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Monthly Members Meeting

7:15 PM

Tuesday, January 21st

Administration Building

Reid Park Zoo

1100 South Randolph Way

(Enter Randolph Way from 22nd St between Country Club and Alvernon)

Jay Withgott

Department of Ecology and Evolutionary Biology
The University of Arizona

Behavior and Ecology of Black Ratsnakes in Arkansas

Jay Withgott decided to pursue biology primarily because of an interest in birds (an avid birder since childhood), but soon became interested in reptiles and amphibians as well. He is currently a second year student in the Ph.D. program in Ecology and Evolutionary Biology at the University of Arizona working with Dr. Nancy Moran on the ecology and evolution of aphids that have social behavior.

His master's degree research at the University of Arkansas, Fayetteville, focused on the black rat snake (*Elaphe o. obsoleta*) because it is a major predator on bird's nests, and the study gave him a chance to work both with birds and snakes. Dr. Charles Amlaner was his major advisor at Arkansas and the study was largely funded by the US Forest Service.

Jay's presentation will focus on predator-prey relationships between black rat snakes and an assemblage of breeding bird species, as well as on data gathered from radiotelemetry of rat snakes. He will not include results of a third aspect of the study presented recently at the UA Student Chapter of THS.

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From the Pres—

Straight Pres Stuff

Our good editor, who heretofore has been generous in doling out space for my loquacious prose, has requested a shorter column for this month (something about wanting to publish something worthwhile). With this in mind, it occurred to me that perhaps a regular pres column would be in order. For those unfamiliar with how "regular pres columns" are supposed to read, your leader invites you to take a look at what presidents of other herp societies across the nation have written. Essentially, they all follow the same format: So-and-so did this, what's-his-name did that, and for this reason, we are forever in their debt. It is hoped that the following will at least be a lesson in the proper techniques for brown-nosing, and hopefully some of you will in turn employ these methods with your president. There could be just a trifle more respect demonstrated within the ranks of our beloved society.

First, a tribute to those who have stepped down from our Board. They are the only ones that will be cited by name in this column. In alphabetical order, they are: Russell Duncan, Brent Martin, Janice Perry, and Fred Wilson. Russell and Brent contributed much in the legal and scientific sense of running a herp society. Fred carried (and hopefully will continue to carry) the burden of distribution of *Sonoran Herpetologist*. This duty certainly falls under the realm of "thankless tasks," and Fred's efforts to track the movements of a very mobile herper population are commendable; we are quite ready to hook some of you up with transmitters to better understand your migratory patterns. But the biggest thanks of all goes to Janice

(Continued on page 8)

NEXT MEETING

Tuesday, February 18th

James L. Jarchow, DVM
Sonoran Desert Hospital

Infectious Diseases in Reptiles :
Current Status of Viruses in Boids and Crotalids,
and URDS in Desert Tortoises

Ditmars' Horned Lizard (*Phrynosoma ditmarsii*) or The Case of the Lost Lizard*

Vincent D. Roth**

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This title sounds like an Earle Stanley Gardner mystery story, but happens to be an account of sleuthing in a non-fiction science mystery. All of the elements of a mystery are present — a missing link, unidentified people, unknown localities, incomplete bits of information, and an exotic setting. "A detective story!" is the comment made by friends who have heard it. Will the hypothesis prove correct? Will the lizard be found? This uncertainty makes mysteries exciting and is what makes science exciting. Maybe this is the reason so many biological scientists find that their vocation is also their avocation.

The missing clue in this mystery was Ditmars' horned lizard, last seen alive in 1898.

Most of the lizards along our borders are well known. Of 136 species from the United States listed in Hobart Smith's *Handbook of Lizards*, all but three are well documented. One of the three is the smooth-necked alligator lizard, *Gerrhonotus lewiconchis lewiconchis* (Stejneger), from western and southern Chihuahua and recorded originally from the "Mexican Boundary," but has not been found along the Arizona and New Mexico-Mexico borders since. Another is *Bipes* sp., a soft-bodied two-legged worm lizard. The nearest distribution of this genus is represented by *Bipes biporus* at the tip of Baja California where the habitat is damp sandy soil. In spite of rumors reported by Smith, it is doubtful that it ever was found in the mountains of southern Arizona because there is almost no damp sandy soil in this area. There have been many reports of two-legged lizards in the Chiricahua Mountains in southeastern Arizona, but they consistently turn out to be the local alligator lizard, *G. kingi* (Gray), a slender lizard with tiny legs and a snake-like movement.

The mystery involving the third, Ditmars' horned lizard, could not be solved so easily. Two collections of "*ditmarsii*" were made in 1890 and 1897, for a total of three specimens and none had been found since, in spite of the efforts of many professional and amateur herpetologists, including myself. Trips through back country in Sonora in my well-traveled pickup camper "El Ghosto Blanco" produced nothing more than a few specimens of the regal horned lizard, *Phrynosoma solare*, along the valley roads. But the quiet old towns, each with its central plaza, church and adobe houses, looking as they did when missions were first established in the late 1600s, made the trips worthwhile.

The country is relatively unexplored by biologists and *ditmarsii* could occur anywhere. The roads, all narrow, winding, gravel or merely two ruts, skirted vast canyons, cottonwood lined rivers, outcrops of rhyolite and volcanic plugs standing stark above the landscape. They wound through narrow canyons with jungle-like foliage and bright-plumed trogons, up dry washes and over rocky mesas. Some places required a second run to get up the hilly roads, even in compound low.

In broad, sycamore-shaded Guadalupe Canyon, at the junction of the three states of Arizona, New Mexico and Sonora, I visited

with John Magoffin, a local cattle rancher. He assured me he had never seen a horned lizard in Guadalupe Canyon, nor in the adjacent Sierra San Luis.

