HORNED LIZARD CONSERVATION SOCIETY
Post Office Box 122, Austin, Texas 78767

Phrynosomatics

The Newsletter of the Horned Lizard Conservation Society

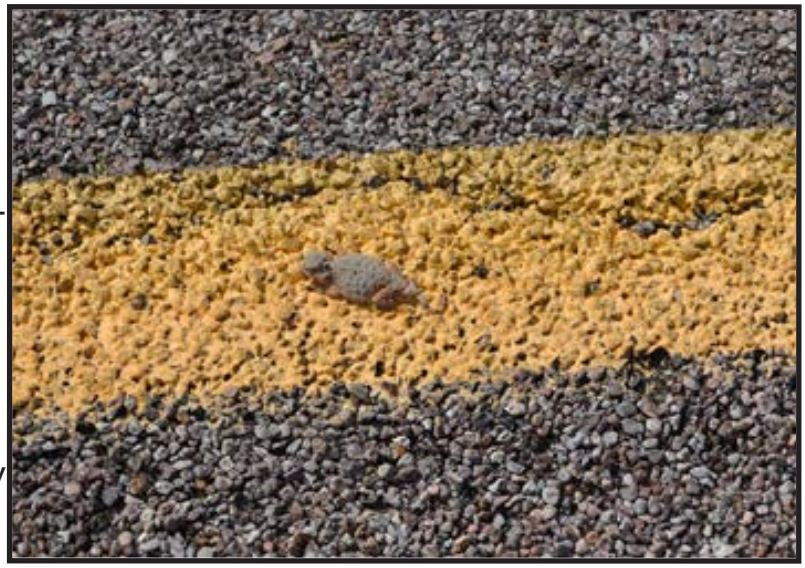
Our purpose is to document and publicize the values and conservation needs of horned lizards, to promote horned lizard conservation projects, and to assist with horned lizard management initiatives throughout their ranges.

Volume 23, Issue No. 2 **MAY 2018**

On the road: The joys and perils of summer sampling for round-tailed horned lizards

By Jared Fuller

I was awarded a horned lizard research grant a few years back to study the genetic structure and phylogeography of populations of the round-tailed horned lizard (*Phrynosoma modestum*). I wanted to give a brief overview of my sampling progress and research goals, share some photos of the lizards I have encountered, and touch on the joys, as well as perils, of field work in the Great American Southwest.



Live male round-tailed horned lizard on the road.

But before I begin, I just wanted to remind everyone of the problem at hand, and why this research is being conducted in the first place. As we all unfortunately know, population declines in Texas horned lizards (*Phrynosoma cornutum*) have occurred throughout their range, and may be due to a combination of factors, including: habitat loss and fragmentation, the introduction of red imported fire ants (*Solenopsis invicta*), and the overuse of pesticides. Unfortunately, little is known about how these factors may be currently affecting another species of lizard, the round-tailed horned lizard, or what their effects may be over time.

These unique lizards can be found across western Texas, New Mexico, southeastern Arizona, and northern Mexico. This species prefers rocky substrate, which leads to patchy distribution within their range. Round-tailed horned lizards are a poorly studied species, which is in part due to their small size and cryptic rock mimicking behaviors, making them very difficult to locate . Resultantly, there is no knowledge of the genetic structure or phylogeography of round-tail horned lizards.

