



# SONORAN HERPETOLOGIST

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## President's Letter

This issue is dedicated to **Robert L. "Bob" Bezy**, and **Edward O. "Ed" Moll** who left us in June, and July, respectively. Both were big figures in the world of herpetology and conservation, leaving us with great legacies, and shoes to fill. In this issue, **Erik Enderson** has curated tributes from various friends, including himself, remembering Bob; and Ed provides us with his own obituary, followed by a message from his son. Having known both fellows as a young herpetologist, I can say it was truly a privilege to have known, worked with, and been mentored to some degree by them.

I'd like to take this moment to congratulate our Chief Editor, **Howard Clark**, the editorial team, and all of the contributing authors for producing another great issue of *Sonoran Herpetologist*. We also welcome copy editor, **Rylie Towne**, to assist with its production.

### Annual Dinner and Jarchow Conservation Award

This year we will hold our annual dinner at the Arizona-Sonora Desert Museum on 16<sup>th</sup> November 2026. We will present an annual report, hold an election, and have a **silent auction**. **We request any herp related items you'd like to donate:** books, art, jewelry, etc. Contact Lee Oler at [cloler@cox.net](mailto:cloler@cox.net)

I'm pleased to announce that we will also be presenting the **Jarchow Conservation Award to Dale Turner!** More information in the announcement below.

## ANNOUNCEMENT

### Recipient of the 2026 James Jarchow Conservation Award

**Don E. Swann**, Tucson Herpetological Society, Tucson, AZ; [donswann3@gmail.com](mailto:donswann3@gmail.com)

The Tucson Herpetological Society is pleased to announce that Dale S. Turner is the recipient of the 2026 James Jarchow Conservation Award. Dale will receive the award in a ceremony at the 2026 Annual Meeting of THS, which will be held at the Arizona Sonora Desert Museum on 16 November.

The Jarchow Conservation Award honors individuals or organizations for their service to the conservation of the amphibians and reptiles of the deserts of North America. The award was created in 1992 and is named for James L. Jarchow, DVM,

### Nominations Committee

Thanks to the timely establishment of a Nominations Committee by **Maggie Fusari** this year, we are not scrambling with our election timeline. This is such an important role required by our bylaws, and we encourage you inquire with Maggie if you are interested in being on the committee or on the board of directors.

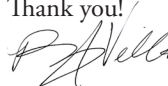
### Conservation Efforts

In October, **Dale Turner**, our Conservation Chair, will resume organizing volunteers to help fill abandoned mine pits in Tucson Mountain Park. On p. 132, Dale has provided a short recap of our conservation actions to date. Contact him for more information: [dale.turner2021@gmail.com](mailto:dale.turner2021@gmail.com)

### Printing the *Sonoran Herpetologist*

We have recently had some interest in printing the *Sonoran Herpetologist*. If you are interested in the topic, please take our survey: <https://forms.gle/EeE7VGH5A74PBaNe9>

The Tucson Herpetological Society continues to thrive thanks to support from members, and donors (monetary and otherwise) like you.

Thank you!  
  
 Robert A. Villa  
[cascabel1985@gmail.com](mailto:cascabel1985@gmail.com)

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**Cover Photo information:** Bob Bezy in the shade of a Fremont cottonwood, *Populus fremontii*, July 2000 in the Tumacacori Mountains, AZ, the summer our friendship began. Photo by Erik F. Enderson.



## 2026 Conservation Actions

Dale Turner, Tucson Herpetological Society, Tucson, AZ; [dale.turner2021@gmail.com](mailto:dale.turner2021@gmail.com)

In the winter of 2025-26, THS members and other volunteers closed 14 old mining features in Tucson Mountain Park. This means permanent closure of century-old death traps for Desert Tortoises and other wildlife by using hand tools to move waste rock back into the holes. We are currently planning locations and logistics for closing many more this coming winter. This effort has been limited to relatively shallow holes (less than 15 feet deep), in part because of the physical effort required but also to avoid affecting potential bat roosting sites. The deeper holes are also death traps for wildlife and could easily trap people, so we are exploring options for getting permanent steel bat-friendly caps installed.

In September, THS members helped with a 4-day survey of biological diversity in the Mule Mountains around Bisbee. The goal was to document presence and abundance of all species, with a special emphasis

on the possible presence of Ditmars' Horned Lizard (*Phrynosoma ditmarsii*). We did not find that species (or any other horned lizard), but made a solid addition to what is known about the mountain range. Results are being posted to *iNaturalist*.

The THS Board has joined in a lawsuit over the ongoing use of federal money to stock predatory non-native fish in Arizona streams, without adequate protection for aquatic native herpetofauna and fish species.

THS Board members met with our partners in the Coalition for Sonoran Desert Protection to learn about priority management issues in Ironwood Forest National Monument. We also met with Pima County staff about efforts to restore connectivity for wildlife, including tortoises, across the Santa Cruz River. We are likely to provide herpetological perspectives for new conservation projects in both areas.

The THS Board has joined in a lawsuit over the ongoing use of federal money to stock predatory non-native fish in Arizona streams, without adequate protection for aquatic native herpetofauna and fish species.



Volunteers working to fill a 12-foot deep mine shaft in Tucson Mountain Park.



Dr. Edward Owen Moll, age 86, of Tucson, Arizona, was born on November 30, 1939, in Peoria, Illinois to parents Edward and Bessie (Kennedy) Moll. He died on July 28, 2026.

Ed attended school in Peoria and graduated from Woodruff High School. He attended Bradley University and graduated from the University of Illinois with a BS and an MS in Zoology. He received his Ph.D. from the University of Utah in 1968.

Ed met his wife, Judy Killian, at a small private lake in northern Wisconsin in 1955. They married in 1960 and traveled the world due to Ed's research. They worked on native turtles in Panama and Malaysia. Ed went to India alone for a year. They traveled to other Asian countries, Europe, South America, Australia, New Zealand, and the South Sea Islands.

Ed was a professor of Zoology at Eastern Illinois University in Charleston, Illinois, for 30 years. He published 80 professional research papers concerning river turtles of the world. He co-authored three books, one with his brother Don. He received numerous excellence in teaching awards and was on the Illinois State Endangered Species Board. He was the first recipient of the John Behler Turtle Conservation Award in 2006.

Upon retirement to Tucson, Ed served on the Tucson Herpetological Society Board as Speaker's Bureau chair. He presented many programs to schools, festivals, organizations, etc. He was docent at Tohono Chul Park for 20 years. In addition to leading bird tours and "Walks in the Park," he presented herpetological programs to attendees. He taught Anatomy and Physiology for Nurses for several years at Pima Community College.

Ed was preceded in death by his parents and brother Don. He is survived by his wife Judy and sons Douglas (Tucson) and Jeff (Maridee) of Longmont, Colorado and two grandchildren.

At Ed's request there will be no service.

#### From his son Jeff

My dad grew up in central Illinois with an adventurous spirit that led him to become a biologist who studied turtles in SE Asia. He was the Crocodile Hunter before there was a Crocodile Hunter. Once in Malaysia, he chased an injured King Cobra into the grass for an opportunity to have a cobra specimen in the EIU natural history collection. He was able to catch the cobra, and I bet it is still in the collection today (see: <https://tinyurl.com/Moll-King-and-I>).

He dove into a pool once to save a girl who was drowning. Not only did he get her out of the water, but he successfully performed CPR on her, and she survived.



Dr. Edward Owen Moll.

He was a kind of Renaissance Man. He traveled the world and taught me that you have to just go with the flow when you travel internationally. It is a lesson that has served me well on many a trip with my family. He was a competitive runner during the first running boom of the 1970s. He ran one marathon and qualified for Boston when the qualifying time was sub 2 hours and 50 minutes. He and my mom were in a bowling league together. He bowled an almost perfect game of 299 in the 1980s. My dad was a typical 1980s dad—absorbed in his profession, a little distant as a father, but he came into his own as a grandfather. He was so good to my children and they adored him.

Finally, he loved reptiles, the Chicago Bears, Dragoon IPA and his family.....maybe not in that order. Best of all he was a good man. He was married to my mom for 66 years. He seemed to figure out as he got older that I needed more from him emotionally. He provided that without me having to ask for it. He always supported me and my family. I knew I could always count on him. We will miss him terribly.

Ed was a professor of Zoology at Eastern Illinois University in Charleston, Illinois, for 30 years. He published 80 professional research papers concerning river turtles of the world. He co-authored three books, one with his brother Don.



## Dr. Edward Owen Moll Inspiring the Next Generation of Herpetologists





# Robert L. Bezy—Memorial Tributes

## The Questions We Carried: Remembering Robert L. Bezy

Erik F. Enderson, Vail, AZ; [erikenderson@icloud.com](mailto:erikenderson@icloud.com)

In May of 2000, I was at a crossroads, wrestling with whether to continue pursuing a career in herpetology. The question of how such a life could sustain me was real, but it was only the visible edge of a deeper one, the question of whether I could commit to a life of sacrifice, fewer possessions, less security, and the willingness to want less so I could do the work I loved. I was more afraid then than I like to admit, uncertain of myself and of nearly everything ahead of me. I was working field projects for Cecil Schwalbe, moonlighting for Richard Felger at Drylands Institute as his computer jock and occasional field hand for a paltry \$600 a month, and doing what I have often done when life became overwhelming, retreating to remote places to observe the plants and animals I love, in the stillness of nature, far from the noise and pressures of humanity.

It was after one of those jaunts that I came home to find a message on my answering machine.

"Hello. This is Bob Bezy and I'm calling for Erik Enderson. Roger Repp suggested I contact you regarding a field expedition to Cabeza Prieta in search of *Xantusia*."

The voice was raspy and unhurried. I listened to it twice.

I cannot place the whole of Bob Bezy's life and work into these few paragraphs. His contributions to herpetology reach farther than this account can follow, and others will tell parts of that story with the depth it deserves.

What follows is something more personal. It is a remembrance of my time with my friend, the questions we carried into the field together, what we added in our own way to herpetology, and how a simple phone call became the beginning of a decades-long friendship between two kindred spirits.

What Bob did not know was that I already knew who he was. A couple of years earlier, Roger and I had driven together to a herpetology symposium in Phoenix and sat directly across from him during the presentations. I had been struck all afternoon by the quality of his questions from the floor, each one precise, thoughtful, the kind that reframes whatever has just been said. I remember thinking, "What fabulous questions." I would learn later that his mentor, the legendary herpetologist Ed Taylor, had a habit at conferences of quietly feeding a young Bob Bezy questions to ask, questions carefully designed to leave a lasting impression on the room. Whether that

afternoon in Phoenix was craft or instinct, the effect was the same.

Roger's talk was, as usual, full of insight and humor. As Roger spoke, Bob's laugh rose through the room, raspy, escalating, impossible to ignore.

"Ah HA HAAA!"

That laugh rings in my ears to this day and brings a smile even as I write this.

As Roger and I were leaving, we happened to walk for a moment with Bob. He turned to Roger and said, "That was one hell of a talk, Roger." It was.

Roger was an unusual man, irreverent, at times outrageous, incredibly knowledgeable, and gifted with an uncommon command of the English language. All of that came through when he spoke. Conference talks are exacting things, careful, precise, and built to withstand scrutiny. Roger's talk met that same standard and brought to it a liveliness that few others could. That was what Bob had noticed. The compliment was not a courtesy. Coming from someone of Bob's standing, it was recognition of something rare. On the drive back to Tucson, I remember saying something to Roger like, "That Bob Bezy seems like an affable guy."

When Bob called looking for someone with field experience and a four-wheel-drive truck, he offered to pay me \$300 and cover all expenses. I thanked him, declined the money, and agreed to the trip. Despite my circumstances, the money was not a motivating factor.

Over a career spanning roughly sixty years, Dr. Robert Lee Bezy watched herpetology shift from morphology to molecules, and his research met each new standard as it came. He earned each of his degrees from the University of Arizona, a distinction that matters here not as a credential, but because it speaks to how deeply Arizona, the Sonoran Desert, and the biology of the Southwest and northwestern Mexico were tied to his life. His advisor was Charles H. Lowe, the desert ecologist and herpetologist whose work helped define Southwestern desert ecology and the biogeography of its herpetofauna, and Bob came of age in what can only be described as a platinum era of UAZ biology, a cohort of researchers whose collective regional contributions have not been equaled since.

Bob was, for the better part of his career, the world's foremost authority on Xantusiidae, the night lizards, and particularly the genus *Xantusia*, small, secretive, taxonomically intricate animals that rewarded exactly the kind of mind Bob brought to them. He was meticulous, empirical, patient, and relentless.

What follows is something more personal. It is a remembrance of my time with my friend, the questions we carried into the field together, what we added in our own way to herpetology, and how a simple phone call became the beginning of a decades-long friendship between two kindred spirits.



After completing his Ph.D., he became Curator of Herpetology at the Natural History Museum of Los Angeles County, a position he held for the better part of three decades before returning, in retirement, to Tucson.

But to stop with Bob's career achievements would miss the person I knew.

Few people I have known loved life as much as Bob did. His love was enormous, wide enough for the people around him, the animals, the places that held them, and even the strange modern human markings we leave across the landscape. While driving, he read signs and place names aloud, some funny because they were clever, some funny because they weren't. We once passed through the appropriately named Nothing, Arizona, and laughed about it for the rest of the trip. That kind of scrutiny spared little, least of all the way we live, and much of it struck him as strange, overwrought, and sometimes absurd.

But amusement was not detachment. Bob was never aloof. Over years of conversations and emails, I came to understand how deeply he was saddened by the damage we do, to one another and to the places around us. He could laugh at our absurdities, but he did not make light of them. I think his research, and the questions that drove it, gave him more than a line of inquiry. Where did a species truly occur, and why? How had its range formed? What did its distribution reveal about its evolutionary history? Questions like these give way to further questions, and the pursuit of their answers kept the sadness at a distance.

However far the questions ranged, they usually led Bob back to the desert, which lived in him like a low-grade fever. As a student, he had walked the foothills of the Catalinas when they were still undisturbed Sonoran Desert. When he came back to Tucson, those same foothills held tens of thousands of houses. He chose to live there anyway, close enough to what desert remained. When a shopping center went up on a few of the last undisturbed acres near his house, built, as always, in the name of progress, Bob was furious about it for weeks. "How does a shopping center represent progress?" he asked rhetorically. Then, in the slow, overenunciated way he had when something truly disgusted him, he drew out each syllable. "*F—in' A!*"

So when we left Tucson for the field and Bob said, "*Get me to the bare-ass desert,*" I knew what he

meant. He was not asking for scenery. He meant a patch of earth without people on it, a place where the desert still felt like itself, or as close to that as we could still get.

Bob was also a man who had suffered in ways that do not make it into a curriculum vitae. Health problems followed him through much of his adult life, and he met them with a hard pragmatism, though never with indifference. He once told me, plainly, that death is a part of life. At the time it struck me as almost unbearably simple, the sort of truth that feels inadequate when measured against the fear and grief it is meant to explain. But it stayed with me, the way so many things Bob said stayed with me. Most of what people say about death is meant to soften it. Bob's words did not. They offered no comfort, but they stayed with me because they were not trying to comfort. They simply told the inescapable truth.

Our first expedition together set a kind of template for much of what would follow. We stopped for permits and some dog-and-pony-show training at an Air Force base in Gila Bend, then drove to Ajo, where we made the catastrophic decision to eat at a Brazier. The intestinal consequences would be invoked, with great hilarity, for years afterward.

From Ajo we drove into Cabeza Prieta, bound for Tule Well. For most of that drive the habitat was wrong—too open, too sparse—and Bob grew quieter as the miles accumulated. I sensed his doubt. Then, west of Tule Well, the landscape shifted, and so did he. "Oh, *Nolina!*"

A hand came down hard on his knee. "*Nolina—*and potatoes—that's it. We've got 'em."

"Potatoes?" I asked.

Bob chuckled. They were not potatoes, of course, but large granite boulders. The kind his son Kit had apparently christened years earlier and the kind so often found in good *Xantusia* habitat (Fig 1). It was the



**Fig 1.** Bob at work, photographing the spot where we found *X. vigilis*. Cabeza Prieta National Wildlife Refuge, May 2000. Photo by Erik F. Enderson.

Few people I have known loved life as much as Bob did. His love was enormous, wide enough for the people around him, the animals, the places that held them, and even the strange modern human markings we leave across the landscape. While driving, he read signs and place names aloud, some funny because they were clever, some funny because they weren't.



sort of private field vocabulary that develops between people who have spent enough time looking at the same habitat together. To anyone else the phrase would have meant nothing. To Bob, it meant we were in the right place.

We drove a bit farther before stopping. With daylight fading, we walked a short distance and found a cluster of dead agaves. I moved toward the nearest one, ready to flip it.

“Let’s save that until morning,” Bob said. “We made it. Let’s set camp and get them in the morning.”

And we did. The first agave we turned shortly after dawn held a night lizard.

I have thought often about that moment, not because the animal was unexpected after Bob saw the Nolina, but because it revealed something essential about the way he worked. He was not guessing. He was integrating habitat, time of day, and the likely thermal state of an animal still hidden beneath the agave. At dusk, after a hot day, any lizard under those agaves would still have enough heat in its body to move quickly. By morning, after the cool of the night had slowed its metabolism, our chances would be better. Bob knew the lizard was there before we saw it, not by magic, but by the kind of experience that had become almost indistinguishable from intuition.

On our way out via the Camino del Diablo, we came upon a Swiss couple whose Jeep had buried itself deep in the Pinta Sands. Strangers in a dangerous place, grateful beyond language for the appearance of another human being. Bob produced a collapsible camp shovel and worked at the tires for a long time before I managed, from a high point, to raise the ranger station on an early-model cell phone. While we waited, we did our best to converse across the language barrier and managed it well enough to share several laughs. At some point Bob asked where they were from. A few minutes later one of the tourists emerged from the Jeep cradling a triangular bar of Toblerone the length of a man’s forearm. He presented it with a smile. “The Swiss,” he explained, “make the world’s best chocolate.”

We thanked him, accepted it, and talked about that bar of chocolate, and the generosity behind it, for the rest of our years together.

When we finally returned home and unloaded my truck, Bob shook my hand. After he drove away, I looked down and counted \$500 in my palm. I called him later to refuse it.

“Erik, it’s for your time, gas, and the wear and tear



**Fig 2.** Bob taking a load off after our first morning with the night lizards. Cabeza Prieta National Wildlife Refuge, May 2000. Photo by Erik F. Enderson.

on your truck. It’s a small price to pay.”

He did not have to pay me anything. I would have driven him anywhere, for nothing, and I think Bob knew that. But that was his way. He had a way of noticing what people gave of themselves, and he did not let it pass as if it were nothing. In that moment, he was telling me my time was worth something, and what he meant, what he would come to say plainly in the years we had left, was that I was. He made people feel that way. I have carried this for more than twenty years, and writing it now, I understand it was never really about the money.

Bob did this in other ways too. He understood the doubt I had carried since before that first phone call. Herpetology had drawn me in through the animals, but what held me was the discipline behind the wonder, the demand that what one saw in the field be tested, documented, and made accountable to evidence. I could not yet see how to build a life around that without giving up too much of myself to keep it. For a time, I tried anyway, making my living in herpetology through the precarious patchwork of field jobs that comes before graduate school, if graduate school comes at all. Eventually I made my living another way and conducted research alongside it, and for a while I wondered whether that left me on the outside of the field. Bob never saw it that way. “There’s nothing stopping you,” he told me early on, “from earning a more lucrative living and still doing real research.” He meant it, and he proved it. Over the two decades that followed, we published often together, our names side by side on work that drew on the strengths of us both. Bob brought the knowledge and judgment of a lifetime in the field. I brought determination, and often the impetus, a pull toward long-standing questions no one had answered, and toward places that had been overlooked since his own years as a student. Sonora was one of those places, biologically rich,

On our way out via the Camino del Diablo, we came upon a Swiss couple whose Jeep had buried itself deep in the Pinta Sands. Strangers in a dangerous place, grateful beyond language for the appearance of another human being.



poorly studied, and changing fast under a growing population. Much of what we did was an effort to look closely before the chance was gone. He never once treated me as anything less than a colleague.

After Cabeza Prieta, we would make many more trips in the ten years that followed, and they all had this quality: Every expedition was also a question. Bob and I were both constitutionally incapable of leaving a puzzle alone, and our time together in the field was in many ways an extended conversation about what we did not yet know. Why was *Anaxyrus debilis* in Vekol Valley? Could *Chionactis annulata klauberi* still be found in Pima County? Did a historical record reflect a real population, a misidentified specimen, a bad locality, a mystery not yet given a fair attempt, or some old-fashioned skulduggery?

Bob knew my particular obsession with amphibians, and so the questions we chased were often theirs. We searched the Mule and Patagonia mountains for *Ambystoma rosaceum*, spending enough nights in enough drainages to feel certain we had checked every likely canyon and spring we could reach—and found nothing. With Kit alongside us on some of those early border expeditions, we documented *Craugastor augusti* in three new mountain ranges in Arizona. We spent nights in the San Rafael Valley and Huachuca Mountains searching for new *Hyla wrightorum* localities. The borderlands had a way of turning every answer into another question.

As often happened, the questions themselves began to push south. Organisms do not recognize borders, and so neither did we. If the salamanders were not in the Mule or Patagonia mountains, how close to the line were they? The answer to this question, and many others, required going into Sonora.

Eventually Bob agreed—somewhat begrudgingly, his nerves having been worn down by years of unpleasant encounters in the Mexican backcountry—to a project mapping the northern distribution of *Anaxyrus kelloggi*. The project did not survive first contact with the landscape. Private property blocked us at every turn, and when we asked a local whether we might search for a toad in the area, he offered this assessment:

“I wouldn’t recommend it.”

As Bob and I understood it, that was polished Latin for something rather more direct. We withdrew from the area and abandoned the project.

