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Front Cover: Photograph of juvenile *Heterodon platirhinos (L)* and *H. nasicus (R)*. Both specimens are from the Pratt/Kiowa County line. Photo by J. Daren Riedle, 2019.

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Fall

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KHS BUSINESS

KHS 2020 Virtual Meeting Annoucement

The Executive Council has voted in agreement that the 47th Annual Meeting of the Kansas Herpetological Society will no longer be an in-person event due to concerns, and circumstances, regarding Covid-19. Christopher Visser, KHS President will lead the meeting transformation into a virtual experience that shall maintain the function, opportunities and charm of the cherished physical gathering as much as possible. The event will take place November 7th and 8th. Details will be updated and posted on the KHS website and Facebook group.

The Annual Meeting will still feature paper and poster presentations, the KHS Business Meeting, and an auction that will no doubt contain the most coveted of items. The talks will be casual and laid-back; where distinguished scientists and 10-year-old Steve Irwins in the making are equally encouraged and anticipated. So please, join us from anywhere in the world to celebrate herpetology and support KHS and the event participants.

Call for papers: KHS is proud to issue a call for both paper and poster presentations and issues awards in excess of $2,000 at each annual meeting. This year virtual talks will be held in lieu of traditional presentations. Herpetologists at all levels of expertise are encouraged and urged to give scientific paper presentations. The scholarship and grant submission deadlines are September 25th. Visit www.ksherp.com/awards for full details on the following awards:

- The Suzanne L. and Joseph T. Collins Award for excellence in Kansas Herpetology. This year the $1,000 award will be issued for the best paper/presentation. Any paper (within the guidelines) from 2019 or 2020 is eligible. To qualify for The Collins Award, a portion of the fieldwork or observations must have occurred in Kansas, or the systematic data must have been based in part on Kansas specimens. Individuals eligible for The Collins Award must be KHS members when they do the research, when the paper is published, or when the talk is given. Further, the KHS requires individuals who present papers to signify they are eligible for The Collins Award when they submit the title of the talk to the KHS Meeting Chairperson or just prior to giving the talk at the annual meeting. Please contact Dan Fogell (dfogell@southeast.edu) to ensure that your paper is considered.
- Howard Kay Gloyd/Edward Harrison Taylor Scholarship. The KHS annually grants a $300 scholarship named for two distinguished Kansas herpetologists.
- Alan H. Kamb Grant for Research on Kansas Snakes. The KHS annually awards a $300 grant in honor and memory of Alan H. Kamb, a longtime supporter and member of the Kansas Herpetological Society.
- The Walter Meshaka Award for Excellence in Ecology. The best poster presented at the KHS Annual Meeting will receive $200 and $100 will go to the runner up.
- George Toland Award for Ecological Research on North American Herpetofauna. CNAH and the KHS annually makes a $200 award in honor and memory of George Toland, a longtime supporter and member of the Kansas Herpetological Society.
- Henry S. Fitch-Dwight R. Platt Award for excellence in Field Herpetology. The KHS annually makes a $200 award to a KHS member that, in the recent past made a significant herpetological discovery in the field or conducted significant herpetological field work that contributed to our knowledge of these creatures.

The KHS Business Meeting and Officer Elections will be held at the conclusion of virtual presentations and awards ceremony. Please contact Dr. Lynnette Sievert at lsievert@emporia.edu with officer nominations ASAP. Self-nomination is encouraged.

Call for Auction Items: The auction format is yet to be determined but it will be concise and desirable. Contact Dexter Mardis (Dmardis784@gmail.com) with any prized herpetological offerings or suggestions. Keep in mind shipping costs and packaging may play a role this year. Please do not offer anything (whole or part) that is either living or once was.

As reptiles and amphibians have done throughout history, we will continue to adapt to current circumstances and persevere through adverse conditions, being better off from the experience. Please plan to join the 47th Annual Meeting, participate if possible, and enjoy the virtual encounter.

-Todd Volkmann
KHS Secretary

The Kansas Herpetological Society's 46th Annual Meeting 1-3 November, 2019 Fort Hays State University and Sternberg Museum of Natural History Hays, Kansas

The 46th annual meeting of the KHS kicked off with an evening social at the Sternberg Museum of Natural History. Guests were treated to a wonderful presentation by world-famous wildlife photographer, Thomas Mangelsen. The Sternberg Museum had just opened an outstanding exhibition of Mangelsen's photographs, and what a perfect way to officially open the exhibit than with a lobby full of wildlife and photography lovers! Along with registration costs, the participants were given a discounted pass to the museum to be used for the entire weekend! Throughout the evening, a cash bar was made available by Chartwell's Catering Service and the galleries and collections were open for KHS participants to peruse at their leisure. Perhaps a little less than leisurely was a highly competitive specimen identification quiz set up in the research collections lab. The top two scorers received prizes the following day at the awards ceremony. After a great night at the museum (no specimens or artifacts came to life), registrants dispersed to their hotels of choice. The Hays Convention and Visitors Bureau graciously provided shuttle service to and from the hotels on both nights for the safety of those attending. To them, we are deeply indebted and extremely thankful!

The "official" meeting began in Albertson Hall on the campus of Fort Hays State University promptly at 8:00 am with KHS Secretary, Dexter Mardis, and Treasurer, Daren Riedle registering folks who had not preregistered and paid online. As always, there was plenty of coffee, soft drinks, and donuts for the registrants throughout the morning. At 9:00, KHS President, Curtis Schmidt welcomed the group, followed by a brief welcome by interim Dean of the Werth College of Science, Technology, and Mathematics, Dr. Grady Dixon. The first session of talks began promptly at 9:15, followed by the second session at 10:30. The KHS group photograph was taken at 11:30 by the unofficial photographer of the KHS, Larry Miller, in front of Picken Hall. After the photograph was taken, the group was set loose to forage freely.

We reconvened at 1:00 for a symposium entitled, "Assessing our Borders: The Herpetology of Kansas' Borders". Experts from Kansas and surrounding states spoke about the herpetofauna near the shared state boundaries in hopes of enlightening the crowd about the biogeography of herps within these areas. This exciting symposium took us to the break at 3:30. Two more talks rounded out the afternoon's session and took us to the KHS Business Meeting at 4:30.

The Business Meeting began with an introduction of the current officers and dignitaries by KHS President, Curtis Schmidt. After these introductions, the officers gave their respective reports. Daren Riedle gave the Treasurer's Report for 2019, followed by the Secretary's Report, given by Dexter Mardis. In 2019, a change was made, as Daren Riedle decided to give a go at being the Editor of *Collinsorum*, the society's publication. As such, he gave an update on the status of the journal, solicited for submissions and spoke on the resurrection of "Herp Counts", to be conducted by any interested individuals. Suzanne Collins, KHS Historian, gave the Historian's report before handing the microphone to KHS President-elect Christopher Visser, who informed the crowd about his on-going plans for the 2020 annual meeting. Little did he know, that whatever plans he had made would be dramatically changed due to circumstances beyond his control!

Bryan Sowards, Stephanie Morrow, and Christopher Visser struggle to identify specimens during the Friday night herp quiz at the Sternberg Museum of Natural History. Suzanne Collins Photo.

The business meeting continued with the present membership voting on two proposed amendments to the By-Laws. The Amendments were to add both positions of the Field Trip Coordinator and Coordinator of Media and Publicity to the KHS Executive Council. Both amendments were approved by a majority vote of the membership, as per the KHS Constitution.

The final business that required the society's attention was the election of new officers for 2020. KHS Nominating Committee Chair, Dr. Lynnette Sievert offered the following slate of candidates: For President-elect, Dr. Andrew George of Pittsburg State University (unopposed); for Treasurer, Dexter R. Mardis of Wichita State University (unopposed); for Secretary, Dr. Keith Geluso of the University of Nebraska-Kearney versus Todd Volkmann of the Great Plains Nature Center in Wichita, Kansas. After tallying the votes, Curtis Schmidt announced the addition of Todd Volkman to the Executive Council as KHS Secretary. At the conclusion of the business meeting, participants were once again set free, but only for a short time, as the Poster Session was scheduled to begin at 6:00 back at the museum, the site for the evening's activities.

The Poster Session ran from 6:00 until 6:30, and was immediately followed by the banquet, a fantastic buffet provided by Jalisco's Mexican Restaurant. The buffet featured a large diversity of Mexican dishes, including both traditional and vegetarian options. As diners engorged themselves, The Keynote Speaker for the meeting, Dr. Stephen Mackessy from the University of Northern Colorado, entertained the crowd with an overview of his lab's fascinating research. His talk, entitled "Snake Venom Research at UNC: From Toxins to Therapeutics" wowed the crowd as he taught about the amazing world of snake venoms, their components, how they evolve, and how they are used to treat several human maladies. Still riddled with excitement from the talk and bursting at the seams from the meal, KHS Awards Chairman, Dan Fogell presented several awards to KHS members.