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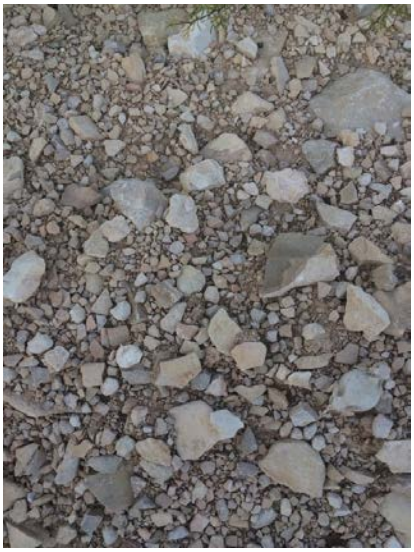
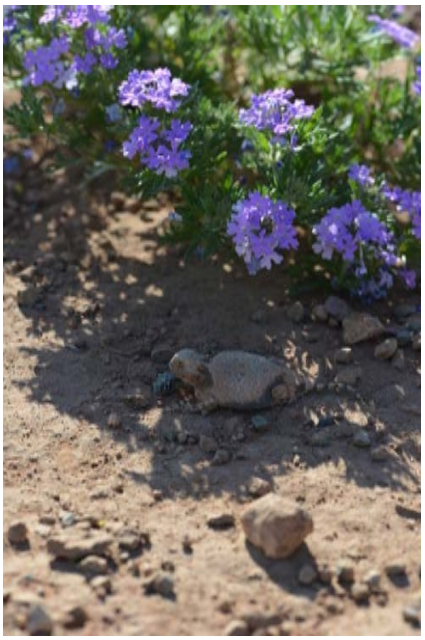


Cyrptic round-tailed horned lizard- lower right.

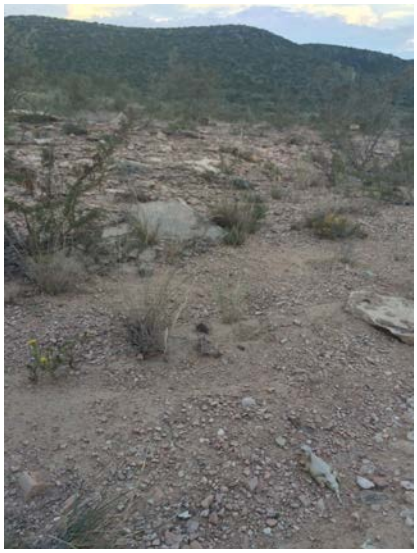
Therefore, an assessment of genetic variation and structuring within and among populations of the round-tailed horned lizard is highly warranted. Through phylogeographic and landscape genomic analyses, which combines genetics and landscape ecology, valuable information about the factors of genetic diversity and divergence across the species' range can be inferred. Specifically, these types of analyses can identify the landscape-level features that promote genetic divergence within and among the lizard's populations. For instance, phylogeographic analysis of the flat-tail horned lizard *(Phrynosoma mcallii*) in a previous study has revealed that the greatest genetic divergence in the population is due to fragmentation by historical isolation combined with human development.

Phylogeographic and landscape genomic analyses can also aid in defining evolutionary significant units (ESUs), which, in the realm of conservation, are populations of an organism that are considered genetically distinct from one another based on differences in allele frequencies that indicate low levels of gene flow, which suggests adaptive differences. These units are functionally independent, yet not phylogenetically unique. ESUs are vital in management for the long-term persistence of an at-risk species.



Round-tailed horned lizard relaxing in the shade, central New Mexico

Through a combination of phylogeographic and genomic analyses, I am addressing the following research goals: i) delineate the genetic variation and genetic structure within round-tailed horned lizard populations across their range, ii) establish baseline genetic variation to compare future population declines, iii) identify geological features and anthropogenic habitat fragmentation that result in divergence of genetic structure, and iv) identify evolutionary significant units (ESUs), which will aid in future conservation efforts. This baseline information is vital for wildlife conservationists and managers as they develop long-term management plans for the species.