From the Trail Dust Zoo near Bisbee, Arizona, came rumors that *ditmarsii* had been found by someone from California. Mr. Howard Hamm, a talented western artist and curator of the zoo who has a "green thumb" when it comes to animals (all of his animals seem friendly!) assured me he had seen *ditmarsii* among lizards brought to him. But later, when my hopes were raised, he decided that actually he hadn't seen any. While looking over the wide range in color of the *douglasi* in his cages, an onlooker commented, "You seem to know something about lizards." I admitted a moderate knowledge. "Well, I've seen one like that," he said, pointing at a *douglasi*, "reddish and flat, but with no horns. My boy picked it up at the Sunnyside Church in Douglas a few years ago."

This was exciting news, but when reconsidered and a second look taken at Douglas, it was discarded. Douglas lacked the necessary habitat.

Tim Walker, an amateur herpetologist from Paradise, Arizona, had made many hiking trips in the mountains below the border in search of snakes and lizards. When it comes to locating snakes, Tim is one of the best and most persistent of the herpetologists, but he had had no success in locating the elusive *ditmarsii*. He and I spent many hours speculating on the habitat of *ditmarsii*, and came to the conclusion that it must be on one of the isolated mountain ranges — but which one?

Dr. Charles H. Lowe, a well-known herpetologist of the University of Arizona at Tucson, has been on the lookout for *ditmarsii* since the 1950's. He obtained a large collection of horned lizards from a mining engineer, Arthur Ruff from Cananea, Sonora, but they were all the mountain short-horned species, *P. douglasi* (Bell).

During the 1890-91 Lumholtz Archaeological Expedition, sponsored by the American Museum of Natural History (AMNH), F. Robinette collected the first specimen of *ditmarsii*, which languished for many years unidentified and with no locality in the AMNH herpetological collections. In 1968, a graduate student of Lowe's, Mike Robinson, began an analysis of the first part of the Lumholtz expedition, and in 1969 received a grant from the Arizona-Sonora Desert Museum to aid his search for the missing lizard. During his visits to the Southwestern Research Station (SWRS), we shared information accumulated separately and speculated whether *ditmarsii* was a valid species or might even be extinct. Mike tried following the guessed-at route of the Lumholtz expedition without success in finding the lizard.

The problem has been that the exact route of the expedition from Bisbee to Fronteras was not indicated by Lumholtz in any of his articles. His field notes were not on file at the AMNH and local newspapers of the 1890s didn't record the arrival and departure of the expedition. After searching through published reports it was possible to piece together some localities and dates given by J. A. Allen in his list of mammals and birds collected on the expedition. Although there were some errors in those records, a tentative route

* from an unpublished manuscript written in 1972

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was established.

The expedition left Bisbee on September 6 and headed southwest to Greenbush Ranch (the present-day Stevenson Ranch) near Palominas, Arizona, crossed the Mexican border September 15 at the San Pedro River to the Mexican Aduana (Customs Station at San Pedro just south of Palomitas), and then turned east along the border where they stopped at Trincheras (September 20), Santa Barbara (September 21) and Leoncita (September 23). These small villages are uninhabited today and not on recent maps.

They probably stopped at Ojo de Agua at the north end of the Sierra de los Ajos and passed through the mountains. After reaching the "Fronteras Highway," they traveled south, arriving in Fronteras on September 23, and in Oputo (also spelled Oposito) on October 22. Although the lizard collected by Robinette had no locality nor a date available, we speculated that "Northern Sonora" would indicate an area north of Oputo, especially since the expedition didn't leave there until November 25 or so, late for horned lizards to be active.

The second and third specimens collected in 1897 had been turned over by a "Mr. Eustace" to Raymond L. Ditmars, then Curator of Reptiles in the New York Zoological Park. Ditmars kept one specimen alive for about a year and commented on its peculiar habits in a letter to Dr. Leonhard Stejneger, Curator in the Division of Reptiles and Batrachians at the United States National Museum (USNM). This letter of October 12, 1905 was located in the USNM archives by Dr. George Zug, Assistant Curator of the Division of Reptiles and Amphibians. Ditmars wrote, "This little creature used to jump clear off the ground in most clown-like fashion when annoyed, emitting a series of hisses like miniature sneezes."

The lizards were preserved and later forwarded to Dr. Stejneger for identification, and he subsequently described them in 1906 as *Phrynosoma ditmarsii* Stejneger, naming them after his colleague Raymond Ditmars. In his letter to Stejneger, Ditmars wrote, "the most definite locality I can give you for this specimen is 'Northern Sonora, Mexico'." Stejneger gave the type locality as "State of Sonora, Mexico, not far from the boundary of Arizona," elaborating slightly on the data available.

My attempts to locate Mr. Eustace, or information about him or his descendants failed. A letter to the Douglas Dispatch directed towards old timers, and searches through the Bisbee, Naco and Tombstone newspapers of the 1890s, and through the Arizona Historical Society files, and even telephone directories, produced no mention of his name.

At this point it became obvious that additional information was necessary before the species could be recovered. So far all efforts had produced only frustration, stronger leg muscles and worn out vehicles. For such a scarce lizard, it was impractical to search over so wide a country. Even in the Chiricahua Mountains, its relative the short-horned lizard, *P. douglassii*, was not easily found. Because of the similarity of the two species, Mike Robinson and I conjectured that it might be a mountain species rather than a lowland species like the Texas horned lizard, *P. cornutum*, or the regal horned lizard, *P. solare*.

After Mike and I had almost given up hope of finding the lizard, another possibility arose. While identifying the stomach contents of some local lizards for a student, Carol Simon, the solution to finding *ditmarsii* became apparent to me. The stomach contents of the three preserved specimens of *ditmarsii* could be studied to identify the insects upon which the lizards fed, determine their habitats and known distribution, and then a summary of the data would

identify the type of habitat and locality of *ditmarsii*.

The search was becoming more exciting.

