproductive status of adult females. The mass of each snake was measured to the nearest gram using a spring scale (Pesola® Spring Scales, Forestry Suppliers, Inc., Jackson, MS 39284). We counted dorsal blotches, not lateral blotches, which ran along the vertebral column of the snake. In cases where two blotches were conspicuously joined, they were counted as one. Scale rows at midbody and rattle segments were counted using a technique described by Klauber (1956). Subcaudal scales, whether divided or single, were counted between, but not including the anal plate and the basal rattle segment.

Most captured individuals were implanted with passive integrated transponders (PIT tag Model TX1400L, Biomark® Inc., Boise, ID 83714) for permanent identification (Camper and Dixon, 1986), population estimates, and mark-recapture study. PIT tags were safely injected subcutaneously, using a spring-loaded syringe (Jemison et al., 1995). Snakes were scanned to check for recaptures using a 134.2 kHz Pocket ReaderTM (Digital Angel Corporation; Biomark® Inc., 7615 West Riverside Drive, Boise, Idaho 83714).

The Schnabel method was used to estimate population size (Seber, 1973). Mark-recapture techniques (PIT tags) were employed to determine growth, mortality, movements, and population size. Population estimates using mark-recapture techniques, excluded snakes captured outside the two study sites, and individuals that were not marked within the study sites (i.e., 12 neonates were not marked because they were too small). In addition, areas that were burned during spring were searched thoroughly, whereas areas with thick vegetation were not.

Each snake was categorized into a specific age class: neonate, young of the year (YOY), juvenile, or adult. A neonate snake is born with a prebutton, which is lost with the first shed (ecdysis), usually a week or two after birth. We categorized YOY snakes as those that had shed once since birth; therefore, having only a button, also known as the first rattle segment, and were captured in the fall (Hobert et al., 2004). Juveniles were snakes that had survived their first hibernation, and did not exceed 500 mm SVL. Rattle segment counts were not used to categorize juveniles or adults, because rattle string breakage occurs and growth rates vary. Because reproductive activity was not observed in snakes <500 mm SVL, the adult age class was designated as >500 mm SVL. This observation is in agreement with the findings of Keenlyne (1978) and Seigel (1986). When Massasaugas exhibited reproductive behavior (i.e., copulation, courting, gestation, or parturition), we recorded notes on behavior. Snout-vent length and mass were collected from breeding males, gravid females, postpartum females, and neonates.

When live snakes were captured, each animal was

palpated for food in the stomach (Fitch, 1987). When a bolus was present in the digestive tract, the fecal mass was palpated out of the cloaca or the food item was regurgitated out of the mouth and stored in 95% ethanol.

Searches were conducted near the two study sites on gravel roads and highways for dead on the road (DOR) Massasauga specimens. When haying and burning occurred at the study sites, we performed visual searches to collect dead specimens. We recorded latitude and longitude for all dead animals. Massasaugas found dead on the road, were collected and frozen until the stomach contents were extracted and stored in 95% ethanol. Stomach contents were viewed later in the laboratory and identified as bird, lizard, mammal, or snake. We used SPSS 10.0 and Microsoft Excel for statistical analyses, with $\alpha = 0.05$, and reported the standard deviation with all means.

RESULTS

Population estimate—Over two years of searches resulted in 171 live encounters, including 77 adults, 77 juveniles, 5 YOY, 12 neonates, and 53 dead specimens (Fig.1). During 2004 and 2005, 150 individuals were marked with PIT tags for mark-recapture study. The estimated population size based on the mark-recapture data for Burchard Lake WMA was 116, and for the north and south areas of Pawnee Prairie WMA, it was 183 and 333, respectively (Table 1).

Sex ratio—A sample size of 47 males and 36 females at Pawnee Prairie resulted in a 1.3:1 sex ratio that was not significantly biased. At Burchard Lake a sample size of 39 males and 20 females (1.95:1), resulted in a significantly male biased sex ratio (Table 2). We collected data on two clutches, one with six offspring and a 1:1 sex ratio, and a second with seven offspring and a 1:1 ratio based on six neonates. The sex of one of the neonates from the clutch of seven was undetermined because the mother had crushed it beyond recognition; however, the ratio would have favored either sex by one. The primary sex ratio (ratio at conception) was not biased towards one sex for either clutch (Table 3).