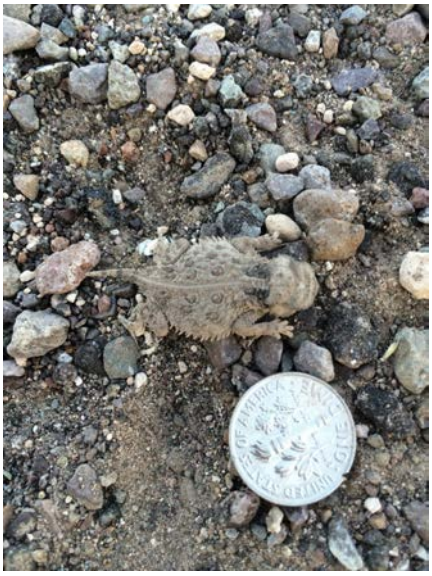


Male round-tailed horned lizard - lower right

Over the last few summers I have traveled extensively throughout west Texas, New Mexico, and southeast Arizona looking for round-tailed horned lizards. Locating them involved meticulous searching during long, dry hikes through the desert, and road-cruising very slowly and cautiously

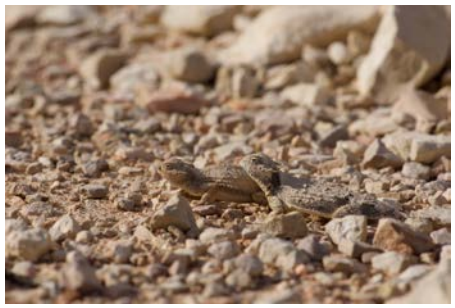
down desert roads. At least with road-cruising you have shade and air conditioning! Some days we all could use a little shade.

In addition to providing a more pleasant environment for a researcher, road cruising is actually a highly effective method for locating lizards once the eye is trained! I have become so proficient at this method that I have even spotted a Texas horned lizard hatchling about the size of a dime on a highway. This occurrence was not even during a planned survey!



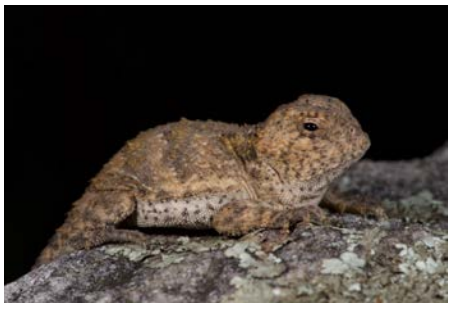
Texas horned lizard hatcling, spotted while driving in West Texas

Furthermore, round-tailed horned lizards have occasionally been encountered after a long day of looking with no luck, and the search had been abandoned. These rare happenstances have occurred while simply pitching my tent in the middle of the desert, or gathering firewood!



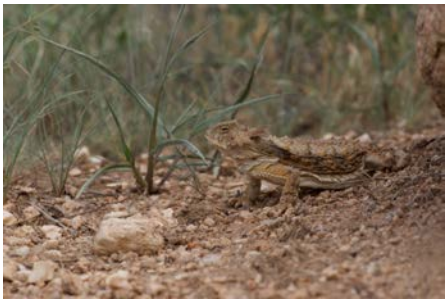
Male and female pair of round-tailed horned lizards

Aside from encountering Texas and round-tailed horned lizards on my searches, I have also had the pleasure of meeting new species! One summer evening I retreated into the Chiricahua Mountains in southeast Arizona to escape the heat, and found my first mountain short-horned lizard hatchling (*Phrynosoma hernandesi*)!



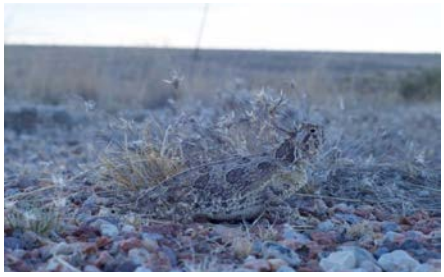
Mountain short-horned lizard hatchling, southeast Arizona

In eastern Arizona, the Sonoran Desert meets the Chihuahuan Desert, and you are able to find not only Texas and round-tailed horned lizards, but also the regal horned lizard (*Phrynosoma solare*), if you know where to look! Upon several occasions, I have found these intriguing lizards while looking for round-tails, and have encountered them most frequently around Tucson, Arizona.



