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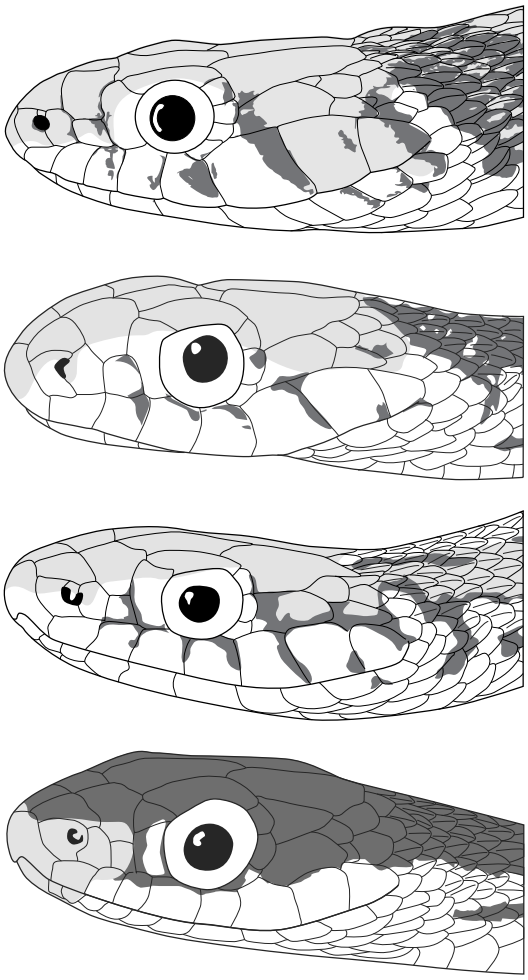

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Front Cover: Illustrations of the heads of Kansas *Thamnophis*: Top to bottom: *T. marcianus*, *T. sirtalis*, *T. radix*, and *T. proximus*. By Travis W. Taggart, 2019.

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KHS BUSINESS

Summary of the 45th Annual Meeting of the Kansas Herpetological Society

The 45th annual meeting of the Kansas Herpetological Society was on 3-4 November 2018 at the Avaste Inn and Conference Center, Emporia, KS. Participants were encouraged to stay at the Avaste in a block of rooms overlooking the large atrium. Attendees started arriving late Friday afternoon and conveniently were able to register for the annual meeting in the atrium. Friday evening's mixer occurred in the atrium along with beer served by the Urban Cowboy bar and wonderful snacks and soft drinks served by the staff of the Avaste. For those who did not want to chat there was a live animal display of Kansas amphibians and reptiles hosted by Emporia State University with plenty of background material for photography.

Saturday morning started with a continental breakfast in the breakfast room conveniently located between the atrium and the ballroom where the paper sessions occurred. Having had plenty, little, or no sleep the night before, attendees fortified themselves with caffeine and headed to the ballroom where they were welcomed to the meeting by Lynnette Sievert, President of the Kansas Herpetological Society at 9:00. After a few minutes of sheer terror, a laptop loaned by a KHS member, and help from the audience, the hosts of the meeting were able to get the AV system working and keep everything on schedule. The first morning session started with David Penning (Missouri Southern State University) presenting "Facing fears for food: Does hunger modify snake behavior?" Did anyone else notice that this is the second year that he has presented the first paper of the meeting? Next, Allison Carothers (University of Nebraska-Lincoln) taught us about "Feeding methods for headstarting in juvenile Bullsnakes (*Pituophis catenifer*)". Our third presenter of the session was Carolyn Hanish (University of Nebraska-Lincoln School of Veterinary Medicine and Biomedical Sciences, Florida Atlantic University) presenting "Gigantic *Gopherus* gastroliths". During her presentation she noted that this was the last time she would get to talk to a group about poop. The sadness in the room was palpable. The final speaker of this session was Christian Neff (Missouri Southern State University) telling us about "Prey under pressure: An analysis of the thoracic and intracranial pressures during constriction by kingsnakes."