Morphology—The mean snout-vent length of adult males was significantly greater than the mean of adult females by 6.5% (ANOVA, $F_{1,76} = 10.70$, $P = 0.002$) (Table 4; Fig. 1). No significant difference in snout-vent length occurred between male and female juveniles (ANOVA, $F_{1,76} = 1.08$, $P = 0.303$). Neither was there a significant difference between mean neonate male and female snout-vent length (Mann-Whitney $U_{6,6} = 15$, $P = 0.699$) or mass (Mann-Whitney $U_{6,6} = 8.5$, $P = 0.132$) (Table 4).

The mean tail length of all females was significantly less than that of all males (ANOVA, $F_{1,157} = 32.99$, $P < 0.000$). The female tail was 8.2% (6.78–10.26%) of the total body length, whereas, the male tail was 10.6% (7.84–13.04%) of the total body length, and was significantly different between groups (ANOVA, $F_{1,157} = 381.84$, $P < 0.000$) (Fig. 2). A significant difference was found between the number of subcaudal scales of males and females (ANOVA, $F_{1,148} = 229.36$, $P < 0.000$) (Fig. 3) and between the number of dorsal blotches of males and females (ANOVA, $F_{1,148} = 7.752$, $P = 0.006$) (Fig. 4). Scale rows at mid-body were usually 25 ($n = 17$) except for one count of 26. Adult Massasaugas shed for the first time after emergence during May ($n = 1$), June ($n = 16$), and July ($n = 6$).

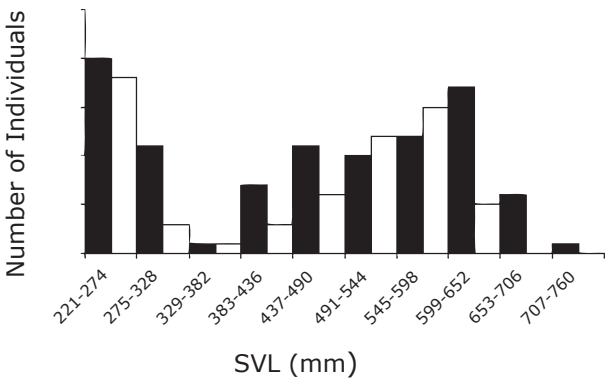

Figure 1. The snout-vent length of male ($n = 96$, indicated by solid bar) and female ($n = 63$, indicated by open bar) Western Massasaugas in Nebraska, excluding neonates.

Reproduction—Courtship occurred during spring and summer in snakes >500 mm SVL. We found six different breeding pairs, copulating ($n = 3$) and courting ($n = 3$), at spring emergence sites during April and May. In addition, we observed copulation and courting once each during August.

A gravid female arrived at a mammal burrow one week before parturition, and then gave birth to three

Table 1. Population estimates for Western Massasauga populations at two state managed properties in Nebraska, using the Schnabel method.

	Number Captures	Number Recaptures	Population Estimate	Snakes/ Hectare
Pawnee (North)	65	8	182.94	9.1
Pawnee (South)	31	1	332.63	13.2
Burchard Lake	88	25	116.12	11.4

Table 2. Number of juvenile and adult Western Massasaugas encountered at Burchard Lake and Pawnee Prairie in Nebraska. Chi-square test for significantly biased sex-ratio.