Regal horned lizard

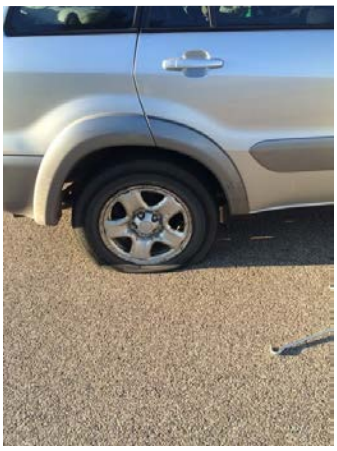
Throughout my travels, though, the Texas horned lizard is most commonly found. Sightings of these alluring lizards have been in the hundreds throughout Western Texas, New Mexico, and southeastern Arizona!



Gravid, alert Texas horned lizard, West Texas

Aside from the thrill and excitement of finding a lizard in the wild, searching for them in the desert isn't all fun. I encountered my fair share of precarious situations along the way, including having to rapidly pack up camp and flee to high

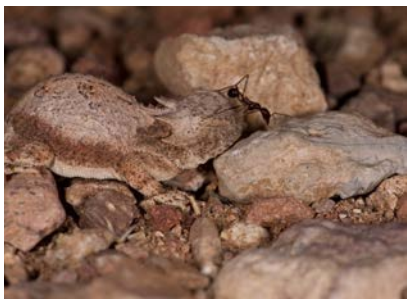
ground during a flash flood in southern New Mexico, getting stuck in sand outside of Truth and Consequences, New Mexico, multiple encounters with Border Patrol (after all, who wouldn't be suspicious of someone driving very slowly down a deserted road in the border land), as well as several flat tires!



One of a few flats

Though my sampling experiences have been rewarding as well as challenging. To date, I have been able to collect genetic samples from over 240 round-tailed horned lizards throughout their range, north of the US/Mexico border. Considering their size and difficulty to locate, I consider this no small feat! I have plans to collect genetic samples from round-tailed horned lizard populations in Mexico in the near future, but this will involve a whole new set of challenges to address!

Unfortunately, due to the expansiveness of the genetic technique I will be implementing, Next Generation Sequencing (NGS), I do not have any genetic data to share with you at this time. NGS requires that all samples be collected before sequencing can take place. Genetic Analysis will occur promptly after genetic samples have been collected in Mexico, which will be a whole new adventure. Like Willy says "on the road again!"



Round-tailed horned lizard trying real hard to not break his rock mimicry

Horned Lizard Research Grant 2019 Applications

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/. We will be offering grants again in 2019. 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 any other funding sources available or received for your project. 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 Monty Criswell: mcrisw1@gmail.com. The deadline is January 1, 2019. The decision will be announced by January 31, 2019.

2018 Grant Recipient Announcement

By Leslie Nossaman

The Horned Lizard Conservation Society is excited to announce the 2018 Grant Award recipients: Sarah Wenner from California State University, California; Hannah Richards from Midwestern State University, Texas; Chris Valdez from Houston Zoo, Texas; and Dusty Rhoads from Texas Christian These grants were partially sponsored by a generous donatation from Alexander Cochran. University, Texas. The following article describes the plans for their interesting research. We look forward to hearing the final results of these worthwhile projects by these researchers!

Identifying conservation units in Blainville's horned lizard (*Phrynosoma blainvillii*) in urban southern California

By Sarah M. Wenner

Massive urban sprawl leads to exploitation, habitat loss, and fragmentation, which have lasting detrimental effects on sensitive species. In order to maximize long-term survival of remaining populations, management strategies aim to preserve and restore genetic diversity and connectivity. For my master's thesis, I will examine how urbanization shapes population structure of the Blainville's horned lizard (*Phrynosoma blainvillii*), a Species of Special Concern in California. I will leverage technological advances in population genomics to determine the severity of population bottlenecks, quantify effective population size, and measure gene flow within and between habitat fragments. I will use these data to delineate conservation units at two scales.