The first award given was to the winners of the herp identification quiz from the night before. There was a tie between Neil Balchan of the University of Northern Colorado, and Stepanie Morrow of the University of Nebraska. Both winners won bragging rights, field guides, and coffee mugs for their efforts. The Howard K. Gloyd-Edward H. Taylor Scholarship is given annually to any KHS student member for contributing to the science of herpetology. The 2019 winner of this award was also Neil Balchan (UNC). Neil received a certificate and a check for $300.

Neil Balchan (Univ. of Northern Colorado) is presented with the Gloyd-Taylor Scholarship. Neil had a very successful KHS meeting winning multiple awards. (Larry Miller Photo).

KHS Awards chairman Dan Fogell presents the Kamb Grant to Jainee Cowen (Missouri Southern State University). (Larry Miller Photo).

Walter Meshaka congratulates Kammie Voves (Missouri State University) for having the best poster presentations and winning his namesake award (Larry Miller Photo).

Tyler Albertson (Oklahoma City) beams with pride as his photograph of a Gray Treefrog won the most coveted of KHS Awards, the Collins Award. Dan Fogell presented Tyler with a certificate and a check for $1000. (Larry Miller Photo).

Meeting attendees browse the plethora of auction items available on Saturday night. (Larry Miller Photo).

The Alan H. Kamb Grant for Research on Kansas Snakes is awarded to any KHS member who is studying snakes. The 2019 winner was Jainee Cowen of Missouri Southern State University, who received a certificate and a check for $300. The Walter E. Meshaka, Jr. Award for Excellence in Ecology is given to the best poster presentation given at the annual meeting. The 2019 winner was Kammie Voves from Missouri State University, for her poster entitled, "Assessing Habitat Suitability for Alligator Snapping Turtles in Southeastern Kansas". Kammie was awarded a certificate and a check for $100. The final award of the evening is the most prestigious award granted annually by the KHS. The Suzanne L. and Joseph T. Collins Award for Excellence in Photography is given on odd-numbered years to the best photograph of an amphibian, reptile, or turtle native to Kansas. The 2019 winner was Tyler Albertson of Oklahoma City, Oklahoma, for his exceptional photograph of an Eastern or Cope's Gray Treefrog. Tyler was awarded a certificate and a check for $1,000 from the Center for North American Herpetology. Congratulations to all the award winners!!

Following the Awards Ceremony and several rounds of adult beverages, the dynamic duo of Dan Fogell and Walter Meshaka kicked off the 2019 auction. After a few hours of laughs, camaraderie, and continued over-indulgence, the auction came to a conclusion with a very significant amount of money raised for the society. The KHS would like to thank everyone who took part in the auction and helped make it a success. Again, the Hays Convention and Visitors Bureau was there to take everyone back to their hotels.

As Sunday morning rolled around, coffee and donuts were more of a necessity for many than the previous morning. Dexter and Daren again were available to register the few late stragglers to the meeting. The final two paper sessions of the meeting began at 9:00 and ended at 12:45. The final piece of business was the presentation of the George Toland Award for Ecological Research on North American Herpetofauna for the best presentation by a student member. Dan Fogell granted the award to Neil Balchan from the University of Northern Colorado for his talk entitled, "Venom Resistance in a Colorado Rodent Community to Two Grassland Rattlesnakes". Neil was awarded a certificate and a check for $200. Congratulations to Neil for all of his awards this year! After the presentation, the meeting was officially adjourned at 1:00.

I would like to personally thank the members of the local committee for their instrumental work in helping me pull off a great meeting. Those members are Jacob Alexander, Reese Barrick, Elmer Finck, Lavonne Finck, Melissa Skelton, Bill Stark, and Travis Taggart. I cannot thank you all enough!

*Abstracts for all talks given at the 2019 annual meeting can be found in this issue of Collinsorum.

**The complete program from the meeting can be found on the KHS website at http://ksherp.com/khs-annual-meeting/.

Curtis J. Schmidt
KHS Past-President

Abstracts of papers presented at the Kansas Herpetological Society's 46 Annual Meeting. 1-3 November 2019 Fort Hays State University and Sternberg Museum of Natural History, Hays, KS

Grip it and Flip it 3.0: Season Three of Herpetofaunal Composition and Monitoring at the Sternberg Natural Area

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On 10 June 2017, twenty-one 2.4x1.2-meter plywood boards were placed throughout the Dr. Howard Reynolds Nature Trails property (Sternberg Natural Area) to begin monitoring of the area's herptofaunal richness and diversity. The objective of the project is to monitor changes in species richness and diversity in relation to changes in landscape composition, as we continue to restore the habitat to native prairie. In the 2019 season the boards were checked once weekly, varying the time of checks with five temperature variables being recorded at each board each time they were flipped. The third season of monitoring began on 15 March 2019 with the first observation occurring on that date. To date, 563 individuals of nine species have been encountered. In addition to temperature measurements, Passive Integrated Transponder (PIT) tags were implanted (2018 season) for individual recognition and to get accurate counts. To date, 74 individuals of six species have been implanted. Out of these implanted individuals, 48, consisting of three species the Great Plains Skink (*Plestiodon obsoletus*), North American Racer (*Coluber constrictor*), and the Gophersnake (*Pituophis catenifer*) have been recaptured at least once. In future seasons, we hope to implant more individuals with PIT tags and estimate population sizes for all species and continue collecting temperature data in attempts to correlate cover use and temperature. Herpetofaunal monitoring is an important part of any environmental or restoration assessment as these species act as indicator species of ecosystem health.

Demographics of a Painted Turtle (Chrysemys picta) Population Responding to Drought in the Nebraska Sandhills

Allyson N. Beard and Larkin A. Powell

Demographics of a population such as survival and movement are essential to understanding the ecology of a species and how it might respond to human-caused disturbances like climate change. A large portion of herpetofauna species are declining as a result of anthropogenic influences, and turtles are no exception. Studying demographics of turtle populations in a wide variety of settings could help develop management plans for these species considering these threats. We conducted a long-term mark-recapture study on painted turtles (*Chrysemys picta*) in a permanent pond in the Nebraska Sandhills to exam population size, survival, and movement of an aquatic turtle as drought conditions changed in a water-limited system. The population size ranged from 87 ± 72–117 CI to 186 ± 186–186 CI. A robust design model indicated that there is strong evidence that drought has a significant influence on survival in both male and female turtles. The model estimated that survival was reduced by 7.1% in females and 10.1% in males. We also estimated that the temporary emigration rate was 19% (CI = 15.5%-23.1%), indicating that about 1/5 of the super-population of painted turtles is outside the study pond at any given time. Our results indicate that drought negatively affects survival of painted turtles even if a pond retains water throughout the drought period. Further study is necessary to determine the mechanism controlling this effect of drought on turtle survival.

Variation in the Diet of the Mudpuppy (Necturus maculosus)

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The Mudpuppy (*Necturus maculosus*) is an elusive and poorly understood permanently aquatic salamander in the eastern United States. Little has been published on its natural history in Kansas and baseline data are needed to assess its status and to inform conservation efforts. Our goal is to examine the trophic role and community interactions of the Mudpuppy through examination of its diet. We predict that dietary differences exist between sexes resulting from their different roles in reproduction. We also predict dietary differences between lake and river populations due to differences in available prey. We have caught mudpuppies in the Marais des Cygnes, Neosho, Cottonwood, Elk and Verdigris rivers and at Melvern and Pomona lakes in Kansas. We have obtained the stomach contents of each individual with a non-lethal flushing protocol. Stomach contents are preserved in 70% ethyl alcohol for identification to the lowest identifiable taxon. We have recovered fish (Teleostei), frogs (*Rana* sp., *Acris blanchardi*), crayfish (*Procambarus* sp.), shrimp (Palaemonidae), caddisfly larvae (Trichoptera), mayfly nymphs (Ephemeroptera), Dobsonfly larvae (*Corydalus cornutus*), midge larvae (Chironomidae), water fleas (Cladocera), and zebra mussels (*Dreissena polymorpha*). Knowledge of diet variation will provide valuable insight into the species' natural history and provide data for state conservation efforts.

Effects of Cover-Object Size and Material in Detecting Herpetofauna in South-Central Nebraska

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To examine community dynamics of reptiles and amphibians, researchers require robust and standardized methods to document the biodiversity of species in designated areas or habitats. One such method involves use of artificial cover-objects that individuals reside under for safety from predators and weather or for beneficial attributes such as thermoregulation and moisture. Cover objects can consist of different types of materials such as plywood, tar paper, and metal sheets. In this study, we examined the use of large wooden, small wooden, and metal cover-objects in Harlan County in south-central Nebraska. Our objectives were to examine which cover object material and size is the best for documenting the most individuals and species. We also examined if these methods would detect a rare species of lizard known from the area (*Ophisaurus attenuatus*). We deployed cover-object arrays at the Alma Municipal Airport and near Harlan County Reservoir from March 2016 to October 2016 and from March 2017 to October 2017. We compared herpetofaunal encounter rates beneath two different sizes of wooden cover-objects and metal (tin) cover-objects in mixed-grass prairies. We observed 9 species of herpetofauna, with twice as many individuals using the large wooden cover-objects compared to using the small wooden cover-objects. We did not document any individuals using the metal cover-objects. In 2016, October had the most observations, whereas in 2017, August had the most observations. Days with rain the previous two days had greater observations than those without rain prior to checking cover objects in 2017. We concluded that cover-object size and materials affect detection and encounter rates, with the most species and greatest abundance of individuals observed under large wooden cover-objects on days after rains.