	Juvenile	Adult	Combined
Female[a]	10	19	20
Male[a]	19	20	39
$X^2_{df=1}$	2.793	3.333	6.119
P-value	0.095	0.068	0.013*
Female[b]	18	18	36
Male[b]	27	20	47
$X^2_{df=1}$	1.800	0.105	1.458
P-value	0.179	0.746	0.227

*significant *P*-value
[a] Burchard Lake
[b] Pawnee Prairie

female and three male offspring, between 6 and 15 August. The post-parturient female remained at that location until the offspring shed, and subsequently found a new location on 21 August. The female had a pre-parturient mass of 226 g, and a post-parturient mass of 129 g, with a total loss of 97 g or 41.8%. The neonates had a combined mass of 54 g, or 23.8% of the mother's pre-parturient mass. Another gravid female was observed in lowland prairie on 4 August, and then maintained in captivity until parturition of seven neonates on 11 August. The mother crushed one of the seven offspring and as a result, accurate measurements were only available for three female and three male neonates (Table 3).

Diet—The diet of Western Massasaugas in Nebraska was composed of mammals (70%), snakes (20%), lizards (5%), and birds (5%), which reflects % prey type of all diet sampled. Adult Massasaugas most commonly fed on small mammals (*n* = 11). We documented one successful attempt *(*Dicksissel, *Spiza americana*) and one failed attempt (Gray Catbird, *Dumetella carolinensis*) at swallowing a bird. It was unclear if the Massasauga had killed or was scavenging the bird. An adult Massasauga fed on a Ringneck Snake *(Diadophis punctatus)* when placed in the same bucket. Diet of juvenile Massasaugas consisted of small mammals (*n* = 3), snakes (*n* = 3) (Lined Snake, *Tropidoclonion lineatum;* Brown Snake, *Storeria dekayi*), and one lizard (Northern Prairie Skink, *Plestiodon septentrionalis*).

Mortality—The Western Massasauga was subject to several sources of mortality: Predation, vehicle tires, fire, and haying equipment. Predation occurred in three out of 27 snakes that were being radio-tracked during our study (Patten, 2006). To collect roadkill specimens, gravel roads and highways between the WMA areas were searched 2 to 3 days per week. The greatest number of road kill deaths occurred during April and May (*n* = 19), and August and October (*n* = 21), and one death occurred each in June and July.

Massasaugas at both study sites have coped with prescribed fire for at least 25 years; however, no documentation of death exists. No death resulted from fire after the 186 ha, prescribed spring (2 April 2004) burn at Pawnee Prairie. However, deaths were recorded during the 32 ha and 129 ha, 2005 prescribed

Table 3. Snout-vent length (SVL), tail length (TL), mass, subcaudal scales, sex, and dorsal blotches for two clutches of Western Massasauga in Nebraska.

	SVL (mm)	TL (mm)	Mass (grams)	Subcaudal scales	Sex	Dorsal blotches
Clutch 1	200	17	8	23	F	35
	170	18	7	*	F	*
	198	18	9	23	F	40
	195	22	10	32	M	41
	195	22	10	31	M	36
	202	23	10	30	M	38
Clutch 2	195	20	9	24	F	40
	196	21	12	24	F	40
	206	19	10	23	F	39
	203	25	12	27	M	40
	194	24	12	28	M	39
	183	26	9	26	M	38
Mean ± SD	194.8 ± 2.8	21.3 ± 0.8	9.8 ± 0.5			

* data not collected

Table 4. The mean (± SD) and range of snout-vent length (SVL) for Western Massasaugas in Nebraska (*n* = sample size).

Age Class	SVL range (mm)	Mean SVL (mm)	Mean female SVL (mm)	Mean male SVL (mm)
Neonate	170–206	194.75 ± 9.72 (*n* = 12)	194.17 ± 12.46 (*n* = 6)	195.33 ± 7.17 (*n* = 6)
YOY	224–280	252.40 ± 20.50 (*n* = 5)	270.00 ± 14.14 (*n* = 2)	240.67 ± 15.00 (*n* = 3)
Juvenile	260-490	327.84 ± 92.76 (*n* = 77)	317.93 ± 92.73 (*n* = 29)	341.78 ± 100.55 (*n* = 48)
Adult	500-710	581.18 ± 51.19 (*n* = 77)	559.88 ± 36.04 (*n* = 32)	596.33 ± 55.19 (*n* = 45)

spring burn at Burchard Lake (31 March) and Pawnee Prairie (27 April), respectively. Two adults and two juveniles were found dead at Burchard Lake, along the shoreline where crayfish burrows were concentrated, as well as a dozen dead Brown Snakes, eight dead Common Garter Snakes *(Thamnophis sirtalis),* and two Northern Prairie Skinks. At Pawnee Prairie, two adults were found dead in upland prairie following a burn.