In May 1970 an airmail request was sent to Dr. Richard G. Zweifel, head of the Department of Herpetology at the AMNH, for the stomach and large and small intestines of their specimen of *ditmarsii* (AMNH 557). They arrived by return mail.

The stomach contents were removed, washed repeatedly in alcohol and screened into various sizes. I then sorted them microscopically using progressively higher magnification. Many of the specimens were partially digested and in pieces, but a total of eighteen different items were separated: pebbles of andesite, seeds of three species of grasses, and fourteen insects.

This approach was so successful that I sent an immediate request to Dr. Zug at the USNM for the stomachs of the other two lizards. One of the two had been kept in captivity for a year, so only one stomach would be of value. Imagine the concern and consternation when Dr. Zug replied that one lizard had been eviscerated! The other lizard was being sent by return mail. The question immediately arose — would Mr. Eustace have removed the stomach of the lizard that had died? Or would Ditmars have eviscerated a lizard that died in the laboratory? The question was pondered apprehensively since one specimen would be useless, the other of great value.

When the specimen arrived by registered mail, excitement charged the laboratory as I opened the package and one of the three known specimens in the world was unveiled. And as the cheesecloth shroud was unfolded, unveiled it was! Such an insignificant animal, alcohol soaked, gray, dead over seventy years, the tips of many tubercles rubbed off, the short horns just as Stejneger had described. With some trepidation, the lizard was opened by Ralph Luetke, a volunteer assistant at the Station, and the stomach and intestines removed.

We held our collective breaths as the first slit was made, and out popped gramma grass seeds, *Bouteloua* sp., and Apache harvester ant heads, *Pogonomyrmex apache* Wheeler, the same seed and species of ant as found in the AMNH specimens. The stomach contents were from the Southwest and not laboratory food. We were on the right track.

Then began the process of sorting and identifying. I made the initial identifications and then made the specimens available to specialists, writing almost fifty letters and making an equal number of personal contacts. For instance, the weevils were taken to Karl Stephan, an amateur coleopterist (specialist in beetles) in Tucson, then sent to a specialist on weevils for a generic identification, and then on to a person who specialized on the specific genus. Everyone cooperated enthusiastically and, caught up in the spirit of the search, remarked, "Let me know if you are successful."

When sorting was finished, there were thirty different items the lizards had ingested, and of special importance, eight species of ants in one stomach. There were pebbles picked up accidentally by the horned lizard, indicating it had fed upon the ants as they carried pebbles from their nest. There were gramma grass seeds, almost one seed for each harvester ant! The lizard obviously was also feeding upon ants returning to the nest.

No specific identifications were available for the seeds, but several grass specialists hazarded guesses. I spent a day in the University of Arizona Herbarium comparing seeds and narrowed the possibilities to several gramma grasses of one type and to bullgrass, *Muhlenbergia* sp. Roy Snelling of the Los Angeles County Museum studied the ants and returned a summary of the habitats of

the eight species. Later, other species were sent to additional ant specialists. Among them was one unique reticulated thorax and part of an abdomen of a ponerine ant, *Gnamptogenys regularis* Mayr, previously known only from Tepic, Nayarit, Mexico. Were we wrong in assuming that *ditmarsii* came from near the border of Arizona?

The next bit of information also directed our attention southward. Dr. Ann Howden of Ontario, Canada recognized the three weevils as identical to an undescribed species of *Pandeleteius* collected a few years before by her husband in the southern part of Sonora at Yecora, on a juniper at 7,000 feet.

Each time an identification was obtained, it meant searches through the literature and of the University of Arizona insect collection for distribution records. Gradually information came in, and a pattern slowly developed. The distribution of most of the specimens showed an affinity for the mountains of southern Arizona or northern Sonora.

Other weevils, tiphid wasps, a male scale, jumping spiders, true bugs and grasshoppers were identified. One of the grasshoppers was *Barylettix h. humphreysii* (Thomas) upon which Dr. Ted Cohn of San Diego State College was working at the time. Its distribution is west of Agua Prieta and Sierra San Jose near Naco, whereas the distribution of a related species, *B. h. cochisei* Gurney occurs east of Agua Prieta. One extremely unusual insect, a true bug with short wings, lateral thoracic horns and a dorsal scutellar horn, was represented by only a few parts. After almost giving up attempts to identify it, I assembled the parts like a jigsaw puzzle, made a composite drawing and sent it to Dr. R. C. Froeschner of the USNM in Washington D.C.

Dr. Froeschner replied immediately that it was very close to a South American genus of largid bug, *Thaumastaneis*, known only from Bolivia and Brazil! It is similar to a local ant-mimicking, brachypterous (short-winged) true bug, *Arhapha cicindeloides* Walker (which lacks the dorsal spines), a very common largid bug among the dead leaves in oak stands in the Chiricahua Mountains.

In another field, several geologists and petrologists suggested that the tiny pebbles were not adequate for a specific determination. However, the pebbles were described by W. H. Pierce of the Arizona Bureau of Mines as "a finely crystalline igneous rock characterized by plates or tables of plagioclase feldspar and a dark to red brown ferromagnesian mineral of undetermined species. A small amount of magnetic and other unidentified material was present. Quartz was not observed. Based upon spotty evidence, I would suggest that the material is diorite in composition."

Mr. Sidney Williams of the Phelps Dodge Corporation at Douglas, Arizona, felt that these mineral specimens were andesite, a close relative of diorite. He knew the areas below the border, and suggested that two mountain ranges be investigated, Sierra Manzanal, south of Cananea, and Sierra San Luis, near the Chihuahuan border, both of which had extensive deposits of andesite. We were able to eliminate Sierra San Luis because it was east of Agua Prieta and out of the range of the *Barylettix* grasshopper.