Long-term Herpetofaunal Monitoring at Glacier Creek Preserve in Eastern Nebraska: the First Two Years and 101 Cover boards

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The 212 ha (525 acre) Glacier Creek Preserve contains restored tallgrass prairie, woodlands, wetlands, old pasture, and agricultural land as well as a headquarters area and associated buildings. Long-term reptile and amphibian monitoring surveys began spring 2018 and as part of this study, 101 cover board were placed within the Preserve boundaries in re-

stored prairie, woodland, woodland edge, and floodplain habitat but not in the agricultural fields. During 2018-2019 cover boards were checked at least once every three weeks. More than 500 reptile observations were made with over 200 snakes being captured, measured, marked and released.

Monitoring herpetofauna on Reclaimed Mined Lands in Southeast Kansas

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More than 15,000 acres of forest, prairie, and wetland habitats in southeast Kansas were strip-mined for coal until the 1970s. We recently established an ecological monitoring project to determine the conservation value of reclaimed mined lands, and to inform for future restoration efforts. In 2018 and 2019, we placed drift-fence arrays at six sites in Crawford and Cherokee counties, and used pit-fall traps, funnel traps, and cover boards to capture and collect data on herpetofauna. These traps were set out at each of the mined land properties and checked almost every day from April to October. We documented 24 species of reptiles and amphibians with over 550 individuals across all sites. The most abundant species were the southern leopard frog, American toad, and Blanchard's cricket frog. Forest and grassland habitats differed slightly in species composition. Our ongoing project will be expanded to additional sites in 2020.

Patterns of Herpetofaunal Species Richness Along Environmental Gradients in Kansas

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The mechanisms explaining regional patterns of biodiversity remain poorly understood because environmental variables that affect species distributions are difficult to isolate. We used Kansas Herpetofaunal Atlas (KHA) occurrence data within an information-theoretic framework to evaluate relationships between herpetofaunal species richness and variables representing topography and climate. We found that mean air temperature, total precipitation, and topographic variation best explained patterns of total herpetofaunal 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 may reflect ectotherm physiology and habitat variability. Our findings highlight the value of biological atlas projects for understanding regional patterns of biodiversity.

Effects Of Seasonal Prescribed Fire On A Rolling Plains Herpetofaunal Community

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Fire is a natural process in grasslands, which makes controlled burning an extremely important management tool. However, most research addressing impacts of prescribed fire have focused on short-term responses, and most studies that have addressed the impact of fire on herpetofauna have focused on dormant season burning. From 2004–2009 and 2018-2019, we explored herpetofaunal responses to seasonality of fire on herpetofauna in a sandsage prairie ecosystem within the southeastern Texas Panhandle. During these years, we sampled reptiles and amphibians using drift fence arrays with pitfall traps during both the early season (= May – early June) and late season (= July – early August) in a randomized complete block design with 5 blocks and 3 treatments (summer burned, winter burned, and unburned). Over this time period, each burned plot was treated 3-4 times. We regressed year of sampling against abundances and community metrics (= species diversity, richness, and evenness) to evaluate responses to the different burning regimes over this period. Western narrow-mouthed toads (*Gastrophryne olivacea*; 21% of individuals captured), six-lined racerunners (*Aspidoscelis sexlineata*; 12%), Great Plains skinks (*Plestiodon obsoletus*; 9%), Prairie Lizards (*Sceloporus consobrinus*; 7%), and Texas Threadsnake (*Leptotyphlops dulcis*; 5%) were the most commonly captured species of herpetofauna across the 2,527 individuals of 15 species captured. Regardless of treatment and

season, Six-lined Racerunners increased over time (P<0.007). In the early season, summer burning increased species richness, diversity, and evenness over time (P<0.029), whereas total number of individuals captured declined over time in the unburned plots (P=0.065). Evenness also increased over time in the winter burned plots during the early season. In the late season, abundance of Texas Threadsnakes, species richness, species diversity and species evenness all increased or tended to increase over time under both burning treatments (P<0.193), but no variables increased over time in the unburned plots (P>0.218). Although the trends are weak and interpretation has been complicated by a persistent, long-term severe drought, the generalities suggest an overall positive response of herpetofauna to burning, and summer burning may be slightly more beneficial than winter burning.

How the Use of One Body Impacts Biomechanical Performance in Borneo Pythons (*Python breitensteini*)

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Snakes have a unique body size and shape. Snakes have to perform many functions and different behaviors with their singular form. This limbless structure has an impact on their performance. Two major performance mechanisms for many snakes are striking and constriction, which use the same axial muscles. At the muscle level, there is a proposed trade-off between the two performance mechanisms suggesting that limitations are present during whole-body performance. Muscles can contract quickly or produce high forces, but not both. Therefore, we predict that snakes can strike quickly or constrict with high pressures, but not both. Using high speed cameras and pressure sensors, we will measure the striking and constriction performance of Borneo Pythons (*Python breitensteini*). We aim to quantify the speed and strength of predation performance by quantifying striking and constriction performance during the same predation event. By simultaneously quantifying multiple performance measures, we aim to describe and quantify potential trade-offs in whole-body performance measurements in a series of similarly sized snakes. Because this is the first time that a performance trade-off has been investigated in snakes, we do not have a baseline prediction of the possible outcome.

The Effect of Different Temperatures on the Endurance of Hopping Activity in *Anaxyrus woodhousii*

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We used 8 male and female *Anaxyrus Woodhousii*, which were caught from Lyon County, Kingman County and Coffee County, to test the endurance of hopping activity at 3 different temperatures: 10 ºC, 15 ºC and 20 ºC. We kept all the toads individually in clear shoe box with a water bowl and plastic retreat which allowed them to access water and hide themselves. In our experiment, we put all the toads in a walk-in chamber which was set to a specific temperature and to 12-hour photoperiod starting at 8:00 CDT. We acclimated all the toads for 7 days before we started the each trial, and we tested each toad 3 times to determine the length of time it could hop at each temperature. In this experiment, all toads were hopping on a small treadmill and speed was set to 0.074 m/s all the time. We found there is a significant difference in hopping duration over 3 temperatures we tested. (P = 0.0006 for treatment and 0.0383 for subject) Moreover, we found toads' hopping endurance at 20 ºC is significantly different compared to both 10 ºC and 15 ºC.

A Comparison of Hematology and Plasma Biochemistry of Alligator Snapping Turtles in Wild, Reintroduced, and Captive Populations

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Population monitoring is an important but often undervalued component of assessing the effectiveness of wildlife reintroduction efforts. Monitoring should be multifaceted, and health assessments can complement assessment of

survival, growth, and shifting demographics. Additionally, comparisons between captive, wild, and reintroduced populations can identify incipient problems. The goal of our study was to compare hematologic and plasma biochemical values of four alligator snapping turtle (*Macrochelys temminckii*) populations: indoor and outdoor captive populations in a head-start program, reintroduced head-starts, and a wild population. We obtained blood samples from 25 indoor and 25 outdoor captive turtles, 30 reintroduced turtles, and 17 wild turtles. Uric acid, total protein, and globulins were significantly higher in the wild population than the reintroduced population, likely resulting from a diet higher in protein. Both captive populations had significantly higher eosinophil counts than the reintroduced and wild populations, which may indicate either high parasite load or result from inflammation. Differences in demographics and diet and environmental conditions may explain several of the differences we detected among the populations. No group presented as categorically "unhealthy" based on the variables we analyzed.

Setting the Record Straight: Assessing the False Map Turtle complex in Kansas

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Kansas lies at the western extent of the distribution of four map turtle taxa—the Northern (*Graptemys geographica*), Ouachita (*G. ouachitensis*), Northern False (*G. p. pseudogeographica*), and Mississippi (*G. p. kohnii*). The herpetological literature for Kansas treats *G. ouachitensis*, *G. p. pseudogeographica*, and *G. p. kohnii* as a species complex, the rationale being that head patterning is confusingly variable and shells lack identifiable features. Currently, authorities disagree on what constitutes diagnostic characters, and species limits are in dispute. Additionally, when assessing museum specimens from the state, many vouchers have been improperly labeled due to misidentification and fluctuating taxonomic boundaries over the last 50 years, resulting in inaccurate and misleading documentation. To set the record straight, we reevaluated all available Kansas specimens. Each specimen was photographed and identified to species based on the current understanding of species limits and diagnostic features. A total of 115 specimens was assessed, of which 109 were unambiguously assignable to a taxon. The remaining six specimens were shells and could not be identified based on known criteria. Further, during fieldwork in 2017–2019, we captured 110 map turtles and detected another 622 through visual surveys, including 71 *G. geographica*, 355 *G. ouachitensis*, 90 *G. p. pseudogeographica*, and 106 *G. p. kohnii.* Using localities from museum specimens and our fieldwork, we have compiled extensive distribution records for each taxon in Kansas.