After a short break, refreshments, and more coffee Travis Taggart took over as moderator of the late morning session. Justin Autz (Emporia State University) presented the first paper of a mini-symposium presented by the Emporia State folks on "Distributional and seasonal activity patterns of the Mudpuppy in eastern Kansas". Jennifer Buchanan (Emporia State University) followed with "Spatial and sexual variation in diet of the Mudpuppy (*Necturus maculosus*) in Kansas". Next, Michael Mahr reported on "An investigation into range limits of the Northern Map Turtle in Kansas". The fourth presentation of the session was by Melissa Skelton (Fort Hays State University) on "Comparisons of amphibian and reptile observations between larger woodland tracts and smaller fragments in eastern Kansas". The final presenter of the session came all the way from Texas (West Texas A&M University) to present "Influence of fire patterns on a herpetofauna community in an eastern Texas woodland". Immediately after the last paper of the session, Larry Miller (Kansas Heritage Photography) hustled the attendees out onto the lawn for a group photo. Meeting goers then rapidly fled on foot or by vehicle to test their optimal foraging skills.

The meeting reconvened at 1:30 and Lynnette Sievert welcomed and introduced the keynote speaker, Dr. Jesus Rivas of the biology department at New Mexico Highlands University. Jesus A. Rivas is a herpetologist, tropical ecologist, and television correspondent. His research interests include natural history, ethology, and conservation. Jesus is well known for his work on anacondas. He kept his post-lunch audience wide-awake with his talk on "Natural history of the Green Anaconda: With emphasis on its reproductive biology".

Daniel Fogell moderated the last Saturday session. Donglin Han (Emporia State University) started the session with his presentation on "The effect of temperature on rate of digestion in *Anaxyrus woodhousii*". He was followed by Jeffery Anderson (Emporia State University) who presented "The effect of temperature on *Pantherophis guttatus* prey-handling behavior". Joselyn Gutierrez (West Texas A&M University) traveled from Texas to tell the audience about "The effects of fire seasonality on herpetofauna in a sand sage prairie ecosystem". Our fourth pre-

senter of the session, Jake Wright (Pittsburg State University) reported on "Establishing long-term herpetofauna monitoring sites in southeast KS". John Bellah (Emporia State University) followed with his presentation of the "Effects of parasitism on stress levels in Northern Watersnakes (*Nerodia sipedon*)". Our penultimate speaker of the session, Jacob Alexander (Fort Hays State University), reported on "Grip it and flip it 2.0: Season two of herpetofaunal composition and monitoring at the Sternberg Natural Area". The last speaker of the session was Adrianna Hodges (Wichita State University) who presented "A needle in a haystack: Searching for *Holbrookia maculata* in a south central Kansas sand prairie".

The last event of the afternoon convened at 4:45pm. KHS General Business Meeting led by KHS President Lynnette Sievert started with an introduction of KHS Officers and dignitaries. The KHS Treasurer's Report for 2018 was given by Daren Riedle. Kelley Tuel gave the KHS Secretary's Report for 2018. The KHS Editor's Report for 2018 was presented by Travis W. Taggart. Suzanne Collins followed with the KHS Historian's Report. Plans for the 46th Annual KHS Meeting in Hays, KS on 1-3 November 2019 were summarized by KHS President-Elect Curtis Schmidt who informed the group that the meeting will be held at Fort Hays State University and the Sternberg Museum of Natural History.

KHS Nominating Committee Chair, Brent Schulze (Denver, Colorado), offered the following slate of candidates: For President-Elect Christopher Visser (Lincoln, NE); for Treasurer (unopposed) Daren Riedle (Pratt, KS); and for Secretary Dexter Mardis (Wichita, KS) and Keith Geluso (Kearney, NE). Dexter Mardis was elected secretary.

Following the business meeting, KHS Awards Committee Chair Daniel Fogell conducted the 2018 KHS Awards Ceremony. The Henry S. Fitch- Dwight R Platt Award went to Daren Riedle (Kansas Department of Wildlife, Parks, and Tourism) for his lifetime dedication to advancing and promoting field herpetology. The award came with a commemorative certificate and check for $200. The Howard K. Gloyd- Edward H. Taylor Scholarship went to Jacob Alexander (Fort Hays State University). It came with a commemorative certificate and $300. The Alan H. Kamb Grant for research on Kansas snakes was given to Jacob Basler (St. Mary's, Kansas) along with a commemorative certificate and $300. The final award given during the ceremony was the Suzanne L. and Joseph T. Collins Award for Excellence in Kansas Herpetology. In even-numbered years, The Collins Award is bestowed upon that member of the KHS who, in the preceding two calendar years, accomplished the following: Had published a paper of academic excellence on the systematics, ecology, or conservation of a native species of Kansas amphibian, turtle, and/or reptile in the Journal of Kansas Herpetology, Transactions of the Kansas Academy of Science, Herpetological Review, or the Journal of Herpetology, and/or presented a lecture of excellence on the systematics, ecology, or conservation of a native species of Kansas amphibian(s) and/or reptile(s). To qualify for The Collins Award, a portion of the field work or observations must occur in Kansas, or the systematic data must be based in part on Kansas specimens. This year's winner of this prestigious award was Colleen Rothe-Groleau (University of Nebraska at Omaha). She received a commemorative certificate and a check for $1000.00.

