



Figure 1.
Greater Short-horned Lizard,
(*Phrynosoma hernandesi*).
Photo by Erik F. Enderson.

IX. *Phrynosoma hernandesi* (Girard, 1858) Greater Short-horned Lizard

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If we conducted an American-Idol type popular poll to choose America's favorite lizards, the horned lizards would be a likely winner except for one minor problem – the majority of those polled would not know that they were lizards. They instead think of them as horned toads or horny toads. We educators continually try to explain to the public that since the term 'toad' implies an amphibian, which these animals are not, the name horned lizard is the scientifically appropriate term to be used. It is a losing battle, however, as I well know. More than once I have been known to blurt out, in the excitement of seeing one of these little critters sitting near an ant hill, "Look, a horned toad!"

Horned lizards are not only popular to the public sector, but their antediluvian appearance and unusual behaviors attract them to the biologist as well. With their flat broad bodies bordered by sharp, pointed scales and heads armored with stiletto-like horns, the horned lizards present a formidable defense to any predator sharp-eyed enough to spot them in the first place. Their colors and irregular outline blend extremely well into their environment. If discovered, horned lizards react by inflating their bodies to appear larger and to further erect their body spines. Elliott

Coues, one of the better known Army surgeon/naturalists of the 1850s in Arizona, described another protective posture: "then the head is lowered, the horns set forward, the back arched up, and the whole attitude becomes ludicrously like that of a bull in miniature." One of the more unusual protective devices found in some *Phrynosoma*, squirting narrow streams of blood from the eyes, seems to have evolved chiefly to discourage canine predation. Some chemical constituent of the blood seemingly repulses canids but not other predators. Still another unique behavior that occurs in some species has been dubbed "rain harvesting." As rain tends to be sporadic in most horned lizard habitats, several species have evolved water gathering behavior to collect the rain that falls on their broad dorsum. As rain begins to fall, the lizard extends its legs, arches its back, and lowers its head. In this position, rain falling on the back is channeled through spaces between the scales to the corner of the mouth. The lizard then ingests this water by rhythmically opening and closing its mouth in a pumping fashion. An apparent example of convergent evolution, the thorny devil (a horned lizard look-alike from Australia) harvests water in a similar manner.

Perhaps the most aberrant group of these already unusual saurians are the short-horned lizards. Compared to typical *Phrynosoma*, short-horned lizards eat a lower

proportion of ants (< 52%). They deviate from the norm in several other ways, as well. Most conspicuously, the horns are much reduced. They are not confined to the typical horned lizard habitat of deserts and grasslands, but also inhabit higher altitudes with forested habitats. In some ways the greatest departure has been forgoing the oviparity and subterranean nesting of their lowland brethren to evolve viviparity (live-birth) like certain other montane lizards (e.g., *Sceloporus jarrovi* - Patronym 7). This month's patronym, *Phrynosoma hernandesi*, is a member of this unusual group. However, before delving into the history of this patronym, let's briefly ponder the significance of reduced horns.

The horns on the back of the head of typical *Phrynosoma* can be a formidable deterrent to the lizard's predators. Should a predator grab the lizard's dorsum, it throws back its head, using the horns to stab its attacker. A recent study published in *Science* on flat-tailed horned lizards by Kevin Young of Utah State and Edmund Brodie III found that lizards impaled by shrikes had somewhat shorter horns than those in the living population. Seemingly, longer horns increase survival

So if long horns provide better protection against predators, might we assume that short-horned lizards have fewer predators at the lofty altitudes that they inhabit? We know that some birds inhabiting islands with few or no predators have become flightless. Could this be the same sort of phenomenon? Dr. Wendy Hodges (University of California - Riverside) called to my attention to still another correlation accompanying the reduction in horns of this group – viviparity. Certainly a reduction in horn size might make mama lizard's pregnancy go a lot smoother. However, not all high-altitude, viviparous horned lizards show a reduction in horns. In Mexico, the rock-horned lizard (*Phrynosoma ditmarsii*) of Sonora shows both viviparity and extreme horn reduction, but three other viviparous species, the Mexican plateau lizard (*P. orbiculare*), the short-tail horned lizard (*P. braconnieri*) and the bull-horned lizard (*P. taurus*) of southern Mexico have moderate, moderate and pronounced horns respectively. This problem has become too taxing for a retired herpetological historian to contemplate further, so I will move on to history and leave this problem for the *Phrynosomologists* to figure out.

