



Studying Nebraska's Short-horned Lizards

2020 Grant recipient summary

By Nicholas G. Kowal



Figure 1: A juvenile *P. hernandesi* on a working ecotourism ranch in southwestern Nebraska.

INTRODUCTION

For the last three years, beginning in the summer of 2020, I have been studying short-horned lizards (*Phrynosoma hernandesi*) in the state of Nebraska. Their distribution enters the western panhandle of the state through two disjoint wings, which served as our two main study metapopulations. Morphological hypotheses place these two populations as species or subspecies (Montanucci, 2015), while the null hypothesis assumes a single-species approach. It's our hope that combining ecological data with the nuclear genetic data collected from specimens studied during this comprehensive survey will allow us to better understand the relationships of proposed taxonomic groupings.

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Figure 2: An adult male *P. hernandesi* from the northern portion of the Nebraska panhandle.

BACKGROUND

No formal study had ever been conducted on short-horned lizards in Nebraska prior to this project. Herpetologists throughout the 1900's entered voucher specimens into the University of Nebraska Museum from chance encounters during collecting trips, of which about fifty-six had reliable location data between twenty separate locales. I specifically surveyed sites within connective distance of as many of these records as possible, as occupancy at historic sites is the only way to truly measure stability or decline in this data-lacking environment.



Figure 3: An adult male *P. hernandesi* from the southern portion of the Nebraska panhandle.

This was proposed and set up as an in-situ study with non-lethal sampling in order to limit impact on native populations until we could gain a better understanding of the species' status and needs in the state.

CHALLENGES

Short-horned lizards are "notoriously difficult" to locate (James, 2002), with their occurrences in Nebraska being no exception. Data-lacking or incomplete assessments coupled with these lizards' cryptic nature and temperature-dependent lifestyle may paint an incomplete picture of their population status and natural history in a state. I visited each site numerous times throughout the three years of the project during varying weather conditions and levels of scrutiny (broad-scale transects and finer-scale scouring) in order to paint a better picture of true occupancy.

Getting to a point where I could consistently locate short-horned lizards wasn't easy. Outside of finding accessible lands to survey, it could take weeks to locate a single horned lizard among a scattered network of road cuts and often less-than suitable habitat.

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Figure 4: Badlands-style habitat, one of the various environments *Phrynosoma* inhabit in Nebraska

Search efforts were consistently intensive throughout the three years of the project, but the number of *Phrynosoma* found each summer followed an exponential growth curve rather than a linear progression as I learned to follow their trails in the sand from burrows and find other telltale signs of their presence in a pocket of habitat. One benefit of this study zone is that short-horned lizards are the only large-bodied lizard with an ant-heavy diet in the area, so finding a horned lizard fecal sample was a surefire indicator to begin scouring the dust for any buried *Phrynosoma* nearby.



Figure 5: A buried female *P. hernandesi*. Many take cover in subterranean burrows or beneath a layer of desert sand for much of the day, reducing visibility and time exposed.

DATA

In total, I hand-captured and measured more than 100 individual short-horned lizards throughout the course of this project (N = 115). Each individual specimen had detailed morphological measurements and identification photos taken for later analysis. Environmental parameters like wind speed, air temperature, humidity, and other detailed notes were recorded at each site throughout the survey window and at every time of capture. Tissue and blood DNA samples were collected to represent a distribution of sites along the species' lateral and vertical ranges in the state, and care was taken to ensure more than 20 unique individuals were genetically sampled to enhance significance of future results while minimizing long-term impact to each population.

Much of my later successes can be attributed to collecting enough negative search data to

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compare and look at under which weather conditions and microhabitats I either did or didn't find any lizards. The primary data goal was genetic sample collection to represent locales, so transects concentrated on substrate areas most likely to harbor short-horned lizards. Some trends in data were surprising, such as out of the 100+ lizards found throughout the last three years, most were found on north or west-facing slope of a hillside or valley, occasionally on the east and less than 1/10 on the south side, despite even search efforts combing hills and ridges from varying directions and elevations. This runs counter to common anecdotal sentiment that south-facing slopes are favored by *Phrynosoma* here in Nebraska.