KHS Business Meeting adjourned and KHS members left for dinner. We made our way back the Avaste Inn and Conference Center by 6:30 pm for FREE BEER, SOFT DRINKS, and SNACKS and the 3rd annual Poster Session. We had eight posters presented. Titles and presenters are: Fat, feisty, fast? Striking and constriction performance from Borneo Pythons (*Python breitensteini*). Nathan Piccoli (Missouri Southern State University): Aquatic turtles on four Emporia State University Natural Areas. Jacob Schaefer (Emporia State University); Biomechanical trade-offs across ontogeny? Striking and constriction performance in Rosy Boas (*Lichanura trivirgata*). Jillian Hackney (Missouri Southern State University); Potential for using photo-identification software in Kansas herpetological population studies. Hannah Hoetmer (Wichita State University); Manipulating body temperature to test for elastic recoil mechanisms in an Australian Python (*Morelia spilota*). Veronica Nguyen (Missouri Southern State University); Silver-spoon snappers? Comparing bite forces in wild and head-started populations of Alligator Snapping Turtles (*Macrochelys temminckii*). David Penning (Missouri Southern State University); Long-term occurrence patterns of reptiles and amphibians on reclaimed mined lands. Rachel Wood (Pittsburg State University); and Analysis of strike kinematics in Kenyan Sand Boas (*Gongylophis colubrinus*). Elva Wright (Mis-

souri Southern State University)

After the poster session, members excitedly gathered in the ballroom for the KHS auction. As always, it featured many breath-taking books and other items (of questionable value). KHS members were urged to bid vigorously and support the KHS. As he has done for many years, our unofficial artist-in-residence, John Lokke watched the proceedings and created water-color paintings, which he promptly donated to the KHS auction. Once all items were auctioned off the attendees only had a short walk back to their rooms or to the atrium for more conversation.

8:00 am arrived a bit early for some but they were greeted with free coffee, donuts and a "fix it yourself breakfast" courtesy of Avaste. After a slight panic, because the AV equipment did not want to work, Dr. Alexis Powell with help from KHS members was able to get everything started on time. Alexis Powell, Emporia State University moderated the first session of the morning. Our first talk of the day was "When females raise their voices: Calling behavior of the Smooth Guardian Frog of Borneo (*Limnonectes palavanensis*)" presented by Johana Goyes Vallejos (University of Kansas). Next Tanner Myers (University of Kansas) told us about "Testing species limits in a cryptic species complex of Hispaniolan lizards (*Anolis distichus*)". Brock Lorenzen (University of Nebraska-Lincoln) taught us about "Occupancy analysis of selected herpetofauna species at range periphery in Southeast Nebraska". He was followed by Zackary Cordes (Kansas Department of Wildlife, Parks & Tourism) talking on "Occupancy modeling of Broad-headed Skinks (*Plestiodon laticeps*) in eastern Kansas". Our last talk of this session was by Neil Balchan (University of Northern Colorado) who spoke about "The snack that smiles back: Venom resistance of Colorado rodents to two grassland rattlesnakes".

After a short break attendees reassembled and Dr. David Edds (Emporia State University) moderated the last session of the meeting. J. Daren Riedle (Kansas Department of Wildlife, Parks, & Tourism) presented "The role of scale in analysis of river turtle assemblages". He was followed by Anthony Bridger (Bureau of Land Management) who told us about "This land is your land: The importance of public lands in herpetology and wildlife conservation". Next Diedre Kramer (Fort Hays State University) informed us regarding "Home range and population dynamics of the Ornate Box Turtle (*Terrapene ornata*) at Quivira National Wildlife Refuge". Last, but not least, William Lanlgey ended the session with "Road mortality of herpetofauna along two-lane highway in south-central Kansas".

