
AMCS

ASSOCIATION FOR MEXICAN CAVE STUDIES

BULLETIN 7

CAVES OF THE SAN JUAN PLATEAU

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AMCS
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Note about PDF reprint made June 2012: The original version of this bulletin consisted of a bound book and seven loose folded map plates. The map plates have been appended to the book to create this PDF. They were originally much larger, but they have been reduced to standard U.S. paper sizes for convenient printing. No detail has been lost, and they can be enlarged if desired.

Cover: Prusiking out the entrance of Sótano de Javalín (Roy Jameson)

Frontispiece: Rappelling the Twin Drops in Hoya de las Conchas (Bill Stone)

Back cover: Artwork by Jayne Gorup

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PREFACE

The publication of this bulletin marks a much needed resumption of the high quality and authoritative journals that have been the hallmark of the Association for Mexican Cave Studies. The regional scope of this report is a reflection of the enthusiasm and dedication that AMCS Cavers displayed in accomplishing a comprehensive speleological survey of the area. The result is of great value to Mexican speleology and particularly so for the Mexican speleologist, who for once can find in one place complete published information on an AMCS-investigated area.

The exploration and survey of San Juan's deep caves took less than a year's time from inception to completion. This fact is largely to be attributed to the unwavering passion for cave exploration of Bill Stone and Tracy Johnson, who never allowed more than three months to pass before returning to continue exploration of the San Juan caves. The highlight of exploration could be said to be the expedition of March 1976 that mapped Hoya de las Conchas, El Sotanito, Sotanito de Canoas, and part of Sótano de Nogal, as well as several kilometers of surface surveying that interconnected all of the major cave entrances. The 37 cavers present adapted easily to the work that needed doing and there was a place for everyone's skills. Through informal leadership and organization considerable work was accomplished in a one-week period. The caves themselves are unique and an expression of a very interesting geological parentage; their speleogenesis defines a very distinct type of vertical pit system.

It is hoped that following this precedent will be a series of bulletins on other major karst areas of Mexico. New areas are being investigated each year with the same research caliber exhibited in these pages; these regions deserve equal documentation. But we must also re-examine the past and bring together the products of an earlier generation of Mexican cave research, lest they be lost to world speleology. We should think not only of ourselves, but also of how the future Mexican caver may benefit from our work.