Although our patronym this month is *Phrynosoma hernandesi*, the history of this taxon is intricately entwined with another (*P. douglasii*) and one can not be discussed without the other in our historical review. *Phrynosoma douglasii* was described first. Thomas Bell christened the species as *Agama douglassii* in 1829. Bell, a dental surgeon and naturalist, was a Resident at Guys Hospital in London when he described this lizard. He named it after David Douglas, British botanist, explorer, and collector (misspelling his name with two 's') who collected two specimens of the species near the Columbia River. Although Douglas' name may not

immediately ring a bell, most of you are probably aware of plants, other animals, and landmarks that bear his name (e.g., Douglas Fir, Douglas' squirrel, Mt. Douglas in the Canadian Rockies, etc.). Douglas was born in Scotland in 1799. Early in life he became interested in plants and gardening and became an apprentice at several formal gardens, including those at the University of Glasgow. It was here that his knowledge and enthusiasm caught the eye of legendary botanist, William Jackson Hooker. With Hooker's recommendation, in 1823 the London Horticultural Society sent Douglas on his first of several collecting trips to Western U.S. and Canada. This trip proved so successful that, in 1824, the Hudson Bay Company, along with the Horticultural Society, sent Douglas back to the Pacific North West for a three year stint. It was on this second trip that the horned lizards were collected. Douglas died in Hawaii in 1834 under somewhat mysterious circumstances. He either accidentally fell or was pushed into a pit containing an enraged bull and was trampled to death.

Phrynosoma hernandesi was described in 1858 by Charles Girard, based on undesignated specimen(s) collected in New Mexico. You may remember Girard from the last Patronym account concerning Louis Agassiz. Girard was one of Agassiz' students in Switzerland and followed him to America. In 1850 Girard broke ranks, leaving Agassiz' service to work with Spencer F. Baird, Assistant Director of the Smithsonian. During his 9 year stint at the Smithsonian, his main areas of expertise became reptiles, amphibians, and fish. *Phrynosoma hernandesi* was described in a rather unlikely work entitled the U.S. Exploring Expedition under the Command of Charles Wilkes, 1838 - 1842. Volume 20. Herpetology.

The U. S. Exploring Expedition was a grand sea faring expedition under the command of Charles Wilkes that began in 1838 to explore and chart the Antarctic Sea, the islands of the South Pacific, parts of the North American Coast, and the mouth of the Columbia River. The expedition which returned in 1842 after covering 87,000 miles brought back thousands of biological and cultural specimens. Many of these ended up in the Smithsonian. In subsequent years, a five-volume account of the voyage was published by Wilkes and these were followed by a series of volumes by specialists who examined various collections from the trip. Volume 20 was Girard's report on the herpetological material. An interesting aside, concerning this publication, is that the official copies of Volume 20 were published under Spencer Baird's name not Girard's. Apparently Baird signed the contract with the Navy to do this volume, and then assigned the work to Girard. Naval authorities, however, insisted that Baird (the signer of the contract) not Girard be listed as author. Subsequent unofficial copies carried Girard's name as author. But back to the

Francisco
Hernández is
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subject at hand, how and why do specimens of a western U. S. montane lizard collected in New Mexico get described in a volume concerning collections from a sea-faring expedition? In part it was a matter of expediency. Both Baird and Girard, when publishing on collections from government sponsored surveys in government funded reports, would include with the salient material, other unpublished material that they had lying around, whether it was related to a particular survey/expedition or not. Such appears to be the case here.