We turned instead to a question that had intrigued herpetologists since the 1920s: the possible occurrence of *Isthmura sierraoccidentalis* at Fort Whipple, Arizona, based on unconfirmed specimens cited by Emmett Reid Dunn. That thread, characteristically, pulled everything with it. What began as a search for a single elusive salamander became a much larger investigation of the herpetofauna of east-central Sonora. Our years there, punctuated by the occasional near-

disaster, yielded a regional synthesis of the Sonoran herpetofauna with comparisons to adjoining states, and later a more focused treatment of the amphibians and reptiles of Yécora and the Madrean Tropical Zone. Those projects were built from questions, but also from long drives, wet boots, anxious nights, moments of real danger, bad directions, generosity from strangers, and the stubborn faith that if one keeps looking carefully enough, the land will eventually reveal part of what it knows.

Through it all, Bob understood that the answers we sought were inseparable from the place that held them. He had worked in Mexico for decades, and it shaped him, personally and professionally. Some of what marked him was Mexico’s overwhelming biodiversity. Some of it was the danger. And some of it was the human cost one encountered there, the kind of thing Bob could notice once and carry for the rest of his life.

In Nuri, a remote town in Sonora, we went door to door looking for gasoline. Someone finally pointed us to a particular house. A child answered, and Bob asked, gently, whether we might speak to someone about buying fuel. The boy said little but seemed to understand, disappeared, and returned with a large plastic container and a hose. He put the hose in his mouth and drew a hard breath to start the siphon, and the gasoline ran up the hose and into his mouth before he spat it out and let it spill to the ground. Bob was visibly shaken, and had to turn away. That a child would take gasoline into his mouth and lungs for a few pesos was the kind of thing Bob could not shake. He did not simply shrug it off, and he did not pretend to. For a while it changed the air in the vehicle, and we rode in silence between stops. Then, slowly, the next canyon, the next bend, the next animal to look for drew us back.

Fieldwork in Mexico could do that. It could show you something you wished you had not seen, then ask you, sometimes in the same day, to trust a stranger.

Years earlier, while working in a remote region of Oaxaca, Bob paid a fisherman to ferry him across a lake, drop him off in the backcountry, and return three days later to bring him home. Before stepping out of the boat, he showed the man a photograph of Kit. He asked him, quietly and without theater, to please come back so that Bob could return to his son.

The fisherman returned on the fourth day.

I have returned to that image often. Bob stepping out of a boat into the forested lowlands of Oaxaca, carrying the resolve required to do fieldwork, the worry of a father, and the knowledge that in remote places the difference between a hard trip and a disaster can rest in the hands of a stranger.

That was Bob. He went anyway.

My last field trip with Bob was to the area around Yécora, Sonora. We planned to spend five nights there, as we had during the previous four summers,

After Cabeza Prieta, we would make many more trips in the ten years that followed, and they all had this quality: Every expedition was also a question. Bob and I were both constitutionally incapable of leaving a puzzle alone, and our time together in the field was in many ways an extended conversation about what we did not yet know.



searching for herpetofauna in that remarkable landscape where tropical Sonora climbs into the Sierra Madre Occidental. We were intrigued by a newly paved road toward a small community called Ónavas, so we turned off Highway 16 and drove slowly in that direction.

Not far along the road, two trucks passed us, one bright orange, the other bright yellow. Both had large tires, shiny wheels, and windows black enough to hold no human expression. Bob and I both knew what they were. Sicarios. Omnipresent, though rarely seen so plainly.

The road looped us around Ónavas and back toward the highway. As we were leaving Ónavas, the orange truck came past us at blinding speed. Bob made a comment and continued talking, but I had gone on alert. Something felt wrong. I checked the rearview mirror and saw the yellow truck coming up fast behind us. It slowed abruptly and settled close on our rear bumper. Ahead, the orange truck was stopped.

I knew then that we were about to be pinned.

"Bob, we're about to be pinned."

Bob yelled: "Left! Left! Go left!"

Instinctively, I chose not to. Besides, the only thing to our left was thornscrub. I stopped in the middle of the road and shut off the vehicle.

More than ten young men poured out of the trucks. They were well dressed and heavily armed, with automatic rifles, pistols at their sides, one in a flak jacket. They surrounded the vehicle. The man who appeared to be in charge walked to Bob's window. At my window stood a younger man with lifeless eyes. I have never forgotten that face. I do not expect I ever will.

My Spanish was limited, so I stayed mostly quiet. They asked the usual questions. What are you doing here? Where are you going? We told them we were studying the plants and animals of the mountains. We were from Tucson. Affiliated with the University of Arizona. They asked the same questions again and again. The man in charge was calm, deliberate, and intense, measuring each answer against something only he knew. Another man was agitated. He chewed his gum rapidly and kept walking toward Bob's window, sticking his head inside.

"¿Han oído de Pacífico? Somos Pacífico."

He repeated it several times. Have you heard of Pacífico? We are Pacífico.

Neither Bob nor I understood what he meant. I played dumb and in my broken Spanish said we did not have Pacífico, but we had other drinks. We did not drink beer, I told him, but he was welcome to whatever we had. The man waved me off, irritated, and walked away still chewing.

The intensity kept building. I looked occasionally at the young man at my window. His expression never changed. At some point I may have smiled. That was all I had.

Eventually the questions stopped. I heard the man in charge say, in Spanish, "They don't speak Spanish." And finally, after an excruciatingly long pause, he said, "Let's go."

The agitated, gum-chewing man was not satisfied. He asked why they were letting us go. I could not hear the rest. Then they walked back to their trucks and drove away.

Bob and I stayed where we were for a while, letting the trucks get well ahead of us. Then I started the car and drove slowly back to Highway 16. We turned east and climbed into the Sierra Madre in near silence. That night we slept atop Mesa del Campanero. In the morning, we packed and headed home.

It was to be our last trip together, and for the first time in our friendship, we did not have much to say. The experience had left us nearly speechless. Some days after returning home, I emailed Bob with what my searching had turned up. Pacífico was another name associated with the Sinaloa cartel. They had not been asking for beer.

In classic Bob fashion, he replied with a line I will never forget.

*Sometimes it pays to be stupid.*

It was a bitter end to several wonderful years in the magnificent Madrean Tropical Zone of Sonora. I did return to Yécora some years later, without Bob. The place felt different. The cartel presence was harder to ignore, and people were less open than they had once been. Music carried through the streets from trucks and houses, corridos and banda with a harder edge than I remembered. People I knew there explained things carefully, indirectly, in the way people speak when plain speech has become unsafe. They were telling me what I already knew. But the greater absence was Bob. Without him, the place had lost much of its pull. The questions were still there, but they no longer felt like ours. Whatever happened on that road near Ónavas had gone deeper than I understood at the time.

We continued to write together and talk regularly, but our field trips were over. Within a year or so, Bob and his family moved to Oregon. A few days before he left Tucson, he came to visit me at my home. We sat on my couch and talked about the move. I thought I would see him again.

I never did.

Time slipped away in the ordinary way it does when one assumes there will be more of it. Weeks became years. Years became a decade. One of my deepest regrets is that I never went to see Bob, Kit, and Kate in Oregon. I took time for granted, as people do, and now time has reminded me that it waits for no one.

In the last years of Bob's life, his world narrowed in ways that were painful to watch from afar. Health problems, notably skin cancer and COPD, placed growing limits on a body that had already endured

Not far along the road, two trucks passed us, one bright orange, the other bright yellow. Both had large tires, shiny wheels, and windows black enough to hold no human expression. Bob and I both knew what they were. Sicarios. Omnipresent, though rarely seen so plainly.

much. There was a particular cruelty in watching a man who had lived so much of his life outside face summers increasingly choked with wildfire smoke. The climate had changed around him, and the air itself became an adversary. I knew how hard that must have been. Bob wanted to be out in the world—looking, listening, walking, noticing. He lived for scenic overlooks, flowing streams, animals along the way, the small astonishments of natural history, and those increasingly rare places where one could still feel, if only briefly, that the earth had not been entirely overtaken by us.

Still, he and Kate got out when they could. He would share photographs of water, open views, animals they encountered, and quiet places that had given him a few hours of relief. I was grateful for those photographs. They let me see that Bob was still getting out, still looking, still meeting the world on the terms available to him.

When he could not be outside, he kept busy through correspondence and the patient work of turning a lifetime of fieldwork and research into papers, essays, and accounts that would outlast him. He was active, engaged, and funny, but always, increasingly, suffering.

Some of my last correspondence with Bob was about health. I had dealt with problems that were not the same as his, but close enough that I wanted him to know he was not alone, that I understood at least part of what it meant to have the body become a constraint, and that I was there. From so far away, that support felt inadequate. It was inadequate. But it was what I could offer.

About three weeks before his death, I wrote to him. He had been quiet, and I asked how he was doing.

His reply was brief.

*Not good. Will write when I can.*

He never did.

There is no making peace with that sentence. Not yet. I carry it with the visit to Oregon I never made,

with the field trips that ended before I knew they had ended, and with all the things I assumed there would still be time to say.

I have written more here than I intended, and still it feels unequal to the life I am trying to remember. Too much is missing. Too many trips, conversations, jokes, questions, messages, silences, and small acts of kindness remain outside these pages. The visible record is there in papers, specimens, localities, discoveries, years of correspondence. The deeper record is harder to cite. It lives in the confidence Bob gave me when I was uncertain, the patience he showed in the field, the care with which he chose his words, and the way he made me feel that my questions mattered, that *I* mattered.

Bob's life should not be defined by the narrowing of its final years. I cannot remember him only through those last messages, or through the illness that kept closing the world around him. I remember his larger life first. Kate and Kit near the center of it. The desert. Mexico. Night lizards under agaves. Salamanders we kept failing to find. That laugh rising through a room. The questions he would not let go, and the people he drew into them.

I was fortunate to be one of those people. When I was young, uncertain, and trying to decide whether there was a place for me in herpetology, Bob helped me believe there was, and did so without ceremony. He invited me into the field, trusted my instincts, put my name beside his, and treated me as if I belonged there. I do not know how to measure what that gave me. I only know that much of the biologist I became, and much of the person I became, carries something of Bob in it. I told him that near the end, as best I could. I am grateful I did, though it does not make his absence easier to bear.

One phone call began my friendship with Bob. More than two decades later, I still hear his voice.

I expect I always will.

Bob wanted to be out in the world—looking, listening, walking, noticing. He lived for scenic overlooks, flowing streams, animals along the way, the small astonishments of natural history, and those increasingly rare places where one could still feel, if only briefly, that the earth had not been entirely overtaken by us.

## Covered in Shit, and Other Field Notes

Erik F. Enderson, Vail, AZ; [erikenderson@icloud.com](mailto:erikenderson@icloud.com)

I am a natural-born introvert, private by habit and slow to trust. The social climate of the last decade has only hardened that, leaving me more cynical than I would like and not much inclined to put myself in print.

Bob Bezy got past those defenses long before the walls got any higher, and he stayed there for our friendship of twenty-six years. I think he would encourage this, which is partly why I am writing it in a way I normally would not. Keeping myself out of it would be a hell of a lot easier. But I was in these stories too, and there is

no honest way to tell them as if I were not.

I should add that none of the aforementioned makes me a curmudgeon. I like to laugh, and with the people I trust I do plenty of it. Bob and I did more than our share.

So here I am, against my better instincts, writing about the parts that have largely stayed with the people who were there. Not because they were secret. More because they can lose something when you try to make them presentable.



Here, then, are a few candid, unvarnished excerpts from our years in the field, beginning with a Tiger Rattlesnake that Bob trusted more than I did.

### Venomous Optimism

In May of 2000, Bob and I were in the Growler Mountains looking for Red-backed Whiptails, *Aspidoscelis xanthonota*. We had spent the entire previous day searching and woke up and started in again. A couple of hours in, a Tiger Rattlesnake, *Crotalus tigris*, crawled out into the open right in front of us.

You don't often see a Tiger Rattlesnake out in daylight in late May, so we took advantage of the opportunity and turned it into a long photo session.

It was hot and we were already worn down. With no hook and no tongs, Bob was working the snake with a short stick. He would pose the snake with the stick and grab it by the tail to move it back every time it drifted out of position.

The snake was tired and hot too. It showed no real aggression, which I think made Bob more comfortable than the situation deserved. He was down on the ground, half on one hip, legs tucked to the side.

"Bob, it's getting real close."

"It's fine."

"Bob. Watch yourself."

"It's fine. It's all fine."

This went on long enough that I started to wonder whether I was watching a field savant or a man about to be bitten. Then, the snake moved across Bob's thigh. It was in no hurry about it, and neither was Bob. He was tired enough that his reactions were slow, at least a half-second behind where they should have been, and I watched the whole thing happen at that stretched-out pace where you have time to understand exactly what you are seeing and no time to do anything about it. The snake crawled over one leg and settled in behind it.

Bob froze and again said, "It's fine"

Except, it was not. His stick was too short to move the snake, and his body was stretched in such a way that he could not reposition himself without the real risk of a bite.

I extended the legs of my tripod and used it to lift the snake away from him and carry it over to the shade of an ironwood, where it would coil up and be done with us.

I was still getting to know Bob then, and this left me a little stunned. We were a long way from help, and neither of us wanted to see the inside of the hospital in Ajo.

I walked over and said, "Well..."

Bob said, "Nah, that snake was a puppy dog. Nothing. It was nothing."

I left it there and did my best to believe that the thing I had just watched had in fact been nothing... and fine. All fine indeed.

### The Eloquent Houses

In the spring of 2001 we were searching for satellite populations of the Arizona Toad, *Anaxyrus microscaphus*, near, but well-removed from the main Agua Fria drainage, where the species is known to hybridize extensively with Woodhouse's Toad, *A. woodhousii*. We were working from maps that had become largely obsolete, because development north of Phoenix had been busy improving the desert into something neither of us wanted.

The main offender was Anthem. We both thought Anthem was an absurd name for a place north of Phoenix, and the more we drove around it, the more it amplified the color our language.

Every road put us back where we had already been. We finally escaped and found another little community, one with houses and kids on bikes and people out walking, all the wrong signs of life. We needed directions, so I pulled up beside a man and parked the truck so Bob had to do the talking.

Bob rolled down the window and asked, in his gentlemanly way, where we might find the road we were after.

The man started in. Go here. Go there. Left at this, right at that. You'll see some houses.

Bob asked, "Near Anthem?"

The man stopped cold. Late middle age, ball cap, most of his teeth, and he had been happily pointing us down the road, but the question seemed to wound him. He drew his hand back and raised it toward Bob, palm out, the way you would ward off a man about to say something foolish in front of company.

"No..." he said. "Those are the eloquent houses."

I had just taken a drink. The instant he said "eloquent houses" I tried not to spray it across the dashboard and windshield, so I tipped my head back to stop it, which only rerouted the whole mouthful down my chin and shirt, and then I started to choke. Bob knew exactly what was happening. His deep raspy chuckle started up low in the passenger seat while the man kept right on with his directions, entirely unaware he had just handed us a phrase we would use for years. After that, any highbrow or overbuilt place became the eloquent houses. So much for avoiding introgression, one of us muttered.

### Putrid, but Better Than Shit

In July of 2001, Bob, his son Kit, Richard Felger, and I went into Vekol Valley for a night of frogging. We had timed it right. It had rained enough to bring the amphibians out in incredible numbers and make the roads nearly impassable.

We got as far as a spot we called the Grand Interchange, a needlessly convoluted junction of ranch roads running in every direction, including circles,

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false starts, and roads that seemed to exist only because somebody had once wanted a road right there and made one. We could go no farther by truck, so we got out and walked toward the nearest choruses.

I took about a half step and spotted the first Sonoran Green Toad, *A. retiformis*, sitting just outside my driver's door. It was going to be that kind of night. Amphibians were absolutely everywhere.

Richard was not the most rugged person in the field. He worried about slipping and going down, which was understandable. The mud was slick, the water was deep in places, and he had a new digital camera on him. Nobody wants to carry an expensive piece of equipment into the field and then drop it in chocolate-brown water full of cow excrement and assorted riffraff.

Bob, Kit, and I were less troubled by this. For us, it was standard table fare. At some point in a night like that you accept that you are filthy and stop taking it personally.

Richard did not reach that point.

Bob took on the job of walking him through it, side by side, step by step. From thirty feet off, Kit and I had the soundtrack.

"Bob, wait."

"Wait, Bob."

"Oh, wait."

"Bob. Bob."

Bob was patient at first. He really was. But every so often, I'd catch his face in my headlamp, and he was not amused. His patience was draining out into the same mud we were standing in. Kit and I documented animals on the far bank for a couple of hours, the whole time trailed by Richard's steady "Bob, wait" drifting across the dark. I finally told Kit we ought to go rescue his father.

When we made it back to the truck we were coated in a repugnant cattle tank marinade. I normally kept lightly scented wipes in the truck for nights like this. I had run out, and the store on the way stocked nothing but a foul-smelling generic brand. It was what we had. I handed the canister to Richard and warned him.

"These are putrid."

He took it, read the label seriously, opened it, pulled one out, and started wiping down his arms.

"Putrid," he said. "But better than shit."

A minute later, doors shut and engine going, finally pulling out, Bob took a long look at the state of us and said, "Here we sit. Covered in shit."

That quote stayed with us permanently, and found endless use. We'd say it downwind of a feedlot with the windows up and still gagging, or driving through a city that reeked, and again in the dead middle of a long night when fatigue started making the case for quitting.

## Nocturnal Hazards

Some of the worst field decisions are not made while walking in the field. They are made on the drive back, after the excitement is over and everyone should already be asleep.

One night in the early 2000s, Bob and I were south of Pisinemo on the Tohono O'odham Nation, near Vamori Wash. It had rained significantly, the desert had erupted with life, and we stayed out much longer than we should have. By the time we got back to Bob's white Ford sedan it was around 3:30 in the morning. We chugged store-bought iced coffees and started north toward Highway 86.

We were deep in conversation about the night's finds and what we might do with them, and paying no attention at all to the road. That became clear when the stop sign at Hwy 86 appeared out of nowhere. Until that moment I had been a self-respecting atheist. I yelled:

"Jesus! Bob, stop!"

Bob did not instantly understand what I meant. Then he saw the sign and stood on the brakes. We skidded through the stop sign, across the highway, down the embankment on the far side, and spun most of the way around. By pure luck, or my newfound religion, we did not flip and end up in the flooded part of the ditch. We came to rest, shaken and awake in a way the iced coffee could never possibly manage. There was relief, and eventually uncomfortable laughter.

After that, Bob generally preferred that I drive, which was understandable, though it did not make either of us any safer.

A few years later we were on Highway 16 in Sonora, heading back to camp at Mesa del Campanero. We had worked all day and most of the night, quitting around two in the morning with a couple of hours of driving still ahead of us. We were exhausted and out of caffeine. Highway 16 is a treacherous road, curve after curve, with semi traffic that gave a tired mind no room to wander.

We were coming around a blind corner in complete silence when Bob screamed. Not a word. Just a full scream.

I jumped, swerved, and nearly put us into the side of the mountain before I got the vehicle back.

"What, Bob? What? What happened?"

"Nothing. Nothing. Nothing. It's nothing."

"Did you see something?"

"No. No. It's fine. It's fine. I thought I saw a truck." There was no truck. That is what sleep deprivation does. It starts making suggestions.

Then there was the milksnake.

In August 2007, Bob and I found a large Sinaloan Milksnake, *Lampropeltis triangulum sinaloae*, well over

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a meter long, on Highway 16. We kept it overnight to photograph in daylight, then continued working the road until we simply could not anymore. The drive back to Mesa del Campanero was quiet, not because we had nothing to say, but because we had absolutely nothing left to say it with.

The snake was in a pillowcase. Admittedly, this was not our finest hour. We both knew that *Lampropeltis* chew through pillowcases, and this one did.

Partway up the long slow climb to camp, something bumped my leg. Then pain. Then more pain. A snake was crawling into my lap and biting my inner thighs and crotch, repeatedly, while I drove.

"Ouch! Goddamnit! What the fuck?! Bob, the fucking milksnake got out!"

"Where is it?!"

"It's biting my legs... ahhh... and my nuts!"

Bob started laughing. Then I started laughing too, which did nothing to stop the biting, and less than nothing for the fact that I was in shorts. He got the light on, saw the snake doing exactly what I had described, and tried to grab it, but it was too late. It had disappeared like the serpent creature from the trash compactor scene in Star Wars. I pulled over at the first place I could, found the snake, and placed it in a more suitable container. Yes, one with a lid.

That was the last time I wore shorts in the field.

### Lines on a Map

Bob's nerves about Mexico were real. He had his own history there and his nerves were not what they had once been. But over the years, enough happened on the Arizona side to complicate matters. How much safer are we here? It was fair to ask.

At Martina Mountain, just east of the Tohono O'odham Nation, we were interested in a possible contact zone between Red-backed Whiptail, *A. xanthonota*, and Giant Spotted Whiptail, *A. stictogramma*. The road was rough and slow, with several barbed-wire ranch gates to open and shut. As we approached a densely vegetated wash, I saw two people duck fast out of sight. My first thought was that they were migrants worried we were Border Patrol. We came across migrants often, and they certainly never frightened us. More than once Bob and I had given people food, water, and directions. A couple of times we made a call for them, to local relatives, or to the Border Patrol if that was what they asked for. This was not one of those times. As we got closer I saw there were three of them, and beside them sat telltale rectangular makeshift backpacks, the kind drug smugglers use. Bob had not seen them. I pointed.

"OK. I see them."

He looked again.

"OK, I see them, and they're wearing camouflage.

Yes, I see them...and the packs. OK, they're hiding. Yes, they're hiding all right. Let's go."

That was our first and last trip to Martina Mountain. It was also when Bob began to wonder whether the U.S. side of the border offered any real safety for people doing the kind of fieldwork we did.

In Vekol Valley, in 2003, we had a similar moment, though this one frightened me far more. We were working west through creosote and washes toward a large earthen tank the maps showed, one that interested us because it was well outside the Vekol Wash floodplain. We came around a bend and found three late-model trucks parked near it. Tinted windows. Extravagant wheels and tires. They were not ranch trucks, field vehicles, or weekend off-roaders. Several men stood around them, well dressed in urban attire, shirts tucked in, hair done, dark sunglasses in the middle of nowhere. It was right out of a movie. Their heads snapped toward us, and then they moved fast for the vehicles.