–Peter Sprouse

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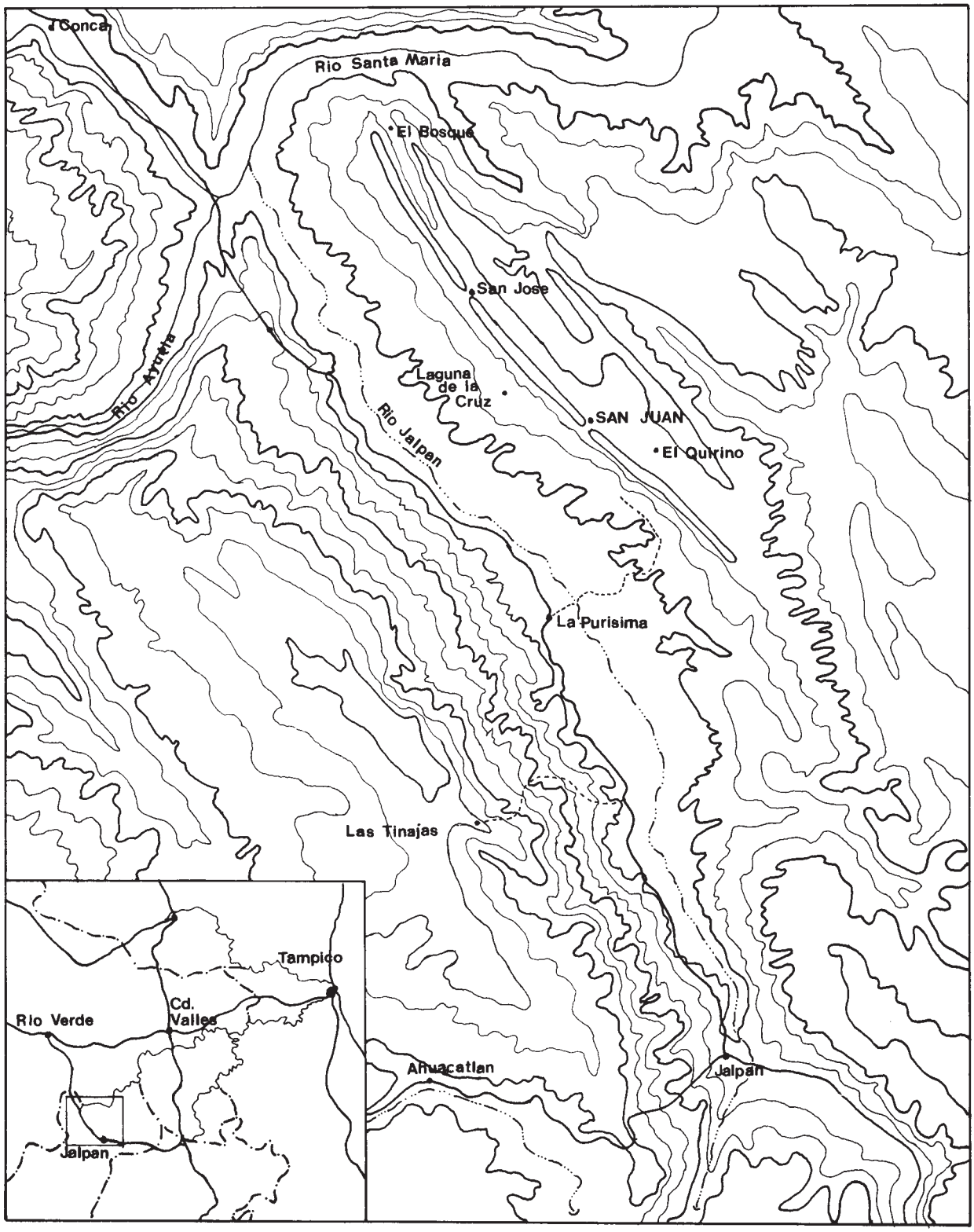
INTRODUCTION

During the nine months it has taken to draft all the maps and write the manuscript to this bulletin, interest has swayed to more exotic areas with greater depth potential and more active water passages such as Huautla: Those cavers who have been to both locations will ultimately observe that perhaps the most valuable asset caving in Mexico has is not the obvious one–that of great depth potential, but a more intangible asset–the friendship of the local people. Nowhere is that asset more obvious than on the San Juan Plateau. Complete strangers to the area have been welcomed with open arms, invited to dinner, and eagerly questioned about the latest cave depths. It is this friendliness of the people of El Quirino, San Juan, Rancho Mojonera, San José, Laguna de la Cruz, and Milpas Viejas that has made the San Juan Plateau such a fond memory to those who have caved there. In this light, it is only proper that this bulletin be dedicated to the people of the San Juan Plateau.

As always, no publication is produced solely by its authors, and this bulletin is no exception. Thanks are due to Bill Russell for his constructive comments and encouragement, and for editing the geology and final manuscript; to Peter Sprouse, who wrote the Preface, drafted the Conchas map and served as a constant literary and cartographic advisor; to David McKenzie, who developed and provided the Ellipse Computer Program used for data reduction and plotting; to Terri Treacy, who typed the final manuscript; to James Reddell, who typeset the bulletin; to Patty Mothes, who was patient and helpful with the geology and photography; to Susan Havorka, who reviewed the geology; to Gordon Mothes, who provided photographic assistance; to Andy Grubbs, who wrote the biology section; to Jan Lewis and Terry Raines for their advice on printing; to Jerry Atkinson, who was invaluable in layout; to Jayne Gorup, for providing artwork; and lastly to Tracy Johnson, whose spirit and drive were always present when something needed pushing beneath San Juan.



SAN JUAN LOCATION MAP

LOCATION AND ACCESS

The San Juan Plateau is located in east central Mexico in the Sierra Madre Oriental approximately 250 kilometers to the west, and slightly south of Tampico in the state of Querétaro (Area Location Map). The nearest major city, Río Verde, lies 100 kilometers to the northwest in San Luis Potosí.