It was time to summarize the data. After many hours of discussion over meals, in my office and laboratory, over campfires, retelling the story of the missing lizard to anyone who would listen, and then sifting through their ideas, suggestions, and speculations, plans for the future evolved. Looking over the data, it was possible to come to the following conclusions:

The lizards had been collected in the fall of the year as evidenced by the expedition collections from northern Sonora and prob-

ably in the month of September. The seeds, grasshoppers and jumping spiders found in the stomachs had been mature, reconfirming the time of year. The presence of gramma grass seeds, Apache harvester ants, and andesitic pebbles in both stomachs indicated that the lizards were collected in the same area. The soil would probably be sandy red as Ditmars described the color of the live lizard; horned lizards normally blend well with the substrate. The specific habitat had been described by Snelling as "a canyon habitat with a small stream, rocky slopes, grass, oak-juniper, possibly with sycamores on the canyon floor. It looked to me like the lizard was foraging above the streams, between the stream and the sides of the canyon."

Then I realized there had been extensive change in the habitats over the past seventy years — lower rainfall and over-grazing in many areas. Was I studying lizards taken from the extreme edge of their habitats? There were still so many variables that at times I was ready to give up.

The Changing Mile by Hastings and Turner describing climatic changes of southeastern Arizona during the late 1800s and early 1900s showed some significant transformations in the vegetation. If similar changes took place south of the border, insect (and lizard) life may have been altered significantly and marginal species such as the horned largid bug, *Gnamptogenys* ant, and the *Pandeleteius* weevil, as well as *ditmarsii*, may have been pushed farther south.

While the identifications of the plants, insects and spiders were being obtained, extensive collections of ants were made in the Chiricahua Mountain area at elevations of 4160 to almost 10,000 feet to determine the altitudinal distribution and habitat preference for the species found in the lizards' stomachs. Most of these species occurred sympatrically within 4,800 to 5,400 feet on dry hill-sides often adjacent to riparian situations.

The key items to locate were the andesite (its magnetic properties made it especially valuable), grasses (conspicuous in the fall), *Barylettix* grasshoppers, Apache harvester ants, *Gnamptogenys* ant, largid bugs, and *Pandeleteius* weevils. With the time of year determined, knowledge of the general area in Mexico and its habitats, and an idea of the mineral make-up of the area, we started serious searches in the field in mid-summer of 1970. The best possibility appeared to be the Sierra Manzanal, one of the two ranges below the border with known deposits of andesite. The mountains at Cananea, nearby, had produced only *douglasi*, and to the east Sierra de los Ajos had been searched briefly with no success. We made several insect collecting trips into northern Sonora for samples of the organisms and pebbles found in the lizards' stomachs. The habitat in which most of the species occurred would likely be the place where *ditmarsii* would be found.

These trips with friends and volunteers from the SWRS required crossing the border with all the hassles involved with Mexican officials over papers for the pickup truck, birth certificates or lack of them, temporary visas, below-age students without written permission from parents, a neat beard ("He's a heepee!"), a German passport, and the often expected *mordida* (the extra pay for "extra service").

The first stop in Mexico would be the *panadería* for a bag of *birotos*, the tasty, hard Mexican rolls, some small but flavorful Mexican bananas, *tamarindos*, dried seed pods with a citrus-acid like flavor, limes for hot limeade or for squeezing over fresh mangos, and bars of *panocha*, a raw sugar for energy food. Then through Agua Prieta, typically lacking direction signs, past the cemetery to the checking station, and then abruptly out into the backcountry —

wide open vistas, no power or telephone lines, no billboards, and little fencing.

Maps from the American Geographical Society, U. S. Coast and Geodetic Survey (Aeronautical Charts) and the Secretaria de Agricultura y Ganaderia, Direccion y Meteorologia from Mexico City gave little help. They were consistent only in their inconsistencies. Localities on one map were missing or spelled differently on another, altitudes varied considerably in the mountain ranges, which never seemed to be in the same place. Roads which didn't exist were depicted with heavy lines, and good roads not even indicated! Still, the maps were of some value.

Our first destination was the west side of the mountain range we thought was Sierra Manzanal. On a back trail, while we were lurching on *birotos* and mangos, a truck bounced out of the mountains with a load of copper ore. We flagged it down and found we were not in the Sierra Manzanal, but in the Sierra de los Ajos. So back up the road to Cananea, a relatively American-looking mining town, and then south on a different road to our goal.

We checked out each road into the Sierra Manzanal, most of them never having seen a grader or bulldozer, so it meant a slow, rough trip. Five or ten miles per hour is considered good progress. After an hour or so on one narrow road gouged out of the steep mountain side we came to a small cluster of brown corrugated-paper-clad shacks with the usual half-dozen or more small children and their pregnant mothers. We asked about the road and about horned lizards. The road went on for a couple of miles, but as for the lizards, they knew of none in the area. One relaxed fellow said they could be found at Sierra San Antonio to the west, but were very rare. Later a look at the map showed no mountain by that name.

A couple of miles up the road we parked at a deserted mine and looked over the area. The habitat didn't appear promising except for many of the ants we were looking for. Soon dark clouds, lightning and rain in the distance cut short our stay. Being caught in a cloudburst in this country can mean an unexpected stay of a few days if the roads turn into rivers or quagmires. We returned to Cañon de Evans in the Sierra de los Ajos and drove five miles up a sycamore and oak-lined wash to make camp.

The area was still promising, with the type of habitat described by Snelling and with many of the insects we were seeking, but no andesite. On our way home we stopped in Douglas to see Sidney Williams, a geologist who knows northern Sonora well, and he gave us the directions we needed to get into the Sierra Manzanal.