Stunned. I stopped, turned around, and drove out through the creosote as fast as the truck and the ground would allow. Bob was checking his side mirror. "I don't see them... I can't see through the dust." I drove as fast as I could while trying to keep one eye on the road and the other on the rearview looking for them to come up behind us. They never did. Whether they never cared or my driving helped, I couldn't tell you. What I can tell you is that the stories about smuggling in the Vekol were not just stories. We would learn later of a string of cartel murders and armed robberies in the area. As I write this in July of 2026, the Vekol is a well-known smuggling corridor for narcotics and migrants.

Near La Cienguita, in southern Sonora, the danger came differently. We were in the Río Fuerte watershed pursuing northern distributional records. A young man flagged us down. We stopped. He started with a half-hearted smile and vague praise for all of it. The river was beautiful. The mountains were beautiful. Everything was beautiful. He went in circles for a couple of minutes and then asked if we would take him to Álamos.

Bob, kind-hearted as he was, asked whether I was okay with it. I was not. I asked him to probe a little.

He had us pegged as tourists headed to Álamos. Then he said he needed to go to Guirocoba for his things and put them in our trunk. When I asked what things, he talked for a solid two minutes, most of it too fast for me to follow, and I could smell the alcohol on him. I began to wonder whether he was simply drunk, and whether I had mistaken intoxication for something more dangerous.

Then he said he might bring friends, because they had stuff too.

Bob became uncomfortable.

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"No, Erik, we shouldn't do it."

The man started talking mostly to Bob and around me. He could feel me hesitating and his voice came up.

"Take me to Álamos."

The friendliness went out of his face.

"You will take me and my stuff to Álamos!"

His hand dropped below my window, down toward his waistband, and I couldn't see what he was reaching for.

"Bob, we need to go." I started the car. "I'm just gonna guts-ball it."

Bob said, "Go."

I floored it. As we pulled away, I saw him slide a short knife into his pocket. I remember being relieved it wasn't a gun, which says something about where our heads were by then.

Later that summer we were meeting with Richard Felger about our Vekol Valley amphibian work, part of the case for what became the Sonoran Desert National Monument. Somewhere in the conversation this incident came up, and we told him what had happened. He offered what he considered the local context.

"It's a well-known fact," he said, "that if you go to Guirocoba, bring a gun. Go to Choquincahui, bring a coffin."

Typical Richard. His flair for the melodramatic was well known. We laughed, though Richard did not, delivering it with the stone-faced seriousness of a man reporting a fact. That said, a man not far from there did pull a weapon on us, which took some of the humor out of it, and left me wondering whether Richard was joking at all.

Not every vehicle behind us meant trouble, though experience made that hard to remember in the moment. Once, east of Yécora on Highway 16, a vehicle came up tight behind us and stayed there. Locals had warned of bandits near the Chihuahua border, so we were cautious. If I sped up, it sped up. If I slowed down, it slowed down. I pulled over a little to wave it around and it would not pass. The back of the truck was packed with gear, so the rear window was useless and the mirrors weren't much better. Finally, around a curve, the sun caught their windshield and I could see a man and a woman inside, maybe someone between them.

"Bob, I don't know what to do. Maybe we should just pull over."

We did. They were ranch caretakers from nearby Arroyo Hondo. A few days earlier we had been asking around about access, word had gotten to them, and they had been chasing us down to say we were welcome to stay at the rancho. This was most generous, though I would not recommend tailgating two tired gringos through the Sierra Madre as the most direct way to extend hospitality. We stayed one night, and they were lovely people.

## Pond Hopping

In July of 2003, Bob, Kit, and I went to Sonora to rediscover the northernmost population of the Little Mexican Toad, *A. kelloggi*. We started around Santa Ana and found only dry ground. That night we camped a few miles south and watched an enormous rainstorm build to our south, too tired to chase it. The next morning we drove down and confirmed what we already knew, that it had fallen well to our south, around Benjamin Hill. We spent a night there and didn't find *kelloggi*.

The next morning we went over a printed spreadsheet of University of Arizona records. The records thinned out up where we were and grew denser to the south, clustering around Hermosillo, then Guaymas, then Álamos.

Bob studied the spreadsheet just long enough to lose patience with our northern approach.

"Hermosillo. Guaymas...". A large sigh followed. Exasperated, Bob said, "Why the hell are we pond hopping up here? Let's hop our way to Álamos."

Kit was a quiet, mild kid, but he let out a laugh I had never heard from him before and never heard again. Bob heard it, and broke into a huge smile and a laugh of his own.

That may have been what settled it.

So, we pond-hopped our way to Álamos. We stayed three nights, and saw a great many things, *A. kelloggi* among them. We never did find the northern population, so by its stated purpose the trip failed. Instead, we went on a pleasure cruise from the top of Sonora to the bottom.

One of Bob's favorite photographs came from that trip (Photo 1). He and Kit are on the bridge over the Río Cachujaqui, the Sierra de Álamos behind them, Bob holding a makeshift lizard noose we'd tied to a branch, Kit leaning on the rail and smiling beside his dad. He loved any picture with Kit in it, and he loved this one.

## Cupcake

In all my years with Bob, I can't think of anyone who made him laugh harder than Roger Repp.

Roger could be crude, kind, outrageous, impatient, and warm, sometimes inside a single sentence. He had a way with words I will always remember, even when the words were not fit for general audiences, which was often.

Sometime in the early 2000s, Roger, Kit, Bob, and I went to Petrified Forest National Park to meet Erika Nowak and help survey for milksnakes. The first night, Erika drove and the rest of us watched the road. Roger was not particularly patient when it came to night driving tactics, and at some point he said to Erika, "Come on! Let Cupcake drive."

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**Photo 1.** Bob and his son Kit on the bridge over the Río Cuchujaqui, the Sierra de Álamos behind them. Sonora, July 2003. Photo by Erik F. Enderson.

Cupcake was a name Roger had hung on me years earlier for reasons I no longer remember. It was the first time Bob had heard it.

He broke into uncontrollable laughter.

Roger wanted me driving because back then I had 20/10 vision and a knack for picking animals off the road that other people missed. It was one of the few natural gifts I had. From that night on, Bob took great delight whenever Roger called me Cupcake, whether in person or in writing.

The next morning I took another of Bob's favorite photographs (photo 2). Bob is holding a milksnake, Kit seated on the ground to his left, both plainly happy. That one meant a great deal to him too.

The milksnake and Cuchujaqui photographs are printed and have sat on my bookshelf for many years. I think I printed them after Kit died. For a long time they were just good memories. Now they feel different, because both Kit and Bob are gone. So too is Roger, last fall. Richard some years back. Four people who filled these stories, and not one left to argue with my telling of them.

I still go out, usually alone, and every so often I catch myself talking to someone who is not in the passenger's seat. Old habits I suppose.

So that's it. I have told these stories as best I can. I was lucky beyond any measure to have known them, and luckier still to have spent the time I did with Bob. And that is not a thing a person should withhold.

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**Photo 2.** Bob and Kit with a milk snake, *Lampropeltis triangulum*, found during a night of searching at Petrified Forest National Park, Arizona. Photo by Erik F. Enderson.

## Reflections on Bob Bezy by Don Swann

Bob Bezy was one of Arizona herpetology's quieter giants and greatest characters. I met him many years ago when we served together on the THS Board of Directors. In matters of conservation, taxonomy, and ethics, Bob's role on the Board was often to be an irascible pain in the butt...but his views were nearly always correct and ultimately convincing.

After a passionate boyhood in herpetology in Phoenix, an apprenticeship with Charles Lowe at the University of Arizona, and career as a professional herpetologist with the Los Angeles Natural History Museum, in retirement Bob returned to Tucson to pursue field work, writing, and THS. He was THS Secretary for many years, but his main contribution to the Society was as Associate Editor for the *Sonoran Herpetologist*—a title that doesn't begin to describe Bob's contribution to the journal. Associate Editor Bob read every word within a day or two of receiving the version for editing, then sent in well-thought comments and corrections. He was a relentless editor who believed in clear, grammatically correct sentences; content that contributed to science but was fun to read; and articles and photos that put the animals first.

A specific example that comes to mind is that it bothered Bob greatly that the photos of our speakers on the cover page would sometimes pose with a captured reptile or amphibian in their hands. He felt it was demeaning to the animals, emphasized the macho stereotype of the brave, male, white herpetologist, and was not appropriate for the journal of a conservation organization. I didn't see it as he did at first, but then I did, and while I was editor we stopped this practice.

Bob's clear vision of what this journal could be forms the foundation of what the *Sonoran Herpetologist* is today with Howard Clark as editor: nationally respected and dedicated to research while also spreading the essential news and mission of the Society.

We are all fortunate in his later years that Bob found time to write down the rich details of a life spent travelling and studying reptiles and their world, especially night lizards. If you have read even a small portion of Bob's book on *Xantusia* and his many articles on herpetological history, boyhood memoirs, travels with Chuck Lowe, and esoteric herpetologica, you cannot help but appreciate Bob's

Bob Bezy was one of Arizona herpetology's quieter giants and greatest characters. I met him many years ago when we served together on the THS Board of Directors.



gifts as a writer. His writing is rich in the history of American Southwest, deep with insights into many different species, and full of wonderful details about desert and mountain habitats and human cultures. His essays are well-crafted, self-deprecating, very funny, and full of insight: prose directed at us commoners written unabashedly in the spirit of a gifted and deeply educated herpetologist.

To protect the animals that fascinate us, we need to love the natural places they live in. In his night lizard book Bob writes:

*“For most of the lure (of herpetology) is a deep fascination with the animals themselves, the beauty and mystery they radiate, their unknown lives, and the wild places they inhabit....As we face the rapidly accelerating Anthropocene mass extinction, this is our last chance to understand and appreciate much of the natural world that produced us.”*

Bob’s legacy is in these writings, truly significant contributions to the world of Sonoran Desert herpetology that will teach and entertain his fellow herpetologists for many years to come.

## Recollections of Robert L. Bezy by Jay Cole

Bob was an amazingly gifted person in many ways, as everybody will note, so I will not repeat what others are saying. As for me, Bob taught me the most about plant ecology, getting me up to speed to survive as a Lowe student. I had the pleasure to get to know Bob best in 1967, when the two of us spent the whole summer driving extensively throughout Mexico in search of frogs, *Sceloporus*, xantusiids, and whiptail lizards for completing our dissertations and other papers. After years of experience with *Xantusia*, Bob was ready to take on the rest of the family. It was as if he had become one of them. At any locality his mind

immediately went into the crevice-searching mode, whether in rocks, plants, human-built structures, or any combination of things, also occupied by scorpions. He jumped into action like a well-trained hunting dog sniffing out its game and persisted until he found what he wanted. At sites where it was reported that one xantusiid had been found previously and it was very rare, after an hour or two Bob would return to the van with a dozen, while I might have been lucky to catch one or two. This became the routine. He could find a xantusiid anywhere, and I swear that in a part of his own mind, Bob really was a xantusiid lizard.

Bob was an amazingly gifted person in many ways, as everybody will note, so I will not repeat what others are saying. As for me, Bob taught me the most about plant ecology, getting me up to speed to survive as a Lowe student.



The demands of tropical fieldwork: heat, humidity, a torn shirt, a bitten hand, and Bob grinning through all of it. Neotropical Whipsnake, *Masticophis mentovarius*, Río Cuchujaqui, Sonora, July 2003. Photo by Erik F. Enderson.



## Reflections of Robert L. Bezy by Jonathan A. Campbell

I was sad to learn of Robert Bezy's recent passing. Although I met him only a couple of times at professional meetings, we maintained between us an active correspondence over the years. It was obvious from the first time I met him that he had a special connection and love with nature. I'll never forget his enthusiasm, especially when talking about things such as his field work in Mexico. His passion was especially evident with regard to the night lizards, towards which he directed so much of his professional endeavors. His excellent contributions

in herpetology will be long remembered. I am pleased to have had the opportunity to coauthor the chapter on Xantusiidae in an upcoming book on the Mexican herpetofauna. This perhaps will be his last contribution of the many he made throughout his distinguished career. I will remember him as a kind and passionate person. Bob's fieldwork took him frequently to Mexico, the land and people he loved. I would like to think his soul is now hovering somewhere over the Land of Enchantment. "Que en paz descanse" my friend.

## Reflections on Bob Bezy by Joseph R. Mendelson III

Bob Bezy was among the very first professional herpetologists I met in my career. I was star-struck when I connected his name tag with the *Xantusia* papers I had read. Astonishingly (but not surprising, as I got to know him), he always remembered me throughout my career and always made a point to check-in with me in a friendly and supportive manner when we were at conferences, etc. Even though our

research was quite similar in some ways (him with lizards and mine on anurans) and across similar geographic areas, we never collaborated on anything. I regret that missed opportunity but am nonetheless grateful that I got to know him a bit. His contributions will last forever, and those of us who got to meet him will always be a bit richer for the experience. Such a nice and slightly eccentric character.

## Remembering Bob Bezy by Michael Robinson

Bob and I were graduate students together and he taught me a great deal about curating herpetological specimens. I was fortunate to share field trips with him collecting amphibians and reptiles, and of course his favorite *Xantusia* lizards. Bob accompanied me on several collecting trips to the Gulf of California islands

that produced several new locality records. His good sense of humor provided relief in our occasionally tense lab environment. Upon graduation, my professional life took me outside the United States, but upon my return, we frequently exchanged messages. He will be greatly missed.

Bob Bezy was among the very first professional herpetologists I met in my career. I was star-struck when I connected his name tag with the *Xantusia* papers I had read.



Bob on the Río Bavispe the morning after our encounter with the sicarios near Ónavas. July 23, 2009. The last photograph I took of him. Photo by Erik F. Enderson.



## Reflections of Robert L. Bezy by José Daniel Lara-Tufiño

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### Spanish version

El Dr. Robert L. Bezy (1941–2026) fue la autoridad indiscutida de las asombrosas lagartijas de la familia Xantusiidae, un antiguo clado compuesto por los géneros *Cricosaura*, *Lepidophyma* y *Xantusia*. A lo largo de 60 años, el Dr. Bezy realizó extensos estudios sobre la sistemática, taxonomía y variación cariotípica de estas lagartijas, estableciendo un amplio y sólido marco para estudiarlas. Este marco excepcional ha permitido comenzar a investigar la filogenómica, la biogeografía y la ecología de estas increíbles lagartijas; y en el futuro, seguirá siendo un punto de partida para revelar interesantes y únicos enigmas dentro de la familia Xantusiidae.

Al igual que al Dr. Bezy, me apasionan las enigmáticas lagartijas *Lepidophyma*, y debido a este gusto compartido, mantuve una correspondencia de aproximadamente 7 años con él. Siempre me alentó a estudiarlas, me relató anécdotas y me enseñó con sus nutridas respuestas en torno a mis dudas sobre el género. También, me contó algunos de sus “planes pendientes”, de investigaciones que planteó pero que el tiempo no le permitió culminar. Sin embargo, algún día estas investigaciones se culminarán, y ciertamente, se harán con ayuda del legado que nos dejó.

No tuve el privilegio de conocer en persona al Dr. Bezy, cuando platicábamos al respecto, me respondía “Sadly we will never meet because I have severe COPD...”, y así fue. Sin embargo, logré conocerlo a través de su excepcional obra y su calidad como persona, y me siento honrado de que me haya considerado su amigo. Como él solía decir “All is well that ends well”, y sin duda, así fue su extraordinaria trayectoria humana y académica.

### English version

Dr. Robert L. Bezy (1941–2026) was the undisputed authority on the remarkable lizards of the family Xantusiidae, an ancient clade comprising the genera *Cricosaura*, *Lepidophyma*, and *Xantusia*. Over the course of 60 years, Dr. Bezy conducted extensive research on the systematics, taxonomy, and karyotypic variation of these lizards, establishing a broad and robust framework for their study. This exceptional framework has made it possible to begin investigating the phylogenomics, biogeography, and ecology of these amazing lizards, and in the future, it will continue to serve as a foundation for uncovering fascinating and unique mysteries within the family Xantusiidae.



Bob taking shade under a strangler fig, *Ficus petiolaris*, east of the Río Yaqui. Sonora, July 2005. Photo by Erik F. Anderson.

Like Dr. Bezy, I am deeply passionate about the enigmatic *Lepidophyma* lizards, and because of this shared interest, I maintained a correspondence with him for approximately seven years. He always encouraged me to study them, shared anecdotes with me, and taught me through his thoughtful and detailed responses to my questions about the genus. He also told me about some of his “unfinished plans”—research projects that he had envisioned but that time did not allow him to complete. Nevertheless, one day these studies will be completed, and they will undoubtedly do so with the help of the legacy he left us.

I did not have the privilege of meeting Dr. Bezy in person. Whenever we talked about it, he would reply, “Sadly we will never meet because I have severe COPD...,” and that is exactly how it turned out. Nevertheless, I came to know him through his extraordinary body of work and the remarkable person he was. I feel honored that he considered me his friend. As he used to say, “All is well that ends well,” and without a doubt, so it was his extraordinary personal and academic journey.

Dr. Robert L. Bezy (1941–2026) was the undisputed authority on the remarkable lizards of the family Xantusiidae, an ancient clade comprising the genera *Cricosaura*, *Lepidophyma*, and *Xantusia*.

## Remembering Beez by Paul Dayton

I am a very old marine ecologist here badly out of my water, yet Bob was my most important mentor in college, my age of enlightenment. I am very grateful for the opportunity to share some memories and thoughts. From a rather small high school in 1959 I stumbled into the UA summer school to take some remedial classes, and I wandered around the campus trying to figure out how to be a real college student rather than a poorly prepared pretender. Fortunately, my mother was friends with Wally Heath, one of Chuck Lowe's students, and Wally dug me out of the library and introduced me to Bob Bezy, an incoming student interested in Lowe's lab. At that time the UA forced us to take a year-long Humanities class. That class was by far the single most important class of my life introducing me to the overwhelming breadth and depth of human history. I struggled to earn B's in Humanities, but unfortunately flat-out flunked introductory Algebra (a real F, not a low D) and got very low C's in all the other classes. I had to declare a major and was interested in archeology, so I listed a major in Anthropology. Barely passing one of their easiest psychology classes helped me lose interest in both people and that major. But at the end of the year, there were serious questions as to whether I belonged in college at all.

The only reason I stayed in college was that I did not want to disappoint Wally and Bob who were always supportive and doing interesting things. While Wally was busy doing his thesis on freshwater fish, Bob was taking many of the same classes I was taking and we became friends, and he was one of those very rare friends that one could ask the most elementary stupid sounding questions and have it treated with dignity and a respectful answer. In this way he educated me on everything from vocabulary to God. He used many words I had never heard, and I still remember a gentle explanation of "ubiquitous," for example. God was a different matter as this had been a very important presence in my little mostly Mormon high school, and one apparently important to Bob who spend several weeks impressing on me that in science we deal in facts, and God was NOT a fact. Braided into these God lessons were many stories of God's weapons, the nuns, who regularly beat Bob's knuckles bloody. For several years I subconsciously put my hands behind my back when I passed a nun.

But it was the love of nature that so inspired both Wally and Bob that saved me. In the early 1950s I had become seriously involved in diving in the Gulf of California where my interests had evolved from killing things to understanding them. However, Wally took me on many of his fish collecting trips where my underwater abilities were useful and appreciated and Bob took me on many local excursions searching for reptiles and very importantly, searching for meaningful

definitions of habitats that had to be defined in terms of the animal in question. This insight was critical to the rest of my career and is still important. I had always had a good sense of place, but it was intuitive, not something that needed to be defined and tested.

The two of us went on many short trips to different habitats around Tucson. As I recall, our little trips to get into the Rincon and Santa Rita mountains, or various canyons on both sides of the Catalina Mountains were simply excuses to see new places. And of course there were other collecting trips, usually with Wally Heath, such as the time we rafted down the Rio Arizona in Wally's VW bus! Bob came on many of our family camping trips where he became something of a legend. I particularly remember a trip to Mexico when we were setting up camp, Bob extracted a pistol from his sleeping bag and began blasting lizards with his pellets. My law-abiding father soiled himself, but my mother thought it was exciting and hustled around with Bob looking for targets and retrieving them to take to Lowe's lab where the living ones would be killed to become critical thermal maximum (CTM) data, thus contributing to science! In this way my mother and Bob also became good friends and he was always welcome on the many family camping trips.

One of these trips badly tested the friendship. It was a trip to Bahia Colorado, one of my all-time favorite spots on earth, now totally ruined. I loved the pristine diving, but the landscape was unique as it had both species of two similar types of columnar cacti that rarely coexist but in a small area one found cardon and saguaro arm-in-arm as well as senita and organ pipe cacti clustered together. In those days it was a rough truck road to the beach, but the habitat was truly magical. One day Bob, Mona (my mother) and I were wandering around looking for lizards to shoot and we wandered into a wash that went near an old mine shaft. I thought I saw a large tractor tire under an ancient creosote bush and could not figure out how a large tire was under a bush much older than any tractor and went to investigate and found the Godzilla of Boa Constrictors! It was massive, awake but very relaxed, and allowed us to gently unroll it from the big bush and Bob was excited about taking it back to the lab where the massive gentle creature would die. Mona and I disagreed, but Bob was stubborn and the snake was gently pushed into one of those old military duffel bags. In the morning the snake was gone, the bag open, and Mona was smug but totally denying guilt. It was clear that she had released it. Bob spent a lot of time tracking it, but the snake lived a few more years, no doubt flattened by a bulldozer. I had a photograph of the snake draped around my mother's neck with a visible amount of both ends of the snake lying on the ground. Not only was it extraordinarily large, it pushed the northern distribution, and Bob bugged me

I am a very old marine ecologist here badly out of my water, yet Bob was my most important mentor in college, my age of enlightenment. I am very grateful for the opportunity to share some memories and thoughts.



for that long-lost photo for decades! Eventually he even confessed that deep down he was glad that Mona had saved the snake!