The area may be reached by traveling south from Río Verde or north from Jalpan to the roadside village of La Purisima de Aristra. From La Purisima a four kilometer dirt road winds 500 meters up the San Juan Ridge before ending abruptly at the southern margin of the caving area. Access thereafter is provided by a well integrated network of trails. The road from La Purisima was constructed in less than six months in 1975; although plans call for an extension of the road well into the San Juan area, no further work had been undertaken as of May 1977. Visitors should therefore plan for backpacking and may wish to arrange for burros in La Purisima.

The San Juan Plateau takes its name from the *Ejido* San Juan de Buenaventura.

View looking east to San Juan from western trail pass. (Bill Stone)

HISTORY OF EXPLORATION

Many cavers who hear of the exploration of deep Mexican caves do so from short, incomplete notices in national publications and by word of mouth, leaving ample room for speculation of the details. Perhaps the biggest misconceptions about Mexican caving are that the deepest caves are easily located and that exploration always occurs smoothly due to highly organized expeditions staffed with only the best cavers. In reality though, the discovery of a spectacular caving area is more often by chance than plan, and expeditions are seldom as smooth as we would like to see. It is not often that the exploration and development of a major caving area can be chronicled from its inception to finish. In this respect the history of exploration should be a benefit to the new Mexican caver.

INITIAL DISCOVERIES

The Christmas of 1973 saw a great deal of caving in Mexico and as usual the Ciudad Valles and Jalpan regions were the centers of activity. In addition to the many groups working in the El Abra and Golondrinas areas a small group of New York cavers from the Rensselaer Outing Club led by Bill Stone and Steve Ward began extensive work in the Tancoyol and Tres Lagunas region. Many leads were collected on this trip which eventually led to the discovery of El Socavón, a 171 meter pit 2 1/2 days hike northeast of Tancoyol. However, at the same time another lead was given to the group by a white-haired old man named Juan Sijuentes Sanchez. Sr. Sijuentes said that there was a very deep pit which captured large amounts of water each summer during the rainy season located near the village where he was born. Other younger locals said the hike would take a minimum of 6 hours without a pack, so the lead was filed away for future reference. There were too many other good leads closer than 6 hours.

Two years later, in the summer of 1975, Stone, Ward, and Spencer McIntyre returned to Tancoyol to check out the Las Flores and Rancho Teposan areas to the north. The group decided that the lead provided by Sr. Sijuentes had sat long enough. Unfortunately the old man had moved to Ciudad Valles. But he was well known and liked and several of the townspeople knew of his birth place. According to locals the village of Tierra Fría, Sr. Sijuentes birthplace, lay only 2 hours by foot from the town of Saucillo, which is 12 kilometers north of Landa de Matamoros. When they arrived in Saucillo the cavers were informed that the hike would probably take four hours. McIntyre and Stone hiked out at dawn the next day with daypacks while Ward, who was recovering from a bad case of blisters, remained behind with the truck. After six hours hike they arrived in Tierra Fría. Much to their surprise they learned that Sr. Sijuentes was actually born in the town of Rancho Mojonera, 1 1/2 hours to the north, and no one knew of any caves nearby. Upon arriving in Mojonera they discovered that there still were no large sótanos in the area and were beginning to give up hope as dusk closed in. The nearest known cave was another 1 1/2 hours away. A small boy guided them to El Quirino where they stopped at the house of the local jefe, Dimas Chauvez. When they asked where a nearby arroyo led, he replied, "Oh, it just goes into a cave near the end of that field over there."

So with new found motivation they hiked over to the entrance of Sótano de Javalín. Any one who has been to the entrance can

Members of Thanksgiving Expedition 1975. (Tracy Johnson)

well imagine the excitement at that moment. Rocks dropped down the 92 meter entrance pitch quite often bounce for 10 seconds or more. The locals said that there were others like Javalín nearby, but Stone and McIntyre decided to hike on out to the town of La Purisima, which lies on the highway north of Jalpan. An hour later they crested the western ridge above San Juan and could faintly make out the highway far below. Halfway down the mountain they intersected the dirt road being built to San Juan. They followed this for 3 kilometers to the Río Jalpan, only 500 meters from the highway. It was still the height of the rainy season and the river appeared too deep and fast to swim. They crossed the river by crawling across a 70 meter long cable suspended 8 meters above the water! Later in La Purisima they managed to catch 2 hours sleep and some food in a friendly local's house before spending their last 10 pesos on a bus ticket to Landa de Matamoros. At 6 AM after hiking down the 12 kilometer road to Saucillo, they surprised Ward by coming in from the opposite direction. They returned to the States, too exhausted to consider hiking back up with gear.