Our next trip into Mexico took us deep into this mountain range because we picked up a Mexican who was heading for his ranch and showed us new roads. He seemed to know nothing about horned lizards and again we wondered if we could be in the right mountain range. After we dropped him off we located a small stream, cooled off in the water, and took a siesta (when in Mexico, do as the Mexicans do). Some collecting in the area again showed a few of the insects in which we were interested, also some red rock similar to what we were looking for, but no lizards. That evening we camped beneath an old oak and had our usual dinner of potatoes wrapped in aluminum foil and baked in hot coals, *birotos* and fresh cantaloupes. Debris nearby indicated that many years ago this had been the site of a large mining camp. We wondered if Mr. Eustace had been a mining engineer and collected the lizards right here. On a nearby hill we saw and heard a drilling rig, indicating current drilling activity.

That night horizontal streaks of lightning broke into fingers of

light and then ended in balls of fire . . . one of the greatest displays of lightning I have ever seen. With the thunder, then came rain, and later a herd of curious burros. It was hard to sleep under my plastic ground cover. After a breakfast of corn pancakes, bananas and hot chocolate, we explored some nearby mine shafts, searched for horned lizards and then climbed the hill to investigate the drilling operation. We found an engineer, Hector Lopez, in charge, and with the help of my daughter, Susie, who had spent some time in Mexico, we communicated fairly well. After the usual, "What are you doing up here?" from both sides, we got down to business.

"Any horned lizards? we asked.

"Si!" His children had been playing with them last week in the brush around the drilling rig. He drew a reasonable facsimile of a horned lizard and then cinched it by saying it squirted blood out of its eye, characteristic only of horned lizards.

I offered a reward of 100 pesos (about \$10) to anyone who would get a specimen for me that turned out to be *ditmarsii*. With this agreement, we left with a promise to return soon.

Over two weeks passed before we could return and then we found that Señor Lopez had left for Mexico City where his wife was having a baby. In the meantime, we had studied the material taken on the previous trip and believed that we were in the right area, but intensive searches around the drilling rig produced no horned lizards. A new engineer, this time an American, Paul Geiger, was at the rig and communication was easy. He promised to obtain a lizard for us if possible. Other searches in the area produced no more likely place for *ditmarsii*. We returned to Cañon de Evans to camp and once again decided that the Sierra de los Ajos couldn't be the right locality.

Almost two weeks later a call came from Cananea. It was Paul Geiger asking if I could meet him in Douglas the following morning. He had a lizard! At the Station the excitement was at high pitch and everyone wanted to go to town immediately. We arrived early at the appointed spot and waited. As he drove in, we dashed up and were handed a small box. We cracked open the lid slightly and out peered a very spiny horned lizard. Our hopes died. "A douglassii!" was all I could say at first, but then added, "It's a good record anyway." We sent a few dollars along for the collector as a consolation prize, and went home wondering where we would look next. At the Station the specimen was turned over to Chuck Lowe, who peeked through a hole in the box and agreed it was a *douglassii*.

The next day a call came from Chuck. "Mike and I are coming down tomorrow." Just a flat statement, no reason, no nothing. Something was in the wind. They arrived the next morning with the electrifying news, the lizard had been identified by its abdominal keeled scales as *ditmarsii*! There still was a slight question in Chuck's mind, but in the meantime the type of the species had been requested for comparison. More specimens were needed for confirmation, so it was back to Mexico.

This time, accompanied by Chuck and Mike, we decided to check out the road along the border to Rio San Pedro and possibly locate some of the Lumholtz Expedition tracks. The road was unproductive for lizards, but a picnic site along the river had a record sized wild grape vine a foot in diameter near the base. The back road eventually led along the river, across farm lands, through grasslands and *ejidos* to Cananea. We located none of Lumholtz's route.

We drove into the Sierra Manzanal and up a narrow mining road where we had to back up to make one turn on the precipitous mountain side to the drilling rig. I introduced Paul to Chuck and Mike and we made arrangements to obtain additional specimens of

ditmarsii.

We looked carefully for lizards, found none, but took notes on this habitat. It was similar but not identical to the habitat we expected because it was on top of a rocky oak-covered hill with sandy red soil rather than in a canyon. Without a doubt we were near, but not necessarily at the type locality.

The rest of the tale was anticlimactic . . . we obtained more specimens, the identity of the lizard was confirmed, and the rediscovery was written up (Lowe, Robinson and Roth 1971). Stomach contents of the new specimens provided additional information on the food habits of these lizards (Roth 1971). The search was over . . . and successful. All that remained was reporting the news at the annual herpetological meeting and to tell the story again and again to interested biologists and herpetologists who almost invariably replied, "Sounds like a detective story" — which it was!

Acknowledgments.— Many thanks go to David Hardy, Sr. and Karen Hayes who typed and repeatedly improved this paper.

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Ditmars' Horned Lizard, or Rock Horned Lizard: An Historical Update Since Rediscovery (1970)

Wade C. Sherbrooke

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American Museum of Natural History
Portal, Arizona 85632

Roth's (1997) account of the scientific sleuthing that led to the rediscovery of an almost unknown lizard wets one's appetite for adventure. In 1970, Ditmars' horned lizard, *Phrynosoma ditmarsii* Stejneger 1906, had not been seen alive for seventy-three years. It was only known from three specimens, all lacking good locality data. This precluded careful searching of known localities.

Over the years many in the herpetological community had come to the conclusion that the "species" was either extinct or that the three known specimens were aberrant individuals of the short-horned lizard, *Phrynosoma douglasi* (note current spelling: Hammerson and Smith 1991; Zamudio 1995a, b). But Reeve (1952) had said that the validity of the species was never in question. Many practicing herpetologists at that time had cut their "herp teeth" reading the various books by Raymond L. Ditmars, including his report of Ditmars' horned lizard (Ditmars 1951). The reporting of the rediscovery of Ditmars' horned lizard (Lowe et al. 1971) was a welcome surprise. What has happened since?

