

The Canadian Greater Short-horned Lizard 2021 Grant Recipient Summary

By Nick Cairns



Figure 1. An adult female *Phrynosoma hernandesi* in early October 2020 at the mouth of a burrow she had prepared for the 2 previous days.

Introduction:

The availability of suitable overwintering sites is thought to be a major constraint on northern range limits in reptiles (Powell and Russell 2007). Most temperate reptiles must overwinter below the frost line to survive brumation. Despite this, several of the most northern lizards do not follow this trend (Berman et al. 2016). In the Canadian semi-arid prairies, the Greater Short-horned Lizard (*Phrynosoma hernandesi*; status: special concern COSEWIC 2018), persists in habitats where the annual air temperature range can exceed 80°C. From early research, *P. hernandesi* in Canada appear to have very specialized overwintering habits which may differ compared to conspecifics further south (Powell and Russell 1994; Mathies and Martin 2008). Here they have been observed to move longer distances to overwintering

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Other contacts***Phrynosomatics* Editor**

Leslie Nossaman
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General Inquiries

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Figure 2. An example of the datalogger setup. Each datalogger was coated in rubber and tapped a plastic tent peg a 10 cm which was implanted flush to the substrate.

sites, congregating with conspecifics at suitable sites and using burrows as shallow as 7 cm, far too shallow to avoid frost penetration in the absence of some mitigating factor (Powell and Russell 1994).

Interestingly it has also be proposed that at these sites, this species is associated with microhabitats which accumulate snow cover. By overwintering in areas with predictable, consistent snow cover, these lizards are potentially selecting a relatively stable microclimate for brumation. As an ephemeral habitat feature, patterns of snow cover have changed drastically in the last 50 years and will likely continue with future climatic shifts (Pauli et al. 2013). To date, the environmental conditions preferred by overwintering *P. hernandesii* have not be fully defined at their northern range limit. The aim of my Horned Lizard Conservation Society: Laurie Piepenbrink award funded research was to address this knowledge gap by quantifying overwintering site selection by *P. hernandesii* in Saskatchewan.



Figure 3: An adult male, observed March 23rd 2022, in Grasslands National Park. The first lizard of the 2022 season and earliest record of the project so far. Please note the mud coating the head and back.

Methods:

I conducted this research in an 400X300 m area of the West Block of Grasslands National Park (GNP) in southwest Saskatchewan, Canada. Using the “non-random” wandering survey methods described by Fink (2014), I looked for lizards in late summer when they are most visible.

Once I located a lizard I attempted to observe it once every 2-5 days with the aim of following it to its overwintering site. One of the ambitions of this project was to be as low impact as possible so no handling or marking was conducted. Lizards were observed from a

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distance and overwintering sites were inferred from context and behaviour. For example, a lizard excavating a semi stable burrow, using a burrow late in the season (after the first snow fall; Figure 1) or emerging from a burrow covered in mud in the spring (Figure 2 and 3) would all be considered evidence of a den site. While regularly burying themselves, burrow construction or modification is rare during the active season for this population (pers. obs.).

When found, each overwintering site was then paired with a control site that is randomly-selected roughly 10 m away. To get an idea of the available subsurface conditions available in the area I also selected at least 6 sites at each cardinal direction (North, South, East and West). Three of these sites were located in topographic features which would collect snow like draws/washes and three were in more open exposed areas. These sites were paired at 3 elevations/slope positions; high, where the slope was steep and erosion based features were less incised, mid, where the slope was moderate and incisement reached its maximal extent and; low, where the slope begins to flatten out, canals are generally wider and paired with deposits of sediment in alluvial fans.



Figure 4: An adult female (lower right corner looking back over her shoulder at the camera), observed April 27th 2022, in almost the exact same spot as the male observed on March 23rd.

At all of these sites I implanted thermal loggers (iButtons of several models DS1921 and 1922; Maxim/Dallas Semiconductor Corp., USA) 10 cm below the substrate as well as several on the surface next to buried sites. Each logger collected a temperature recording every 4 hours. Each logger was coated in rubber (Plasti Dip, Plasti Dip International, Blaine, MN, USA) and then taped to a plastic tent peg which was inserted into the substrate to 10 cm based on the observations of Powell and Russell (1994). These were left to record all winter. This was combined measuring snow depth every two weeks using a metal ruler. Descriptive statistics were used to present a basic overview of the conditions available and used by overwintering *Phrynosoma hernandesi*.