Temperature Impacts on Striking and Venom Delivery in Cottonmouths (*Agkistrodon piscivorus*)

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Temperature is one of the most important aspects in the lives of many organisms. To be able to function effectively, most organisms would need to have a body temperature within a certain thermal range. Maintaining a specific body temperature allows for animals to better obtain food and guard against threats. However, some organisms have certain mechanisms within their body that allows them to perform at a constant rate across a variety of temperatures. These mechanisms are traditionally called elastic recoil mechanisms. Elastic recoil mechanisms are unique in that they allow organisms to store energy within their elastic structures, and release that energy to produce a constant rate of speed, regardless of temperature. Based on studies of muscle activity patterns, snake strikes have been suggested to work by elastic recoil. With this mechanism, venomous snakes would be able to strike at a constant speed, and potentially deliver the same amount of venom across wide thermal ranges to catch prey or defend against threats. Here, we measured the strike performance and venom delivery of cottonmouth vipers (*Agkistrodon piscivorus*) with different body temper-

atures to test the impacts of temperature on strike mechanisms and venom output.

Characterization of Mite Parasitism on Eastern Collared Lizards in the Kansas Flint Hills

Daniel Peacock and Eva Horne
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The goal of this research was to study the relationships between characteristics such as sex and body condition of the eastern collared lizard (*Crotaphytus collaris*) and trombiculid parasite load, as well as the differences in parasite load between natural habitats and artificial habitats. Eastern collared lizards were sampled from Tuttle Creek Dam and Konza Prairie Biological Station in northeastern Kansas. The habitat at Tuttle Creek Lake Dam is predominantly made up of large, artificially placed rocks with few scattered areas of herbaceous plants. The habitat of Konza Prairie is made up of naturally exposed rock with vertical ledges up to five feet in height, surrounded largely by grasses and shrubs, with a few areas covered by large trees. Lizards at the dam were found to have significantly fewer mites than lizards on Konza prairie. There was no relationship found between parasite load and body condition on lizards at either site. There was no difference in mite count between males and females at the dam, with females actually having a higher average mite count. However, there was a significant difference between males and females on Konza Prairie, with males having more mites on average. This is potential evidence for linking parasite load to the types of plants that make up the plant community of eastern collared lizard habitat, as well as potential evidence for differences in parasite load between male and female collared lizards due to behavioral differences and or hormonal states.

An Incomplete Story of an Important Mechanism: Do We Really Understand How Constriction Works?

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Across the evolution of snakes, venom and constriction have been two key mechanisms of their successful radiation and diversification. While venom is quite complex, its function is straightforward (breaking a physiological mechanism within the prey). Here, we will discuss the less-clear mechanisms of how constriction works. Our understanding of the mechanisms of constriction have changed across centuries and have included crushing, suffocation, cardiac arrest, and other proposed methods. Using multiple studies and observations, we will review the overarching patterns in the constriction performance literature and elaborate on specific areas of uncertainty. We will present current data on constriction pressure recordings from a phylogenetically diverse group of snakes spanning approximately 4 orders of magnitude in body size. We also quantified the thoracic and cranial pressures within rodent-prey to better measure the internal pressures experienced by prey during constriction. Current literature suggests that constriction is primarily effective against endothermic prey while ectothermic prey are inherently more resistant to its effects. We are of the position that this is either not entirely accurate, or is more of an exception to the actual (and unmeasured) rule.

Baby Got Bite? Venom Injection and Strike Performance Across Ontogeny in Cottonmouths (*Agkistrodon piscivorus*)

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Striking behavior represents one of the most important and adaptive traits to the evolution of snakes. Although almost all snakes exhibit this behavior for both predation and defense, the physiological mechanisms used vary between the type of strike and species of snake. Defensive strikes offer insight into predator-prey interaction among snakes. Viperids and colubrids have acquired separate physiological responses to predators in their environment throughout evolutionary time. Vipers have evolved a highly potent enzyme cocktail capable of inflicting pain, tissue damage, and death. This venom is produced by glands that are situated within the head. Changes in size and shape of each individual is likely to have an effect on defensive responses, strike performance, and venom delivery. Here, we mea-

sured the striking performance and venom injection of a widely-recognized viper (*Agkistrodon piscivorus*) across an ontogenetic series in order to better understand how venom delivery and strike performance changes across size.

Quantifying Color Pattern Mimicry and Background Color-Matching in Desert Squamates Utilizing Digital Photography and C.O.I. Technology

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Quantifying color-matching among organisms and their environments has been a challenge for ecologists due to the qualitative nature of the variable and a lack of affordable technology for such assessments. Many longstanding hypotheses regarding color-pattern mimicry and crypsis remain untested due to these constraints. We tested a previously proposed hypothesis that Gray-Banded Kingsnakes mimic sympatric pit vipers in the Trans-Pecos and Big Bend regions of the Chihuahuan Desert using a newly available and affordable technology for measuring color-matching. We also utilize the same method to measure the influence of background color-matching between these snakes and their natural substrates, as their color-pattern phenotype is likely reflective of an interplay among varying selective pressures in these taxa. Results aim to address these hypotheses while providing further implications for the use of this technology in fields such as evolution and conservation biology.

Hybridization in *Sceloporus* lizards: Extreme Aggression and Confusion

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Hybridization in the wild can be a strong evolutionary force with many possible results, such as gene flow between populations, genetic assimilation of a parental species, or even speciation of hybrid lineages. We studied the population genetics and behavioral ecology of Sceloporus parental species and hybrids to better understand how hybridization influences lizard populations in the wild. Eastern fence lizards (*Sceloporus undulatus*) and Florida scrub lizards (*S. woodi*) hybridize where their habitats are adjacent and produce viable hybrids. The population genetics suggest biased mating of female *S. woodi* with male *S. undulatus*. Our behavioral studies suggest hybrid advantages in male-male competition and hybrid confusion in antipredator escape behavior.

Differences in Medically Significant Venom Toxins Between Populations of the Prairie rattlesnake, *Crotalus viridis*

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Snake venoms are complex mixtures comprised primarily of potent bioactive proteins used for prey incapacitation. Venom composition has been shown to vary geographically, taxonomically, with age, and with dietary preference. North America's most wide-ranging rattlesnake, *Crotalus viridis* (the Prairie Rattlesnake), is found from northern Mexico through the plains of the western United States to southern Canada. Coupled with its wide species range, *C. viridis* is also a habitat generalist, and inhabits areas in close proximity to humans, increasing the likelihood of human encounters and bites from this snake. *Crotalus viridis* venom is known to induce hemorrhage and muscle degradation due to the presence of large enzymes like snake venom metalloproteases (SVMPs), snake venom serine proteases (SVSPs) and smaller nonenzymatic muscle toxins (myotoxins). Though previous research on *C. viridis* has shown geographic variation in some venom toxins, to date, no analysis has investigated broad-ranging variation in the entire venom proteome of this species. The current project investigates venom variation in the *C. viridis* throughout its range in the United States by determining geographic population-level patterns in abundance of major toxins using gel separation, high performance liquid chromatography, mass spectrometry and biochemical assays. The patterns observed straddle the Type 1-Type 2 venom compositional dichotomy previously characterized in rattlesnakes, as there appears to be a trade-off between dominantly enzymatic and nonenzymatic venom phenotypes. Ultimately, the patterns of venom variation in *C. viridis* can help inform snake-bite treatment in addition to providing clues about foraging ecology and venom evo-

lution of this wide-ranging rattlesnake.

Rattlers and Ranges: On the Impact of Size and Spatial Usage in Three Sympatric Species

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The spatial usage of an organism can be quantified and visualized as a home range, and the size and habitat of this range can differ within populations. Individual variation in home range size can influence behavior and ecology within populations. Such variation is compounded when looked at between species, as this allows us to incorporate interspecific interactions in our understanding of space use. We explored the influence of one such facet of variation, body size, in three sympatric species of rattlesnake: the western diamond-backed rattlesnake (*Crotalus atrox*), the eastern black-tailed rattlesnake (*C. ornatus*), and the rock rattlesnake (*C. lepidus*). All three species inhabit our study site, the Indio Mountains of west Texas, and display similarly restricted movement patterns. Individuals from these three species were implanted with VHF transmitters and tracked twice weekly during the summer and fall season (May-October) of 2019. We estimated home range size using 100% MCP, and compared these data with snake body size. We found that there was no significant correlation between body size either within or between species, implying the larger snakes do not necessarily require larger territory. These results were surprising as we previously hypothesized *C. atrox* to occupy larger home ranges than *C. lepidus*, and such findings augment our understanding of space use in this rattlesnake community.