So, like many readers with much closer professional and personal ties to Bob, he was a best friend and very important mentor to me at a time when I desperately needed a mentor. He was a true and very important friend for the rest of our lives, always fast to respond with

supportive words and encouragement, even as his own life started to collapse with the loss of his health and his beloved son. He died peacefully in his sleep, an ending many of us hope for, but before I wrote these words, and I never communicated these thoughts to him when he could have appreciated them. This fact leaves a hole in my soul, and I pledge to attempt to share such thoughts with other surviving important friends.

## Remembering Robert L. Bezy by Robert W. Murphy

I first met Bob c. 1972 when I was a wannabe graduate student working as a preparator at the Dallas Museum of Natural History and he was an established Curator at LACM. Initially, contact was made via my early interest in using non-traditional characters in herpetological systematics, i.e., chromosome evolution, and after contacting the other Curator at LACM, John Wright, a seemingly established purveyor of karyological studies. The first contact only lasted a few minutes only, but I was immediately impressed by his professionalism and willingness to help a young student. Time passed and I got to know him better c. 1977 after I moved to UCLA for graduate studies.

My interactions with Bob, and by extension Kate, were more on a personal rather than professional level, because John suppressed Bob's authority by not letting him make decisions on loan requests, but rather gave the authority to his technician, and hogged interactions with visitors. This spoke very loudly about Bob's kindness, patience, character, and incontestable ethics. Whereas today such persistent, egregious bullying by John would be a matter of great concern for any HR department, and nowadays a crime, but back then nothing would or could be done. Bob held his course, kept his nose to the grindstone, tolerated the repression, and moved forward with research and publications as much as possible. I will forever remain in awe about Bob's silent and inspiring inner strength.

Bob and I never worked together on research. He largely studied xantusiids, and I did not. That said, I have many very fond memories of our interactions, virtually all of which are not related to research but rather associate with my family. For example, one day when John Wright was out of town(!) and at the invitation of Bob and Kate, I took my young daughters to LACM for a back-room tour of a new exhibit that was being constructed. Bob and Kate took complete control of the event leaving a lasting impression on me and my daughters. That was the nature of both Bob and Kate—genuine friends whose too little time we spent together remains cherished.

Time passed, I graduated from UCLA and moved to Canada, and topographically my research largely shifted from North America to Asia. Subsequently, I lost contact with Bob, that is until we rediscovered each other on Facebook. Bob's innumerable posts rekindled fond memories and brought countless smiles. I grew to greatly appreciate his insights and story-telling abilities. His stories would make me laugh out loud, often make me recall my own experiences in Mexico and the Southwest, and sadly bring tears when I read about the tragic loss of his son, Kit. Memories about Bob will always occupy a pigeonhole in my mind.

Robert W. Murphy  
Sr. Curator Emeritus—Royal Ontario Museum

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## Remembering Robert L. Bezy by Dr. Elizabeth Sinclair

I first met Bob when he visited Jack Sites and myself (a then new post-doc) at Brigham Young University in 1999. Bob shared his precious Xantusiid tissue collection with us. He was so very excited about what genetic data could bring to understanding relationships among night lizards, especially the ancient divergent *Xantusia* lineages from Baja California, Mexico. I saw my first living *Xantusia vigilis* during a visit to the Bezy family residence in Tucson, Arizona in May 2000.

Bob's extraordinary knowledge of and attention to detail allowed a rare opportunity to truly integrate multiple data types to understand evolution of this ancient group across a complex biogeographic history of southwestern USA and central America.

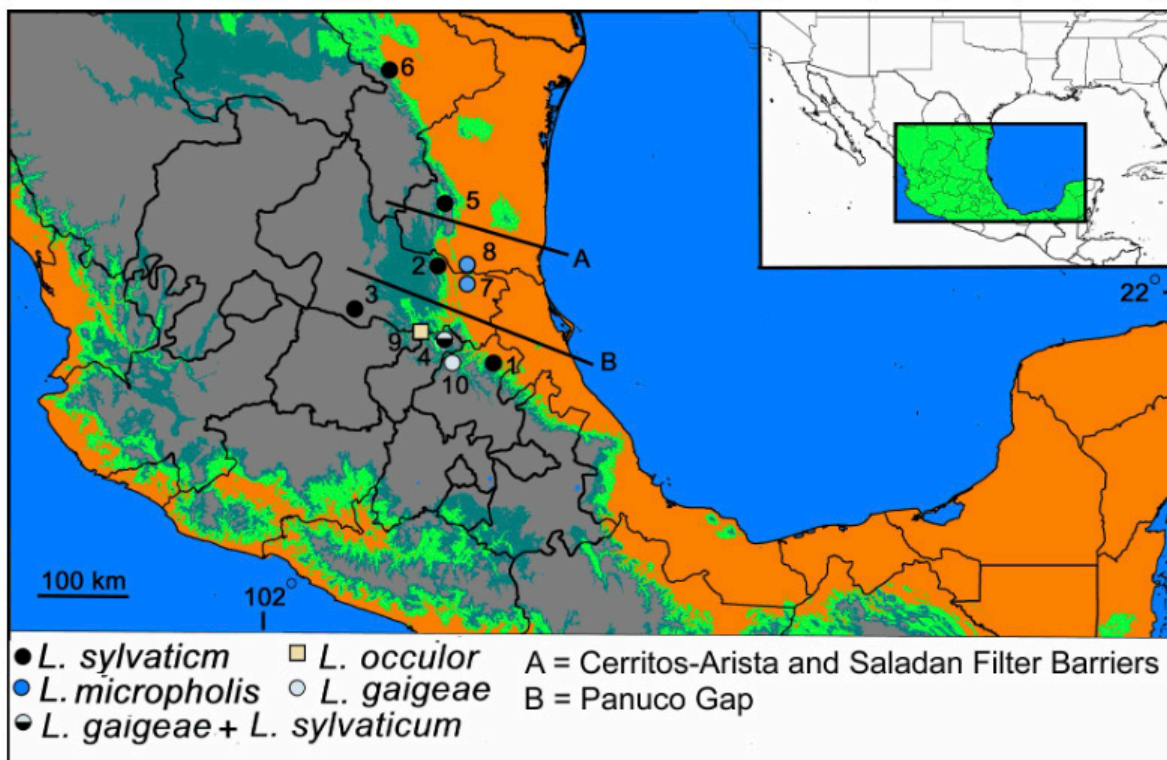
We went on to publish four papers including a seminal one demonstrating non-hybrid vertebrate parthenogenesis in *Lepidophyma flavimaculatum*—hopefully someone will determine the actual mechanism in time. Sadly, one last manuscript did not get published, much to Bob's frustration! A new position back in Australia, advances in genetic technologies and time got the better of us. We were trying to understand origins of the tropical night lizard clade *Lepidophyma sylvaticum* and *L. micropholis* inhabiting the Sierra Madre Oriental in northeastern Mexico. I'm sharing a graphical abstract here which I'm sure Bob would appreciate.

# Tangled Evolutionary Histories: Speciation, Incomplete Lineage Assortment, and Secondary Contact in Tropical Night Lizards (Xantusiidae: *Lepidophyma*) of Northeastern Mexico\*

E.A. Sinclair, R.L. Bezy, K.A. Crandall, and J.W. Sites, Jr.

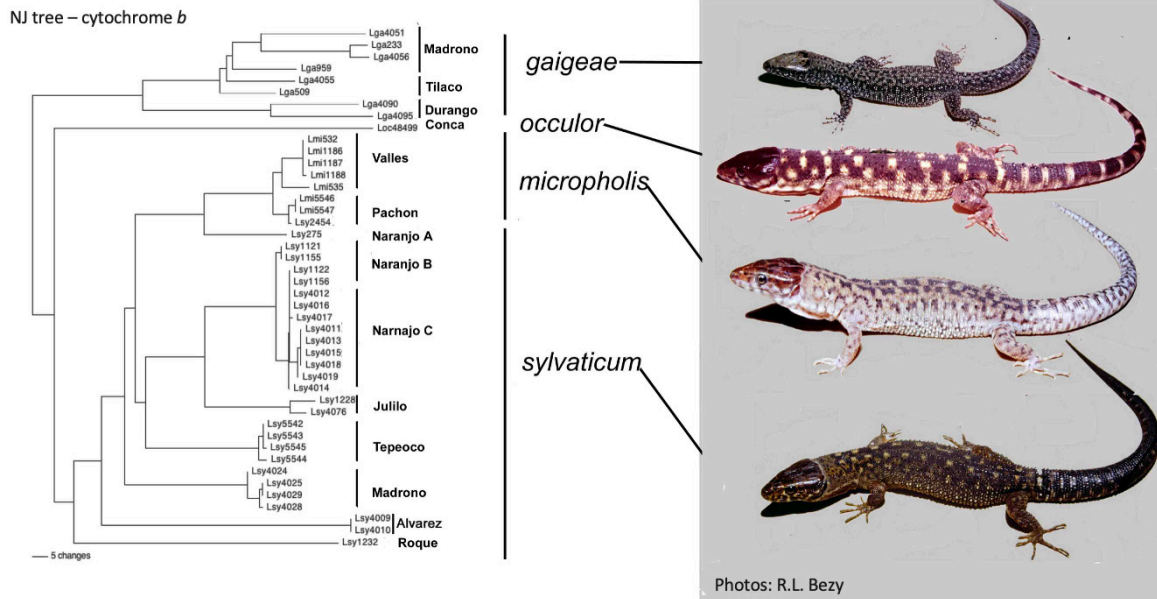
**Abstract**—The extraordinarily rich biodiversity of Middle America has been shaped by a complex geological history that includes extensive Miocene aged mountain building and climate cycling throughout the Pliocene/Pleistocene. This history resulted in species' range expansions and contractions leaving genetic signatures of speciation, complex biogeographic and phylogeographic patterns, secondary contact zones and hybridisation, and facultative parthenogenesis. We examined genetic patterns in mitochondrial and nuclear markers within a well-supported clade of the reclusive tropical night lizards (*Lepidophyma* spp.) inhabiting northeastern Mexico. The mitochondrial DNA lineages within *L. sylvaticum* were deeply divergent, consistent with genetic isolation and suggestive of cryptic speciation. They also suggest that 'troglodytic' populations of *L. micropholis* in the Sierra Abra were derived from *L. sylvaticum* in the Sierra Madre Oriental to the west in San Luis Potosí. Heterozygosity in nuclear DNA markers (sequences and microsatellite loci) detected signals of incomplete lineage sorting and zones of secondary contact, also in San Luis Potosí. The deeply divergent, time-calibrated lineages within the *L. sylvaticum*/*L. micropholis* clade are consistent with Miocene volcanic events creating a complex topography and isolating peripheral populations. Climatic change associated with the Plio-Pleistocene cycles, which resulted in cyclic expansions and contractions of the Mexican pine-oak woodlands, likely explain the secondary contact zone in San Luis Potosí and elsewhere. Speciation of *L. micropholis* probably occurred as a result of a drying climate, restricting populations to limestone caves and crevices, but with some potential for gene flow.

\*Abstract to an unpublished manuscript as explained on page 151.





## MEMORIAL TRIBUTES FOR ROBERT L. BEZY



I'm very grateful our paths crossed so early in my research career. Bob was a shining example of how a love and fascination for our beautiful natural world drives a lifelong dedication to the pursuit of knowledge, to make a difference, and inspire generations of young scientists.

Thank you Kathryn and Kit for sharing him with us.

Best wishes at this difficult time,

Dr. Elizabeth Sinclair  
University of Western Australia



Bob and Kate with a local family who talked with us about the area and our work, municipio de Yécora, Sonora. July 2006. Photo by Erik F. Enderson.

# Notes on Reproduction of Woodhouse's Toads (*Anaxyrus woodhousii*; Anura: Bufonidae), from Texas

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*Anaxyrus woodhousii* (Girard, 1854) (Fig. 1) has a range including the Western United States (excluding Great Basin and Pacific Coast) and Northern Mexico (Frost 2026). It is a species of Least Concern due to its wide distribution, habitat tolerance and presumed large population (IUCN SSC Amphibian Specialist Group 2021). Stebbins (1951) reported *A. woodhousii* breeding occurs February to September across its range. In Arizona *A. woodhousii* breeds February to June in permanent water, and July to September in summer rains (Holycross et al. 2002). Tipton et al. (2012) reported *A. woodhousii* in Texas may breed from February to September. Other information on *A. woodhousii* reproduction is summarized by Goldberg (2017), Sullivan (2005), and Dodd (2023). In this paper I present data from a histological examination of *A. woodhousii* gonadal material from Texas.

A sample of 33 adult *A. woodhousii* collected 1946 to 2002 from Texas was examined from the Biodiversity Research and Teaching Collection of the Department of Wildlife and Fisheries Sciences (TCWC), Texas A&M University, College Station, Texas, USA (Appendix). The samples consisted of 13 adult males (mean snout–vent length, SVL = 78.3 mm  $\pm$  7.0 SD, range = 66–90 mm) and 20 adult females (mean SVL = 86.4 mm  $\pm$  10.4 SD, range = 70–106). Utilization of museum collections for obtaining reproductive data avoids removing additional animals from the wild.

A small incision was made in the lower part of the abdomen, and the left testis was removed from males and a piece of the left ovary from females. Gonads were embedded in paraffin, sections were cut at 5  $\mu$ m and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreiber 1997). Histological slides were deposited at TCWC.

Testicular morphology is like that of other anurans as described in Ogielska and Bartmńska (2009a). All 13 males were undergoing spermiogenesis. My male samples are from the following months: March (1), April (5), May (2), June (1), August (1), September (3). The smallest reproductively active male (abundant sperm) measured 66 mm SVL (TCWC 85188) and was collected during September. Wright and Wright (1949) reported 56 mm as the minimum size for maturity of male *A. woodhousii*.

The mean SVL of *A. woodhousii* females was significantly larger than that of males ( $t = 2.5$ ,  $df = 31$ ,  $P = 0.019$ ). Ovarian morphology is similar to that of other anurans as described in Ogielska and Bartmńska (2009b). Three stages were present in the ovarian cycle



**Fig. 1.** Woodhouse's Toad (*Anaxyrus woodhousii*) courtesy of Austin Reptile Service. Photo by L.A. Dawson and is licensed under the Creative Commons Attribution-Share Alike 2.5 Generic license.

(Table 1): (1) Not spawning; immature early diplotene oocytes predominated; (2) Vitellogenic (follicles accumulating yolk); (3) Spawning condition: ovary contains mature oocytes filled with yolk droplets; the surrounding layer of follicular cells is thinly stretched. Spawning females were found March to September (Table 1). The smallest reproductively active female (spawning condition) measured 70 mm SVL (TCWC 101515) and was collected in August. Wright and Wright (1949) reported the minimum size for mature *A. woodhousii* females was 59 mm SVL.

Follicle atresia is the spontaneous degeneration and resorption of follicles and may occur at any stage of development (Saidapur 1978). Follicular atresia was noted in 35% (7/20) of *A. woodhousii* females. Atresia is a widespread process occurring in the ovaries of all vertebrates (Uribe Aranzábal 2009). It is not understood why some follicles complete development and ovulate while others undergo atresia (Saidapur 1978). See Saidapur and Nadkarni (1973) and Ogielska et al. (2010) for a detailed description of the stages of follicular atresia in the frog ovary. In atresia the ooplasm is phagocytized by follicle cells, leaving a mass of pigmented material which gradually decreases. Atresia has an important role in fecundity as it may reduce the number of ovulated oocytes (Uribe Aranzábal 2011).

Postovulatory follicles form when the ruptured follicle collapses after ovulation; the follicular lumen disappears and proliferating granulosa cells are surrounded by a fibrous capsule (Redshaw 1972). Postovulatory follicles are short lived in most anuran species and are resorbed after a few weeks (Redshaw 1972). The presence of numerous postovulatory follicles in one March female (TCWC 74379)

*Anaxyrus woodhousii* (Girard, 1854) (Fig. 1) has a range including the Western United States (excluding Great Basin and Pacific Coast) and Northern Mexico (Frost 2026). It is a species of Least Concern due to its wide distribution, habitat tolerance and presumed large population (IUCN SSC Amphibian Specialist Group 2021).



**Table 1.** Three monthly stages in the ovarian cycles of 20 *Anaxyrus woodhousii* females from Texas; \* = postovulatory follicles present.

| Month     | n | (1) Not spawning | (2) Vitellogenic | (3) Spawning Condition |
|-----------|---|------------------|------------------|------------------------|
| March     | 2 | 1*               | 0                | 1                      |
| April     | 2 | 0                | 0                | 2                      |
| May       | 1 | 0                | 0                | 1                      |
| June      | 4 | 1                | 1                | 2                      |
| July      | 3 | 1                | 1                | 1                      |
| August    | 5 | 0                | 0                | 5                      |
| September | 3 | 0                | 1                | 2                      |

indicates spawning was underway. There were no concurrent vitellogenic follicles in this same ovary so it is unknown if this female would have spawned again in the same year.

Months of *A. woodhousii* breeding are given in Goldberg (2017). The presence of non-spawning females in June and July (Table 1) indicates not all *A. woodhousii* females from Texas spawn at the same time. This was also reported for *A. woodhousii* from North Dakota by Wheeler and Wheeler (1966). Since there are no reports of autumn spawning for *A. woodhousii* in Dodd (2023) it is likely the eggs in mature females from September (Table 1) would be utilized during reproduction the following spring. Jørgensen et al. (1979) reported ovaries are close to breeding size, by the time of hibernation, in frogs from the temperate zone.

**Acknowledgments**—I thank Toby C. Hibbitts (TCWC) for permission to examine *A. woodhousii* and for facilitating this loan 2024-07.

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**Appendix:** Thirty three *Anaxyrus woodhousii* from Texas, listed by county, examined from the Biodiversity Research and Teaching Collection, Texas A & M University (TCWC) College Station, Texas, USA.

**Bastrop:** TCWC 2121; **Bell:** TCWC, 26966, 26967; **Clay:** TCWC 74388; **Gray:** TCWC 101665, 101986; **Hansford** TCWC 101515; **Hemphill:** TCWC 101498, 101499; **Hall:** TCWC 101598; **Hill:** TCWC 29110, 85185, 85186, 85188, 85226; **Hood:** TCWC 25098; **Hutchinson:** TCWC 101657, 101671, 101994; **Llano:** TCWC 64776, 64777, 64781; **Montague:** TCWC 101949; **Parker:** TCWC 87082; **Potter** TCWC 101507, 101661; **Randall:** TCWC 101549; **Ward:** TCWC 85138; **Wichita:** TCWC 74372, 74379, 74381, 74382, 74391.

## RANGE EXTENSION

# Range Extension of the Dusky Baja California Rattlesnake (*Crotalus enyo furvus*) in Baja California, Mexico

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The Baja California Rattlesnake (*Crotalus enyo*) is a medium sized rattlesnake from the family Viperidae and subfamily Crotalinae. It is distinguished from other rattlesnake species in the region by having a relatively narrow head, large eyes, and supraoculars that slant noticeably upwards (Beaman and Grismer 1994). This species is distributed throughout most of the Baja California peninsula, including Magdalena and Santa Margarita islands in the Pacific Ocean, and Carmen, Cerralvo, Coronados, Espíritu Santo, Pardo, Partida Sur, San Francisco, San José, and San Marcos islands in the Gulf of California (Klauber 1956, Grismer 2002, McGinnis and Stebbins 2018). Three subspecies (pattern classes) have been described: *C. e. cerralvensis*, endemic to Cerralvo Island (Cliff 1954); *C. e. enyo*, which is distributed from Cabo San Lucas to the vicinity of El Rosario in the north, including the islands in the Pacific and the Gulf of California; and *C. e. furvus* that is distributed on the western slope of the mountain range of northern Baja California, from Punta Colonet to El Rosario (Grismer 2002).

Between subspecies, *furus* can be distinguished by usually having the third and fourth supralabials not in contact with the lacunals, and completely or partly separated by 1-3 subfoveals that are absent in *enyo* and *cerralvensis* (Beaman and Grismer 1994). The northernmost locality of *C. e. furvus* has been recorded in Colonet, ~2.8 km north of Arroyo Seco, from a specimen collected by Clark R. Mahrdr on 15 September 1965, specimen number: SDNHM 46196

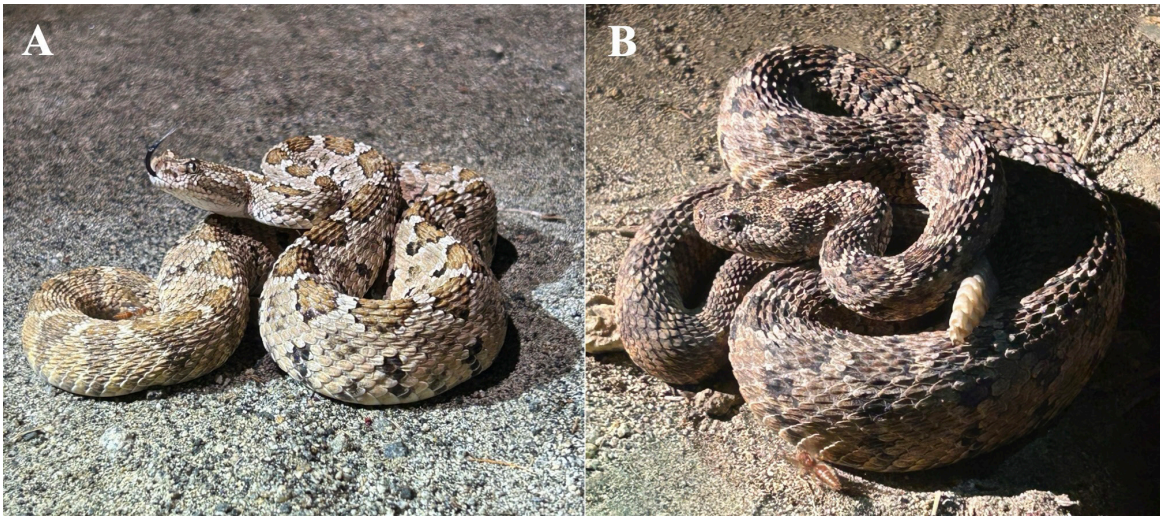
(Herp Atlas 2026). In this note, we report on a new location, extending the known range of this species to the north, as well as suggesting the use of a different ecoregion habitat.