Results:

Overall, 23 (8 female; 6 male; 9 young of year) lizards were observed in the study area in late summer of 2021. As is typical in this area, females were usually observed multiple times at the same site while males and young of year individuals typically were not re-observed. Two adult females were observed prepping burrows in the fall resulting in two occupied sites. In the

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spring of 2022, one additional adult male was found at a third site where an adult female was later found.

The latest observation was a male found on an east facing slope on October 28th. The earliest male was found on March 23rd while the earliest female was observed on April 27th (Figure 2 and 3). A total of 42 loggers were deployed on October 24th and collected on May 15th. Four were not retrieved (3 disappearing and 1 failing) and another 3 were dug up and displaced then found and replaced. As would be expected the most extreme temperatures were recorded by loggers placed on the substrate surface ranging from -33°C and 49°C compared to the subterranean range of -16.5°C and 26°C . The temperatures as they relate to specific habitat variables over the whole season are as follows (Figure 5):

Topography	Mean	SD
In draw	4.93	4.89
Out of draw	5.09	5.04

Slope	Mean	SD
High	5.05	5.03
Mid	4.77	4.57
Low	5.44	5.57

Aspect	Mean	SD
East	5.23	4.69
North	3.85	5.07
South	5.50	4.73
West	5.26	5.43

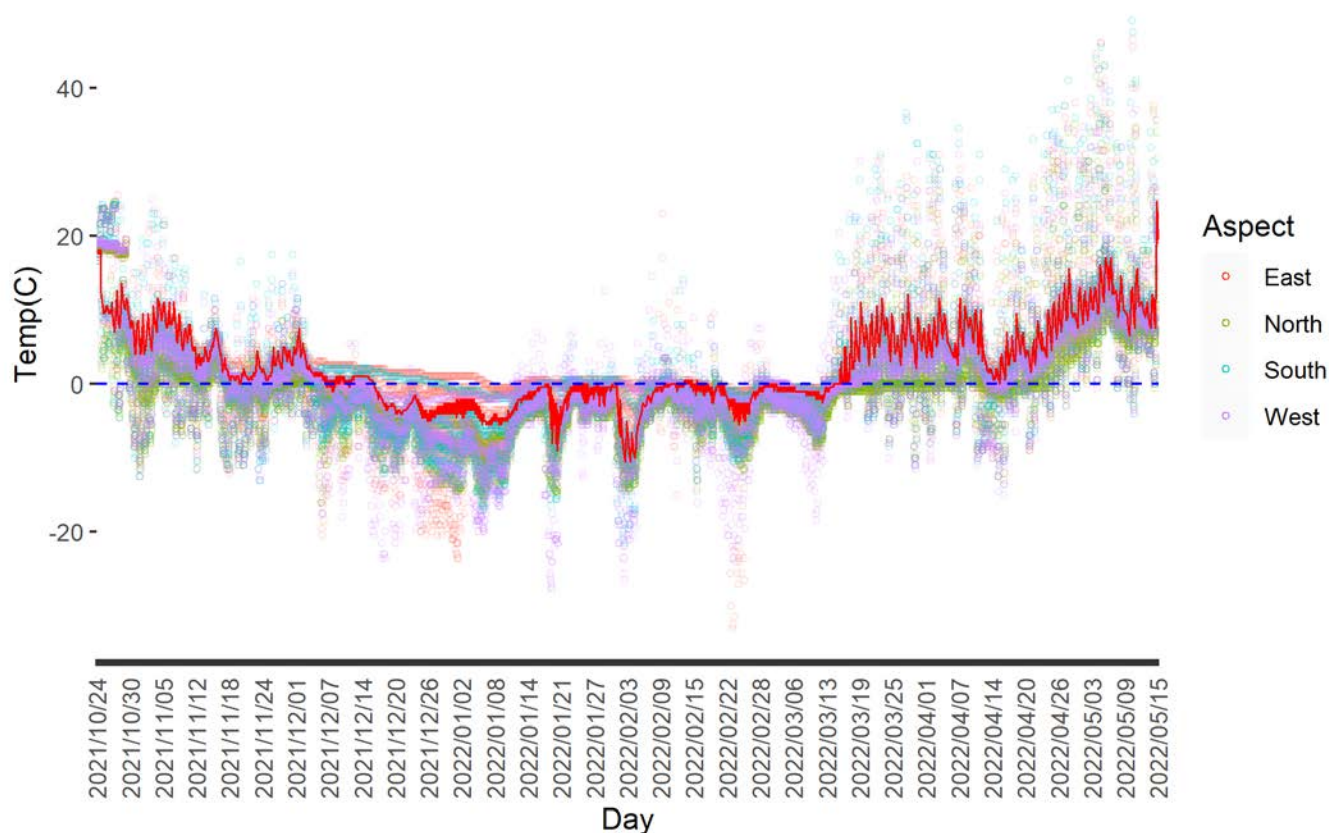


Figure 5. A visual representation of all temperature data collected over the winter of 2021-2022. Individual records taken every 4 hours are represented by open circles colored by the aspect they are facing. The red lines represent locations which were occupied by lizards in that season.