Haying occurred at Burchard Lake and Pawnee Prairie in August of 2004 and 2005. We documented one observation of a dead Massasauga from haying equipment; however, we spoke with one contractor at Burchard Lake that claimed to have killed four Massasaugas during 2004 with his equipment. The hay contractor also explained that he normally kills several Massasaugas during each haying event. In addition, two Massasaugas were found dead in a hay bale in Colfax County, during 2004 (Mike Fritz, NGPC, pers. comm.).

DISCUSSION

The estimated population size for Burchard Lake WMA of 116 individuals is a conservative estimate because we did not perform visual searches at all hibernation sites. However, the estimate does indicate the number of Massasaugas using the hibernation sites that we searched. The estimated population size of the north and south areas of Pawnee Prairie WMA were 183 and 333, respectively. Because we searched these areas extensively with few recaptures, the estimates provided a reliable estimate of the number of Massasaugas that use the north and south hibernation sites.

The male to female sex ratio at Burchard Lake of 1.95 was significantly male biased, whereas the 1.3 sex ratio at Pawnee Prairie was not. Klauber (1956) described three factors that play a role in the outcome of a rattlesnake population's sex ratio: 1) At birth, the sexes are approximately equal in numbers, 2) there is a slightly higher mortality among the females, and 3) collectors capture more males than females because of greater activity in the summer and early autumn.

Sex ratios may vary within different age-classes of a population, but the primary sex ratio is the one subject to natural selection (Shine and Bull, 1977). Given that the primary sex ratio was equal, and we searched during spring emergence, the male-biased sex ratio of the Nebraska population was most likely due to higher mortality of females. Seigel et al. (1987) defined the costs of reproduction as "…the decrease in survivorship or future fecundity..." and noted that the cost of reproduction may be higher in viviparous species, such as the Massasauga.

Because the major focus of our search efforts was during spring at hibernation sites, Klauber's third observation did not explain the male-biased ratio. Males

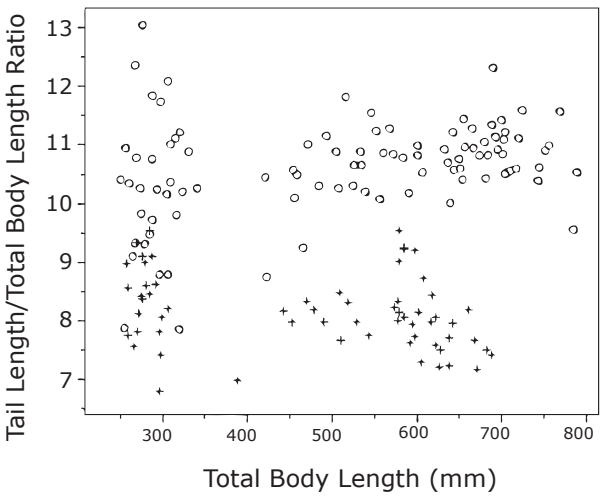

Figure 2. The tail length/total body length ratio compared to total body length for male (circle) and female (cross) Western Massasaugas in Nebraska (*n* = 158).

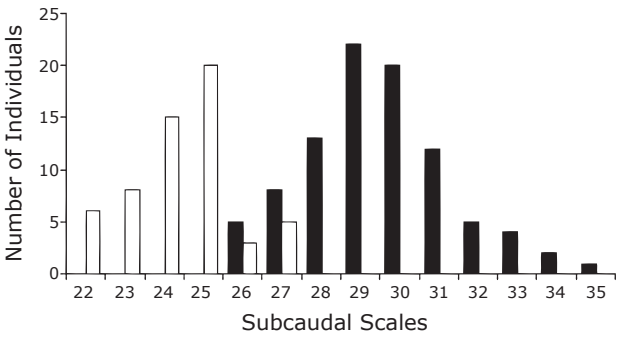

Figure 3. The number of subcaudal scales for male (*n* = 92, indicated by solid bars) and female (*n* = 57, indicated by open bars) Western Massasaugas in Nebraska.