The total traverse during the hike was 45 kilometers on foot, 95 kilometers by bus, and 70 meters via cable!

THANKSGIVING 1975

During Thanksgiving 1975, 3 1/2 months later, a return was made to the San Juan Area. Optimism was high as Tracy Johnson, Jim Jacobs, Jim Fike, Eric Means, Rick Day, and Bill Stone hiked into San Juan with 600 meters of rope. The crew set up camp along the side of the trail leading from the water trough at San Juan towards El Quirino.

Soon after dinner that day Johnson and Stone could no longer endure the excitement and hiked over to Javalín with a 300 meter rope. While a crowd of curious locals built a campfire in the arroyo they rigged the ent-

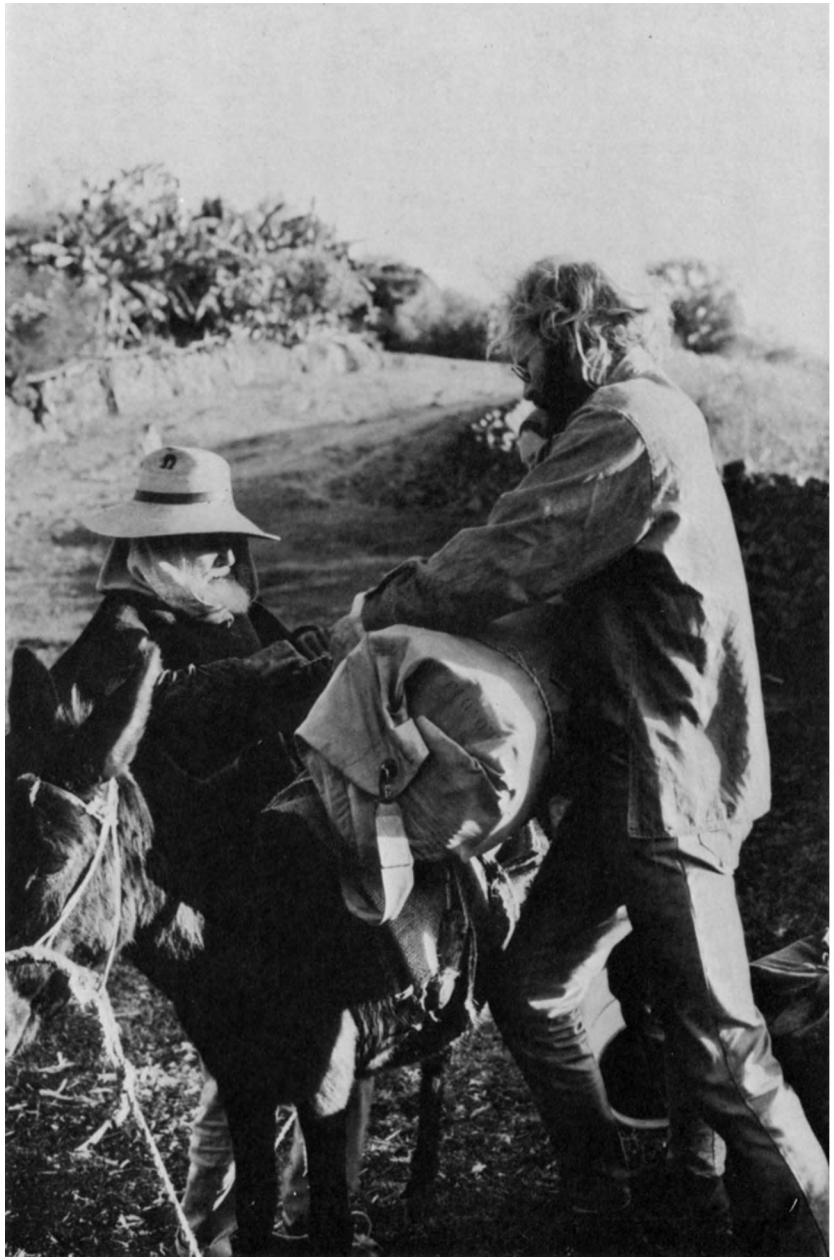
rance. Past the entrance chamber they played out the cumbersome coil into the Thanksgiving Shaft and continued down four more drops until they ran out of rope at the top of the Big Room drop series. Needless to say, there was far too much line dragged in the next day as all six entered for the push to the bottom and mapping. Johnson, Means, and Stone swam through the sump past the last drop and pushed the bad air passage to the cave's terminus at -308 meters. By the time everyone reached the Thanksgiving Shaft with 430 meters of wet, muddy rope it was clear that gear hauling was going to be a problem. Johnson ended up having to rappel some 30 meters back down the shaft to free the ornery tangle from projections on several occasions. The entire craw was out and the survey completed by 3 AM. Much to their surprise, as many as 15 locals had stayed up sitting around a camp fire waiting for them to return.