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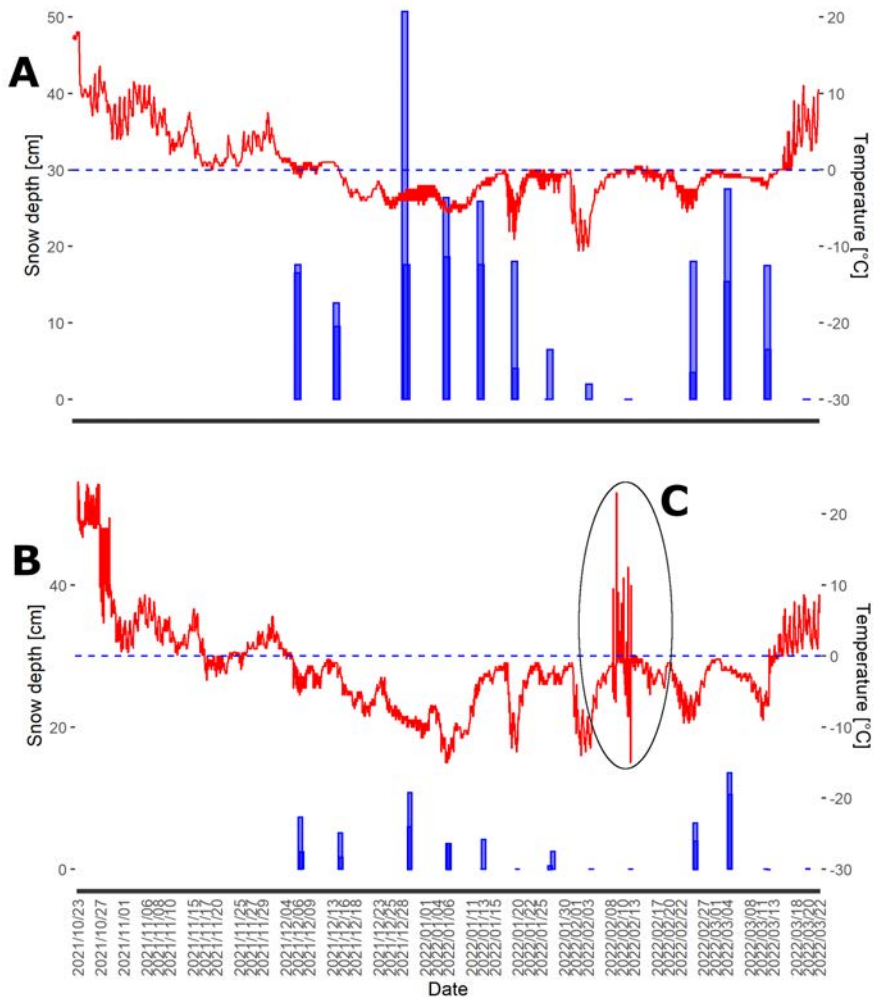


Figure 6. Climatograms representing A) Occupied and B) Control sites. Thermal data (left hand y axis) was collected by dataloggers every 4 hours and snow (right hand y axis) was measured every 2 weeks by hand. Not the fluctuation at “C” this represents when a coyote dug up and moved the data logger but it was found and re-installed.

from other descriptions of overwintering sites further south (Mathies and Martin 2008; Barron, pers. com., January 3, 2023). This original description provided fantastic insight but did not directly observe the overwinter temperatures.