Immediately after the last talk of the meeting Daniel Fogell presided over the Presentation of the 10th annual George Toland Award and the Walter E. Meshaka, Jr. Award for Excellence in North American Herpetology for the best ecology poster of the meeting. This year's Toland Award went to Diedre L. Kramer (Fort Hays State University). She received a commemorative certificate and a check for $200. Nathan Piccoli (Missouri Southern State University) won the Meshaka award, which came with a commemorative certificate and a check for $100.

KHS President Lynnette Sievert thanked all who had attended the 2018 KHS meeting and wished them a safe drive home.

First Report of the Rough Earthsnake (*Haldea striatula*) in Labette County

The afternoon of 25 October 2018, my brother Brody Byrd and I were moving wood onto a trailer. We observed, caught, and photographed a Rough Earthsnake (*Haldea striatula*).

This sighting is the first observation of the secretive Rough Earthsnake in Labette County (Taggart, 2019. Kansas Herpetofaunal Atlas; http://webapps.fhsu.edu/ksherp/default.aspx).

The Rough Earthsnake was found at 37.344167°, -95.100556° (WGS84). There is a thick tree line of Hackberry (*Celtis occidentalis*), Eastern Red Cedar (*Juniperus virginiana*) and Osage Orange (*Maclura pomifera*) just to the south. The site is about 1/2 mile from the east bank of the Neosho River and approximately 1/4 mile north of US 400.

The Rough Earthsnake was discovered in the dirt at the bottom of the wood pile. The wood had been stacked for several months, and tall grasses grew around the wood.

The fall weather was cool, and the temperature was approximately 50 degrees F at 5 pm when the snake was discovered.

Not knowing the significance of our discovery, we didn't record any measurements, however we estimated the snake to be about 7 inches in total length.

Rough Earthsnakes have been found in Crawford, Cherokee, Chautauqua, and Elk counites in Kansas (Taggart, 2019. Kansas Herpetofaunal Atlas; http://webapps.fhsu.edu/ksherp/default.aspx). Those in Chautauqua and Elk are associated with the Cross Timbers region, and the Cherokee and Crawford records are all near the eastern border of Kansas. Our record significantly fills a gap, with the nearst specimens being FHSM 15329, 54.5 mi W in Elk County and PSU 148, 17.5 mi E in Crawford County.

Collins, Collins, and Taggart (2010. Reptiles, Amphibians and Turtles of Kansas, Eagle Mountain Publishing) listed the following habitats for Rough Earthsnakes in Kansas, rocky hillsides in moist woodlands, woodland edge, and meadows, pastures and grasslands with abundant thatch. This is the first reported instance of a specimen in Kansas being found in association with a wood pile, however the surrounding area is pasture and old field.

Based on this observation, I think that there are more to be found in the same general area. My brother and I will look for them again in warm weather and especially in late summer when we are moving wood.

Brock Byrd,
8th grade
Service Valley Charter Academy
Oswego, Kansas

Figure 1. An adult Rough Earthsnake (*Haldea striatula*) from Labette County, Kansas.

Figure 2. Aerial photograph (22 January 2015) of the vicinity of the collection locality (37.344167°, -95.100556°). The area the Rough Earthsnake (*Haldea striatula*) was discovered is marked by the yellow pin. It is 0.5 mi E of the Neosho River and 0.27 mi N of US 400 just west of Xavier Road in northeast Labette County.

Patterns of Herpetofaunal Species Richness Along Environmental Gradients in Kansas

ANDREW D. GEORGE, AMY M. HAMMESFAHR, MICHAEL W. BARNES, CHRISTINE C. REGA-BRODSKY, Department of Biology, Pittsburg State University, Pittsburg, Kansas 66762

ABSTRACT — Species richness of most taxa follows a latitudinal gradient, reflecting broad-scale interactions between climate and topography. Yet the mechanisms explaining regional patterns of biodiversity remain poorly understood because environmental variables that affect species distributions are difficult to isolate. We used data from the Kansas Herpetofaunal Atlas (KHA) within an information-theoretic framework to evaluate relationships between herpetofauna species richness and variables representing topography and climate. We found that mean air temperature, total precipitation, and topographic variation best explained patterns of total herpetofauna species richness and reptile species richness. Amphibian species richness was related to annual temperature range and total precipitation, but models with only latitude and longitude were equally well-supported. Overall, we provide evidence that the diversity of amphibians and reptiles in Kansas is related to environmental factors that reflect ectotherm physiology and life-history characteristics. Our findings highlight the value of biological atlas projects for understanding regional patterns of biodiversity.