On 17 September 2025, we found an active adult *C. e. furvus* in Rancho Agua Caliente, Municipality of Ensenada, Baja California (31.40407° N, 116.14005° W, 248 m a.s.l.), extending the current range 29.8 km N of northernmost record (Herp Atlas 2026). The rattlesnake was found between small bushes, at 2040 h after a light rain (Fig. 1A). The following night, on 18 September 2025, we found a second and a third individual. The second individual was found at 1.2 km SE of previous record (31.39614° N, 116.13078° W) at 1959 h; and the third individual was 23 m apart from the second (31.39592° N, 116.13084° W) and observed at 2021 h on a dirt road (Fig. 1B). Other snakes recorded in the locality were the Red Diamond Rattlesnake (*C. ruber*), Glossy Snake (*Arizona occidentalis*), and Western Threadsnake (*Rena humilis*).

Prior to our discovery of this new northern population, *C. e. furvus* inhabited two ecoregions: the Coastal Succulent Scrub and the Central Desert. The former is characterized by a slightly cooler climate and is considered a transition zone between Mediterranean ecosystems and true deserts. A significant amount of moisture is derived from coastal fog and marine spray, brought by Pacific winds and winter rains. Typical vegetation associated with this ecoregion include succulent plants, dominated by coastal agave (*Agave*

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**Fig. 1.** Dusky Baja California Rattlesnakes (*Crotalus enyo fuvus*) from Rancho Agua Caliente, Baja California. **A)** First individual from 17 September 2025; **B)** third individual found on 18 September 2025. Photos by Luc Myers.

*shawii*), San Diego bursage (*Ambrosia chenopodiifolia*), cliff spurge (*Euphorbia misera*), and *Dudleya* species (González-Abraham et al. 2010). The Central Desert ecoregion in the El Rosario area, is located to the east, along a stretch where mountains are relatively low, with influence from Pacific winds as well, but warmer, with temperatures that come from the Gulf of California, with both winter and summer rains. The dominant species in this area are mainly sarcocaulous plants like elephant trees (*Pachycormus discolor*), small-leaf elephant tree (*Bursera microphylla*), cardon (*Pachycereus pringlei*), and various species of *Agave* and *Yucca* (González-Abraham et al. 2010).

The vegetation in the habitat at the location of this northern population belongs to the Coastal Sage Scrub ecoregion dominated by California sagebrush (*Artemisia californica*), white sage (*Salvia apiana*), and California buckwheat (*Eriogonum fasciculatum*; Fig. 2). Precipitation in this region occurs mostly during the winter, with occasional summer rains (González-Abraham et al. 2010).

Range extensions can be useful to our understanding of a species natural history. In the case of *C. e. fuvus*, the range extension includes the addition of what might have been considered atypical habitat for the species and this subspecies. Coastal Sage Scrub has

Range extensions can be useful to our understanding of a species natural history. In the case of *C. e. fuvus*, the range extension includes the addition of what might have been considered atypical habitat for the species and this subspecies.



**Fig. 2.** Habitat of the Baja California Rattlesnake (*Crotalus enyo fuvus*) from Rancho Agua Caliente, Baja California. Photo by Jorge H. Valdez-Villavicencio.



not been reported as a habitat in which the species or subspecies has been found. The addition of this range extension, and additional habitat utilization, may suggest more habitat plasticity than previously assumed. We found three specimens in the course of 24 hours with minimal effort, which might indicate common use of the area and habitat type. Grismer (2002) suggested that this species is widespread throughout most of Baja California. Here we increase that understanding by suggesting the species/subspecies utilizes additional habitats further north than previously believed.

**Acknowledgements**—We sincerely thank Rolando Arce and his family for generously granting access to their property. Their hospitality and commitment to conserving Baja California's wildlife made this observation possible. All field activities were conducted with the permission of the landowners and under SEMARNAT permit: SBRA/DGVS/05532/25. We also thank everyone who continues to support the work that Fauna del Noroeste conducts in the region.

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#### NATURAL HISTORY NOTE

## Further Evidence of Parasite-Induced Supernumerary Limb in a California Newt (*Taricha torosa*) of the East Bay Area, California

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The California Newt (*Taricha torosa*) is the only California endemic newt found in the East Bay Region (Hansen et al. 2025). California Newts are a biphasic and semiaquatic urodele (Storer 1925). As adults, they spend roughly three to five months in ponds each year for their breeding season, then leave the water to live in moist areas, such as mammal burrows, and beneath rocks and logs (Petranka 1998). However, the larval stage of the California Newt life cycle is exclusively aquatic, and it is during this stage that newts are exposed to parasitic flatworms, namely *Ribeiroia ondatrae* (Orlofske et al. 2012).

*Ribeiroia ondatrae* is a digenetic trematode that utilizes multiple hosts. Aquatic snails serve as the first intermediate host where *R. ondatrae* produces free-swimming cercariae which then infect larval amphibians, typically at the limb buds (Johnson et al. 2024). These cercariae then encyst and form metacercaria that can cause limb malformations (Johnson et al. 1999). These malformations alter the infected amphibian's fitness reducing locomotion, swimming, and endurance negatively, ultimately,

making it easier for the parasite's definitive host (birds) to eat these amphibians (Goodman et al. 2011).

Typically, *R. ondatrae* infections kill the host before they complete metamorphosing to adults either through infection, starvation, or successful consumption from a predator (Goodman et al. 2011). However, an adult California Newt exhibiting left hindlimb polymelia was identified 19 June 2023 at 0829 hrs near a pond at Pleasanton Ridge Regional Park, Alameda County, California, with a known *Ribeiroia ondatrae* population. This individual was identified moving across the landscape toward the pond by technicians conducting related amphibian parasite field sampling. The individual was photographed and observed *in situ*.

This particular case of malformation is of interest due to the malformation being observed in an adult California Newt. While it is clear that amphibians infected by *R. ondatrae* do not tend to live to adulthood (Goodman et al. 2011), it is also important to note that California Newts have high concentrations of tetrodotoxin which aid in the deterrence of

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predators and trematodes (Johnson et al. 2018). While it is uncommon to see such a malformation in an adult California Newt, it is possible such occurrences are increasing as Hohn et al. (2025) identified a juvenile *T. torosa* with a similar malformation on 13 February 2025, within the Inner Coast Range or the East Bay, approximately 33 km to the east.

The loss of biodiversity and increased warming temperatures due to climate change may lead to increased prevalence of parasite infections and thus parasite-induced malformations (Gopko et al. 2020). Further, they determined increased temperatures overall increased the impact of parasites on their aquatic ecosystems. This is concerning considering East Bay Area temperatures have been steadily rising, with the region experiencing more days with extreme heat (Cloern et al. 2011). Additionally, decreased biodiversity can also be the result of increased *R. ondatrae* infection. Johnson et al. (2013) determined that parasite diversity had potential for reducing *R. ondatrae* transmission by over 50%. As warming temperatures and loss of suitable habitat continue to threaten amphibians, it is important to consider other less obvious stressors to amphibian health. Therefore, continued amphibian sampling is necessary, reporting malformations when observed and applicable.

**Acknowledgements**—I am grateful to East Bay Regional Park District (EBRPD) for granting us the necessary permits and access to conduct our fieldwork. We deeply appreciate their continued dedication to preservation. Also, I thank Jeff A. Alvarez, his edits and encouragement, which made this manuscript possible. This individual was found during seasonal field surveys conducted with the assistance of the 2023 Pond Crew sampling team: Felicia Conheady, Teagan Richardson, and Sydney Watson without whose tireless effort this individual would not have been observed.

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**Fig. 1.** Left hindlimb polymelia in an adult *Taricha torosa* found traversing Pleasanton Regional Park, Pleasanton, in June 2023. Photos by Laura Heller.

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The loss of biodiversity and increased warming temperatures due to climate change may lead to increased prevalence of parasite infections and thus parasite-induced malformations (Gopko et al. 2020).

# Sonoran Whipsnake Consuming a Bat in an Emory Oak Canopy

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On 16 August 2026, at around 1210 h, while walking a trail between the Chiricahua National Monument visitor center and Faraway Ranch (approximately 32.009° N, -109.362° W), we began hearing high-pitched noises, which sounded like a small mammal in distress. The source of commotion was approximately 6 m (~20 ft) up an Emory Oak (*Quercus emoryi*). This area was in a narrow valley bottom at 1,612 m (5,289 ft) ele. dominated by dense oak forest with a fairly open understory.

Using binoculars we observed a large Sonoran Whipsnake (*Masticophis bilineatus*) well over 1 m (3.3 ft) in length flailing wildly to hold onto a large brown bat that it had captured with its mouth (Fig. 1). The bat species was not identifiable with certainty to species, but likely a Big Brown Bat (*Eptesicus fuscus*) or possibly a Desert Red Bat (*Lasiurus frantzii*; pers. comm. with Arizona Game and Fish Department).

The bat was vigorously flapping, vocalizing, and attempting escape. A tree cavity was just above the area; however, we did not witness whether the snake pulled the bat from the cavity. The location of the cavity relative to the snake's body and where its body clung to the tree strongly suggests the bat was captured inside the cavity.

Over the course of several minutes, the snake successfully subdued and swallowed the bat. About half an hour later, the snake was still in the same tree in a different location, a large bulge evident along its midsection.

Southwest and Mexico *Masticophis* species *M. schotti*, *M. taeniatus*, and *M. bilineatus* are primarily lizard feeders (Camper and Dixon 2000), but are known opportunistic feeders as well. Only larger individuals of these *Masticophis* species appear to feed on mammals, and relatively infrequently (Camper and Dixon 2000). *Masticophis taeniatus* and *M. flagellum* have been documented actively foraging and feeding on bats in central Texas cave systems (Herreid 1961).

While many snake species are known to feed on bats (chiroptophagy; Sparks 2000), Sonoran Whipsnake (*Masticophis bilineatus*), specifically, appears to have no such records. Also, this method of foraging and capture of a bat by *Masticophis* from a tree cavity may be rarely seen and likely not documented.



Fig. 1. Sonoran Whipsnake (*Masticophis bilineatus*) predating a bat within an Emory Oak (*Quercus emoryi*). Photo by S. Jacobs.

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# Battle of the Whipsnakes: Combat Between a Coachwhip (*Masticophis flagellum*) and Sonoran Whipsnake (*M. bilineatus*)

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On 20 June 2026, the two lead authors observed a most unusual combat event between two closely-related whipsnakes, a Sonoran Whipsnake (*Masticophis bilineatus*) and a Coachwhip (*M. flagellum*). We were hiking near Romero Canyon in Catalina State Park (Pima County, AZ) along an established trail at 0730 when we observed the two snakes. The Sonoran Whipsnake was approximately 75 cm in length and the Coachwhip approximately 1.5 m in length; both were of unknown sex. Temperature was 23.9° C and the sky was clear with no wind.

We observed the snakes for approximately two minutes as they twisted against and bit each other (Figs. 1 and 2). The Coachwhip appeared to have the upper hand during the period we observed the two snakes. It appeared to be ingesting a portion of the Sonoran Whipsnake, as seen in Fig. 2 by the difference in diameter of the whipsnake on both sides of the mouth of the Coachwhip, as well as by the bulge in the Coachwhip below its jaws. The photos show blood on the head of the whipsnake but also suggest that this species was biting the Coachwhip.

After watching them for about 2 minutes, we observed the Coachwhip rush off into the brush alongside the trail with the Sonoran Whipsnake in its jaws. At that time we lost sight of both snakes.

Coachwhips are well-known to be aggressive predators of other reptiles, including snakes. Lazcano et al. (2024) documented predation of a Mohave Rattlesnake (*Crotalus scutulatus*) by a Coachwhip and summarized the literature of other snake prey items by this wide-ranging species, which include Ring-necked Snake (*Diadophis punctatus*), Rough Greensnake (*Opheodrys aestivus*), Glossy Snake (*Arizona elegans*), Northern Pacific Rattlesnake (*Crotalus oreganus*), and others. Coachwhips have also been observed to be cannibalistic (LaDuc and LaDuc 2003). Schuett and West (2024) observed what appeared to be male combat in this species. The encounter they witnessed

did not end in a feeding event, and they believed it might have been related to sexual rivalry.

While it seems likely that the larger Coachwhip initiated the combat, Sonoran Whipsnakes are also known to include snakes in their diet (Enderson 1999, Bezy and Enderson 2003), so it is also possible that the smaller Sonoran Whipsnake initiated it. The two species have different habitat requirements in southern Arizona, with the Coachwhip favoring dryer desert environments and the Sonoran Whipsnake more commonly found in riparian habitat and at higher elevations. However, it is not unusual to find them both in the same area, especially near desert streams such as Romero Canyon.

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On 20 June 2026, the two lead authors observed a most unusual combat event between two closely-related whipsnakes, a Sonoran Whipsnake (*Masticophis bilineatus*) and a Coachwhip (*M. flagellum*).



**Figs. 1.** (left) and **2** (right). Combat and possible predation event with a Coachwhip (larger, darker snake) and Sonoran Whipsnake. Photos by the lead authors.

# Brachydactyly and Macroductyly in the Mexican Spadefoot Toad (*Spea multiplicata*) in an Urbanized Habitat in Central Mexico

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Morphological anomalies in amphibians have received considerable attention because they may reflect alterations occurring during development and, in some cases, may be associated with environmental factors such as contaminants, parasitism, radiation, or habitat modification, although they may also have a genetic origin or occur spontaneously (Blaustein and Johnson 2003, Henle et al. 2017a,b, Haas et al. 2018). Limb anomalies include alterations in the number, size, and development of digits and phalanges, such as brachydactyly, ectrodactyly, polydactyly, and other less frequently reported conditions. In Mexico, at least 31 types of anomalies have been documented in amphibians, with brachydactyly among the most frequently reported morphological anomalies; however, the etiology of many cases remains unknown (Castro-Bastidas et al. 2025).

The Mexican Spadefoot Toad (*Spea multiplicata*; Cope, 1863) is a fossorial anuran widely distributed throughout Mexico and the southern United States and is capable of persisting even in environments affected by anthropogenic disturbance and urbanization. In central Mexico, the species has been documented in urbanized areas, suggesting a certain degree of tolerance to these environments (Hernández-Gallegos et al. 2024). To date, morphological anomalies reported in *S. multiplicata* are scarce; recently, a case of amelia was documented in an individual from Jalisco, Mexico (Reyna-Bustos and Serrano 2025). Here, we document a concomitant case of brachydactyly and macroductyly in the left hand of an adult *S. multiplicata* found in an urbanized habitat in central Mexico, thereby expanding current knowledge of the morphological anomalies recorded for this species.

On 1 September 2026, at 2021 h, an adult Mexican Spadefoot Toad (Fig. 1), was recorded in the backyard



Fig. 1. Mexican Spadefoot (*Spea multiplicata*) in situ. Photo by E.A. Reyes-Velázquez.

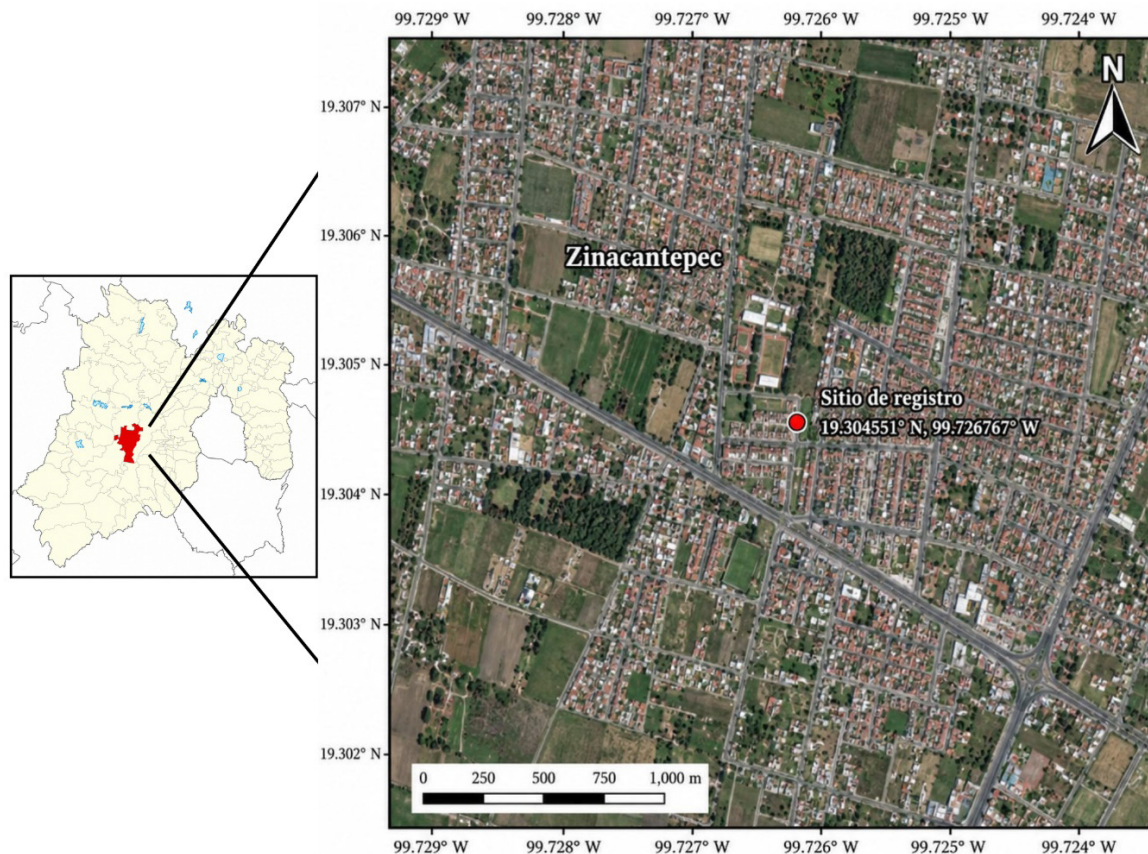
of a residence in the municipality of Zinacantepec, State of Mexico, Mexico (19.304551° N, 99.726767° W; WGS 84; Fig. 2). The individual was active on a concrete surface within a predominantly urbanized residential area. The backyard consisted mainly of concrete, with a small patch of grass and several potted ornamental plants.

The malformation observed in this individual of *Spea multiplicata* is noteworthy because of the simultaneous occurrence of two contrasting anomalies in adjacent digits of the same limb: an apparently excessive development of digit I and a marked reduction of digit II (Fig. 3). This combination suggests a localized alteration in hand development rather than a generalized modification of the limb. Reports of limb anomalies in *S. multiplicata* remain scarce. The recent case of amelia documented by Reyna-Bustos and Serrano (2025), together with the present record, indicates that this species may exhibit different expressions of appendicular anomalies. In particular, the combination of brachydactyly and macroductyly reported here expands the range of anomalies known for the species and highlights the value of documenting even isolated cases, especially when they include a detailed description of the affected structures.

Despite the anomaly, the individual had reached adulthood and was active at the time of

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**Fig. 2.** Location of the recording site in Zinacantepec, State of Mexico, Mexico. The red dot indicates the exact location of the recording. During examination of the individual, a morphological anomaly was observed in the left hand (Fig. 3), characterized by concomitant alterations of digits I and II. Digit I showed an evident increase in both length and thickness relative to the expected morphology, consistent with macrodactyly, whereas digit II exhibited a marked reduction in length, consistent with brachydactyly (Fig. 3). Digits III and IV showed no evident external anomalies. No scars, open lesions, or other external signs of trauma were observed on the affected limb.

observation. This indicates that, at least up to the time of the record, the anomaly was compatible with postmetamorphic survival. However, it remains unknown whether the condition affected functions associated with the forelimbs, such as locomotion, body support, or certain reproductive behaviors. This is relevant because the presence of an evident morphological anomaly does not necessarily imply a degree of functional impairment sufficient to prevent survival to adulthood.

Finally, the individual was found in a highly urbanized area of Zinacantepec (Fig. 2). This context is noteworthy because *S. multiplicata* has previously been recorded in residential areas of the Toluca Valley, including the city of Metepec, where it appears capable of persisting in properties surrounded by urban infrastructure. However, a single record does not allow the anomaly to be causally associated with urbanization or with any particular environmental factor. Rather, its documentation underscores the importance of examining individuals found in these environments, because the accumulation of additional records may eventually help determine whether such anomalies represent isolated events or occur at higher

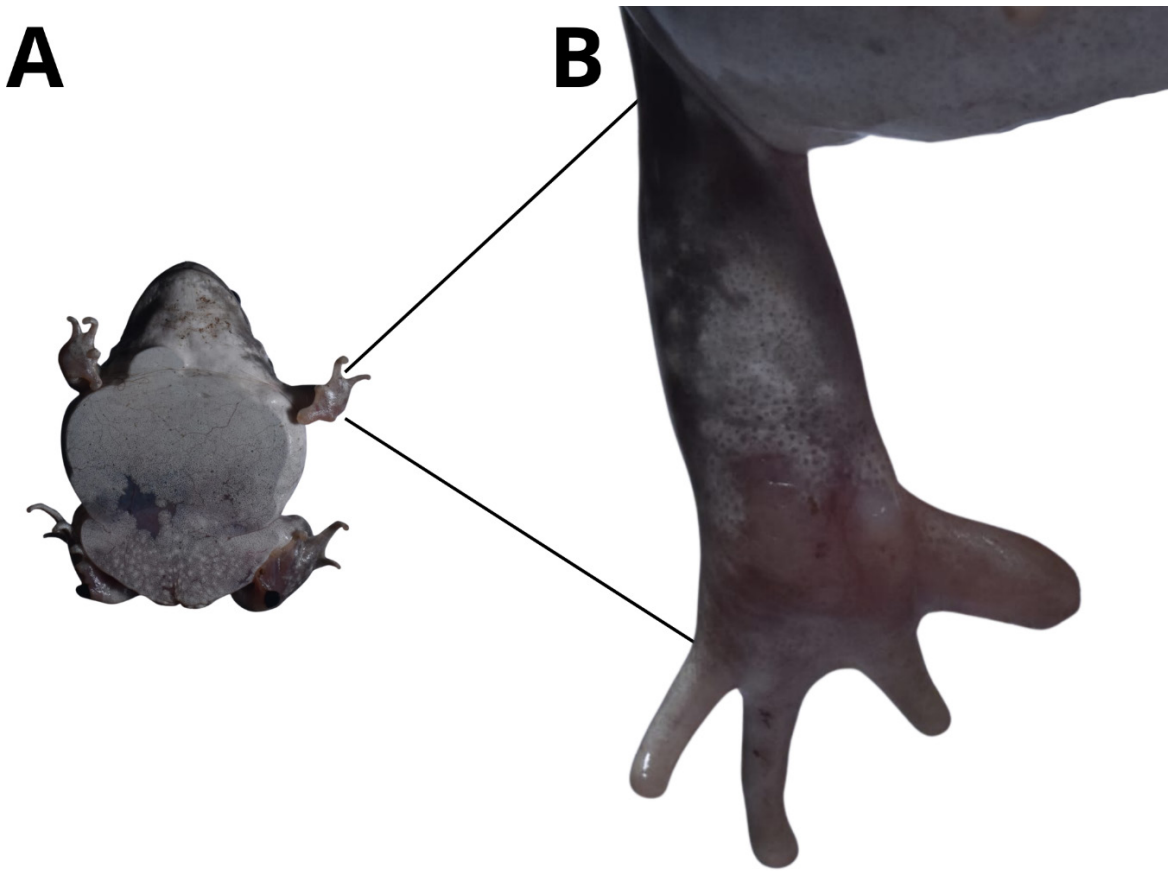
frequencies in populations exposed to anthropogenic disturbance.