Figure 6: Two short-horned lizards found within five meters of one another.



Figure 7: Measurements were taken with a digital caliper and recorded in a small waterproof field notebook.



Figure 8: Newborn *P. hernandesi* from the northern panhandle.

PRIVATE LANDS BIOLOGY

Nebraska's lands are more than 97% privately owned (Pennisi et al., 2015). This poses an obstacle to research designs and is one of the main reasons a study like this for *Phrynosoma* hadn't been attempted in Nebraska prior, in addition to the large distances of travel required to reach the far corner of the state. I knew this would be a significant impediment to study from the get-go, so the project was proposed with a three-year initial window to ensure we could aggregate enough data while taking the time to get to know local landowners and study within permitted locations.

The first two years of data collection helped with getting familiarized with the area, learning what to look for when it comes to choosing a search location for *Phrynosoma*, and making connections for access to private lands. In the third field season, I'd locked down the methodology and was welcome in the area to a degree where collecting a well-spread distribution of genetic samples amongst the known range was an achievable goal.

Building rapport with private landowners is an important step should we decide to do captive head-starting or facilitate genetic exchange between these populations in the future.

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Figure 9: Road surveys and counts were a useful tool to gather target areas for further study.



Figure 10: This adult female *P. hernandesi* was relocated each of the three consecutive years of study via tail clip and unique head scale asymmetry.

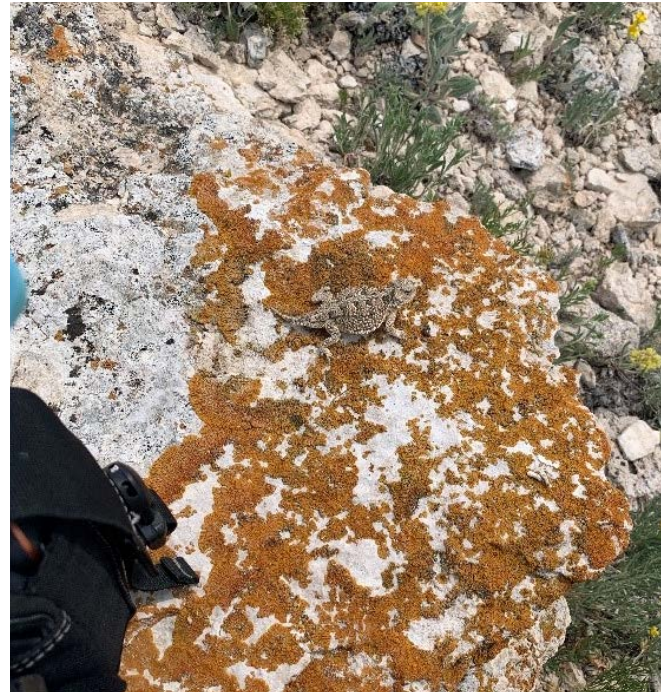


Figure 11: A male *P. hernandesi* re-released after implanting a subcutaneous PIT tag for mark-recapture data.

CONSERVATION

Short-horned lizards are currently protected from collection or trade in the state of Nebraska. They are considered a “Tier 2” at-risk species under the state wildlife action plan, the Nebraska Natural Legacy Project (Schneider et al., 2011). Since it’s technically illegal to touch this species in the state of Nebraska without a scientific permit, promoting education and awareness of the existing rules will be one of the more effective ways to help conserve these local populations for the future ahead.

It was often a surprise for folks to hear that this genus is known for being particularly difficult to keep in captivity- even amongst zoos and scientific institutions. Sharing information on their ecological role in the ecosystem and some of the more unique aspects of their life history (live birth, blood-squirting phenomenon) went a long way to foster a positive understanding of these creatures.