As Roth describes so well, by 1970 the sum total of ecological knowledge about the species had been plucked out of its stomachs—two (Roth 1971, 1997). The rest of its habitat requirements were surmised by comparison with a presumed close relative, *Phrynosoma douglasi*. The nature of that relationship has been of continuing interest to herpetologists (see below). Once the species was recollected in the field there was new information. Its habitat had been identified, the Madrean evergreen woodland (Lowe et al. 1971). This might be useful in locating the lizard in other areas. But where? Other mountain ranges in Sonora? In the United States? It had been known from the original specimens that the species occurred near the Mexican-United States border. Therefore, there had always been some hope, expressed by those dreaming of rediscovery, that the species would be discovered living in poorly ex-

plored mountains or desert canyons of southern Arizona or New Mexico. To date this has not been the case.

Lowe, Robinson and Roth (1971) speculated that *P. ditmarsii* would be found, in the woodland-grassland ecotone, sympatrically with surrounding populations of *P. douglasi*. The latter species, they felt, was largely restricted to the grassland habitats of north-eastern Sonora. They reported the collection of 49 *P. douglasi* within "a dozen or so miles of the Sierra Manzanal." (The distance from their rediscovery locality was not made clear.) Nevertheless, to date, no sympatric populations have been located. Indeed, the most outstanding thing to report 25 years after the rediscovery is that there are now only two additional localities known.

Mr. Paul Geiger was the geologist working in Sonora, in the Sierra Manzanal, who had brought the first specimen of *Phrynosoma ditmarsii* to Roth. He must have retained his interest in the species, and his eye for locating it. For when the second locality for the species was reported in 1975, his name appears in the acknowledgments as being the provider of the first specimen from there as well (Lowe and Howard 1975). In the Sierra Baviacora the lizard was located in Madrean oak woodland, in rocky habitats. The dominant species of oaks were different from the locality in the Sierra Manzanal. The new locality, at an elevation of 1,425 m (4,700 feet) was approximately 130 airline kms southeast of the Sierra Manzanal locality (Lowe and Howard 1975). Both localities are in the drainage of the Río Sonora.

Lowe and Howard (1975) now proposed a new common name for the lizard, the "rock horned lizard." At both localities they had been found in rocky habitats, and indeed the lizards were rock-like in form and appearance. The earlier report (Lowe et al. 1971) had noted that the recently collected specimens were spinose, in contrast to the three earlier known specimens that were smooth and

"hornless." This condition seems to have been a result of captivity and/or long preservation. Therefore, at this time, the common name of "hornless horned lizard" (Smith 1946) seems inappropriate.

Lowe and Howard (1975) reported that in 1974 a large (SVL 90 mm) female gave birth to nine young in captivity (an earlier collection at this locality was made in 1972). They verified their suspicion that the species was viviparous, and again suggested a close relationship to *Phrynosoma douglasi*, which is also viviparous. The birth date July 23 (ten days after capture) combined with information from other specimens, led them to suggest that the timing of male and female reproductive cycles in *P. ditmarsii* allows for coincidence of parturition with the onset of the summer monsoons. Some information about the natural history of the species was beginning to come to scientific light.

The discovery of the third locality did not happen until 1983, more than ten years later. Perhaps it was more fortuitous even than the first two discovered. This time the discoverer was a botanist at the Arizona-Sonora Desert Museum (ASDM), Robert H. Perrill (Perrill 1983). The single subadult animal was photographed and released (Perrill had no collecting permits for reptiles in Mexico). The fact that the lizard was recognized and reported by a naturalist whose orientation was botany is probably attributable to the role the ASDM had played, and was playing in 1983 (see below), in the pursuit of Ditmars' horned lizard. Also Perrill had an interest in reptiles. Earlier the ASDM had given support to Dr. Charles H. Lowe, at the University of Arizona, for work on the amphibians and reptiles of Sonora. Also, it was the ASDM that had given a grant to Michael D. Robinson, Lowe's Ph.D. graduate student at the time, to try to use historical documents to trace Carl Lumholtz's expedition trail through Sonora in an attempt to locate the origin of the single specimen collected by F. Robinette in 1897. (Lumholtz, whose expedition goals were anthropological, did note the details of one horned lizard, a design discovered on an archaeological ceramic jar (illustration Plate 1, c, p. 95, Vol. 1.; Lumholtz 1902).

Perrill's reported observation (1983) gave new insight into the biogeography of the lizard. He had found it in a different drainage, in the Río Yaqui, approximately 150 airline kms south-southeast of the nearest known location (Sierra Baviacora). The substrata seemed familiar. "The lizard was found on a steep, south-facing slope with widely scattered rocky outcrops" (Perrill, 1983). But the Madrean evergreen woodlands were not to be found at this locality. The lizard was living in Sinaloan Deciduous Forest with Mexican tree ocotillos and kapok trees. Our earlier concept of the habitat requirements of this species, based on two localities, needed to be altered. Where else might it be found? That question remains today.

As Perrill's report suggests, study of this lizard in Mexico was somewhat thwarted by the difficulties in obtaining scientific collecting permits. But in 1983, Howard E. Lawler (at the Arizona-Sonora Desert Museum) obtained a permit to collect live *P. ditmarsii*. A collaboration was arranged with Dr. Richard R. Montanucci, of Clemson University, to establish a breeding colony for study in South Carolina. Montanucci invited me to join himself and his student, Tom Mann, on the collecting expedition, August 2-6. Dr. Lowe, with whom I had studied at the University of Arizona, sketched a map of the Rancho La Palma locality in the Sierra Baviacora for me.

Once there, we spent a full day and a half combing one slope intensively without seeing a horned lizard of any species. Weather conditions were ideal for collecting. Before leaving the United

States we had contacted Vince Roth concerning our plans. He had indicated that he might meet us in the field. On the second day, around noon, he arrived with his wife, Barbara, and a group from the Southwestern Research Station. We had no lizards to show him, and spirits were low. Late that afternoon, around 4:30, I took off by myself and changed search strategy to focus on a different slope, one that was close to where we had searched and to our campsite. At 6:05 I found my first *P. ditmarsii*, an adult, and was thrilled. When I returned to camp and pulled it out of my collecting bag everyone was joyful. But it was too late to mount a search party until the following morning. Then, after breakfast, seven of us ascended the slope where I had been successful. By late morning we had two more adults and three juveniles. Then time ran out, and we departed for the trip home.