First, I will identify Management Units (populations with little to no gene flow between them) in Santa Monica Mountains National Recreation Area. Second, I will determine Evolutionarily Significant Units (groups of populations defined by genetic divergence and local adaptation) in the Transverse Ranges of southern California. Together, these units can be used to develop effective management strategies for conservation of local populations of Blainville's horned lizards. Funding from the Horned Lizard Conservation Society will help cover the cost of molecular supplies for this project.

Digestive Efficiency of Texas Horned Lizards Fed Different Species of Prey

By Hannah Richards

Texas horned lizards often supplement their diet of harvester ants with other arthropods including beetles, spiders, and grasshoppers (Sherbrooke 2003; Thibodeau et al 2017). Through work performed at Midwestern State University, we know that Texas horned lizards near Canadian, Texas primarily eat harvester ants, but other insects, notably beetles, are a small but ever-present part of their diet (Thibodeau et al 2017). While beetles may comprise a small amount of horned lizard diet in terms of numbers of prey items, they may represent a large caloric portion of the diet if they are digested more efficiently. This research allows us to establish differences in digestive efficiency of Texas horned lizards for different prey items and those used in their captive husbandry.

The samples used in this research will be obtained in collaboration with the Dallas Zoo in Dallas, Texas who maintains a breeding population and is actively involved in Texas horned lizard conservation. We will test digestive efficiency using one of four diets of harvester ants, adult mealworm beetles, adult bean beetles, or wax moth larvae. Horned lizard fecal samples from each treatment will be taken to the Watson Laboratory at Midwestern State University to measure digestive efficiency using bomb calorimetry.

By better understanding the energetic contribution of prey items, we can tailor management practices to enhance availability of other insect prey alongside ants. This will help zoological managers by providing other options to supplement the costly ant diet with other more easily cultured species if they prove to be energetically beneficial. Thanks to the Horned Lizard Conservation Society, we can purchase necessary materials to complete this research.

How the Horny Toad Got its Stripe: Testing the Plant Stem Mimicry Hypothesis in Texas Horned Lizards (*P. cornutum*)

By Dusty Rhoads

Horned Lizards are often regarded as among the most cryptic in terms of behavior and color pattern among North American lizards. Yet, very little has been experimentally tested regarding this alleged crypsis.

As one example of this, an untested hypothesis regarding crypsis in Texas Horned Lizards (*Phrynosoma cornutum*) postulates that their characteristic vertebral stripe mimics sun-bleached plant stems. Further untested is the observation that there exists much color pattern variation in *P. cornutum*; it appears that the ground color of an individual's skin tends to match, on average and to a degree, the color of soil from whence its lineage arose.

If these hypotheses are true, then they will have important implications for conservation and reintroduction efforts currently underway with a number of zoos and state wildlife agencies. Therefore, for this research, visual reaction times of (human proxy) predators to *P. cornutum* images with and without (i.e. Photoshopped out) vertebral stripes will be tested using Inquisit Psychological millisecond software. Furthermore, equal numbers of lizards from several differently colored substrate habitats will have their dorsal colors measured and compared to the colors of their respective natal soils, using a colorimeter or narrow-band skin color reflectance meter. If there is a pattern that holds up, then ex situ microhabitat choice experiments may also be conducted., since cryptic-colored species often choose between matching and non-matching substrates when natural selection is strong.

Reintroduction into the Katy Prairie Conservancy

By Chris Valdez

The main objective of this project is to thoroughly survey property managed by the Katy Prairie Conservancy (KPC) for the presence/absence of *P. cornutum*, and to determine if the habitat is suitable for future reintroductions and/or translocations. Because harvester ants are the primary diet of P. cornutum, analyzing ant colony densities are essential to determining the viability of future horned lizard releases. One of the major goals of the KPC organization is to eventually reintroduce extirpated species back onto the Katy prairie. The last known sightings of Texas horned lizards on the Katy prairie are from the late 60's early 70's. These sight-