INTRODUCTION

The latitudinal gradient in species richness remains one of the most persistent patterns in ecology (Hillebrand 2004; Wiens 2007). With some notable exceptions, most taxonomic groups are more diverse near the equator and less diverse near the poles (Wiens 2007; Mannion et al. 2014; Angielczyk et al. 2015). However, species richness is variable at regional scales, where latitude alone may be less important than underlying environmental gradients. Numerous hypotheses have been proposed to explain regional patterns of species richness, many of which are interrelated (Mannion et al. 2014). For example, species richness of amphibians and reptiles in North America increases with atmospheric energy and water availability (Currie 1991; Pyron and Wiens 2013). Other biotic factors, such as environmental heterogeneity and natural history, become more important at regional scales (Costa et al. 2007; Field et al. 2009; Moreno-Rueda and Pizarro 2009; Angielczyk et al. 2015). Statistical analyses linking species richness patterns to environmental gradients require adequate location-specific richness data and associated environmental covariates.

Biological atlas projects, broadly defined as spatially explicit datasets of species occurrence, are increasingly being used for applications in ecology and conservation biogeography (Robertson et al. 2010; Ochoa-Ochoa et al. 2014). The Kansas Herpetofaunal Atlas (KHA) is one of at least two dozen biological atlas projects that document all known records of amphibians and reptiles from their respective states. KHA data originate from museum collections, literature records, and observations by both hobbyists and professional biologists. With >60,000 records from across the state, occurrence patterns of Kansas herpetofauna are relatively well documented (Taggart 2019).

Kansas is an ideal location for studying regional effects of environmental gradients on species richness patterns because climate factors (e.g., precipitation and air temperatures) vary widely across the state's diverse ecoregions (Chapman et al. 2001). We used county-level data from the KHA to assess spatial patterns of herpetofauna species richness within the state. Specifically, we compared hypotheses describing the relationships between species richness and 1) precipitation, 2) temperature, 3) topography, and 4) latitude and longitude.

Ectotherm physiology, behavior, and life history characteristics are closely linked to the thermal environment, impacting the suitable habitat ranges of species. Therefore, amphibians and reptiles are informative study organisms for understanding changes in biodiversity across environmental and climate gradients. Due to their life history and habitat requirements, we predicted that reptile species richness would be positively related to mean air temperature and that amphibian species richness would be positively related to both air temperature and annual precipitation (Qian 2010). We predicted

Table 1. Model-selection results for the best-supported models predicting herpetofaunal species richness in 105 Kansas counties. Candidate models included combinations of mean annual air temperature, mean annual precipitation, elevation, and topography. K = number of parameters in each model. ΔAIC_c = the difference in AIC_c values, w_i = model weight. The latitude-longitude models and null models are included for comparison with the best-supported models.

Response	Model	K	ΔAIC_c	w_i
Total Species Richness	Temperature + Precipitation + Topography	5	0.0	0.59
	Latitude + Longitude	4	25.2	0.00
	Null	2	44.6	0.00
Reptile Species Richness	Temperature + Precipitation + Topography	5	0.0	0.62
	Latitude + Longitude	4	26.3	0.00
	Null	2	46.1	0.00
Amphibian Species Richness	Temperature Range + Precipitation	4	0.0	0.24
	Latitude + Longitude	4	0.6	0.18
	Temperature + Precipitation	4	1.4	0.12
	Null	2	12.9	0.00

that overall species richness would more closely resemble the model for reptiles because there are more reptile species than amphibian species in Kansas.

METHODS

For each county in Kansas (n = 105), we used KHA occurrence records to calculate total species richness and species richness for both amphibians and reptiles. Species records that were considered accidental or questionable by KHA were omitted from the analysis. Species complexes were considered single species in richness calculations. We obtained 30-year averages of mean monthly air temperatures and total annual precipitation for each county from the Kansas State University climate database (Kansas State University 2019). The annual temperature range was calculated as the difference between mean temperatures for July and January. We used a 7.5-minute USGS digital elevation model (DEM) to calculate the mean elevation for each county. An index of topographic variation was calculated as the standard deviation of elevation in each county.