Back at Clemson University, Richard Montanucci established a breeding colony. Over the years this captive colony was the source of the only subsequent data on the behavior of the species. In particular, Montanucci (1989a) published on diel activity, locomotion, aggressive interactions, and sleeping sites. He also published (Montanucci 1989b) on the reproductive behaviors of adults, mating, non-receptive behavior in females, parturition, and the growth of juveniles. Although his conclusions from his captive colony suggested an agreement with Lowe and Howard (1975) on birth coinciding with the summer monsoons, he found a discrepancy with the time of mating (spring) suggested by Lowe and Howard (1975). Apparently, Lowe and Howard (1975) had based part of their reasoning on a comparison with *P. douglasi* in Arizona, a study by Goldberg (1971). Montanucci (1989b) concluded that mating takes place from August through December, not in the spring like in *P. douglasi*. He suggested that in females either (1) embryogenesis is halted during the winter, or (2) sperm is stored. The discrepancy in these two views of mating time in the species remains unresolved.

When Leonhard Stejneger at the Smithsonian Institution described *Phrynosoma ditmarsii* in 1906 he noted the following: "It is difficult to say to which of the former known *Phrynosomas* the present species is most nearly related. It has no special affinity to any of them." By 1952, in his review of the genus, Reeve said: "The absence of the spines, the enormous development of the lower jaw, the extreme notched condition of the occipital area and other cranial features would seem to indicate that the nearest relative of *P. ditmarsii* is *douglasi*." And in an osteological review of the genus in 1969, Presch said: "It apparently represents a highly localized derivative of *douglasi*." Lowe et al. (1971) and Lowe and Howard (1975) concurred with this view. In 1987, Montanucci published a phylogenetic study of the genus based on skeletal and external morphology. It incorporated cladistical analysis of character states. A striking conclusion of that study was that *P. ditmarsii* and *P. douglasi* are not closely related but fall in two different lineages within the genus. Recently, Zamudio (1996) presented a cladogram, based on her work and on unpublished molecular and morphological studies by Tod Reeder, that suggests that *P. ditmarsii* is most closely related to one segment of the polytypic species *P. douglasi*. Currently the former *P. douglasi* is recognized as two species (Zamudio et al. 1997), *P. douglasi* and *P. hernandezii*, the latter of which seems to be the closest relative of *P. ditmarsii*. This throws the relationship of *P. ditmarsii* back with the *P. douglasi* evolutionary line, at least for the present.

Ditmars' horned lizard was first collected nearly 107 years ago, then again 100 years ago, then rediscovered 25 years ago. Today it is known from only three localities in Sonora, Mexico. It has never

been the subject of a field investigation. Still today, very little is known about this curious lizard. I wonder, What more will we know 25 years from now?

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From the Pres- (continued)

Perry. In her years of serving on the board, she not only was a dynamite Secretary, but also stepped up when needed to become the Editor of *Sonoran Herpetologist*. She did a Komodo dragon-sized job, and there aren't enough ways, using every language in the world, to say thank you to Janice for her work in this regard.

In looking back at 1996, the big question that a real president would have to face is "What did the Society accomplish?" With pride in our Society, I can honestly say that '96 was our most active year. Now, a real president might say "because of me, this happened." However, this pres realistically and gratefully acknowledges that in SPITE of me, this happened: The establishment of a homepage for the THS. Not only did we get a homepage, we got an EXCELLENT homepage, and I continue to receive unsolicited praise from herp heavies around the country. Even if we don't change it one lick in the upcoming years (NOT a likely scenario), our homepage will be forever excellent.

Moving out of cyberspace and into the land of the live herpers, the THS has seen other noteworthy occurrences in 1996. At the top of my list is the rejuvenation of the THS Youth Chapter. I went to several of their meetings over the past year, and was pleased to see the same children coming back month after month. They are a VERY sharp bunch of youngsters, and it is my solemn hope that we can continue to keep this worthwhile group alive for years to come. Going hand in hand with the Youth Chapter is the Speaker's Bureau, which has continued to inform the public, usually school-aged children, of the importance of our local Herpetofauna in the overall scheme of the environment in Arizona. The Speaker's Bureau plants the seed, and the Youth Chapter waters it, and who knows what the

future results of this effort may yield.

And the herp hits of '96 just keep on comin'! In addition to serving the community, we did a field trip too! How many times can a bunch of persnickety herpers get together and have a good time the way we did last September? The Brown Canyon Field Trip was not just a herp-trip, it was a genuine adventure, and I pity those that didn't make it. There is talk of another field trip for 1997, maybe in the spring. How about the Student Chapter of the THS, huh? Was fall '96 a banner semester or what? *Sonoran Herpetologist* continued to maintain its reputation as one of the best newsletters from herp organization in the country, period. After each issue, comments from across the nation poured in through my computer, phone lines, and mail box. Without question, people are reading the S.H., and at times, are even inspired to write in and voice their support. Unsolicited praise for a newsletter is practically unheard in this day and age, ESPECIALLY from herpers! We've got a good thing going, and it is our plan to maintain this level of excellence for a long time to come. Along with the S.H., we had some first rate presentations at our monthly meetings as well. The information freely given at our general meetings could fill encyclopedias with information about the animals that we love.

Lastly, in 1996 we became involved in an issue that may set the stage for even bigger things to come. With the flat-tailed horned lizard lawsuit, you, the general membership of the THS, demonstrated your willingness to step up to a cause that should and does concern us. I am ecstatic at the way the THS folks have responded to help to save this lizard from pending doom. Whether we win or lose, both the THS AND the AHA have demonstrated that we Ari-

zona Herpers will not sit idly by while our charges are threatened. Kudos to all who have helped in this cause, and we can all rest assured that the Arizona spirit of unity is being felt by our government.