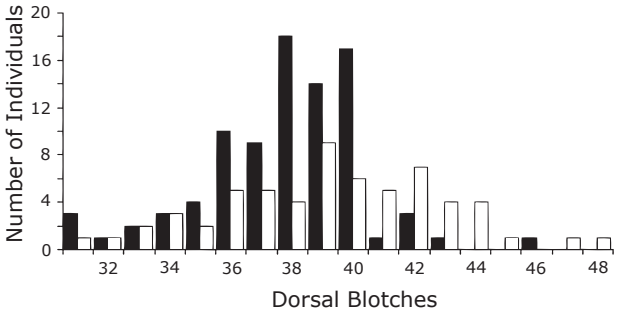

Figure 4. The number of dorsal blotches for male (*n* = 87, indicated by solid bar) and female (*n* = 61, indicated by open bars) Western Massasaugas in Nebraska.

and females did not use different types of hibernacula, segregate themselves according to sex, or emerge at different times. We captured only 23 Massasaugas during summer and autumn, when males tended to have a larger activity range than females, and might have therefore been found in greater numbers. To that end, during June–October we captured 8 females and 15 males, and more juveniles (*n* = 8) and YOY (*n* = 5) combined were captured than adults (*n* = 10; female = 6, male = 4). Gravid females may bask more than nongravid females or adult males, agility may be reduced because of the burden of the embryos, and depletion of energy reserves from being gravid is common (Shine, 1980; Wang et al., 2003). Therefore, gravid females at our site may have been highly susceptible to predation by mammals or birds of prey. Although, this does not explain the 1.6 ratio that occurred in juveniles as well, perhaps immature females do not move as far as males of the same age-class, which may result in an increased mortality from haying in the lowland areas. However, before this can be concluded, juvenile habitat use and spatial ecology should be studied.

Klauber (1956) reported a general trend of adult female rattlesnakes being slightly smaller than adult males, except in *Crotalus cerastes.* In Nebraska, adult male snakes are significantly longer than female adult snakes. Hobert et al. (2004) noted that this comparison is not a direct test of sexual size dimorphism if age structure of the population was not determined. Seigel (1986) reported no sexual dimorphism in SVL within the population at Squaw Creek, Missouri, but found significant sexual dimorphism in TL and relative TL. Wright (1941) found that in a northeastern Illinois population males were larger in mean length than females. Females may be smaller due to the cost of reproduction, which in turn would reduce growth during pregnancy, and possibly shortly after parturition. Wright (1941) reported a mean adult length of 637 mm (range = 540–731 mm) in Illinois, much larger than the Nebraska mean of 580 mm (range = 500–710 mm). The eastern subspecies had an overall greater mean SVL compared to the western subspecies in Nebraska.

Male snakes have longer tails than females because the copulatory organs of the male retract into the tail (Klauber, 1956). For Massasaugas, Wright (1941) reported a ratio of tail length to the total body length of females as 8.3% and 10.9% in males. Greene and Oliver (1965) reported the tail length/total body length ratio of newborn Massasaugas to average 8.3% (7.4–9.3) for females and 10.7% (10.3–11.0) for males in Tarrant County, Texas. Our results for tail length/total body length ratio in females and males did not conflict with previously published results.

Evans and Gloyd (1948) report that specimens of Massasaugas from the western part of Missouri represented the western subspecies, specimens from the eastern part of the state represented the eastern subspecies, and those in the north-central part of the state represented intergrades between the western and eastern subspecies. Based on morphological data, Evans and Gloyd (1948) pointed out a tendency towards reduction in number of ventral scales and blotches from west to east. Our results for Massasauga blotch counts compared to Missouri (Evans and Gloyd, 1948) matched those of the intergrade as well as the western subspecies. Female and male blotch counts were significantly different, which could be representative of morphological dimorphism between sexes; however, this has not been documented from other Massasauga populations.