Girard had become interested in horned lizards and here was a good chance to publish his most recent findings. In this report, he created a subgenus *Tapaya* (based on a generic name first used by Cuvier and applied to the horned lizard species *orbiculare*) that encompassed a group of horned lizards with reduced horns, including *douglasi*, *hernandesi*, *brevirostre*, *ornatissima* but also *orbiculare*. Girard's type description of *hernandesi* contained only 15 lines and made no mention of the person he was honoring with this eponym. In Edward Cope's 1900 tome on *Crocodylians, Lizards and Snakes of North America*, the name *hernandesi* began to dwindle in importance being demoted from a species epithet to that of a mere subspecies, *Phrynosoma douglassii hernandesi*.

For over a century thereafter, the taxonomy of short-horned lizards remained relatively stable. In the first edition of Stebbins (1966) field guide, *Phrynosoma douglassii* with five subspecies (*douglasi*, *hernandesi*, *brevirostre*, *ornatissimum*, and *ornatum*) had become the most widely distributed lizard in North America. The taxon *hernandesi* remained a little-known, poorly-defined subspecies. By the second edition in 1985, *P. douglassii* was listed sans subspecies and *hernandesi* had all but sunk into oblivion as an invalid junior synonym of *Agama douglassii*. Then just when things appeared darkest for *hernandesi*, help arrived in the form of a small band of molecular taxonomists led by K.R. Zamudio. There ensued a flurry of, phenol/ chloroform extractions, gel purifications, and other procedures too debased to mention. When the DNA dust had finally settled in 1997, *P. douglasii* had been exposed as a genetic misfit among short-horned lizards, an interloper dethroned from its lofty perch by parsimony, paraphyly, and phylogenetics, the once mighty *P. douglasii* now existed only in the Columbia River Basin, a paltry shadow of its former domain. Conversely *P. hernandesi* had risen from obscurity like the proverbial Phoenix to become the new 'most widely distributed lizard in North America' - ranging all the way from Canada to south Durango, Mexico. In the latest edition of Stebbin's field guide (2003), even the respective common names reflect this reversal of fortune — *P. douglasii* has been demeaned to the Pygmy short-horned lizard, while *P. hernandesi* has become the Greater short-horned lizard. Only in America!

One question remains, who was the mysterious person for which *hernandesi* was named? Hobart Smith et. al. 1999 felt that Girard was clearly honoring Francisco Hernández. The difference in spelling resulted as a product from Girard's knowledge of classical Latin. As we saw in the case of *Sceloporus jarrovi* (Patronym VIII) honoring Henry C. Yarrow, the letters j and v were substituted in the specific epithet because y and w do not exist in classical Latin. In this case, s was substituted for z to form *hernandesi* for the same reason. Hernández certainly would be a logical choice for the honor, as he was the first European to observe and report on a horned lizard squirting blood from its eye.

Francisco Hernández is known for being the first naturalist to write extensively about the flora and fauna of Mexico. He was born in Toledo, Spain in 1517, graduated as a medical doctor from the U. of Salamanca, and eventually became a court physician for Phillip II. In addition to medicine, Hernández was very interested in botany and made collecting trips to Castile and Andalusia. Relatively late in his life, he began to develop a wanderlust for the New World. Upon reading accounts of de Oviedo, who was long stationed in Panama, he decided that he must visit this exotic land. After much persuasion, in 1570 Hernández convinced King Philip to send him to Mexico on a scientific venture. At the age of 53, he began a six year tour covering most of the country, accompanied by artists, interpreters, collectors, and naturalists. Hernández' main interest was in recording what the local people knew about the plants and animals that surrounded them. He included relatively little in the way of original observations (the horned lizard blood squirting being an exception). Only one of his scientific names for a herp (*Lacertus orbicularis novae Hispaniae*) has been perpetuated to present day. This was a horned lizard, now known as *Phrynosoma obiculare*.