We used an information-theoretic framework to compare models representing a priori hypotheses about the relationships between herpetofaunal species richness and environmental gradients (Burnham and Anderson 2002). We fit generalized least squares (GLS) models with species richness as the response variable and all additive combinations of mean air temperature, temperature range, mean annual precipitation, elevation, and topography as predictor variables. We also fit models with only latitude and longitude as predictor variables, and null (intercept only) models. To reduce multicollinearity, correlated predictor variables ($r > 0.5$) were not included in the same models. All models included an exponential correlation structure to account for spatial autocorrelation among species richness across counties. Akaike's Information Criterion for small sample sizes (AICc) and model weights were used to select the best-supported models for total species richness, species richness of amphibians, and species richness of reptiles (Burnham and Anderson 2002). Models within two ΔAICc of the top model were considered supported unless they added only uninformative parameters to the top model (Arnold 2010).

RESULTS

The KHA contained records for 98 species that met criteria for inclusion in our analysis, including eight species that were combined into four species complexes due to identification uncertainty. Total species richness ranged from 14 species in Thomas Co. to 68 species in Cherokee Co. Amphibian species richness ranged from 5 species in Decatur Co. to 22 species in Cherokee Co. Reptile species richness ranged from 8 species in Thomas Co. to 50 species in Crawford Co.

We found support for models that included climate, topography, and latitude and longitude as predictors of herpetofaunal species richness (Tables 1, 2). The best-supported models for both total species richness and reptile species richness included positive responses to mean air temperature, precipitation, and topographic variation. Amphibian species richness was best explained by models that included positive responses to air temperature and precipitation, and a negative response to air temperature range. For amphibians, latitude and longitude predicted species richness nearly as well as climate variables. Model-predicted species richness gener-

Table 2. Estimated coefficients for the best-supported models for herpetofaunal species richness in 105 Kansas counties. Temperature indicates mean air temperature (°C), precipitation indicates mean annual total precipitation (cm), and topography is the standard deviation of elevation.

Model	Parameter	Coefficient	Standard Error	Lower 95% CI	Upper 95% CI
Total Species Richness	Intercept	-232.27	30.05	-291.16	-173.38
	Temperature	4.28	0.57	3.16	5.41
	Precipitation	0.91	0.13	0.65	1.17
	Topography	0.35	0.07	0.22	0.48
Reptile Species Richness	Intercept	-203.85	24.52	-251.91	-155.79
	Temperature	3.73	0.47	2.81	4.64
	Precipitation	0.68	0.11	0.48	0.89
	Topography	0.30	0.06	0.19	0.41
Amphibian Species Richness					
Model 1	Intercept	29.40	7.78	14.14	44.65
	Temp Range	-0.56	0.16	-0.88	-0.24
	Precipitation	0.27	0.03	0.21	0.33
Model 2	Intercept	137.05	18.06	101.65	172.46
	Latitude	-1.18	0.31	-1.80	-0.57
	Longitude	0.83	0.14	0.56	1.10
Model 3	Intercept	-25.95	9.59	-44.74	-7.16
	Temperature	0.56	0.18	0.19	0.92
	Precipitation	0.19	0.04	0.11	0.28

ally increased from the northwest to southeast (Fig. 1). Residual maps indicated that several counties contain more or fewer reported species than predicted by the best-supported models.

DISCUSSION

Understanding the mechanisms underlying regional biodiversity patterns remains a central goal of biogeography and community ecology, and our results provide useful insight. We found relationships between environmental gradients and patterns of Kansas' herpetofauna species richness. For reptiles and combined herpetofauna, environmental gradients were better predictors of species richness than latitude and longitude. Environmental gradients also predicted amphibian species richness, although models with only latitude and longitude were equally well-supported. Latitude and longitude may serve as a proxy for predicting species richness in regions such as Kansas where environmental variables follow directional gradients.