Here I observed temperature near overwintering lizards falling well below freezing for roughly 2 months with limited freeze thaw cycles. One occupied site (Eastern exposure) went down to -0.5°C for 8 hours Dec. 12, 2021, while both occupied sites started a long-term freeze on Dec. 16th. They briefly went above freezing on Feb 14th 2022 but generally remained below 0°C until the 15th (Southern exposure) and 17th (Eastern exposure) of March 2022. Both sites reached at least 10°C by March 23rd when the first lizard was seen. The minimum temperature reached by an occupied site was -10.07°C . This suggests that *P. hernandesi* is one of very few freeze tolerant lizards and, if true, would be one of the most cold tolerant reptiles known. Interestingly, the most northern lizard in the world, *Zootoca vivipara* (common lizard) in Siberia appears to share a similar strategy. Like *P. hernandesi*

Looking at specific overwintering sites within the confines of the active season, occupied sites had a mean temperature of 0.526 (SD 4.46) $^{\circ}\text{C}$ with mean depth 128 (SD 119) mm of snow while at control sites mean values were -1.52 (SD 6.36) $^{\circ}\text{C}$ and 32 (SD 39) mm (Figure 6).

Discussion:

Due to lack of replication and limited sample size I chose to present some basic descriptive statistics rather than potentially misleading statistical tests. As such, this report represents preliminary results to be expanded upon and major inferences should not be drawn yet. With that caveat noted, a few findings and observations so far are notable and add to what we know about overwintering in *P. hernandesi* in Northern parts of its range.

Powell and Russell (1994) were, to my knowledge, the first to describe the novel overwintering strategies for this species at its northern range maxima. Their description suggested they utilize shallow retreats, on south and southeastern slopes where snow tends to accrue which differs

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overwinters in burrows just 5-13 cm deep and is routinely exposed to freezing temperatures (Berman et al. 2016). More research is required to see how these two species compare.

Similar to Powell and Russell (1994) I observed multiple individuals using the same area and perhaps even the same burrow. Initially, on March 23rd 2022, I observed a male on the surface completely covered in dried mud, including its mouth appearing to be sealed shut (Figure 3). A month later on April 27th I found a similarly mud-covered female within 15 cm of where I had observed the male (Figure 4). Under the *Juniperus horizontalis* (creeping juniper) that dominates this site there were a number of burrows of unknown origin. It seems both lizards spent the winter very close together if not in the same burrow. This site was only roughly three meters from another occupied site.

The hope of this project was to use the least invasive method possible to investigate this species at risk. Unfortunately, finding lizards prepping burrows using walking surveys was incredibly inefficient, finding just 3 sites and 4 lizards over the course of fall and spring. There is also a concern that looking for lizards as they prepare overwintering sites may be biasing the type of site I find. Due to these concerns subsequent surveys will use radio tracking and Passive Integrated Transponder (PIT) tags to find lizards at their overwintering sites and to calculate survival.

Acknowledgements:

I would like to thank Pam Rutherford, Adam Sprott, Larry Powell and Anthony Russell for their donation of time, expertise and equipment; Sandi Robertson and Julia Riley for their advice; as well as Noah and Adam Johnson and Krista, Alec and Sally Cairns for their assistance in the field. This project would not have been possible without the Horned Lizard Conservation Society's Laurie Piepenbrink award. The support provided by the HLCS has allowed me to build and refine the questions and methods I want to pursue. I initially conducted this as a hobby but I will continue this work in my new role as the curator at the Royal Alberta Museum and I look forward to reporting my future findings to HLCS' members.



Figure 7. The author, checking loggers and measuring snow in -35°C

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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.



Member Highlight

Laurie Piepenbrink



I currently live near Klamath Falls, OR although my “hometown” is the small rural community of Tulelake in NE California. My father homesteaded 110 acres of farm ground in Modoc county in 1949. It was there that I was first introduced to horned lizards as he brought one back from Texas in shoe box. My brother and I were fascinated by it, however one day I took it out for a “walk” and it got away, never to be seen again. My brother was devastated and he always accused me of losing his horny toad. When I was in college and taking a drawing class, I did an ink drawing of a horned lizard and gave it too him. He finally forgave me:)

I left Tulelake in 1974 to attend college at Cal Poly San Luis Obispo, CA. I married a year after graduating and spent the next 30 years moving around the country for my husband’s education and training as a military medical officer. In 2004 he (we) landed with the Air Force outside of San Antonio, in New Braunfels, TX. It was there I became acquainted with HLCS and united with others who were passionate about horny toads. I was able to participate in a field survey near Terlingua in West Texas in May of 2009. My daughter Amy, joined me and we had a memorable time with a group of herpephiles searching for horned lizards. Amy found the first (juvenile) roundtail horned lizard because she saw it when it moved. She commented later, “Mom, it was like the paparazzi descending on this unsuspecting little lizard taking its weight, measurements, sexing it and more.”