This record expands current knowledge of appendicular anomalies in *Spea multiplicata* by documenting the concomitant occurrence of brachydactyly and macrodactyly in an adult individual. Although its etiology cannot be determined, the finding highlights the importance of documenting these anomalies to assess their frequency and potential patterns in populations inhabiting urbanized environments.

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This record expands current knowledge of appendicular anomalies in *Spea multiplicata* by documenting the concomitant occurrence of brachydactyly and macrodactyly in an adult individual.



**Fig. 3. A.** Dorsal view of *Spea multiplicata*. **B.** Dorsal view of the left hand of *Spea multiplicata*. Digit I exhibits macrodactyly, while digit II exhibits brachydactyly. Photograph by A. Gómez-Benítez.

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# A Preliminary Herpetofauna of the Sierra La Púrica, Sonora, Mexico

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**Abstract**—We documented four species of amphibians and 25 species of reptiles from the Sierra La Púrica, a sky island in northeastern Sonora, Mexico, that has been infrequently visited by herpetologists and other biologists. Most of our records come from expeditions we made in 2013 and 2025, but we also draw upon literature, museum records, the Madrean Discovery Expedition faunal database, and iNaturalist. Notable records include an elevational maximum (1,657 m) for the Mexican Spadefoot (*Spea multiplicata*) in Sonora, an elevational maximum (1,722 m) and 22 records of Ditmars' Horned Lizard (*Phrynosoma ditmarsii*), and the fourth Sonoran record for the Chihuahuan Hook-nosed Snake (*Gyalopion canum*). This is a preliminary herpetofauna because we did not visit the west side of the Sierra La Púrica where several southern species associated with the Río Sonora valley may occur. Some montane species likely eluded detection as well.

The Sierra La Púrica, located in the municipalities of Nacozari de García and Bacoachi in northeastern Sonora, Mexico, rises to about 2,467 m and, as we define it here, extends downslope on the west to about 1,109 m on the upper bajada of the Río Sonora Valley, and to about 1,250–1,360 m on the east side of the sierra (just west of Highway 17, Fig. 1). The Sierra La Púrica is part of a chain of sierras that runs from the Sierra Los Ajos east of Cananea south through the Sierra Buenos Aires and the Sierra La Púrica to the Sierra Cobriza west of Nacozari de García. Mountain passes between these ranges vary from about 1,550 to 1,600 m elevation, providing good corridors for movement of montane species among them. Much of the east side of the Sierra La Púrica drains into the north-flowing Arroyo las Calabazas, a tributary of the Río Bavispe–Río Yaqui, although the southeastern slopes drain into the south-flowing Arroyo Nacozari. Much of the west side drains into the Río Sonora, but drainages on the southwestern slope of the Sierra La Púrica drain into the Río Santa Rosa that confluences with Arroyo Nacozari at San Rafael de la Noria.

At Nacozari de García (1,103 m elev., ~21 km SSE of the high point in the Sierra La Púrica), mean annual precipitation is 578.5 mm, with 77% of that falling during July through September. April and May are the driest months (mean precipitation of 7.6 mm). The lowest mean monthly high and lowest mean monthly low temperatures (23.7 °C and 12.0 °C, respectively) are recorded in January, whereas the highest mean monthly high temperature (38.9 °C) is in June and the highest mean monthly low temperature (28.6 °C) is in July ([weatherandclimate.com](http://weatherandclimate.com), accessed June 2026). Precipitation is likely greater and temperatures somewhat cooler in the Sierra La Púrica, particularly at high elevations.

Sanchez-Escalante et al. (2018) presented a preliminary flora of the Sierra La Púrica that included

306 plant taxa in 71 families and 215 genera. The authors described four plant communities: desert grassland at the lowest elevations (Fig. 2), oak woodland on the slopes (Figs. 2 and 3), and pine-oak forest at the highest elevations. Linear riparian deciduous forest occurs along drainages passing through these larger vegetation communities (Fig. 4). At the very highest elevations, pine forest with few to no oaks is locally present (Fig. 5).

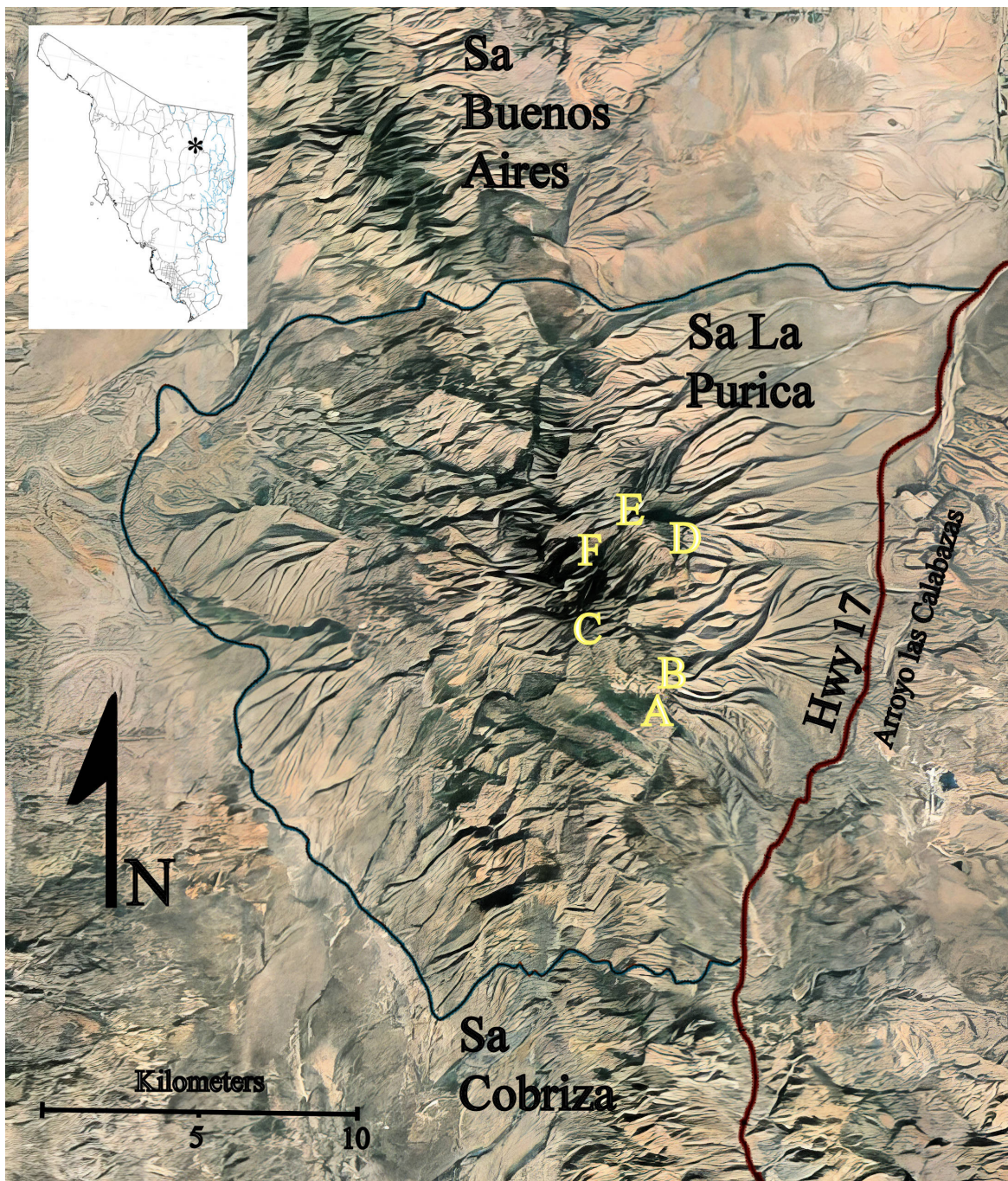
The Sierra La Púrica is part of the Área de Protección de Flora y Fauna Bavispe (APFF Bavispe), managed by the Comisión Nacional para el Uso y Conocimiento en México (CONANP). The APFF Bavispe extends over eight sierras in northeastern Sonora. The APFFs are areas established to conform to the regulations provided by the Ley General del Equilibrio Ecológico y la Protección al Ambiente (LGEEPA) and other applicable laws regarding places that contain habitats that flora and fauna depend on for their existence. The federal LGEEPA is a landmark piece of Mexican environmental protection legislation passed in March 1988 that defines the framework for all environmental law in Mexico, and provides some protection for APFFs, although most of the land with the APFF Bavispe is privately owned.

## Methods

We define the northern and southern limits of our study area on roads through passes between Sierra La Púrica and the Sierra Buenos Aires on the north (Puerto Mababi, 30.6355 N, elev. 1,572 m) and between the Sierra La Púrica and the Sierra Cobriza on the south (30.4452 N, elev. 1,553 m). On the east, the boundary is just west of Highway 17 and on the west, we have drawn the boundary at the approximate juncture of the sierra and the bajada (Fig. 1). The Sierra La Púrica study area is approximately 426 km<sup>2</sup>.

The Sierra La Púrica is part of a chain of sierras that runs from the Sierra Los Ajos east of Cananea south through the Sierra Buenos Aires and the Sierra La Púrica to the Sierra Cobriza west of Nacozari de García.





Our records for the Sierra La Púrica were collected during biological expeditions to the east side of the sierra: 10-17 July and 7-11 September 2013, and 1-5 November 2025. The July 2013 trip was a scouting trip for the larger September 2013 expedition.

**Fig. 1.** The Sierra La Púrica study area is outlined in the dark line and Highway 17 (our study area does not include the highway). Yellow letters show the locations of primary collection or observation localities: **A** – Rancho El Salto, **B** – Rancho Viejo, **C** – Las Antennas, **D** – Rancho Los Alisos, **E** – Rancho Jarazo, **F** – Barker's (1992) *Crotalus willardi silus* collection site (approximate). See Table 1 for additional information about these localities.

Our records for the Sierra La Púrica were collected during biological expeditions to the east side of the sierra: 10-17 July and 7-11 September 2013, and 1-5 November 2025. The July 2013 trip was a scouting trip for the larger September 2013 expedition. The latter trip, based at Rancho Viejo (part of Rancho El Salto, Fig. 1, Table 1), was a Madrean Archipelago Biodiversity Assessment (MABA) expedition hosted by Sky Island Alliance; it included 46 participants. The November 2025 trip, based at Rancho Los Alisos (Fig. 1, Table 1), was a Conservation Field Study hosted by

Greater Good Charities; it included 24 participants. Many participants in those expeditions were not herpetologists, but represented other biological disciplines. Participants who conducted herpetological inventories are authors on this paper. Trips included biologists from both the U.S. and Mexico. We did not visit the west side of the Sierra La Púrica.

We searched for amphibians and reptiles mostly with visual encounter surveys, although limited aquatic trapping for turtles (primarily in stock ponds) occurred with baited hoop nets and a few metal





**Fig. 2.** Desert grassland (foreground) and montane woodlands in the distance, September 2013. Photo by S. Minter.



**Fig. 3.** Oak woodland, Rancho Viejo, September 2013. Photo by J. Rorabaugh.



**Fig. 4.** Riparian deciduous forest. Arroyo below Rancho Viejo, September 2013. Photo by J. Rorabaugh.



**Fig. 5.** Pine forest near Las Antennas, September 2013. Photo by J. Rorabaugh.

funnel traps were employed terrestrially to capture lizards and snakes. Visual encounter surveys were conducted during the day and night; however, due to cool temperatures, very little nocturnal searching was conducted during the November 2025 expedition. A concerted effort was made to find Ditmars' Horned Lizards (*Phrynosoma ditmarsii*) during the November 2025 trip. Most surveys were within 2.5 km of base camps, but some longer excursions by vehicle were made to places such as Las Antennas at the high point of the sierra (Fig. 1). Our herpetological records (photo vouchers only) were collected mostly at or near primary localities listed in Table 1 and illustrated on Fig. 1.

We also consulted literature that might include observations or collections from the Sierra La Púrica. Additionally, we searched the Madrean Discovery Expeditions (MDE) faunal database, VertNet, the Arizona State University collections database, and iNaturalist for other records from the Sierra La Púrica. Records from iNaturalist were only accepted if they were accompanied by photographs that we could identify to species, or that referenced museum specimens collected from specific localities. We assumed that iNaturalist localities are correct.

## Results

Amphibians and reptiles documented from our Sierra La Púrica study area include four species of

amphibians and 25 species of reptiles (Table 2). Collection and observational records are from the MDE database, our field notes, VertNet, iNaturalist, Armstrong and Murphy (1979), Barker (1992), including museum specimens of the Ridge-nosed Rattlesnake [*Crotalus willardi silus*] cited in that paper), Turner et al. (2017), and Van Devender et al. (2026). Most of the species were documented during our 2013 or 2025 expeditions (Table 2). Photos of vegetation communities and survey sites are presented in Figures 2-8. Some of the amphibians and reptiles we found are illustrated in Figures 9-17.

The first amphibian or reptile to be documented from our study area was a Gophersnake (*Pituophis catenifer*, MVZ:Herp 21030; see footnote #2 in Table 2 for museum acronyms) collected by Seth B. Benson, 2 June 1936 from "7 mi N Santa Rosa, ca. 35 mi N Cumpas". Ernest C. Tanzer collected a Desert Night Snake (*Hypsiglena torquata* = *Hypsiglena chlorophaea*, TCWC 33735) 20 September 1969 from the Sierra La Púrica, "64 mi S Agua Prieta". In June 1974, Michael D. Robinson and Darrel R. Frost collected Sonoran Spotted Whiptail (*Aspidoscelis sonora*), Elegant Earless Lizard (*Holbrookia elegans*), Clark's Spiny Lizard (*Sceloporus clarkii*), and Ornate Tree Lizard (*Urosaurus ornatus*) from the "SE end of Sierra La Purica NW Nacozari, ca 4500 ft el." for the UAZ.

To our knowledge, Barry L. Armstrong and James B. Murphy were the first herpetologists to access

Records from iNaturalist were only accepted if they were accompanied by photographs that we could identify to species, or that referenced museum specimens collected from specific localities. We assumed that iNaturalist localities are correct.

**Table 1.** Primary localities at which we and others collected or observed amphibians and reptiles in the Sierra La Púrica. See also Fig. 1.

| Locality                                    | Coordinates (WGS84) and elevation (m)     | Vegetation Community | Observers, month, year              |
|---------------------------------------------|-------------------------------------------|----------------------|-------------------------------------|
| Rancho El Salto                             | 30.52309, -109.72487 ; 1,504              | Oak woodland         | MABA, MDE, Jul & Sep 2013, Nov 2025 |
| Rancho Viejo                                | 30.53084, -109.72242; 1,657               | Oak woodland         | MABA, Jul & Sep 2013                |
| Las Antennas                                | 30.54406, -109.74861; 2,467               | Pine-oak forest      | MABA, Jul & Sep 2013                |
| Rancho Los Alisos                           | 30.56531, -109.71461; 1,504               | Oak woodland         | MDE, Nov 2025                       |
| Rancho El Jarazo                            | 30.57556, -109.73250; 1,609               | Oak woodland         | MDE, Nov 2025                       |
| Barker's <i>C. w. silus</i> collection site | 30.56620, -109.74927; 2,026 (approximate) | Pine-oak forest      | D.G. Barker, 1984                   |

the high country of the Sierra La Púrica, where they collected and observed *C. w. silus* in 1970–1974, 1978, and 1986. Specimens were deposited at UTA and KU. Armstrong and Murphy (1979) describe their trips during the 1970s. About 40 specimens of *C. w. silus* were observed during 1970–1974, including 11 in a two hour period in early July from 1,630 to 2,300 m elev. Canyons where snakes were found were in pine-oak forest with Sycamores (*Platanus wrightii*) and flowing water in the canyon bottoms. *Crotalus willardi silus* was observed from April through October, but most were found in the July–August rainy season. A pair was observed copulating on 15 July. A gravid female gave birth to five young on 7 August 1970, and another gave birth to four young on 10 August 1978. The authors noted the snakes from areas of predominantly pine forests were lighter in color, resembling the pine needle litter on the forest floor, whereas snakes from predominantly oak woodlands were a darker brown, matching the color of the oak leaf litter. Interestingly, Armstrong and Murphy observed no other species of *Crotalus* in the Sierra La Púrica. Their book (1979) includes a photograph of *C. w. silus* habitat in the Sierra La Púrica as well as other interesting natural history notes, although no observations or collections of other amphibian or reptile species are noted. In 1984, David G. Barker collected 12 *C. w. silus* from a canyon on the eastern slope of the sierra (Barker 1992, Fig. 1 and 17). Those specimens were deposited in various museums (Table 2).

We find no further herpetological museum collections or documented observations until our July and September 2013 MABA trips to Ranchos El Salto and Viejo, and Las Antennas, during which four species of amphibians and 16 species of reptiles were documented. During our November 2025 expedition, we documented two species of amphibians and 15 species of reptiles, including seven species of reptiles not documented during the 2013 expeditions (Table 2).

Records in iNaturalist, aside from those attributable to our expeditions, added a patch-nosed snake (*Salvadora* sp., iNaturalist #292362613) to our list, although the image provided was not adequate to determine if it was a Big Bend Patch-nosed Snake (*S. deserticola*) or Eastern Patch-nosed Snake (*S. grahamiae*). A 2025 photograph of a juvenile *Aspidoscelis sonora* in iNaturalist (#328108285) was misidentified as a Desert Grassland Whiptail (*A. uniparens*). Other iNaturalist records for the Sierra La Púrica include a Sonoran Whipsnake (*Masticophis bilineatus*, iNaturalist #335727767), Black-tailed Rattlesnake (*Crotalus molossus*, iNaturalist #296860301), and 1984 records of *C. w. silus* provided by D. G. Barker (iNaturalist #335641325). Those latter records include an approximate location of where he made his observations and collections (Fig. 1, Table 1). A Ring-necked Snake (*Diadophis punctatus*) observed on 2 November 2025 by Sky Jacobs in iNaturalist is the same snake observed by Ryan Martinez on the same date and reported in the MDE database (Fig. 15, Table 2).

A Ring-necked Snake (*Diadophis punctatus*) observed on 2 November 2025 by Sky Jacobs in iNaturalist is the same snake observed by Ryan Martinez on the same date and reported in the MDE database (Fig. 15, Table 2).



**Fig. 6.** Sierra La Púrica from the eastern bajada (west of Hwy 17), November 2025. Photo by J. Rorabaugh.



**Fig. 7.** Dead and dying oaks on a south-facing slope near our Rancho Los Alisos camp, November 2025. Photo by J. Rorabaugh.