ings come from anecdotal/testimonial evidence from Ranchers on Warren Ranch.
In 2016 Chris Valdez (Houston Zoo), Monty Criswell (Houston Zoo), and Cassidy Johnson (HCC Professor) conducted 21 surveys located on a KPC property known as Warren Ranch. Over 200 harvester ant mounds and 13 different species of reptiles and amphibians were documented. Zero Texas horned lizards were found, but that was to be expected.
Our primary goals for 2018 is to continue our survey for Texas horned lizards and new harvester ant mounds at a KPC site known as Jack Rd South. We plan to set up cover boards in order to better document the diversity of reptiles and amphibians on the prairie. Setting up cover boards (~50) in the form of 2'X2' sheets of plywood increases opportunities for reptile and amphibian capture and can be used to form transects and/or grids along different sites. Our secondary goal will be to check back on older harvester ant mounds discovered in 2016 to determine how many are still active. This project will run from February 2018 to January 2019 and we aim to complete at least 2 surveys each month.

Recovering America's Wildlife Act

By Mason Lee

We know our members are not only passionate about horned lizard conservation but are also advocates of preserving biodiversity in our natural world. We wanted to bring to our members' attention to a proposed bill that is currently being considered in Congress.

The Recovering America's Wildlife Act would use a portion ($1.3 billion) of existing revenue from energy and mineral production royalties to fund state wildlife conservation programs. Each state's wildlife and fish agency would apply their allocated money to projects that benefit and protect species of greatest conservation need (SGCN), which are species that are at risk of becoming endangered. This bill has bipartisan support and is also supported by energy companies and outdoor equipment companies.

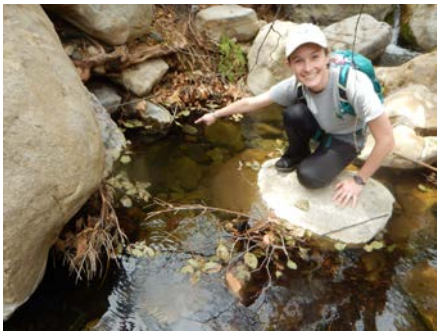
If this Act is passed, the state of Texas would receive $60 million to go towards protecting SGCN such as the Texas horned lizard. Texas is not the only state that lists a horned lizard species as an SGCN. Eight other states would also receive money that could be put towards horned lizard conservation.

The voice of the people is a powerful tool in legislation. Our aim is to inform our members of potential legislation that could benefit horned lizard conservation and to provide them with opportunities to become involved, if they so choose.

Attached to this article is a link to the HLCS website with a fact sheet about the Act (tailored for Texas). Also attached is a link to a sample letter (also tailored for Texas) that can be sent to your state representative requesting that they co-sponsor this bill, if you decide to get involved. You can find your state representative on this website: https://www.house.gov/representatives/find-your-representative

Thank you for your continued support of the Horned Lizard Conservation Society and its mission to publicize and promote horned lizard conservation throughout their ranges.

Member Highlight - Sarah Wenner

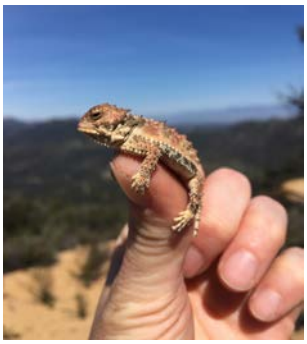


Here I am pointing out an over-wintering California red-legged frog tadpole while colunteering in Sanda Monica Mountains National Recreation Area

Growing up in southern California meant spending the majority of my free time outside, camping every summer, trail running on weekends, and tidepooling at all times of day. Despite my affinity for the outdoors and keen interest in ecology, I was not able to avoid the years of soul-searching so many of us are forced to endure. I've come to appreciate the experiences that guided me onto my current path, the origins of which can likely be traced to the hallways of UCLA.