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Figure 12: Cooler, cloudy days provided consistently successful searching weather for *Phrynosoma* during the heat peaks of the summer.

Every landowner I worked with shared a fond enthusiasm for “horny toads,” with many sharing worries that they don’t see them as often as they used to. While there’s potential for local declines, based on occupancy data collected I was able to verify presence at almost every historical location that I surveyed throughout the panhandle.

The northern panhandle is largely intact habitat for the entire range due to a majority land use for livestock agriculture. The southern panhandle has lost portions of habitat in the range due to historical conversion of suitable short-horned lizard habitat for crop agriculture, but the trend appears to be reversing as lands are brought back into grazing use. From our project data, cattle & bison agriculture are highly compatible with short-horned lizard population occurrences in Nebraska, and I regularly found gravid, adult horned lizards nested buried underneath cow pies during surveys.

It’s important that conservation and management decisions be based on data. Data from the genetics I’ll be analyzing through this winter will aid our ability to effectively conserve the unique variations of local populations as well as improve our understanding of when or if the disconnected north & south metapopulations last shared genetic exchange.

EDUCATION & OUTREACH

Throughout my field travels, I had the opportunity to meet hundreds of new faces and talk for untold hours with landowners and locals about the project and various reptiles native to the area. It was a great learning experience on my end to see so many different land ethics in action, and it led to a more diverse outlook as a scientist. I’ve been happy to hear when on return trips to the western hills that this study brought enthusiasm and curiosity to many. It still makes me laugh at how often I was referred to as simply “the Horny Toad guy” in town.

Time is a valuable resource, so when a landowner would take the time to send the location of a lizard or take me out to a spot they had been found historically- I’d take the time to listen to them and hear what they had to say. Many shared a lack of public trust in wildlife management- know that how we conduct our field studies on private lands affects the ability for new generations to continue studying creatures like these for years to come.

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Figure 13: A gravid female *P. hernandesi*. These lizards are a great conversation- starter when members of the public happen to come across me in the field searching or taking measurements.



Figure 14: I had the opportunity to give insight into search methodologies for native *Phrynosoma* and other lizards with a visiting AmeriCorps group in Kimball Co., 2021.

THE FUTURE:

I plan to continue longer-term monitoring of this species in the state for as long as is feasible throughout my career. Next year I'll be returning to the study area for at least one or two expeditions to collect tracking data and investigate some of the extralimital records from our state museum.

The connections I've established will allow more advanced study in this model environment for a species at the edge of its natural range. Fringe distributions like these lend useful environmental parameter data since we can begin to see on a gradient which parameters play significant roles as populations fade in the landscape or concentrate along specific clines.

Follow-up surveys spaced out every five or ten years will enhance our long-term understanding of how the species responds to our changing climate and the human era now that we've established a solid baseline for both populations.

I am incredibly grateful for the support of the Horned Lizard Conservation Society, without which blazing this trail would not have been possible.

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Figure 15: Sagebrush habitat at a study site in the northern panhandle. Wildfires are a regular occurrence in this region.

Figure 16 (insert): Author with a *P. hernandesi* from the southern panhandle.

REFERENCES:

James, J. D. (2002). *A survey of short-horned lizard (*Phrynosoma hernandesi hernandesi*) populations in Alberta*. Alberta Sustainable Resource Development, Fish & Wildlife Division, Resource Status and Assessment Branch.

Kowal, N. (2022) *Nebraska's Short-horned Lizard Population Status Assessment*. Unpublished data.

Montanucci, R. R. (2015). A taxonomic revision of the *Phrynosoma douglasii* species complex (Squamata: Phrynosomatidae). *Zootaxa*, 4015, 1-177.

Pennisi, L., Burbach, M. E., Kil, N., Kahn, M. I., & Tyre, A. J. (2015). Nebraska's Public Access Hunting Program: Hunter Preferences and Usage Final Report.

Rocha, J. (2021) Figure 14.