Assessing Habitat Suitability for Alligator Snapping Turtles in Southeastern Kansas

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Reintroduction has been employed to reestablish extirpated populations of Alligator Snapping Turtles throughout the species' range. Selection of suitable reintroduction sites is a critical first step in reintroductions, but past site selections have primarily relied on qualitative site descriptions. A broadly applicable, data-driven approach is needed to standardize the selection of future reintroduction sites. We developed a standardized model to quantify key habitat features for both adult turtles and nests based on previously published habitat preference studies and known requirements of the species. The output of the model is a habitat suitability score. This model was then used with habitat survey data to identify locations suitable for alligator snapping turtles in Kansas. We identified the Verdigris River above Toronto Lake to be suitable for potential reintroductions. While the remaining sites in the Verdigris and Arkansas watersheds may have sufficiently suitable habitat, high rates of public use increase the likelihood of human related disturbance and mortality to reintroduced turtles. Before reintroductions in Kansas are initiated, factors beyond habitat suitability should be carefully considered.

Movement, Space-use and Thermal Macrohabitat Selection by Ornate Box Turtles (*Terrapene ornata ornata*) and Three-toed Box Turtles (*Terrapene carolina triunguis*) in Northeastern Kansas

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Movement and space-use is a critical component to an animal's ecology. Movement allows animals to acquire resources, find mates, avoid predators, and to disperse. Understanding animal movement can help ecologists predict rates of disease and parasite transmission, predator-prey interactions, resource needs, range shifts and patterns of speciation. Intraspecific variation in movement has been shown to be an important factor in better understanding broader population and species level patterns of movement and space-use. Here, we questioned whether individual movement and ranging patterns are related to macrohabitat temperature variation within the environment. Our hypothesis is that an individual's home-range size will covary with macrohabitat temperature during the primary

active season. To investigate this hypothesis, we used radio telemetry with 24 box turtles (*Terrapene ornata ornata*, n=23; *Terrapene mexicana*, n=1). To supplement our ranging data, we used stratified sampling to place 30 thermochrons (digital temperature recording devices) throughout the area where the turtles were expected to inhabit. As expected, we found variation in the turtle's movement and ranging activities, as well as their microhabitat and macrohabitat use. We also found that our various macrohabitats monitored via the thermochrons differed in average temperature over our monitoring period. We observed variation in average home-range size, daily movement, and range overlap amongst individuals. Our study helps contribute to our growing understanding of the ecological significance of intraspecific variation on observed movement patterns and space-use. This work can also help guide effective habitat and population management plans for one of the Midwest's most iconic species.

Articles

Report of a Central Newt (*Notophthalmus viridescens louisianensis*) population in Newton County, Missouri.

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Introduction

Notophthalmus viridescens louisianensis (Central Newt) has a broad range throughout the eastern United States (Powell et al., 2016). In Missouri, their range extends to the western border, but recent historical range data for this area is lacking (Daniel and Edmond, 2020). In the westernmost counties in Missouri, there have only been five known expeditions reporting Central Newts (from 1944-2012). In Kansas, their range just extends into four of the eastern-most counties (Collins et al., 2010) and is currently listed as a Kansas Threatened Species (Kansas Department of Wildlife, Parks, and Tourism, 2020). Given the increasing declines in amphibians (Adams et al., 2013), it is becoming increasingly important to monitor populations at range edges and at state borders.

On May 12, 2020, a few individual *Notophthalmus viridescens louisianensis* were found within the overflow of a fishless pond on a private farm in Newton County. Pictures were sent to Dr. David Penning who established identification. At that time, three organisms were then collected to be preserved as museum specimens (deposited into the collection at Missouri Southern State University). This species was first recorded in Newton county in 1944 (vertnet.org, 2020). This record is lacking in geographical details making it difficult to establish if a population is still present in an artificial pond that is described with this historical record. More recently, Andrei et al (2013) reported finding this species in the same general area as the initial 1944 record. After determining a scarcity of historical data in southwest Missouri, we decided to sample the collection site to document the size and demographics of the population.

Site Location

The private pond (36.9514656, -94.1403567) is approximately 36 m x 30 m. It is a manmade, fishless pond used historically for livestock watering. There has not been livestock access to the pond or immediate surrounding area for over a year. There is one primary inlet on the northern side of the pond that gathers run-off primarily from surrounding forest. The overflow to the pond was created intentionally by human removal of the pond bank on the southern side between 2014 and 2016. Around this same time frame, approximately 14 hectares of forest to the west and south of the pond was cleared. This resulted in large piles of downed trees and brush surrounding the pond. Johnson (1987) notes that the eft stage of this species benefits from this habitat type as they survive on land.

Methods

On May 14th, 2020, we performed a population survey in the pond overflow, pond, and inlet to the pond. Organisms were collected either with nets or by hand and placed into a small aquarium for measurement. We concluded the survey when the population had exhaustively been collected. All individuals were returned to their capture site. This sampling was approved by Missouri Southern State University IACUC and the Missouri Department of Conservation (permit #18536).

Additionally, we took water quality parameters in order to further describe habitat. Parameters collected in situ were: pH, dissolved oxygen (mg/L), conductivity (µs/cm), temperature (°C), and turbidity (NTU). Water samples were collected and transported on ice to Missouri Southern State University's water lab for analysis of: nitrate (mg/L), orthophosphate (mg/L), total coliforms (MPN) and *Escherichia coli* (MPN).

We determined in situ morphometrics for all individuals: total length (TL; mm),

snout–vent length (SVL; mm), mass (g), and sex (male, female, juvenile). We attempted to separate juvenile/female to the best of the identifier's (DAP) ability. If they were not able to be determined, we defaulted to juvenile status. Males were identified from cloacal swellings, enlarged hind limbs, broad tails, and/or horny structures on legs. Females were identified by lacking any of these characters and being an adult form. We categorized individuals with no obvious sexual characters as "juvenile". If any portion of the identification was in question, we defaulted to juvenile, making our sex determination conservative.

Results

Water quality parameters were within expected levels for this area and waterbody (Table 1). A total of 56 living individual *Notophthalmus viridescens louisianensis* were collected from the pond overflow in approximately 30 minutes on May 14th. Cumulatively, 62 individuals were found at this location (3 dead individuals and the 3 originally collected) from both May 12th and 14th. No organisms were found in the pond or inlet to the pond. In total, we were able to get morphometric data from 60 individuals (2 dead individuals were quite decayed; Figure 1, Table 2). The TL ranged from 61.0–98.0 mm, the SVL from 31.7–48.0 mm, and mass from 1.16–3.22 g. Approximately 63% of organisms caught were males. There were six individuals recorded as female. Our identified females were significantly heavier ($t_{42}=3.93$, $p<0.001$) and longer ($t_{42}=2.36$, $p<0.03$) than males. However, for their length, females were not heavier than similarly sized males (ANCOVA; $F_{1,41}=1.07$, $p>0.30$).

Table 1: Water quality measurements from fishless pond (36.9514656, -94.1403567) on private farm in Newton County, Missouri, collected May 14th, 2020.

Parameter	pH	Dissolved Oxygen	Conductivity	Temp.	Turbidity	Nitrate	Ortho-phosphate	Total Coliforms	*E. coli*
Unit	N/A	mg/L	µs/cm	°C	NTU	mg/L	mg/L	MPN	MPN
Value	6.57	9	296	15.1	4.59	0.8	0.05	816.4	139.6

Table 2: Morphological measurements of Central Newts collected from a private pond, Newton County, MO, May 14th, 2020.

		TL (mm)		SVL (mm)		Mass (g)	
	Count	Range	Mean±SD	Range	Mean±SD	Range	Mean±SD
Total	62	61.0–98.0	82.8±6.7	31.7–48.0	39.1±3.0	1.16–3.22	2.08±0.45
J/F	10	61.0–87.3	79.6±8.0	34–42	39.1±2.5	1.16–3.0	2.12±0.61
J	6	71.0–86.0	79.4±6.4	31.7–40.8	37.4±3.3	1.27–2.07	1.75±0.33
F	6	75.9–98.0	85.8±8.3	41–48	41.7±3.4	2.3–3.22	2.63±0.44
M	38	70.9–92.0	83.5±6.0	32.8–44	38.8±2.8	1.34–2.81	2.01±0.34