By 1577, Philip had stopped bankrolling the expedition and Hernández had collected so much information, that he took up residence in Mexico City to practice medicine allowing him time to write up his extensive findings before returning to Spain. By fall of 1577, he had put together 6 folio volumes of text and 10 of illustrations and, with this huge manuscript in hand, departed for Spain. Upon his arrival, Phillip gratefully received the manuscript, had it bound, and placed in the royal library but never published it. This was likely the crowning disappointment of Hernández' life. He died in 1587, never seeing any of this great work published. Although various attempts were made to publish an abridgement, none succeeded until 1648. However, Smith (1973) referred to this work as "a sorry abridgement, several revisions removed from the original." Several other naturalists had access to the original and quoted portions in their own works but a fire in the royal library in 1671 destroyed the original and these excerpts and abridgements are all that are left of Hernández' outstanding achievement.

Today Hernández is hardly a household word. It isn't even familiar to many present day naturalists. However, Francisco can be proud to be namesake of a horny little lizard who went from obscurity to being the widest ranging saurian in North America, at least until the next band of molecular taxonomists' hits town.

Acknowledgements: Special thanks to Dr. Wendy L. Hodges for critiquing the manuscript, supplying hard to find literature, and for responding promptly to my many emails.

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Rattlesnake ecology, and particularly the relationship between nuisance rattlesnakes and human-modified habitats, is the primary focus of several studies conducted by Erika Nowak, a researcher with the USGS Colorado Plateau Research Station's Herpetology Lab at Northern Arizona University. Erika is currently a PhD candidate in biology at NAU, and is a USGS SCEP ("co-op") student.

Erika's MS thesis project at NAU was on the effects of relocating nuisance western diamond-backed rattlesnakes at Montezuma Castle National Monument. Her current research is focused on the question of why rattlesnakes seem to use human-modified habitat disproportional to natural habitat in some areas. One of her primary study sites is Tonto National Monument, where she and her colleagues are using radio-telemetry to study the ecology of Black-tailed rattlesnakes (*Crotalus molosus*), Western diamond-backed rattlesnakes (*C. atrox*) and Arizona black rattlesnakes (*C. oreganus cerberus*). She is collaborating with Justin Schofer, a Master's student at NAU, on the denning ecology and other aspects of the natural history of Arizona blacks in sites ranging from the Flagstaff area to Tonto National Monument and Saguaro National Park. Roger Repp assists with this study. In addition, she and Amyann Madara are studying the movements and ecology of Tonto NM Gila monsters (*Heloderma suspectum*) using telemetry.

In addition to her work with venomous reptiles, Erika continues to be involved in inventories of national park herpetofauna in the Mojave and Sonoran Deserts, including Tuzigoot National Monument, Mojave Desert Preserve, and Death Valley National Park. She and collaborator Trevor Persons have conducted inventories at Petrified Forest National Park (including a special emphasis on Milksnakes (*Lampropeltis triangulum*) and 13 other sites on the Colorado Plateau as well. Assistants in this research have been Laura Cunningham, Shawn Knox, AJ Monatesti, Renata Platenberg, Bob Parker, Jason Pilarski, and Eric Zepnewski.

Finally, as THS members heard in her talk in Tucson last year, Erika also studies the ecology of the Narrow-headed garter snake, (*Thamnophis rufipunctatus*) in Oak Creek in central Arizona, in collaboration with Arizona Game and Fish and US Forest Service folks and Manuel Santana-Bendix. The goal of these investigations, funded by the Arizona Game and Fish Department, are to study the habitat requirements and ecology of this uncommon and declining species.

Erika's work is primarily funded by the National Park Service (individual park, regional, and national funds). Her venomous reptile research is also supported by the Desert Southwest Cooperative Ecosystem Study Unit and the Western National Parks Association. All of her research is assisted by large numbers of volunteers, to whom she is very grateful.