The scale row counts at midbody of nearly all Nebraska Massasaugas equaled 25, which was consistent with the first authors' observations of specimens at Sam Noble Oklahoma Museum of Natural History (SNOMNH) of the western subspecies found in Oklahoma. Nine of the Oklahoma specimens had 25 scale rows, and one specimen each had 23, 24, and 26 scale rows. Hobert (1997) reported the majority of

specimens from Kansas to have scale rows at midbody equaling 25. The scale rows of the desert subspecies *(S. c. edwardsii)* at midbody equal 23 (Hobert, 1997). One Wisconsin specimen at the SNOMNH was examined and the scale rows equaled 25.

Courtship and copulation in Nebraska occurred during April, May, and August and parturition occurred during August (*n* = 2). Anton (1992) reported parturition dates from July through mid-September, with clutch sizes ranging from 2 to 11 in Illinois populations. In Colorado, the Desert Massasauga gave birth between August and September to clutch sizes of 5 to 7 (Hobert et al., 2004). In Pennsylvania, Eastern Massasaugas gave birth in August and September with clutch sizes of 5–8 young (Swanson, 1933). The third author found a gravid female in August that had been run over, and shortly thereafter, she gave birth to 11 neonates. The clutch sizes of 6, 7 and 11 observed in Nebraska were common for the subfamily Crotalinae (Zug et al., 2001), and other populations of Massasauga (Swanson, 1933; Anton, 1992). In Illinois, Anton (1992) reported a mean SVL = 226 mm and mean mass = 10.5 g for a clutch of nine and a mean SVL = 210 mm and mean mass = 10.2 g for a clutch of six, which is greater than those from our study (194 mm, 9.8 g).

The diet of Western Massasaugas in Nebraska and Texas were similar. The diet in Texas was composed of mammals (79.5%), lizards (11.4%), snakes (6.8%), and birds (2.3%) (Holycross and Mackessy, 2002). In Nebraska, there appears to be an ontogenetic shift toward consuming more small mammals and fewer snakes or lizards as Massasaugas reach adult size.

It is common for researchers investigating reptile communities or species to use road searches. Hobert et al., (2004) used road searches and searched suitable habitat on foot for investigations of Massasaugas in Colorado. We used the same techniques in Nebraska. When performing road searches the majority of the snakes observed were dead on the road (DOR). We detected a high occurrence of DOR's on the roads during April, May, August, and October and only two found during June and July, corroborating the general observation of spring and fall migrations from and to hibernacula. For example, on 13 September seven DOR's were found, six of these were within a mile of each other. Most of the DOR's occurred on Highway 8 and Highway 99 in Pawnee County outside of the two study sites. Both of these highways were heavily traveled at all hours, indicating that traffic fluctuations did not play a role in the reduced number of deaths during the summer.

Because the Western Massasauga is restricted to remnant tallgrass prairie and has declined since documentations were first made by Taylor (1891) and Hudson (1941), it was necessary to investigate this species in these areas with respect to subspecific identity and natural history. The two populations of Western Massasauga that we studied shared similar life history characteristics of other Massasauga populations. Current land management techniques may have a profound impact on the female subset of these populations, especially at Burchard Lake. For years, Burchard Lake has been hayed extensively in the lowland areas surrounding the 61 ha lake. A road is open to park visitors and fishing occurs throughout this area. This area of high human activity and Massasauga activity may contribute negatively to the population. However, because of the extent to which all cohorts use these areas, a more thorough investigation of spatial use for all age groups would be beneficial. The long-term effects of current land management techniques on Massasaugas are unknown because population parameters were never investigated prior to this study.

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

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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 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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The Journal of Kansas Herpetology, 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 10th 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 common names used in *JKH* will follow the latest edition of standardized common names as organized by CNAH (www.cnah.org; Collins and Taggart, 2002), which are also used in the prior and current editions of *Amphibians and Reptiles in Kansas* (currently Collins and Collins, 1993) and the *Peterson Field Guide* (Conant and Collins, 1991, 1998).

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