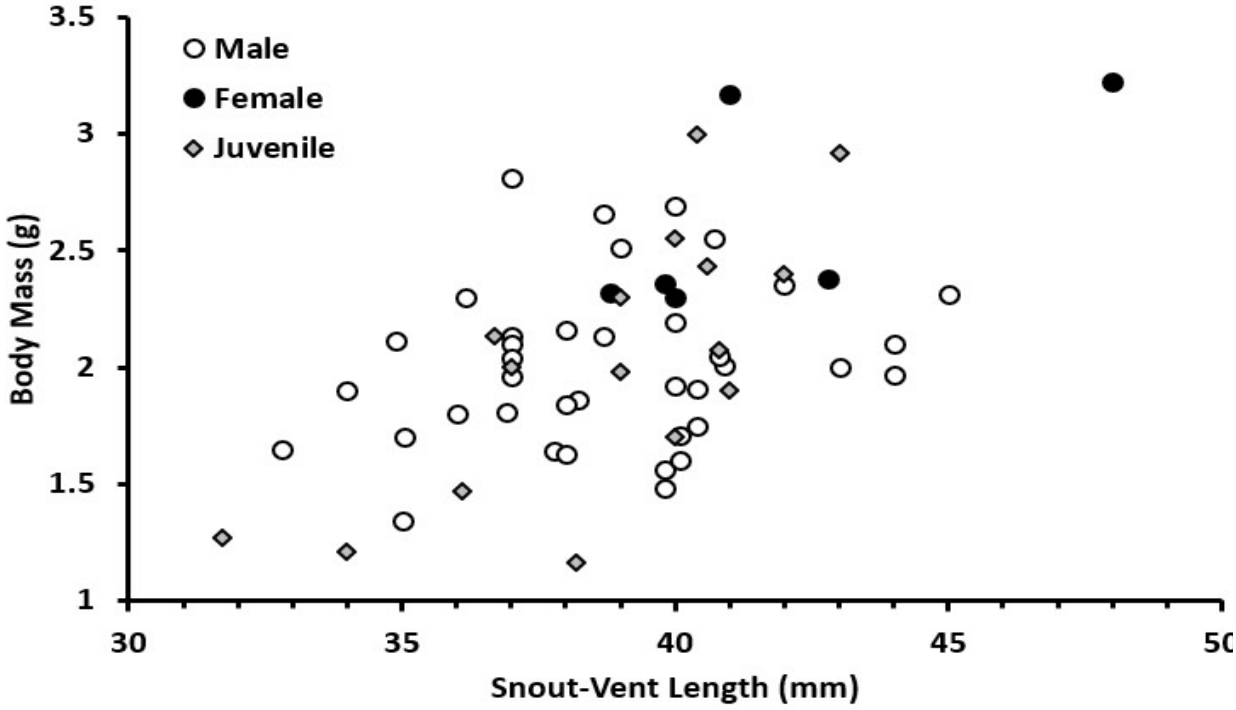

Figure 1. Scatterplot of *Notophthalmus viridescens louisianensis* (Central Newt) body mass (g) against Snout-Vent length (mm). Individuals are split into three demographic categories.

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Anoline Succession Follows Habitat Succession at the Barnacle Historic State Park in Southern Florida

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Abstract- Standardized surveys of diurnal lizards were conducted at the Barnacle Historic State Park (BHSP) in the Coconut Grove neighborhood of Miami, Miami-Dade County, Florida, in 2007 and 2020. During the initial survey, the Brown Anole, *Anolis sagrei*, comprised 54.6% and 81.6% of lizards seen at two survey routes, outnumbering the Puerto Rican Crested Anole, *A. cristatellus*, 2.72:1.00. In 2020, 70 individuals of *A. cristatellus* and a single male *A. sagrei* were encountered. Combined search time for all sites during each of the two surveys revealed a change from 2.69 times as many *A. sagrei* to a system supporting 69 times more *A. cristatellus* per unit time than its erstwhile dominant congener. Furthermore, encountered as often as 1.71 individuals/ minute, *A. cristatellus* exploited lower perch heights more so in 2020 than when outnumbered in 2007 by *A. sagrei* whose perch heights were predominantly close to the ground. With a presumed competitive edge over *A. sagrei* in shaded habitats, *A. cristatellus* colonies such that of BHSP are not surprisingly successful. However, like the hammocks themselves, extensive loss of canopy through human activities or hurricanes could revert this site to the pineland it once was with a return of *A. sagrei*.

Introduction

The Barnacle Historic State Park (BHSP) is a 2.0 ha park located at 3485 Main Highway in the Coconut Grove neighborhood of Miami, Miami-Dade County, Florida (Figure 1). Originally part of a 16.2 ha bayfront parcel overlooking Biscayne Bay that was purchased by Ralph Middleton Munroe in 1886, what is now the BHSP with the house and boathouse was purchased by the Florida Park Service from Munroe's descendants in 1973.

A herpetofaunal bioblitz was conducted at the BHSP in 2005 (Meshaka et al., 2008) at which time seven new exotic species and two new native species were added to the list of resident species bringing a total of 10 exotic species and eight native species (Meshaka et al., 2008). At the time of the bioblitz, the Brown Anole, *Anolis sagrei*, was primarily seen on vegetation near and on walls. The Puerto Rican Crested Anole, *A. cristatellus*, was found primarily in the hammock which extended 0.19 km southeast from the entrance to the park. On 6 July 2007 and 14 February 2020, timed surveys were conducted in portions of the park for diurnally-active lizards. Of primary interest to us was the status of diurnal anoles, especially *A. sagrei* (Figure 2), *A. cristatellus* (Figure 3), the Cuban Green Anole, *A. porcatus* (Figure 4), and the Bark Anole, *A. distichus*, whose activity could be expected in the dry season.

Materials and Methods

The Barnacle Historic State Park (BHSP) is a 2.0 ha public park overlooking Biscayne Bay (Figure 1), 3485 Main Highway in the Coconut Grove neighborhood of Miami, Miami-Dade County, Florida (25°43'30"N 80°14'32"W). Rectangular in shape, the northwest corner provides the main entrance along Main Highway, and the park is bordered by cement walls and vegetation leading southeasterly toward the ocean. A winding stone trail leading from the entrance to the parking lot and office bisects a tropical hardwood hammock with remnant pine trees. The remaining portion of the park is sod, formerly dune, upon which rests the two-story house, and near the bay, a yellow boathouse.

Figure 1. Survey sites at the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 14 February 2020. Left Wall and Right Wall (A), Boathouse (B), Hammock Right and Hammock Left (C), and Main House (D). Photographs by W.E. Meshaka, Jr.

B **D**

The first diurnal survey was conducted on 6 July 2007. Portions of the park along the northeastern wall and the entrance, and waterfront were surveyed during 1050–1140 hrs. The trail leading from the office to the main gate was surveyed during 1150–1210 hrs. Perch heights were recorded as follows: 0.00–0.50 m, 0.50–1.00 m, 1.00–1.50 m, >1.50 m. The second diurnal survey was conducted on 14 February 2020 during 1410–1540 hrs at six sites:

Left Wall (Figure 1a) refers to the transect along the northeast wall and adjacent vegetation from the parking lot to the water surveyed during 1410–1424 hrs. Distance was approximately 165.5 m. Right Wall (Figure 1a) refers to the transect along the southwest wall and adjacent vegetation from the water to the parking lot surveyed during 1430–1436 hrs. Distance was approximately 165.5 m. Boathouse (Figure 1b) refers to the two-story structure located along the shoreline. Search time was one minute during each of two surveys of 1425–1426 hrs when cloudy and 1539–1540 hrs when sunny. Hammock Right (Figure 1c) refers to the transect following the stone trail from the office to the main gate along which lizards were counted on the right side of the trail to 2 m into the hammock. Hammock Right was surveyed during 1440–1447 hrs. Distance was approximately 214 m. Hammock Left (Figure 1c) refers to the transect following the stone trail from the main gate to the office along which lizards were counted on the left side of the trail to 2 m into the hammock. Hammock Left was surveyed during 1447–1459 hrs. Distance was approximately 214 m. Main House (Figure 1d) refers to the historic residence situated between the parking lot and the waterfront and was surveyed during 1521–1527 hrs.

Perch heights of the 2020 survey were recorded as follows: 0.00–0.60 cm, 0.60–1.05 cm, 1.05–1.80 cm, >1.80 cm. Cloud cover ranged from partial sun to sultry. Local air temperature ranged 79–82 F. Pearson's X2 test was used for count data as part of the native stats package in R (R Core Team 2019) to test whether or not there was an association between the distribution of species at different sampling periods and at different heights in their habitats. Absence of support for an association would indicate that the relative abundance of the two lizards has undergone a significant change over the years of sampling and/or at different levels of the vegetation. In cases where sample sizes were too small to reliably meet the approximation of a normal distribution required for the X2 test, we used Fisher's exact test for count data. We assigned a nominal significance level of $p < 0.05$.

Results and Discussion

Assemblage structure 2007 v 2020- In 2007, *A. sagrei* was the dominant lizard, comprising 69.01% of all diurnal lizard sightings from the combined sites and was dominant in both survey sites (Table 1). During that survey, *A. cristatellus* comprised 25.35% of all lizard sightings. Congeneric species and the Wood Slave, *Hemidactylus mabouia*, were marginal in detection (Table 1). *Anolis cristatellus* comprised 92.86% of the 70 individual lizards encountered during the 2020 survey and was the dominant lizard at all survey sites (Table 2). Among its congeners, only a single adult male *A. sagrei* (1.43%) (Figure 2) and two *A. porcatus* (Figure 4) were detected that day (Table 1). *Leiocephalus carinatus*, a recent colonizer, was seen at the Boathouse and the Main House (Figure 1b).

Relative abundance 2007 v 2020- Encounter rates as measured by no. lizards observed/ minute was highest in *A. sagrei*, and especially so in the hammock during the 2007 survey ($X2 = 72.5$, $p < 2.2e\text{-}16$) (Table 3). In 2020, *A. cristatellus* greatly exceeded encounter rates of all species at all sites, especially the well-shaded left wall and the hammock (Table 4).