**Table 2.** Amphibians and Reptiles documented from the Sierra La Purica.

| Scientific Name                              | Common Name                 | Elevation Range (m) | Vegetation Community <sup>1</sup>                                                                | Source <sup>2</sup>                                                              |
|----------------------------------------------|-----------------------------|---------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>AMPHIBIANS - Anura</b>                    |                             |                     |                                                                                                  |                                                                                  |
| <i>Anaxyrus punctatus</i> <sup>2</sup>       | Red-spotted Toad            | 1,500-1,657         | oak woodland                                                                                     | MDE                                                                              |
| <i>Hyla arenicolor</i> <sup>3</sup>          | Canyon Treefrog             | 1,486-2,467         | oak woodland, pine-oak forest, pine forest, riparian deciduous forest                            | MDE                                                                              |
| <i>Incilius alvarius</i> <sup>3</sup>        | Sonoran Desert Toad         | 1,392-1,657         | oak woodland                                                                                     | MDE                                                                              |
| <i>Spea multiplicata</i> <sup>3</sup>        | Mexican Spadefoot           | 1,657               | oak woodland                                                                                     | MDE                                                                              |
| <b>REPTILES - Testudinis</b>                 |                             |                     |                                                                                                  |                                                                                  |
| <i>Kinosternon sonoriense</i> <sup>3</sup>   | Sonora Mud Turtle           | 1,424-1,507         | desert grassland-oak woodland ecotone, oak woodland, riparian deciduous forest                   | MDE, field notes                                                                 |
| <b>REPTILES – Squamata - Lacertilia</b>      |                             |                     |                                                                                                  |                                                                                  |
| <i>Aspidoscelis sonorae</i>                  | Sonoran Spotted Whiptail    | 1,316-1,885         | desert grassland-oak woodland ecotone, oak woodland, riparian deciduous forest                   | MDE, UAZ, field notes                                                            |
| <i>Elgaria kingii</i> <sup>3</sup>           | Madrean Alligator Lizard    | 1,486               | riparian deciduous forest                                                                        | MDE                                                                              |
| <i>Holbrookia elegans</i>                    | Elegant Earless Lizard      | 1,316-1,679         | desert grassland, desert grassland-oak woodland ecotone, oak woodland                            | MDE, UAZ                                                                         |
| <i>Phrynosoma ditmarsii</i> <sup>3</sup>     | Ditmars' Horned Lizard      | 1,502-1,770         | desert grassland-oak woodland ecotone                                                            | MDE, field notes, Turner et al. (2017)                                           |
| <i>Phrynosoma hernandesi</i> <sup>3</sup>    | Greater Short-horned Lizard | 1,505-2,467         | oak woodland, pine-oak forest, pine forest                                                       | MDE                                                                              |
| <i>Plestiodon callicephalus</i> <sup>3</sup> | Mountain Skink              | 1,486-1,637         | oak woodland                                                                                     | MDE                                                                              |
| <i>Sceloporus clarkii</i>                    | Clark's Spiny Lizard        | 1,372-1,642         | desert grassland-oak woodland ecotone, oak woodland, riparian deciduous forest                   | MDE, UAZ                                                                         |
| <i>Sceloporus jarrovi</i> <sup>3</sup>       | Yarrow's Spiny Lizard       | 1,659-2,467         | oak woodland, pine-oak forest, pine forest                                                       | MDE                                                                              |
| <i>Sceloporus virgatus</i> <sup>3</sup>      | Striped Plateau Lizard      | 1,448-2,467         | desert grassland-oak woodland ecotone, oak woodland, pine-oak forest                             | MDE                                                                              |
| <i>Urosaurus ornatus</i>                     | Ornate Tree Lizard          | 1,316-1,595         | desert grassland, desert grassland-oak woodland ecotone, oak woodland, riparian deciduous forest | UAZ, MDE, field notes                                                            |
| <b>REPTILES – Squamata - Serpentes</b>       |                             |                     |                                                                                                  |                                                                                  |
| <i>Crotalus molossus</i>                     | Black-tailed Rattlesnake    | 1,630               | oak woodland                                                                                     | MDE, iNaturalist                                                                 |
| <i>Crotalus willardi silus</i>               | Ridge-nosed Rattlesnake     | 1,630-2,300         | pine-oak forest, oak woodland, riparian deciduous forest                                         | MDE, iNaturalist, KU, SDNHM, UF, UTA, Armstrong and Murphy (1979), Barker (1992) |
| <i>Diadophis punctatus</i> <sup>3</sup>      | Ring-necked Snake           | 1,597               | oak woodland                                                                                     | MDE                                                                              |
| <i>Gyalopion canum</i> <sup>2</sup>          | Chihuahuan Hook-nosed Snake | 1,448               | desert grassland-oak woodland ecotone                                                            | MDE, Van Devender et al. (2026)                                                  |

**Table 2 (continued).** Amphibians and Reptiles documented from the Sierra La Purica.

| Scientific Name                                               | Common Name                | Elevation Range (m) | Vegetation Community <sup>1</sup>       | Source <sup>2</sup>   |
|---------------------------------------------------------------|----------------------------|---------------------|-----------------------------------------|-----------------------|
| <i>Hypsiglena chlorophaea</i>                                 | Desert Nightsnake          | 1,302-1,397         | desert grassland                        | MDE, TCWC             |
| <i>Lampropeltis pyromelana</i> <sup>3</sup>                   | Sonoran Mountain Kingsnake | 1,499-2,467         | oak woodland, pine-oak forest           | MDE                   |
| <i>Masticophis bilineatus</i>                                 | Sonoran Whipsnake          | 1,543               | desert grassland-oak woodland ecotone   | MDE, iNaturalist      |
| <i>Micruroides euryxanthus</i> <sup>3</sup>                   | Sonoran Coralsnake         | 1,657               | oak woodland                            | MDE                   |
| <i>Pituophis catenifer</i>                                    | Gophersnake                | 1,469               | desert grassland-oak woodland ecotone   | MDE, MVZ <sup>4</sup> |
| <i>Salvadora deserticola</i> or <i>grahamiae</i> <sup>5</sup> | Patch-nosed Snake          | 1,420               | desert grassland-oak woodland ecotone   | iNaturalist           |
| <i>Senticolis triaspis</i> <sup>2</sup>                       | Green Ratsnake             | 1,586               | riparian deciduous forest               | MDE                   |
| <i>Tantilla yaquia</i> <sup>3</sup>                           | Yaqui Black-headed Snake   | 1,486               | desert grassland-oak woodland ecotone   | MDE                   |
| <i>Thamnophis cyrtopsis</i> <sup>2</sup>                      | Black-necked Gartersnake   | 1,486-1,615         | oak woodland, riparian deciduous forest | MDE                   |
| <i>Trimorphodon lambda</i> <sup>2</sup>                       | Sonoran Lyresnake          | 1,550               | desert grassland-oak woodland ecotone   | iNaturalist           |

<sup>1</sup>Vegetation community derived from **1)** the record, **2)** field notes, or **3)** Google Earth imagery.  
<sup>2</sup>Museum abbreviations are as follows: UAZ = University of Arizona; KU = University of Kansas; SDNHM = San Diego Natural History Museum; UF = University of Florida; UTA = University of Texas, Austin; TCWC = Biodiversity Research and Teaching Collections (Texas Cooperative Wildlife Collection); MVZ = Museum of Vertebrate Biology, University of California, Berkeley.  
<sup>3</sup>First observation or collection of this species from the Sierra La Púrica made during our MABA or Conservation Field Study expeditions.  
<sup>4</sup>Locality is too imprecise to define an elevation or vegetation community.  
<sup>5</sup>The photo in iNaturalist is not adequate to determine the species.

**Notable Records**

Our expeditions documented four amphibian species and 15 species of reptiles from the Sierra La Púrica for the first time (Table 2). Our record of a Mexican Spadefoot (*Spea multiplicata*, Fig. 10) from oak woodland at Rancho Viejo represents an elevational maximum (1,657 m) for this species in Sonora. This anuran is more commonly found at lower elevations in grassland or desertscrub valleys in Sonora (Rorabaugh and Lemos-Espinal 2016).

The first *Phrynosoma ditmarsii* from the Sierra La Púrica (Fig. 11) was collected during our September 2013 expedition at Rancho El Salto. That animal was a young-of-the-year lizard (32 mm SVL) found at 1,679 m in an oak woodland-desert grassland ecotone on 10 September 2013 (Turner et al. 2017). We returned to that locality on 3 November 2025 and found nine additional *P. ditmarsii*. Twelve more *P. ditmarsii* were also found at three localities (1,502, 1,527, and 1,770 m elev.) near our Rancho Los Alisos base camp in November 2025, with the latter being the highest elevation *P. ditmarsii* ever recorded (Turner et al. 2017). The vegetation community at those three sites was oak woodland/

desert grassland ecotone (Fig. 8). Greater Short-horned Lizards (*Phrynosoma hernandesi*) were generally found at higher elevations, but their elevational distribution overlapped with that of *P. ditmarsii* at 1,505 to 1,770 m. Discovery of a Chihuahuan Hook-nosed Snake (*Gyalopion canum*, Fig. 13) at 1,448 m near Rancho Jarazo represents only the fourth record for Sonora (Van Devender et al. 2026). In Sonora, this species was previously documented in high grassland valleys but also in sky islands and the Sierra Madre Occidental to 1,845 m in pine-oak forest (Rorabaugh and Lemos-Espinal 2016).



**Fig. 8.** Some of the authors at a *Phrynosoma ditmarsii* collection site near our Rancho Los Alisos camp, November 2025. Photo by J. Rorabaugh.

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**Fig. 9.** *Hyla arenicolor*, Rancho Los Alisos, November 2025. Photo by Lana Ramsey.

#### Species Expected but not yet Documented

We suspect many species occur but are not yet documented from the Sierra La Púrica. We can look to collections and observations in the other sierras in this chain, as well as records from Highway 17 immediately to the east of our study area, to compile a list of likely species.

The Sierra Los Ajos, east and southeast of Cananea and the northernmost sierra in the chain that includes the La Púrica, has yielded Tarahumara Barking Frog (*Craugastor tarahumaraensis*, ASUHEP000456), Tarahumara Salamander (*Ambystoma rosaceum*), Chiricahua Leopard Frog (*Rana fisheri*), Chihuahuan Black-headed Snake (*Tantilla wilcoxi*), and Twin-spotted Rattlesnake (*Crotalus pricei*) (Rorabaugh and Lemos-Espinal 2016), all of which could occur in the Sierra La Púrica. However, no ranid frogs have been reported from the La Púrica, despite there being apparently suitable habitat in the areas we surveyed. We searched for *A. rosaceum* in suitable habitat but failed to find it. *Crotalus pricei* and *T. wilcoxi*, if present in the Sierra La Púrica, likely occur at high elevations based on their distribution elsewhere. Both *C. tarahumaraensis* and the Barking Frog (*C. augusti*) could occur in the La Púrica, but they are unlikely to be detected unless areas are surveyed early in the summer monsoon season when these anurans are active and calling. Our July 2013 scouting trip was in the early monsoon period, but no *Craugastor* were detected. An MDE scouting trip in July 2016 and an expedition in August of that year to the high country of the Sierra Buenos Aires did not document any amphibian or reptiles species not reported here for the Sierra La Púrica.



**Fig. 10.** *Spea multiplicata*, Rancho Viejo, September 2013. Photo by J. Rorabaugh.



**Fig. 11.** Juvenile *Phrynosoma ditmarsii* from near Rancho El Salto, September 2013. Photo by J. Rorabaugh.



**Fig. 12.** *Sceloporus virgatus* (juvenile), Rancho Los Alisos, November 2025. Photo by G. Molina-Padilla.

Other species not documented by us but found broadly across northeastern Sonora are likely to occur in the La Púrica, such as Sonoran Desert Tortoise (*Gopherus morafkai*), Canyon Spotted Whiptail (*Aspidoscelis burti*), Great Plains Skink (*Plestiodon obsoletus*), Regal Horned Lizard (*Phrynosoma solare*, LACM 5054 collected at “4 mi N Nacozari”, likely

We suspect many species occur but are not yet documented from the Sierra La Púrica. We can look to collections and observations in the other sierras in this chain, as well as records from Highway 17 immediately to the east of our study area, to compile a list of likely probable species.





**Fig. 13.** *Gyalopion canum* (DOR), near Rancho Jarazo, November 2025. Photo by J. Rorabaugh.



**Fig. 14.** *Senticolis triaspis* in an arroyo near our Rancho Los Alisos camp, November 2025. Photo by J. Rorabaugh.



**Fig. 15.** *Diadophis punctatus*, Rancho Los Alisos, November 2025. Photo by C. Hedgcock.



**Fig. 16.** *Micruroides euryxanthus*, Rancho Viejo, September 2013. Photo by J. Rorabaugh.

on Highway 17), Common Kingsnake (*Lampropeltis getula*), Coachwhip (*Masticophis piceus*, UMMZ 78457 collected at “8.5 km al O de Pilares”; and two MDE observations from Highway 17 just east of our study area), Long-nosed Snake (*Rhinocheilus lecontei*), Western Diamond-backed Rattlesnake (*Crotalus atrox*), and Tiger Rattlesnake (*C. tigris*). These species are likely to occur in the lower to middle elevations of our study area (see distribution maps in Rorabaugh and Lemos-Espinal 2016).

We consider this a preliminary herpetofauna mostly because we did not visit the west side of the sierra. The Río Sonora Valley (west of the Sierra La Púrica) supports a number of species whose distributions are primarily to the south of the Sierra La Púrica, but that extend northward in mid- to lower elevations, often following fingers of foothills thornscrub or desert grassland-foothills thornscrub ecotones. Rancho Las Playitas, on the west side of the Río Sonora, is at a similar latitude (30.589° N) and elevation (1,060-1,590 m) as our study area, and a regional herpetofauna was recently published for that ranch (Turner et al. 2022). Species found at Rancho Las Playitas that could occur in the Sierra La Púrica, and not already mentioned above, include Mazatlan Narrow-mouthed Toad (*Gastrophryne mazatlanensis*), Lowland Leopard Frog (*Rana yavapaiensis*), Black Banded Gecko (*Coleonyx fasciatus*), Gila Monster (*Heloderma suspectum*), Great Plains Skink (*Plestiodon obsoletus*), Western White-bellied Spiny Lizard (*Sceloporus albiventris*), Mexican West Coast Boa (*Boa*

*sigma*, also see Van Devender et al. 2020), Thornscrub Hook-nosed Snake (*Gyalopion quadrangulare*), Neotropical Whipsnake (*Masticophis mentovarius*), Neotropical Vinesnake (*Oxybelis microphthalmus*, also see Van Devender et al. 2024), Western Threadsnake (*Rena humilis*), and File-tailed Groundsnake (*Sonora aemula*).

### Land Use and Conservation

As mentioned above, parts of the Sierra La Púrica are within the APFF Bavispe, and as such the sierra is afforded some protection from anthropogenic impacts. The primary use of lands within our study area is cattle grazing. There are numerous cattle tanks constructed to collect runoff and provide water for cattle. Some of these tanks provide breeding habitat for anurans and Sonora Mud Turtles (*Kinosternon sonoriense*). We also observed roads, corrals, fences, and other livestock developments, but those projects have small footprints. In general, livestock grazing appears to be well-managed with relatively minimal impacts to vegetation communities. We observed no evidence of mining, and no mining disturbance can be seen on 2024 Google Earth imagery, though processing facilities for the Nacozari copper mine, including a smelter at La Fundación, are in the valley just east of Sierra La Púrica, so aerial deposition of toxic material is possible. Cut tree stumps are likely evidence of past timber and or fuelwood harvest. Darrel R. Frost reported that in 1974 he and Michael Robinson followed a relatively

The primary use of lands within our study area is cattle grazing. There are numerous cattle tanks constructed to collect runoff and provide water for cattle. Some of these tanks provide breeding habitat for anurans and Sonora Mud Turtles (*Kinosternon sonoriense*).



new logging road into the Sierra La Púrica (pers. comm. with JCR, June 2026), but currently the montane forests are not significantly affected by those activities. We observed no areas that have burned catastrophically in recent times.

In the American Southwest, the climate is getting warmer and, at least during the winter rainy season, drier (Garfin et al. 2013). Monsoon rainfall is difficult to model accurately, but some studies predict an increase in monsoonal precipitation as a result of climate change (Demaria et al. 2019; Douville et al. 2021; Battacharya et al. 2022), whereas other models predict decreases in precipitation (Pascale et al. 2017). Results of predictive climate models for Cananea posted by M. C. Fitzpatrick's lab (University of Maryland, Frostburg, <https://fitzlab.shinyapps.io/cityapp/>) suggest that by 2080 in winter, temperatures will increase by 4.3 °C and it will be 5.8% drier. Summers are predicted to be 5.1 °C warmer and 13.8% drier. Climate change may already be affecting vegetation communities in the Sierra La Púrica. In places, particularly on south-facing slopes, we observed many dead oaks (Fig. 7), likely killed by recent drought. Dead trees and other vegetation can increase the chances of damaging wildfires.

### Taxonomic Notes

Regarding common and scientific names, we follow the latest compilation of Sonora's herpetofauna (Lemos-Espinal et al. 2019), with exceptions as noted in the "Taxonomic Notes" of Turner et al. (2025) and the following: we use *Rana fisheri* for the Chiricahua Leopard Frog (Hekkala et al. 2011 and Nicholson 2025), *Masticophis piceus* for the Coachwhip (Myers et al. 2017, 2019; Nicholson 2025), and *Oxybelis microphthalmus* for the Neotropical Vinesnake (Jadin et al. 2020, Nicholson 2025). We also use Ditmars' Horned Lizard as the common name for *Phrynosoma ditmarsii* (Sherbrooke 2020).

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Fig. 17. *Crotalus willardi silus*. Sierra La Púrica, 1984. Photo by D.G. Barker.

invertebrates. We thank Darrel Frost for sharing his recollections of the trip he and Michael Robinson made into the southeastern portion of the Sierra La Púrica in June 1974. Thanks to Raymundo Barrera of Rancho El Salto and Araceli Acosta (owner) and Manuel Tomás López Irigoyen (administrator) of Rancho Los Alisos for granting access to their lands.

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# Extreme, Yet Sub-lethal Malformation in the Carapace of a Southwestern Pond Turtle

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Until recently, the Western Pond Turtle (*Actinemys marmorata*) was the sole endemic freshwater turtle in California (Stebbins 2003). While previously referred to as Western Pond Turtles, in 2014 the taxonomy was re-examined and subsequently identified two biogeographical events determining that the Western Pond Turtle consists of two distinct species—the Northwestern Pond Turtle (*Actinemys marmorata*) and the Southwestern Pond Turtle (*A. pallida*; Spinks et al. 2014). In California, the Northwestern Pond Turtle range includes California's Central Valley, the Sierra Nevada, and the North Coast Range. The Southwestern Pond Turtle occurs in the south Coast Range, south of Monterey Bay. Currently there is a region associated with the San Francisco Bay that is comprised of genetically indistinct individuals (Todd et al. 2022, Germano 2026).

Both species of turtle are vulnerable to many of the same threats including habitat loss and fragmentation, competition and predation from invasive species, and drought which may be confounding recovery and leading to the proposition of federally listing both species as threatened (Manzo et al. 2021, USFWS 2023a, 2023b). Here, we report on an observation of an extreme, yet sub-lethal deformation of the carapace in a Southwestern Pond Turtle as an additional stressor to a declining turtle species.

The University of California Berkeley's Blue Oak Ranch Reserve is in the Inner Coast Range, east of San Jose, California. Despite being within the zone of significant admixture (Todd et al. 2022, Germano 2026), most turtles at this site appear to be Southwestern Pond Turtles (following: Seelinger 1945). On 13 May 2025, at 12:05 pm, while conducting seining activity associated with unrelated research on the site, a single young (age undetermined) Southwestern Pond Turtle was captured at one of the 11 ponds on the 1,319 ha site, known as Gramps Pond. The turtle had an obvious carapace malformation that was visible when the turtle was first observed. The individual's marginal scutes curved steeply upward (Fig. 1). Following capture and photographic



**Fig. 1.** Carapacial malformation in *Actinemys pallida* captured from Gramps Pond, Blue Oak Ranch Reserve, East of San Jose, California, May 2025. Photos by Laura Heller.

documentation, the individual was immediately released and observed *in situ*. The malformation did not outwardly appear to impact the individual's movement or general fitness.

Carapacial abnormalities are not a new occurrence (Coker 1910, Lynn and Ullrich 1950, Velo-Anton et al. 2011, Cordero et al. 2023). Coker (1910) suggested pressure placed on the egg from the surrounding turtle eggs may contribute to abnormalities being imparted on developing embryos. While this may be one explanation, abnormal morphology has also been attributed to environmental fluctuation leading to variations in cell division and proliferation particularly in species like pond turtles that undergo embryonic development within the eggs (Cordero et al. 2023).

Both Northwestern and Southwestern Pond Turtles have similar nesting behaviors in which they rely on upland areas near water sources for estivation and nesting, with factors such as vegetative cover, proximity to water source, soil type, and habitat all leading to nest site selection (Davidson and Alvarez 2020). Following nest site selection and nest building, oviposition typically occurs May through July with a clutch size ranging from 1 to 13 eggs (Holland 1994). Incubation time varies greatly, ranging from 80 to 126 days, with increased

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hatchling success occurring in drier, warmer summers (Holte 1998). Although warmer temperatures increase survivorship, Christie and Geist (2017) determined atypical maximum temperatures markedly reduce egg viability. Telemeco et al. (2013) revealed painted turtle nests exposed to prolonged “hot” temperatures (> 60 h) had a higher rate of hatchling abnormalities than nests exposed to the same temperature for shorter periods of time. Furthermore, Zimm et al. (2017) tested this theory more closely and found that higher temperature and drier conditions in the nest will produce anomalies in the scute pattern of turtles. Lynn and Ullrich (1950) suggested that shell malformations may occur due to many factors, namely temperature and moisture variations. They found that late-season moisture could create changes in the nest, which they believed caused significant changes in the anatomy. It is possible that the malformations in scutellation are due to altered microclimate within the nests of this species of turtle, which may be exacerbated by climate change.

The effects of climate change may go unnoticed in many species until adults show signs of significant change. This type of malformation, whether lethal or sub-lethal, can present an additional stressor on a turtle species that already faces numerous reasons for declines in populations (Thomson et al. 2016). Young Northwestern and Southwestern Pond Turtles (i.e., post-emergent and hatchling turtles) should be monitored when encountered, and the rate of malformation reported when appropriate.

**Acknowledgements**—We thank Blue Oak Ranch Reserve for allowing access to this site and their continued stewardship to this property. This individual was found during seasonal field surveys conducted with the assistance of the 2025 Pond Crew sampling team: Nick Masi, Jack Respet, Lexi Twing, James van Gorkom, and Griffin Wagner.

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The effects of climate change may go unnoticed in many species until adults show signs of significant change. This type of malformation, whether lethal or sub-lethal, can present an additional stressor on a turtle species that already faces numerous reasons for declines in populations (Thomson et al. 2016).



# Revisiting Off-highway Vehicle Disturbance Claims Affecting a Scaphiopodid

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Western Spadefoot (*Spea hammondi*) is a largely upland associated bi-phasic anuran that inhabits much of Central California to coastal southern California and into northern Baja, California (McGinnis and Stebbins 2018). This species has been in decline due to habitat loss and water diversions from agriculture and urban development (Fisher and Shaffer 1996, Lovich and Bainbridge 1999, Thomson et al. 2016, Neal et al. 2018, Rose et al. 2020, 2022). An additional confounding reason for decline is a misunderstanding of the species natural history and a commensurate lack of effective management (Alvarez and Woodall 2024). There is little information on other forms of disturbances that impact the species, and few terrestrial studies to fully understand the species upland requirements.