After graduating with a B.S. in Biology, I worked as a laboratory technician in a population genetics lab that focused primarily on reptiles and amphibians. Inspired by my newfound community of herpetologists, I found myself reading field guides, surveying trails, and posting on iNaturalist every spare moment I had to gain familiarity with the local herpetofauna. At the same time, I joined the Bruin Naturalists Club, founded by UCLA graduate students with a mission to provide hands-on lessons about complex natural ecosystems. Though all of my professional experience had been in molecular labs, my informal trips to the field made it clear to me that I needed to try my hand at fieldwork.

Fate and fortune were on my side when I was offered a wildlife internship with the National Park Service, where I assisted with long-term monitoring of terrestrial reptiles, surveys for stream-breeding amphibians, and the California red-legged frog (Rana draytonii) reintroduction project in Santa Monica Mountains National Recreation Area. My time as an intern was nothing short of transformative, providing me not only with new skills but also with a career goal to do ecological research with a government agency. Most importantly, it (quite literally) helped me along my path to horned lizards.



My first Blainville's horned lizard of the season! It is a juvenile weighing 5g. which probably hatched this past fall

From the time I started my internship, I was determined to fulfill my most elusive dream—to find a Blainville's horned lizard. Naturally, when the day finally came that I spotted a hatchling scuttle by, I was inundated with borderline ridiculous joy. Casual encounters of these charismatic reptiles are enough to appreciate their distinct morphology, unique adaptations, and apparent grumpy demeanor, but I never expected to have the opportunity to make them the focal point of my research.

Last fall, I joined the lab of Dr. Jeanne Robertson at California State University, Northridge. For my Master's thesis, I am applying my molecular tools from the lab to my more recent experiences in the field by doing a conservation genetics study of Blainville's horned lizards (*Phrynosoma blainvillii*) in southern California. I am collaborating with my former supervisor from the National Park Service, Dr. Katy Delaney, to determine patterns of fine-scale gene flow across habitat patches in Santa Monica Mountains National Recreation Area. I hope to continue to work on projects with conservation implications throughout my career.

With the 2018 field season in full swing, I am excited to be outside catching horned lizards every opportunity I get. When I'm not searching for horned lizards, I'm searching for my favorite amphibians—California red-legged frogs—with the frog team at the National Park Service. I find it hard being outside and not asking questions about the flora and fauna I encounter, so my naturalist lifestyle has become a major part of who I am.

President's Message

By Jared Fuller

As summer rapidly approaches, I would like to encourage everyone to get out in nature and look for horned lizards. Nothing brings joy like stumbling upon a plump horned lizard out in the wild! As always, we are looking for additional areas to conduct surveys, which is a great way to get our members out and exposed to more horned lizards! If you have any suggestions, please do not hesitate to contact me or one of our board members. In addition, we are also always on the lookout for talented volunteers, so if you have a special skill that you think the society could benefit from, please let us know! Thank you for your continued support of the Horned Lizard Conservation Society!

New Email Address for HLCS

The HLCS has a new email address that we would like to announce! It is now: hornedlizardinfo@gmail.com

So, any general questions you have regarding issues such as volunteering, horned lizards in your area, donations, and educational materials should be sent to this address. The email will go directly to our Secretary, Mason Lee who will either answer your question directly or forward the email to someone who can. Any questions regarding membership should still go to our Membership Services Officer, Lynn Seman and questions regarding grants should still go to our Director-at-Large Officer, Monty Criswell. We are very excited by this change and hope you take advantage of this email address to learn more about the HLCS and the horned lizard!

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If you are an online Amazon shopper, please consider shopping via www.smile.amazon. com. The AmazonSmile Foundation helps you support a charity of your choice while doing your regular shopping on Amazon!