The next day many leads were written down which were to play a major role on the San Juan Plateau in the months to come. Sótano de Nogal, Sótano de Nonas, Cueva de Guayavitos, Sotanito de Canoas, Hoya de las Conchas and Cueva de Canoas were all new leads on this trip. On Friday cavers headed for the closest lead, Sotanito de Canoas. While Jacobs, Day, Fike, and Stone checked out Cueva de Canoas, Johnson and Means went to look at Sótano de Nonas far across the fields to the north. Cueva de Canoas ended rather abruptly in a silt fill and the cavers moved on to Sotanito de Canoas, only 150 meters to the north. Day and Jacobs descended the 30-meter entrance drop and reported no passage except for a tight fissure filled with debris. The lead was given up at that time and most of the party, including all the Mexicans, returned to camp as dusk was setting. Johnson and Means had not returned, so Stone and Jacobs hiked north to check on them. A lone Mexican whom they met on the trail guided them to a cave with no less than four arroyos dumping into a small hole at the bottom of a 10-meter deep sink. He called it Hoya de las Conchas. Johnson was immediately inside the entrance and let out a yell of "on rope." Upon hearing this, Stone and Jacobs also entered and the four descended till they ran out of rope five pitches later.

As it turned out, Sótano de Nonas was nothing more than a large steep walled sink 10 meters deep with no passage. When Johnson had inquired about other caves in the area their guide took them to Conchas. The entrance, which was originally plugged with logs and other debris, required an hour's work before passage could be made through the crawlway to the first drop. The four men returned to camp after losing the trail several times in the notorious San Juan pea soup fog. Camp was packed up and all six hiked out the next day.

CHRISTMAS 1976

Four weeks later, an international cast of cavers were back in San Juan. Neil Montgomery and Julia James from Australia teamed up with Henry Schneiker, Roy Jameson, Patty Mothes, Sheila Johnson, Tracy Johnson and Bill Stone to finish Conchas. After setting up camp near the San Juan stock pond, Montgomery, Johnson and Stone hiked out to the cave on a "scouting trip" with 300 meters of rope. Shortly after entering, Montgomery discovered a 2-meter long rattlesnake sitting on a ledge only 1 meter above the constriction before the entrance pitch. Having no equipment to deal with it they gingerly dropped past it into the pit. They quickly explored to the point of previous exploration (-65m) and continued on for four more pitches to the waist deep plunge pool at the bottom of the "Twin Drops." At the first sump Montgomery found a bypass via a tight vertical slot. This led to a deep rimstone pool overlooking a 10-meter flowstone climbdown. While Montgomery and Stone were checking for leads at the bottom Johnson dislodged a rock plug in the bottom of the pool. Though the ensuing torrent of water which roared into the chamber below lasted only 10 minutes, it was a chilling vista of floodstage Conchas. Just 10 meters away was a far more terminal looking sump. It had less than 4 centimeters of air space, but Mont-



Equipment-hauling with the aide of Sr. Palacios. (Bill Stone)

Sorting ropes for the known drops in Hoya de las Conchas. (Bill Stone)

gomery was convinced it continued and under he went. Following a 1 meter duck he popped up into a going passage. Thirty meters of wading later the floor fell out in a 4-second free drop. Having only 40 meters of rope left they returned to camp.