Perch height 2007 v 2020- The distribution of perch heights of *A. cristatellus* and *A. sagrei* differed significantly from one another in 2007 (Fisher's Exact Test for Count Data, $X2 = 9.05$, $P = 0.022$), whereby *A. sagrei* differentially occupied lower perches than did invading *A. cristatellus* (Figure 5). Distribution of perch heights by *A. cristatellus* in 2020 were significantly different (Fisher's Exact Test for Count Data, $X2 = 19.77$, $P = 0.00014$) than that of *A. cristatellus* in 2007, whereby those in 2020 differentially occupied lower perches than conspecifics in 2007 (Figure 5). A comparison of perch height distribution between *A. cristatellus* in 2020 with that of *A. sagrei* in 2007 detected no significant difference (Fisher's Exact Test for Count Data, $X 2= 4.76$, $P = 0.20$; (Figure 5). These analyses indicate that colonizing *A. cristatellus* did not occupy favored perches until *A. sagrei* was gone (Figure 6). To that end, both species favor lower perches at the Doc Thomas House, where *A.*

sagrei is relegated primarily to a sunny edge of the property (Meshaka et al., 2008). Lower perch heights were also favored by *A. sagrei* at the Doc Thomas House before Post-Hurricane Andrew canopy development and subsequent colonization of *A. cristatellus* (Meshaka, 1999).

Herpetofaunal species list 2007 v 2020- Since the herpetofaunal bioblitz of 2005 (Meshaka et al., 2008), only one new exotic species, *L. carinatus*, appears to have colonized the BHSP (Table 5). First seen in 2014 (Jessica Cabral, pers. Comm.), this species is well established around buildings on the property, where it has demonstrated an ability to negatively impact the Everglades Racer, *Coluber constrictor paludicola* (Figure 7). We do not know the extent of this lizard's range in Coconut Grove. Although both *A. cristatellus* and *A. sagrei* remain on the species list for the BHSP, their distributions have shifted profoundly during the intervening years of the surveys. As in the case of *L. carinatus*, we do not know the extent to which *A. cristatellus* has colonized Coconut Grove nor do we know the relative abundances of these two anoles. During our 2020 survey, we photographed what we believe to be a hybrid between *A. cristatellus* and *A. sagrei* (Figure 8). If this lizard represents a hybrid, then the demise of *A. sagrei* on the BHSP can be primarily attributed to superior competitive ability by A. cristatellus in canopied habitat and secondarily by hybridization to some extent with remaining individuals of *A. sagrei*. Presumably, hurricane-mediated opening of the canopy on the property will serve as a selective pressure favoring a reversal of this assemblage structure and the habitat itself back to rockland pine. The remaining anoles could actually benefit in this scenario depending on the extent to which the canopy were to open.

Figure 2. A male Anolis sagrei from the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 14 February 2020. Photograph by W.E. Meshaka, Jr.

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Table 1. No. of individuals of each of five diurnally-active lizard species expressed as a percentage of all individuals of all five species seen at each site at the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 6 July 2007.

Species	Fence sites	Hammock
A. carolinensis	3.03030303	0
A. cristatellus	33.33333333	18.42105263
A. equestris	3.03030303	0
A. sagrei	54.54545455	81.57894737
H. mabouia	6.060606061	0
Percent total	100	100
N	33	38

Table 2. No. of individuals of each of four diurnally-active lizard species expressed as a percentage of all individuals of all four species seen at each site at the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 14 February 2020.

Left side from parking to water	Left Wall	Boathouse	Boathouse	Right Wall	Main House	Hammock Right	Hammock Left
A. cristatellus	89.47	66.67	100	80	92.31	100	100
A. sagrei	0	0	0	20	0	0	0
A. porcatus	10.53	0	0	0	0	0	0
L. carinatus	0	33.33	0	0	7.69	0	0
Percent total	100	100	100	100	100	100	100
N	19	3	3	5	13	12	15

Table 3. No. of individuals seen per minute search time of four diurnally active lizards at the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 6 July 2007.

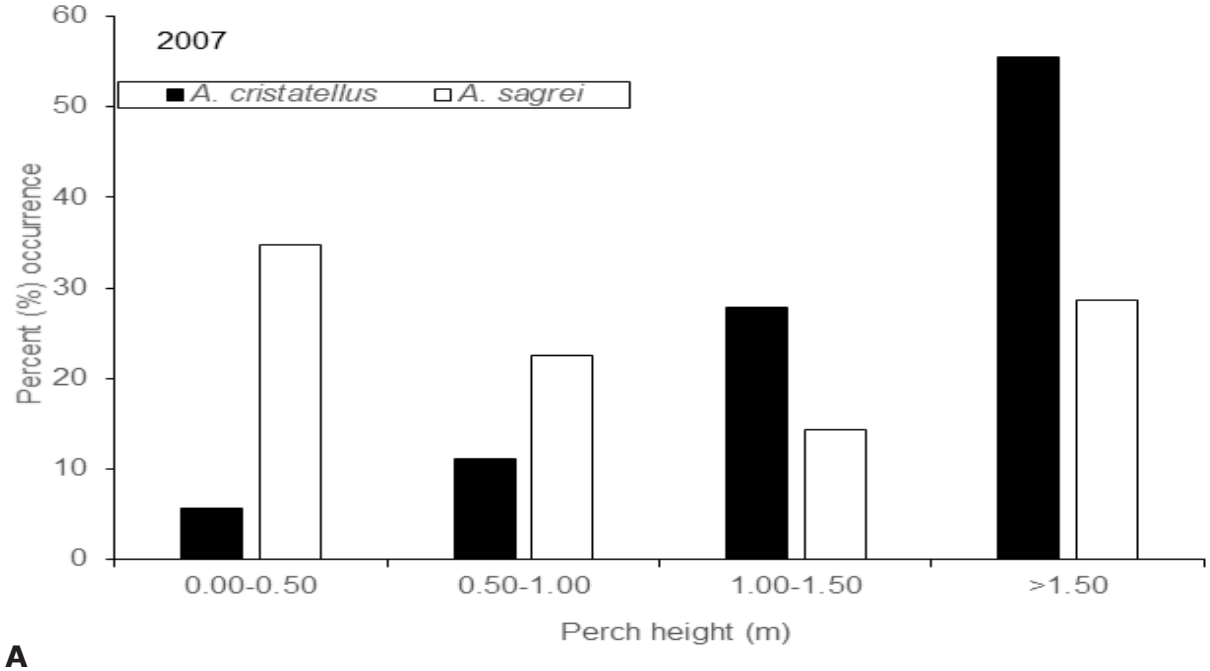
Species	Fences	Hammock	Combined sites
A. carolinensis	0.02	0	0.0143
A. cristatellus	0.22	0.35	0.2571
A. equestris	0.02	0	0.0143
A. sagrei	0.36	1.55	0.7
H. mabouia	0.04	0	0.0286
N	50	38	71

A

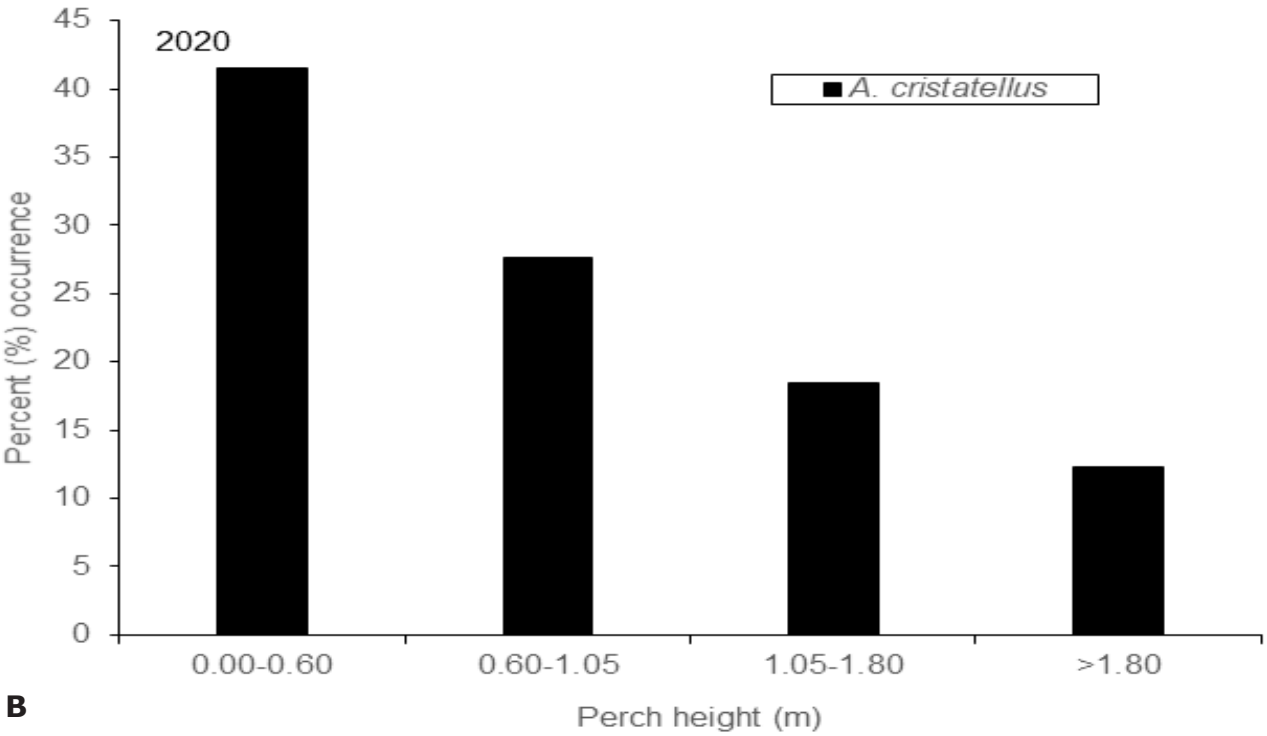
B

Figure 3. Two males of *Anolis cristatellus* (A and B) from the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 14 February 2020. Photographs by W.E. Meshaka, Jr.