Throughout the last few paragraphs, the astute reader might have noticed that no names were mentioned. Each and every accomplishment for 1996 was the direct result of combined effort of many individuals, and it was "Team THS" that benefited from said effort. A heart-felt thank you to all the many people involved in making the THS a great society. To those of you who would like to get more involved, I invite you to join in! It is my hope that more people will be willing to step forward to help as needed in the future.

In looking forward to 1997, we have what appears to be a very solid new Board of Directors. What can your president guarantee for this upcoming year? Nothing! However, if we can maintain the status-quo, all will be well in the world. If we can do better, let's do it! Looking forward to another year of rockin' and rollin'!

NEW THS MUGS AVAILABLE

The new Tucson Herp Society mugs are available and can be purchased at Society monthly meetings (not available by mail order). The price is \$10 each with each purchase contributing \$4.40 to the THS general fund. Members will want to buy their mugs soon, especially since this may be a limited addition.

NEW ADDRESS FOR THS

Please note the Society's new POB and Zip Code:
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NEW ADDRESS

THS Internet World Wide Webpage

The THS homepage has a new address:

<http://www.azstarnet.com/~bsavary/THSpag.html>

The new address will facilitate Bill Savary's management of our homepage. We are indebted to him for devoting the time and energy to making ours one of the best of herp homepages.

Lizard Lawsuit Fund

Contributors

Tom Caldwell	Tucson
Abe & Norma Lackow	Tucson
Jeff Moorbeck & Jennifer O'Leary	Tucson
Trevor Persons	Flagstaff AZ
Chris Wolner	Tucson
Don Swann & Phi Pham	Tucson

HORNED LIZARD LAWSUIT FUND

If you agree forcing the USFWS to take action on listing the flat-tailed horned lizard is a worthwhile project, please send a contribution to the Tucson Herpetological Society. State on your check that it is for the Lizard Lawsuit Fund.

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The artwork on the THS horned lizard conservation t-shirt is shown above. Priced at \$15, revenue over shirt production cost goes to horned lizard conservation which currently are legal expenses related to the flat-tailed horned lizard lawsuit. Shirts will be available at monthly meetings and by mail order from:

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Wanted: Ads for this space. See above for particulars. 624-8879.

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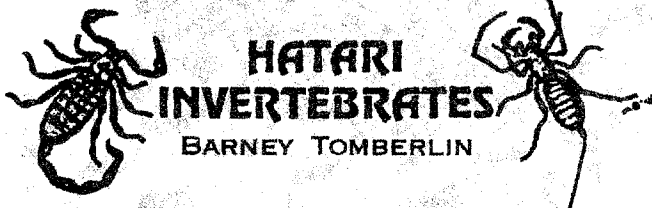
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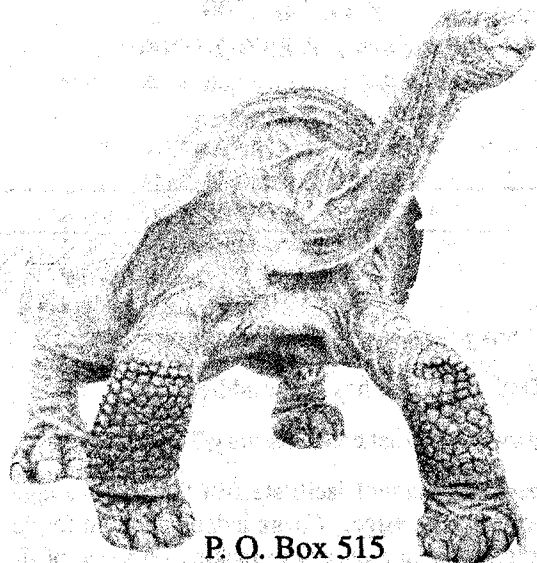
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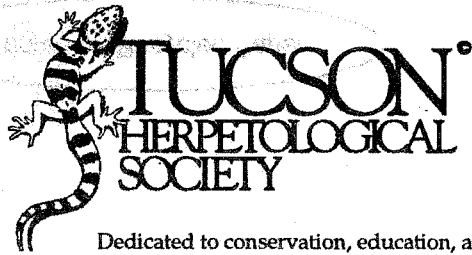
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Tuesday 28 January, 7:00 PM
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Speakers Bureau
Roger Repp, Director
Scheduled presentations

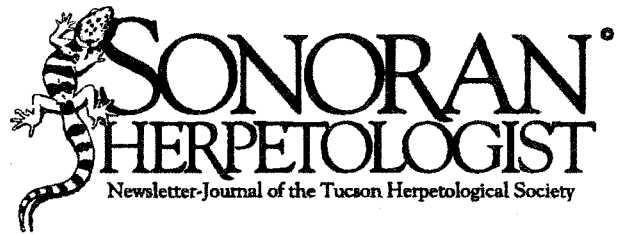
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Jeff Seminoff, President
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Bob Brandner, Director
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THS Collected Papers, 1988-1991 (out of print)
THS Internet World Wide Webpage
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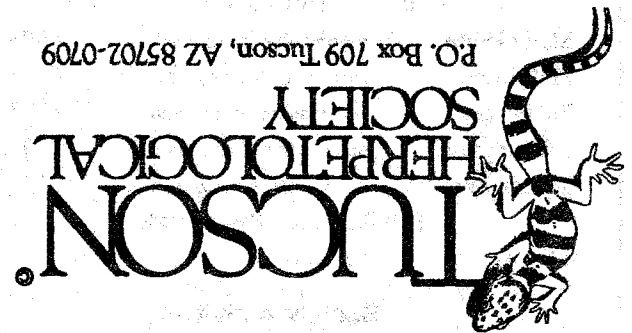
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