Off-highway vehicle (OHV) activity is cited as one of the few disturbances outside large-scale habitat loss that is detrimental to the Western Spadefoot (Rose et al. 2020). OHV activity is stated to cause early emergence, burrow collapse, and soil compaction (Bondello and Brattstrom 1979, Berry 1980, Lovich and Bainbridge 1999, Ouren et al. 2007, British Columbia Southern Interior Reptile and Amphibian Recovery Team 2008, Kupferberg and Furey 2015, Hutcherson et al. 2026). However, Carnegie State Vehicular Recreation Area (SVRA) finds this anuran to be persistent on an annual basis with this atypical, highly disturbed habitat. Carnegie SVRA, located in the Diablo Range between Livermore and Tracy, is an off-road vehicle park that caters to dirtbike riders attracted to the steep clay hills. The park contains an ephemeral creek with a silty, rocky floodplain, and is transitioning from an open-riding system—allowing riding anywhere throughout the hills, valley, and even creek—to a trails-only system. Despite very active OHV activity, *S. hammondi* appear to thrive with consistent breeding and regular adult observations (Alvarez and Kerss 2023, Kleponis and Alvarez 2024, 2025, Alvarez et al. 2025, Woodall et al. 2025).

The only *ex situ* study on OHV disturbance effects to scaphiopodids was conducted by Bondello and Brattstrom (1979). This study, which was subsequently summarized in the Springer Environmental Management book “Environmental Effects of Off-Road Vehicles: Impacts and Management in Arid Regions” as Brattstrom and Bondello (1983), is the more frequently cited version of their work. The experimental study placed 20 Couch’s Spadefoots (*Scaphiopus couchii*) beneath 10 cm of sand in a

15-gallon terrarium, played recorded motorcycle noises for up to 30 minutes, and recorded their emergence behavior. The authors concluded that the vibrations and decibel levels from the motorcycle recordings mimicked the cue of rainfall or thunder, leading to early *Sc. couchii* emergence and potential desiccation outside of the precipitation season (Bondello and Brattstrom 1979). While this study may be a valuable starting point for understanding scaphiopodid sensitivity to sounds and vibrations, the conclusions of the study were cursory and may have been taken out of context.

The study by Bondello and Brattstrom (1979) included crowded conditions (i.e., many spadefoots in a small area), in shallow sandy substrate which may have skewed the results toward emergence, as the study itself states that *Sc. couchii* burrows are upwards of 50 cm deep. The shallow depth of the terrarium does not accurately simulate the natural environment Bondello and Brattstrom (1979) claim as the species’ preferred habitat. The authors conclusions appear premature, as they rely on improperly tested methods that do not support such broad assertions, and therefore should not claim that the sound and vibration cues would similarly permeate through deeper depths and provide similar results in natural conditions. Additionally, these variables may not impact species in different substrates like clay-dominant soils for which Carnegie SVRA is known.

The Bondello and Brattstrom (1979) study is the only experimental study on OHV effects on a member of the family Scaphiopodidae and is regularly cited in regard to other species of spadefoot. However, *Sc. couchii*, the study’s focal species, breeds in temporary pools made from summer monsoons and their emergence may be triggered by thunderstorms (Bragg 1965, Tinsley 1990, Dayton et al. 2004) differing from *S. hammondi*’s life history (Morey and Reznick 2004). *Spea hammondi* breeds primarily in late winter and early spring (Storer 1925, Morey and Reznick 2004) when thunderstorms are unlikely in the species’ range. Therefore, it is doubtful that *S. hammondi* would rely on an emergence cue such as thunder, making the decibel cue much less valid and the study inapplicable to *S. hammondi*, unless tested independently. Most importantly, there are few, if any, instances at Carnegie SVRA where OHV noise would occur near an individual spadefoot for more than a few seconds because the vehicles are in motion, limiting the noise exposure to the length of time a takes a vehicle to

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pass a *S. hammondi* located underground. Furthermore, the notion that *S. hammondi* and other scaphiopodids remain underground for months at a time has been disproven (Bragg 1965, Alvarez and Woodall 2024). Alvarez and Woodall (2024) found that *S. hammondi* has been observed during every month of the year, emerging to forage, nearly nightly, during spring and early summer. These individual *S. hammondi* have been observed foraging during humid nights and are known to maintain body fluids (McClannahan 1967, 1972, Ruibal et al. 1969, Shoemaker et al. 1969), supported by their occasional fluid release during capture (Kleponis and Woodall, pers. obs.).

With the current literature stating OHV activity is harmful to scaphiopodids, one may expect them to be absent from developed (i.e., heavily used) areas where OHV riding occurs. Yet *S. hammondi* at Carnegie SVRA have been documented in developed areas in addition to ruderal habitats where riding is prohibited. Further, they have been observed in several of the constructed vehicle tracks, finding refuge in the adjacent riprap piles and hay bale edges during the day. These disturbed areas can create useful microhabitats due to their lack of vegetation from vehicle activity, which provides open space, allowing these anurans to easily move and forage. Bordering vegetation and vehicle-restricted areas found along the margins of developed areas provide shelter and opportunities for burrowing. *Spea hammondi* is predominantly nocturnal and Carnegie SVRA restricting riding to daylight hours allows the *S. hammondi* to share the site with OHV riders, each using the site at different times.

Off-highway vehicle activity is well-known to cause erosion, creating deep ruts and depressions in the landscape, and has been cited as a cause of burrow collapse (Lovich and Bainbridge 1999). At Carnegie SVRA, *S. hammondi* are protected from burrow collapse in non-riding areas but are at risk in the open-riding area of the adjacent hills. This may highlight a need to restrict riding to trails in order to protect



**Fig. 1.** An ephemeral pool in the Corral Hollow floodplain within Carnegie SVRA that *S. hammondi* have used for breeding. Fence posts indicate that once detected, *S. hammondi* breeding habitat was protected from OHV activity.

the surrounding occupied landscape and to prevent wildlife mortality. Creating a matrix of riding and protected areas may also prevent a complete landscape of OHV-caused soil erosion and/or compaction. Off-highway vehicle induced soil compaction may prevent species like *S. hammondi* and other herpetofauna from creating burrows and seeking refuge. Coincidentally, the mechanical disturbance of the vehicles in the floodplain of Carnegie SVRA has compacted soils in the floodplain area, allowing water retention, which *S. hammondi* have used for breeding habitat (Fig. 1). *Spea hammondi* breeding at Carnegie SVRA has occurred in these compacted depressions, stock ponds, the ephemeral creek, and concrete-bottomed riding features (Kleponis and Alvarez 2024, 2025). This consistent breeding activity has been documented since 2010 in over 65 pools (Carnegie SVRA, unpub. data; Fig. 2).

With the current literature stating OHV activity is harmful to scaphiopodids, one may expect them to be absent from developed (i.e., heavily used) areas where OHV riding occurs. Yet *S. hammondi* at Carnegie SVRA have been documented in developed areas in addition to ruderal habitats where riding is prohibited.





**Fig. 2.** Location of *S. hammondi* breeding at Carnegie SVRA from 2015–2024.

The *S. hammondi* population within Carnegie SVRA highlights the behavioral plasticity, adaptability, and opportunistic nature of the species which allows them to reside in this atypical habitat. It also provides an example that suggests this species of wildlife can share multi-use lands if those lands are carefully managed and willing to prioritize environmental protections. As this species gets more attention from potential listing status at the State and federal level, biologists should be wary of eliminating the possibility of presence based exclusively on the assumption that the habitat is not considered typical, especially since there is a significant knowledge gap of *S. hammondi*'s terrestrial ecology. More research is needed to understand how to protect this species and avoid continued misconceptions, like where this species can potentially exist.

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# Climbing Behavior in *Phrynosoma orbiculare* as a Fleeing and Antipredatory Mechanism

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*Phrynosoma orbiculare* is one of 17 recognized species and belongs to the Tapaja clade of *Phrynosoma* which includes the other viviparous species of *Phrynosoma*: *P. ditmarsii*, *P. hernandesii*, and *P. douglassii* (Leaché and McGuire 2006). *Phrynosoma orbiculare* is endemic to México and has a distribution that spans from the northern part of Sonora through the central Plateau giving this species a wide geographical and ecological range; as such, distinct lineages have been recognized (Moreno-Barajas et al. 2013) leading to discussion regarding the phylogenetic status of this species. The wide distribution of this species also leads to a wide-range of habitats from pine-oak woodlands to semiarid shrubland. Despite its wide distribution, little is known about habit use in this species. Here we report climbing behavior in *P. orbiculare* in a population from central Mexico.

During fieldwork on 3 July 2026 we witnessed an individual of *P. orbiculare* utilize a prickly pear cactus (genus *Opuntia*) for escape behavior. The field site was in San Francisco Cheje, Jocotitlán, Estado de México, México (19° 41' 39.79" N, 99° 44' 33.55" W; WGS84; 2706 m a.s.l.), and the habitat was mainly semiarid shrubland (Fig. 1A) with dispersed bushels of grasses, prickly pear cacti (Fig. 1B), and agave plants. Cloud cover was approximately 80% during the time of field work. The individual was a juvenile male (43 mm SVL; Fig. 1C) and climbed to approximately 0.5 m in height (Fig. 1D) when approached. The body temperature was 31.9 °C, the air temperature was 21.6 °C, and the substrate temperature was 20.5 °C.

From our knowledge, this represents the third report of climbing behavior in *Phrynosoma* as similar behavior has been described in *P. coronatum* (Whitford and Bryant 1979) and *P. cornutum* (Lara-Resendiz et al. 2020). This behavior has been hypothesized to be a result of thermoregulation

(Whitford and Bryant 1979) and antipredatory behavior (Lara-Resendiz et al. 2020). Our observation supports the hypothesis of climbing behavior within cactus species to avoid predation. However, based on niche diversity within this species, and *Phrynosoma* in general, more studies on habitat use and niche selection should be completed in these species as this work will help elucidate diversification patterns and provide better context for conservation efforts.

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**Fig. 1. A)** Overview of semi-arid habitat with sagebrush grass, prickly pear cactus, and agave plants in San Francisco Cheje, Jocotitlán, Estado de México, México. **B)** Image of prickly pear cactus in which *Phrynosoma orbiculare* was found. **C)** Image of *P. orbiculare* scaling the prickly pear cactus. **D)** Close up view of *P. orbiculare* in prickly pear cactus showing spines impaling individual.

## Remember the THS in Your Will

Including the THS in your will is an excellent way to support the value of this organization and the conservation of the herpetofauna of the Sonoran Desert. We thank anyone who has included the THS in their will. Please contact us so we can express our appreciation. For information about designating the THS in your will, please contact Ryan Perry, Treasurer, at [tucsonherps@gmail.com](mailto:tucsonherps@gmail.com).

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## Beaded Lizard (*Heloderma horridum*; Squamata: Helodermatidae), Inside a House in Tlatlaya, Estado de México, México

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The Beaded Lizard (*Heloderma horridum*) is a venomous lizard distributed along the Pacific coast of México, from Sinaloa to Chiapas, and in central Mexico (Morelos, Puebla, and Estado de México; Reiserer et al. 2013). The species occurs from sea level to 2,108 m asl (Arenas-Moreno et al. 2022). It inhabits tropical dry forests; however, it can also be found in temperate habitats at higher elevations (Guadarrama et al. 2019).

*Heloderma horridum* occupies a variety of microhabitats, showing a preference for rocky slopes and sandy stream banks, which are used particularly during the spring nesting season of the Spiny-tailed Iguana (*Ctenosaura pectinata*), whose eggs constitute

an important prey item for *H. horridum* (Beck 2005). The species also occurs in cultivated pastures bordering tropical dry forest, where individuals occasionally modify mammal burrows for use as shelters. Individuals may also leave these burrows to use branches or hollow tree trunks as temporary shelters, particularly during periods of rainfall (Beck and Lowe 1991). Herein, we report the occurrence of a juvenile *H. horridum* inside a house at a locality in central Mexico.

On 10 June 2026 at approximately 1930 h, a juvenile *H. horridum* (Fig. 1A) was observed inside a house (Fig. 1B). The adobe house has a tile roof, front window openings, a concrete floor, and two

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**Fig. 1.** (A) Juvenile *Heloderma horridum*. (B) Rural house in El Arenal, Tlatlaya, Estado de México, México, where the individual was observed. (C) Interior of the house showing the space beside the refrigerator where the juvenile found temporary shelter.

rooms. The property is enclosed by a barbed-wire fence, and the entrance to the house lacked a door, allowing the individual to enter and take shelter besides a refrigerator (Fig. 1C). The house is located in El Arenal, Tlatlaya, Estado de México (18.562424° N, 100.097796° W; datum WGS84; 836 m asl; Fig. 2), approximately 300 m from a ravine, in the vicinity of a conserved tropical dry forest. The individual was safely guided into a plastic container using a branch and subsequently released away from nearby houses.

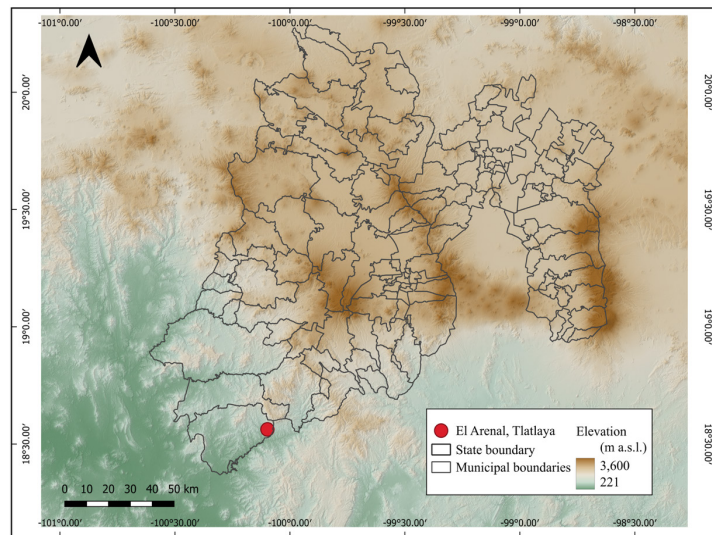
The occurrence of *H. horridum* inside a rural house located near a conserved tropical dry forest suggests that the individual most likely originated from the adjacent natural habitat. Previous studies indicate that *H. horridum* is closely associated with habitats that retain native vegetation and natural cover (Beck and Lowe 1991), whereas current evidence does not support the persistence of populations in areas modified by human settlements (Domínguez-Vega 2010). *Heloderma horridum* is protected from collection, transport, and killing throughout its range under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and is listed as Threatened under NOM-059-SEMARNAT-2010. At the global level, Domínguez-Vega and Beck (2021) assessed the species as Least Concern (LC). Despite these legal protections, wild populations continue to face important threats in México, particularly habitat loss due to land-use change and intentional killing driven by negative cultural perceptions (Beck 2005). Therefore, our observation highlights the importance of complementing legal protection with the conservation of tropical dry forest and environmental education programs that reduce fear and misconceptions about helodermatid lizards, thereby helping to prevent the intentional killing of individuals encountered near rural houses.

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**Fig. 2.** Geographic location where the record of the juvenile *Heloderma horridum* at El Arenal, Tlatlaya, Estado de México, México, was made.

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The occurrence of *H. horridum* inside a rural house located near a conserved tropical dry forest suggests that the individual most likely originated from the adjacent natural habitat.



# Back to the Basics: Photographing Scat, Tracks, and other Sign in the Field for Identification

Howard O. Clark, Jr., CWB®, CSE, Editor, Tucson Herpetological Society, Tucson, AZ; [editor.sonoran.herp@gmail.com](mailto:editor.sonoran.herp@gmail.com)

As a senior mentor in the wildlife profession, I often receive text messages from coworkers and colleagues asking for help identifying scat, tracks, burrows, skulls, and other wildlife sign (e.g., Fig. 1). Sometimes the photos are ideal for species identification, but other times a few simple improvements in how the images are taken would make identification much easier.

The first questions I usually ask are: *Where was the photo taken?* and *What is the habitat type?* These details immediately narrow the list of potential species and provide valuable context for making an accurate identification.

Most biologists no longer carry point-and-shoot cameras, relying instead on their iPhones or other smartphones. With today's advanced camera systems, a smartphone is usually all you need to document wildlife sign effectively.

When photographing a subject, hold the camera directly above it whenever possible. This minimizes perspective distortion and ensures the object is accurately represented. If you're photographing during the middle of the day, harsh sunlight may wash out important details. Creating an artificial shadow with your body or another object can often improve image quality. Experiment with the lighting to determine which conditions produce the clearest photograph.

Fill the camera frame with the subject, but avoid standing so close that the image cannot focus or so far away that important details are lost. Sharp focus is essential. Including a scale is also extremely helpful, especially when photographing tracks. For example, a ruler immediately communicates whether a track is the size of a house cat or a bobcat. I recommend that



**Fig. 1.** Agassiz's Desert Tortoise (*Gopherus agassizii*) scat, photographed directly above with scale in cm. Photo by H. Clark.

every field biologist carry a six-inch ruler in a vest pocket or another easily accessible location.

The same principles apply when photographing skulls and bones. For skulls, capture multiple views, including the dorsal (top), ventral (bottom), and lateral (side) perspectives (Fig. 2). Keep the camera perpendicular to the subject, ensure each image is in focus, and always include a scale.

Many of my colleagues use identification apps such as *iNaturalist* and *Seek*, which can be valuable field tools. However, relying solely on these apps can sometimes result in incorrect identifications. Whenever possible, confirm your observations with experienced biologists or coworkers. These discussions not only improve identification accuracy but also provide opportunities to learn from one another and share our enthusiasm for the natural world.



**Fig. 2.** Common Snapping Turtle (*Chelydra serpentina*) skull, dorsal (top), ventral (bottom), and lateral (side) perspectives photographed directly above with scale in cm. Photos by H. Clark.

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## MEETING MINUTES

BOD minutes can be found here:

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### Membership Information

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The Tucson Herpetological Society would like to thank existing members and new members for renewing their membership. We appreciate your support and are always looking for members to actively participate in THS activities and volunteer opportunities. It is a great way to be involved with the conservation of amphibians and reptiles in the Sonoran Desert.

Including the THS in your will is an excellent way to support the value of this organization and the conservation of the herpetofauna of the Sonoran Desert. We would like to recognize and thank anyone who has included the THS in their will. Please contact us so we can express our appreciation. For information about designating the THS in your will, please contact Ryan Perry, Treasurer, Tucson Herpetological Society, at [tucsonherps@gmail.com](mailto:tucsonherps@gmail.com).

## What is Wild Apricot, Why is THS using it, and How can you use it?

**The Board of Directors**, Tucson Herpetological Society, Tucson, AZ; [tucsonherps@gmail.com](mailto:tucsonherps@gmail.com)

**W**ild Apricot (WA) is a commercial data management service. We pay a fee and they take care of our data, our financial transactions, and our messaging. They use a payment system, AffiniPay, that is similar to PayPal but free to use for us as WA users.

We are using it because our former system for managing our data is broken and unfixable. With WA (after we make some corrections to data as we imported them) we will have a professionally managed system that we can trust. Using it will make the job of reporting on our member, non-member contact, and donation data accurate, precise and easy. If you are a member or have contacted THS in the past, you are in our contact database. We imported all of you into WA.

First you need to reply to the email you received and click the link to set a password for yourself. You should then check your information, add your address, and note if there are any errors. Email [tucsonherps@gmail.com](mailto:tucsonherps@gmail.com) if you find anything wrong. Also email us if you did not receive or you lost the link and we will resend.

All Contacts will receive our general emails from WA and the link to our quarterly Newsletter-Journal, the *Sonoran Herpetologist*, which is an excellent publication on herpetological topics.

If you are a Member you will have access to all the past issues of the *Sonoran Herpetologist*. WA will automatically notify you when your membership is due for renewal. You have choices. You can renew at the same level or change your level. You can renew for one year at a time or select one of the auto-renew levels for a small discount (because we are grateful to you for making it easier for us all).

You can pay right away, online, by signing on to the WA payment system, which is very similar to PayPal (We are using it because using PayPal would result in additional charges to THS). It is entirely trustworthy.

If you do not pay right away the WA system will generate an invoice. Then you can return and pay the invoice online or print it out and mail us a check, in which case we will update your membership manually.

If your membership is already lapsed, you can renew it as per the instructions above. We will send out an email via WA to all lapsed members, asking them to renew. If you are a non-member Contact, we hope you will join as a member. If you want to make a donation, you can do that from our website or from WA. If you have a problem, email [tucsonherps@gmail.com](mailto:tucsonherps@gmail.com) and we will help you. We can send you a hard copy form for memberships and donations to send by regular mail if you prefer.

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**T**he Tucson Herpetological Society invites your contributions to our Natural History Notes section. We are particularly interested in photographs and descriptions of amphibians and reptiles involved in noteworthy or unusual behaviors in the field. Notes can feature information such as diet, predation, community structure, interspecific behavior, or unusual locations or habitat use. Please submit your observations to Howard Clark, [editor.sonoran.herp@gmail.com](mailto:editor.sonoran.herp@gmail.com). Submissions should be brief and in electronic form.

## Local Research News

**T**he *Sonoran Herpetologist* welcomes short reports on Local Research News in our journal. We are interested in articles that can update our readers on research about amphibians and reptiles in the Sonoran Desert region. These articles need be only a few paragraphs long and do not need to include data, specific localities, or other details. The emphasis should be on how science is being applied to herpetological questions. Please submit your materials to Howard Clark, [editor.sonoran.herp@gmail.com](mailto:editor.sonoran.herp@gmail.com). Submissions should be brief and in electronic form.





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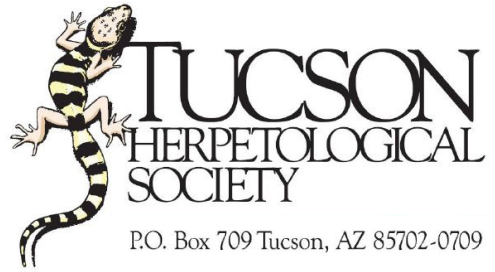
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