I must mention here that I had roots in west Texas, specifically Pecos and Terrell counties. My grandmother was born in 1894 on the family ranch outside of Sanderson, TX. That was where my father had captured and transported the original horned lizard back to NE California; highly illegal nowadays but not frowned upon in the 1960s. After the Terlingua trip, my daughter and I went back to visit the portion of my grandmother’s ranch that was still in the family. When I was there, I saw another roundtail horned lizard, the first I had seen on the ranch in years. The ranch has since been sold and I have moved from Texas, however I spent over 10 years in Las Vegas, NV and was able to see several desert horned lizards during the time there. It was also Bill Brooks who introduced me to the term “color encryption”. I saw a desert horned lizard in Valley of Fire State Park near Lake Mead. It was as red as the rocks and sand alongside the path where my husband saw it move. I have supported HLCS through the years because I think the horned lizard is worthy of conservation and recognize that the loss of habitat has decimated its numbers. While I am not able to actively participate since I left Texas I still can, by being a life time member and helping fund research to protect this remarkable little lizard. I had a Navajo woman tell me that horned lizards represented the ancestors of their people and were to be left alone. I think it is important to remember those who came before us. I want to honor the spirit of my grandmother who grew up amongst horny toads as a child and valued their presence upon the land. I also want to convey to the next generation the importance of preserving this unique species.



Official HLCS Facebook Group Member Page

HLCS has created a new method for communicating between members. This page will also allow the HLCS Board to keep you updated with the latest news and activities and allow you a forum to post your photos and stories and ask others questions and make comments.

This page is for the dues paying members and the objective is to provide more value to you!

If you are on Facebook and are dues paying member, look for the official page to be a part of this group.

Go to this page and ask to become a group member: <https://www.facebook.com/groups/HLC-Smembers/> It is easy to sign up and it is fun! Hope to see you there!



President's Message by Cheryl Jenkins

Summer is heating up and record high temperatures have been persistent throughout the southern regions and beyond. This is a good time to remind everyone to be prepared and take precautions when out hiking or searching for your favorite reptiles in the heat. Always check the weather forecast and conditions in the areas you will be hiking, and watch for monsoon thunderstorms and flash flooding, especially in those desert washes and arroyos. Have plenty of water available for everyone in your party along with sun protection and proper footwear.

Be aware of your surroundings at all times and let someone know where you will be going, especially in areas with limited cell or satellite reception. Watch out for venomous snakes and arachnids and spiny plants. Stay on marked trails and off private property (unless you have permission from the landowner) and remember to leave no trace! Be safe out there and always have a safety plan before you venture out.

Mid to late summer is when you are most likely to encounter horned lizard hatchlings, so keep an extra eye out for them underfoot. If you happen to find any horned lizards on your adventures, please follow safe and ethical practices when observing or taking photos. Also tread lightly in their habitat and remember that most horned lizard species are protected by law and should not be handled or harassed without a permit. You can upload your horned lizard sightings to help keep track of the populations throughout their range on iNaturalist: <https://www.inaturalist.org/projects/hlcs-horned-lizard-documentation-project>. Please don't provide exact locations of your sightings, just a general vicinity. If you are unsure about what species of horned lizard you have seen, you can reach out to us and/or share photos of horned lizards on our Facebook page for identification.

Speaking of iNaturalist, our recent 2023 HLCS BioBlitz was a huge success! Thank you again to our

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membership coordinator Lynn Seman for setting up and publicizing the project and thank you to everyone who participated in the surveys.

New Mexico came in with the most observations at 86, followed by Texas/Oklahoma with 55, and California with 51.

The most observed species were:

Texas horned lizard (*Phrynosoma cornutum*) – 108

Greater short-horned lizard (*Phrynosoma hernandesi*) – 61

Roundtail horned lizard (*Phrynosoma modestum*) – 46

Blainvilles' horned lizard (*Phrynosoma blainvillii*) – 34

The top observers were sent some HLCS swag. Stay tuned for info about next year's event which will occur around the same timeframe in 2024.

HLCS will have a booth set up at a couple of events coming up in the fall including RipFest in Eastland, Texas on October 7, and the Texas Master Naturalist Annual Meeting in McAllen, Texas on October 12-15, 2023. If you are in the area, please stop by the booth and say hello. If you are willing to volunteer at these events or know of any other events coming up where HLCS might be able to set up an educational booth, please let us know. Enjoy the rest of your summer and stay cool!





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