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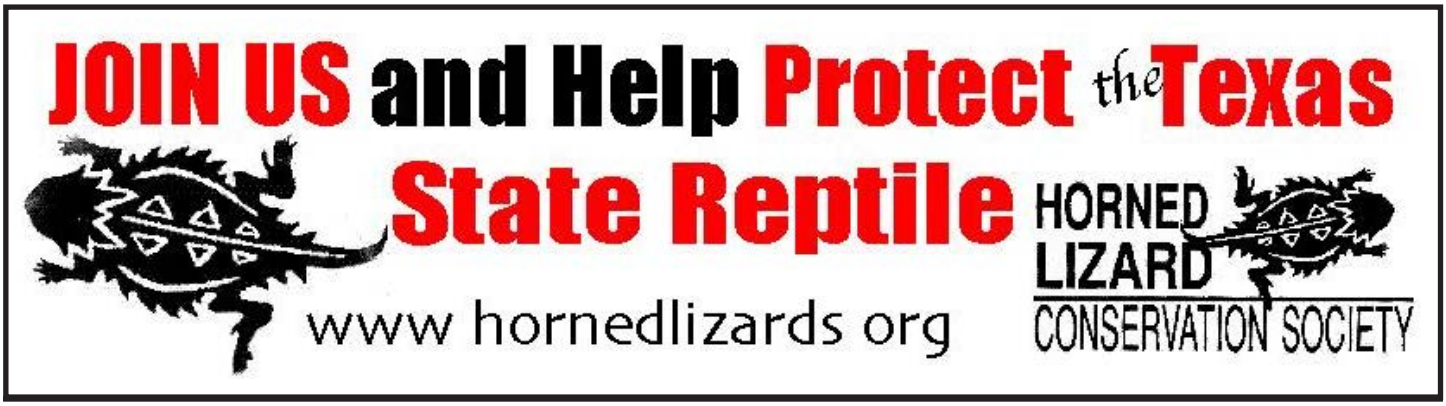
Once you select the Horned Lizard Conservation Society as your charity to support, our society will receive 0.5% of the price of eligible purchases. And from then on, every purchase made through AmazonSmile will benefit the Horned Lizard Conservation Society. Every little bit helps!



Calling All Horned Lizard Survey Ideas!

By Leslie Nossaman

In terms of promoting the HLCS mission and providing research and educational opportunities in the field, HLCS volunteers conduct surveys on private property, state parks, wildlife management areas, and state and national refuges periodically when requested and scheduled. Surveys are only open to current members and no one under the age of 12 is allowed for safety reasons.

Surveys are important to track the horned lizard numbers and their health. In the past we have done surveys with other organizations such as Texas Parks and Wildlife, Dallas Zoo, and the Wildlife Biological Diversity Team.

Some of the past surveys have been located at the boundary of the horned lizard habitat in central and some east Texas in an effort to find any evidence they may still exist and to locate areas where there might be good reintroduction opportunities.

We're currently looking for horned lizard survey ideas for 2018. Please send ideas to HLCS, President Jared Fuller (jaredansley@gmail.com).

Guidelines on Submitting Photos to the Newsletter

If you are planning on submitting photos, the editors for *Phrynosomatics* would like to recommend the following for the best photos for our newsletter.

- Send the highest possible resolution image possible unless the file size is too large to email.
- Send a permission statement for general HLCS use. We sometimes use the photo for other purposes,
- JPEG files are preferable
- We cannot publish specific locations where horned lizards are found so we will need to remove any such verbage in the caption or text
- We would like to know who took the photo, when and where it was taken, and with a description of the subject. If possible, we also like to have short stories about the photo such as why was it taken, what was going on when it was taken, and anything else the photographer would like to share about the photo.
- If it is a photo of a horned lizard, please try to photograph it in the sun as these photos work better than if it is in the shade. Also it is interesting to have a photo where the horned lizard is on the ground, on a rock, or something natural for background.

Fannie Messec is moving on

Fannie Messec has been the *Phrynosomatics* newsletter design editor for nearly 13 years. She has done an outstanding job designing and caring for our newsletters during that time. Fannie has decided to move on to other activities that her life requires and she will be very much missed not only for her fantastic design skills but also for her warm humor and easy going nature. We wish her all the best in her endeavors and hope to see her in the future at some of our horned lizard surveys.

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