Our findings are consistent with studies that found strong relationships between species richness and climate or productivity (Gaston 2000, Qian et al 2007). Air temperatures and water availability affect environmental energy and ecosystem productivity. Generally, ecosystems with greater environmental energy can generate higher biomass, which can in turn support minimum viable populations of more species (Gaston 2000, Buckley et al. 2008, Angielczyk et al. 2015). Populations of reptiles and amphibians may be further limited by local thermal conditions and water availability. The positive relationships we observed between species richness and mean air temperature may reflect constraints on ectotherm physiology, either during the growing season, winter, or both (Wiens 2007). Likewise, the positive relationships we observed between species richness and annual precipitation may reflect the fact that many of Kansas' reptiles and amphibians are limited by the availability of standing water. For example, southeast Kansas may support more species of amphibians and aquatic turtles because higher rainfall translates to a greater abundance and diversity of aquatic habitats. One of the best-supported amphibian models included a negative relationship between species richness and temperature range. Kansas counties that undergo seasonal temperature extremes may limit the persistence of amphibian species with narrow physiological limits (Buckley and Huey 2016). Relationships between species richness and climatic factors also reflect phylogenetic patterns of speciation, extinction, and shifts in

species distributions, although the scale of such processes is beyond the scope of our analysis (Mannion et al. 2014, Pyron and Wiens 2013).

Our residual plots indicated that the best-supported model predictions overestimated or underestimated species richness for several Kansas counties. The residuals likely represent one of two sources of potential error. First, type II errors may have resulted from under-sampled counties, in which the true number of species for a given county is higher than reported by the KHA. Models could be improved by increasing future sampling efforts in these counties, or by basing models on quantitative species richness estimates rather than raw county records. The second source of error affecting model residuals likely arises from environmental variability that was not accounted for in our analysis. True species richness is dynamic and ultimately determined by interactions among complex environmental factors that affect organisms at multiple spatial and temporal scales. Depending on the objectives, future models could be refined by incorporating higher resolution species richness