Figure 4. A male *Anolis porcatus* from the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 14 February 2020. Photograph by W.E. Meshaka, Jr.



A



B

Figure 5. Perch heights in m of *Anolis cristatellus* and *A. sagrei*, on 6 July 2007 (A) and *A. cristatellus* on 14 February 2020 (B) at the Barnacle Historic State Park, Miami, Miami-Dade County, Florida.

Figure 6 Two adults of *Anolis cristatellus* in the tropical hardwood hammock of the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 14 February 2020. Pho-

Figure 7. Predation by *Leiocephalus carinatus* on *Coluber constrictor paludicola* at the Barnacle Historic State Park, Miami, Miami-Dade County, Florida. Photograph by Jessica Cabral.

Figure 8. A suspected hybrid of *Anolis cristatellus* X *A. sagrei* from the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 14 February 2020. Photograph by W.E. Meshaka, Jr.

Table 4. No. of individuals seen per minute search time of four diurnally active lizards at the Barnacle Historic State Park, Miami, Miami-Dade County, Florida, on 14 February 2020.

Site	*A. cristatellus*	*A. sagrei*	*A. porcatus*	*L. carinatus*	Total
Left Wall	1.21	0	0.14	0	1.36
Boathouse	2.0	0	0	1.0	3.0
Boathouse	3.0	0	0	0	3.0
Right Wall	0.67	0.17	0	0	0.83
Main House	2	0	0	0.17	2.17
Hammock Right	1.71	0	0	0	1.71
Hammock Left	1.25	0	0	0	1.25
Totals	1.38	0.02	0.04	0.04	1.49

Table 5. Amphibian and reptile species documented from the Barnacle Historic St Park, Miami, Miami-Dade County, Florida. * = exotic species.

Amphibians	
Greenhouse Frog*	*Eleutherodactylus planirostris*
Green Treefrog	*Hyla cinerea*
Squirrel Treefrog	*H. squirella*
Cuban Treefrog*	*Osteopilus septentrionalis*
Lizards	
Green anole	*Anolis carolinensis carolinensis*
Puerto Rican Crested Anole*	*A. cristatellus*
Bark Anole*	*A. distichus*
Knight Anole*	*A. equestris equestris*
Cuban Green Anole*	*A. porcatus*
Brown Anole*	*A. sagrei*
Eastern Six-lined Racerunner	*Aspidoscelis sexlineata sexlineata*
Indo-Pacific Gecko*	*Hemidactylus garnotii*
Wood Slave*	*H. mabouia*
Green Iguana*	*Iguana iguana*
Northern Curly-tailed Lizard*	*Leiocephalus carinatus*
Southeastern Five-lined Skink*	*Plestiodon inexpectatus*
Reef Gecko*	*Sphaerodactylus notatus*
Snakes	
Everglades Racer	*Coluber constrictor paludicola*
Southern Ring-necked Snake	*Diadophis punctatus punctatus*
Brahminy Blindsnake*	*Indotyphlops braminus*
Red Cornsnake	*Pantherophis guttatus*
Yellow Ratsnake	*Pantherophis obsoletus quadrivttatus*
Rim Rock Crowned Snake	*Tantilla oolitica*
Turtles	
Loggerhead Sea Turtle	*Caretta caretta*

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Notes

Scavenging of the Dekay's Brownsnake (*Storeria dekayi*) by the Eastern Copperhead (*Agkistrodon contortrix*)

David Kelley
Sedgwick County Zoo
5555 W. Zoo Blvd.
Wichita, KS 67212

On September 21st, 2019 Nate Nelson, Yang Zhao and I were road cruising backroads near Sedan, Chautauqua County, KS for Timber Rattlesnakes (*Crotalus horridus*). Twenty minutes after sunset, we spotted an Eastern Copperhead (*Agkistrodon contortrix*) in the center of a dirt road. Upon inspection, the snake was in the process of consuming a road killed Dekay's Brownsnake (*Storeria dekayi*). The Brownsnake had been dead for quite some time, evident by the condition of the carcass. After a short series of photographs, the copperhead retreated to the underbrush with the Brownsnake mid-consumption.

Photograph by Yang Zhao.

An observation of the Spiny Softhshell (*Apalone spinifera*) in Leavenworth County, Kansas.

Matthew A. Cross[1], William Summers[1], and Neil Bass[2]
[1]1000 Chief Joseph Loop, Fort Leavenworth, KS 66027
[2]810 McClellan Ave, Fort Leavenworth, KS 66027

On June 18, 2019 while inspecting the Sherman Army Airfield levee Matt Cross and Billy Summers spotted and photographed this spiny softshell. They then sent the photos to the Fort Leavenworth Natural Resources Specialist, Neil Bass. The Natural Resources Specialist recognized the turtle as a county record and followed up with Mr. Cross and Summers for locality information.
Spiny Softshell had previously been recorded from Platte County Missouri, which is directly across the river from Fort Leavenworth, Kansas. Photos of the turtle were submitted to the University of Missouri, Columbia as a voucher.

Spiny Softshell Turtle, Leavenworth, Co, KS (39.373924, -94.906663). UMC3732P.

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 of the Society. Membership dues per calendar year are $15.00 (U.S., Regular), $20.00 (outside North America, Regular), and $20.00
(Contributing) payable to the KHS. Send all dues to: KHS Secretary, (address inside the front cover)

KHS Meetings
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.

Field Trips
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.

Editorial Policy

Collinsorum, currently issued as submissions warrant, publishes all society business.

Submission of Manuscripts
As space allows, *Collinsorum* publishes all manner of news, notes, and articles. Priority of publishing is given to submissions of Kansas herpetological subjects and by KHS members; however all submissions are welcome. The ultimate decision concerning the publication of a manuscript is at the discretion of the Editor. Manuscripts should be submitted to the Editor in an electronic format whenever possible. Those manuscripts submitted in hard copy may be delayed in date of publication. Manuscripts should be submitted to the Editor no later than the 1st of the month prior to the month of issuance. All manuscripts become the sole possession of the Society, and will not be returned unless arrangements are made with the Editor.

Reprints & Artwork
Collinsorum publishes original peer-reviewed submissions under the Articles and Notes sections. Upon review, acceptance, and publication, Portable Document File (PDF) copies are provided gratis to the author on request.

Societal Awards, Grants, and Recognitions

Distinguished Life Members
Individuals selected as Distinguished Life Members are chosen by the KHS Executive Council based on their distinguished published research papers on Kansas herpetology.

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

The Howard K. Gloyd - Edward H. Taylor Scholarship
Established in 1993, The Gloyd-Taylor Scholarship is presented annually by the Kansas Herpetological Society to an outstanding herpetology student. The scholarship is a minimum of $300.00 and is awarded on the basis of potential for contributing to the science of herpetology. Students from grade school through university are eligible.

The Alan H. Kamb Grant for Research on Kansas Snakes
KHS members only are eligible to apply for The Alan H. Kamb Grant for Research on Kansas Snakes, which was established in 2001. The recipient of the grant will be selected by the KHS Awards Committee. A minimum award of $300 is given annually. Research results (in whole or in part) must be submitted for publication in Collinsorum.

The Henry S. Fitch - Dwight R. Platt Award for Excellence in Field Herpetology
KHS members only are eligible to apply for The Henry S. Fitch - Dwight R. Platt Award for Excellence in Field Herpetology, which was established in 2010. The recipient of the grant will be selected by the KHS Awards Committee. The award will be given annually when sufficient funds have been raised to establish a trust.

The George Toland Award for Ecological Research on North American Herpetofauna
This CNAH Award was established in 2008 in recognition of the scientific career of George Fredrick Toland, whose life-long interest in herpetology was passed on to so many of his students. The recipient of this award will be selected by the KHS Awards Committee. A minimum award of $200 is given annually at the end of the KHS meeting. Research results (in whole or in part) must be submitted for publication in Collinsorum.

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

Kansas Herpetological Society
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