Schneider, R., K. Stoner, G. Steinauer, M. Panella, and M. Humpert (Eds.). 2011. *The Nebraska Natural Legacy Project: State Wildlife Action Plan*. 2nd ed. The Nebraska Game and Parks Commission, Lincoln, NE.

University of Nebraska State Museum (Zoology) Herpetology Collection. [<https://www.gbif.org/dataset/fca6147f-6460-445a-9e6a-5ebc5eddf703>]

All photos by Nicholas G. Kowal unless otherwise specified



Welcome New Board Members!

By Cheryl Jenkins

The election for the 2023-2024 Board was held in November 2022. This year we again used a digital voting process which was very successful and resulted in a good voter turnout. Thank you for voting! Once we received all the votes, we checked that each member was in good standing. Congratulations to the new 2023/2024 HLCS Board members and returning Board members!

There will be two new Board members, two moving into new positions, and two continuing in the same positions they previously held. Our two new Board members are Rachel Alenius-Thalhuber as President-elect and Shana Fredlake as Secretary. Ryan Zach will continue as Treasurer, and Lynn Seman will continue as Member Services Officer. Dalton Neuharth will move from Secretary to Director-at-Large, and Cheryl Jenkins will move into the President position from President-elect.

The Board would like to sincerely thank outgoing President Mason Lee and Director-at-Large Miranda Vesey for their excellent contributions over the past two years. The official term started January 1, 2023, and the new board has already begun working toward the next chapter of horned lizard conservation. We are all looking forward to what the new term will bring!



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Please consider making the move to a digital copy. To make the change, contact Lynn Seman, the HLCS Membership Services officer at rlynnseman@gmail.com



HLCS 2024 Grant Program

The Horned Lizard Conservation Society is dedicated to protecting horned lizards by documenting and publicizing the values and conservation needs of horned lizards, promoting horned lizard conservation projects, and assisting with horned lizard management initiatives. Towards those ends, the HLCS annually sponsors research that has direct conservation applications. To learn more about the society and past grants, go to <http://www.hornedlizards.org/>.

HLCS will be offering grants again in 2024. In the past, priority has been given to projects that have direct conservation implications, including public education.

To apply, send a proposal detailing the goal of the study, the rationale for it including relevance to conservation of horned lizards, and how your work would benefit from this opportunity. The proposal may not exceed 1000 words. Also include a preliminary budget with as much detail as possible and with any other funding sources available, received for your project, and other grants you are applying for. Word format documents are preferred. In addition, send a short resume or CV (up to 3 pages) for the lead applicant and have a single letter of reference sent to Dalton Neuharth: dneuharth15@gmail.com. All three documents should be in separate digital files. Check the website for more information. The deadline is January 15, 2024. The decision will be announced by March 1, 2024.



President's Message

by Cheryl Jenkins

Happy 2023, fellow horned lizard enthusiasts! It is with tremendous gratitude and excitement that I take the reins as President of HLCS. This really is a full circle moment for me as it was my fascination with horned lizards as a child that fueled my aspirations of becoming a wildlife biologist. I love knowing there are so many other dedicated individuals and organizations out there working towards a common goal of preserving the species and their habitats and educating others to do the same.

I would like to take a moment to thank our board members past and present for all of the wonderful work they do. I would also like to acknowledge our donors whose contributions big and small help fund our grant and educational programs.

The past several years have been challenging for everyone with the ongoing pandemic, but I am optimistic that and we can start planning and attending more in-person events soon. I encourage you all to get involved and let us know if there are any events in your communities that might provide an opportunity for a HLCS booth or presentation.

We also want to hear about any interesting research or field events going on that members might be interested in volunteering for or reading about. We are always looking for content for our newsletters and YouTube channel and posts for our social media accounts. Also, please let us know if you are interested in volunteering for a committee or to be a representative for your home state. This society cannot function without the dedication of our members and volunteers, and I encourage you all to get out there and continue the good work!





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