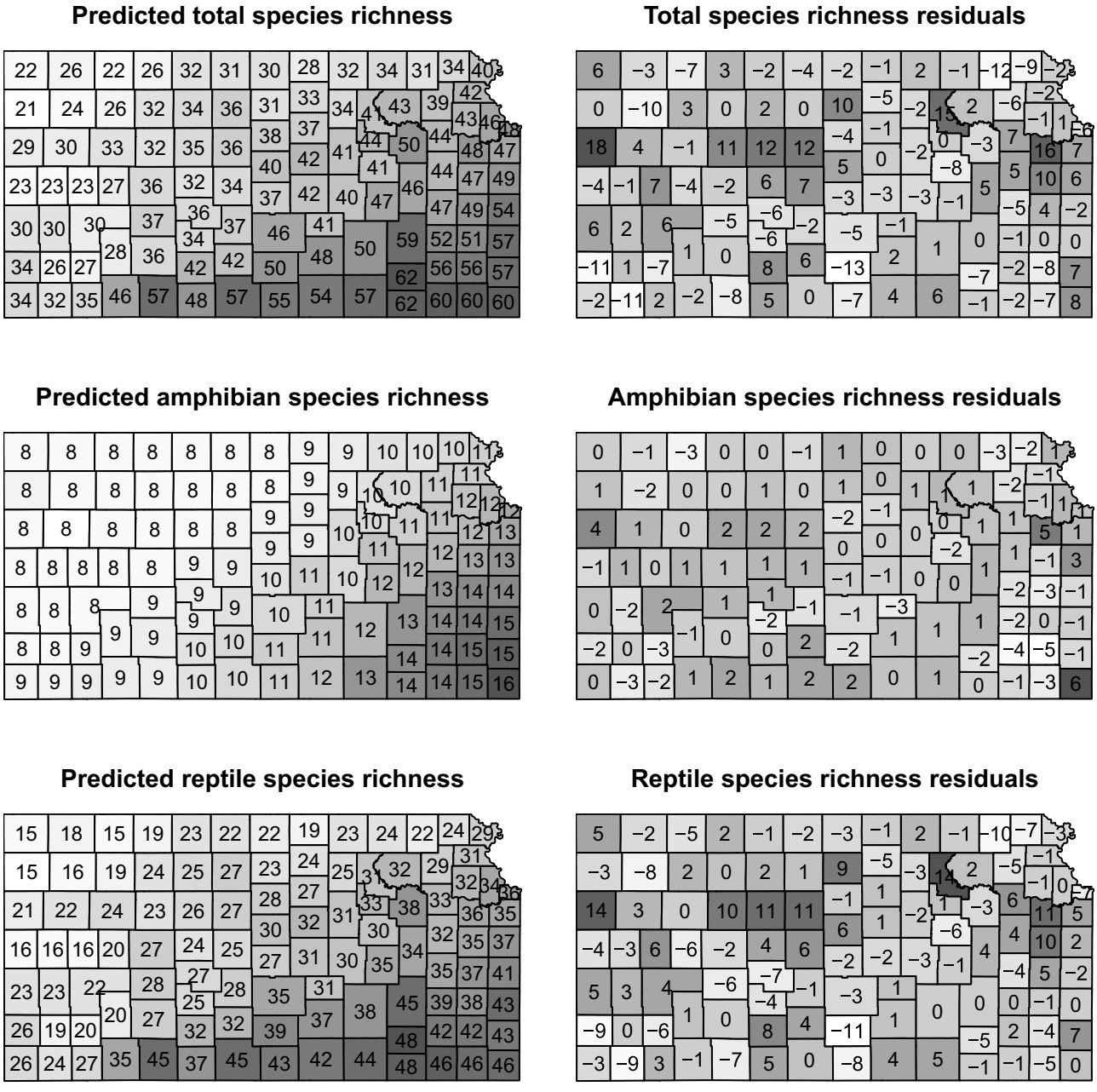

Figure 1. Predictions (left) and residuals (right) of the best-supported models of the relationships between environmental variables and total herpetofaunal species richness, amphibian species richness, and reptile species richness. Negative residuals indicate that documented species richness was lower than predicted species richness.

data and additional environmental covariates.

In addition to describing patterns of herpetofauna species richness in Kansas, we demonstrate a novel application of data from biological atlas projects. The KHA is one of a growing number of spatially explicit datasets based on both museum collections and observations from citizen scientists (Robertson et al. 2010). Because data could be linked to county-level environmental data, we were able to elucidate relationships between herpetofaunal species richness and environmental gradients at a finer scale than many previous studies of biodiversity patterns. Understanding factors that affect the distribution of species richness at the state-level can help identify locations with high biodiversity, and ultimately inform conservation efforts. Continued improvements in data quality and accessibility of biological atlas projects will permit their continued use in biogeography and conservation.

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Bronze Frog (*Lithobates clamitans*) Entanglement and Mortality in an Erosion Control Blanket

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Mesh products (e.g., wildlife exclusion netting and erosion control blankets) pose a risk to herpetofauna as they can become entangled, resulting in severe lacerations and/or mortality (Stuart et al. 2001, Walley et al. 2005a,b, Kapfer and Paloski 2011, Ebert et al. 2019). Snakes are the most reported taxa found entangled in mesh products (Montez and Saenz 2018, Ebert et al. 2019), however other animal taxa are also vulnerable to entanglement including turtles (Smith and Parker 2017) and lizards (Leatherman 1996).

On 11 May 2018, we encountered a dead *Lithobates clamitans* (SVL = 55.5 mm) that had become entangled in a polypropylene erosion control blanket comprised of two mesh layers (mesh size = 12.7 mm²) that was installed to mitigate against soil loss at a Texas Department of Transportation construction site in Houston County, Texas, USA (31°29'25.865'' N, 95°13'31.353'' W). The L. clamitans was found dead with the mesh entangled around its neck and appeared desiccated (Fig. 1). Prior studies have noted that erosion control blankets comprised of polypropylene mesh with fused corners are particularly effective at entangling animals (Kapfer and Paloski 2011, Ebert et al. 2019). Our observation contributes to the growing number of observations documenting wildlife entanglement in erosion control products.

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Figure 1. *Lithobates clamitans* entangled in erosion control blanket comprised of polypropylene mesh in Houston County, Texas, USA. Photo by Cory Adams.

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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 of the Society. Membership dues per calendar year are $15.00 (U.S., Regular), $20.00 (outside North America, Regular), and $20.00
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The KHS holds an annual meeting in the fall of each year. The meeting is, minimally, a two day event with lectures and presentations by herpetologists. All interested individuals are invited to make presentations. The annual meeting is also the time of the Saturday night social and fund-raising auction.

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

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