The next day all eight hiked out with another 150 meters of rope, planning to finish Conchas. Johnson nabbed the rattlesnake with a pole and slip noose. All was going well, for a while. Just as Montgomery was rappelling the big drop Jameson came crashing through the sump. There had been an accident. When a handhold broke Sheila Johnson had fallen most of the way down the 10-meter climb above the sump and had to be hauled out at once. Injuries were uncertain, but they suspected at least a concussion and fractured ribs. Montgomery and Stone returned from the big drop with a 90-meter line to help with the rescue. At this point they were 175 meters down with nine drops to be negotiated. After transporting Sheila back to the base of the "Twin Drops" the more serious rigging began. Three ropes were rigged on the drop: one static line for James to guide Sheila up the drop, one belay line and one haul line which was rigged from the top of the first drop. One-to-one pulleys with double Jumar safeties were used on the haul line. Johnson and Stone did the hauling while Montgomery belayed. This system worked well on the big drops. The narrowness of the rig points on the small pitches demanded a different system. Using a 2:1 pulley system with auto-locking Jumar safety directly attached to Sheila's harness permitted hoisting from above using only one man. By this time Sheila was cold due to inactivity and had to be placed in a wet suit. All went smoothly from there on. The entire operation took only five hours. Sheila was taken to camp and it was decided to wait till morning before attempting a trip down the mountain. The following morning they drove to the hospital in Ciudad Valles. Twenty hours had elapsed from the time of the accident. Though the X-rays revealed no breaks, it is evident that had there been any serious internal damage rescue efforts would have been fruitless.

While Sheila recovered in Valles, Jameson, Mothes and Schneiker began the first extensive scouting hikes to the north of Conchas, locating most notably, the Sótano del Tigre sink. Closer to San Juan, Mothes located the entrance to El Sotanito.

Two days later Martyn Farr from Wales joined the crew as James and Montgomery left for Mexico City and Australia. Sheila was well enough to hike back up without gear. That same day Jameson and Mothes hiked out and took a bus back to the States. After a day of psyching, T. Johnson, Farr and Stone left camp at dawn for a final push in Conchas. All three were on the bottom of the 4-second pitch in short order. A tight squeeze through the breakdown floor opened into another pitch. Stone and Farr descended while Johnson returned to the top of "the 200" for more rope. After ascertaining that the cave was going and more rope was required, Farr returned to the base of "the 200" and shuffled the ropes which Johnson lowered down to the next pitch. Johnson then returned to the top of the "Twin Drops" for the 90-meter line used in the rescue. With the four lines they had, Farr and Stone continued. Past the 12-meter "window" drop they downclimbed three pitches and traversed the left wall into the Big Room. They decided to leave this till later as the majority of the water appeared to drop into the fissure below the traverse. They rappelled the next three pitches, 33 meters, 10 meters and a spectacular 40-meter calcite-ringed shaft, before they ran out of rope. After this they downclimbed four exposed pitches without ropes and continued down the steeply-sloping passage to a 10-meter freefall drop. They still had their vertical gear with them and decided to give it one final try. By tying all their slings together and rigging to a loose solution pendant they had a line which was still 2 meters off the floor. While Stone backed up the rigging Farr climbed down. He followed the passage another 50 meters, downclimbing a 7-meter pitch and an extremely exposed 24-meter pitch to where he gave up, though the passage still continued. Estimated

Hoya de las Conchas Expedition, March 1976. (Gill Ediger)

depth at this point was 470 meters. They then returned to the top of the 40-meter pitch where Johnson was patiently waiting. The rope had snagged and he was unable to descend any further. The three of them then derigged the entire cave before returning to camp. Surveying was not attempted due to the difficulty of derigging.

The next day Farr hiked out and took a bus to the U. S. The Johnsons hiked up to the Rendija Mesa and checked a few 40-meter pits before dark. Stone and Schneiker hiked to the entrance of El Sotanito. Schneiker descended the entrance drop and two downclimbs before returning.

The following afternoon the Sotanito was bottomed at an estimated 210 meters. After cleaning up camp and thanking the countless locals who had brought gifts of food to them upon learning of Sheila's accident, the four hesitantly left San Juan and drove back to Tucson.

HOYA DE LAS CONCHAS EXPEDITION

By mid-February 1976 correspondence between Austin and Tucson had reached a peak. An expedition was in the making. In Austin, Peter Sprouse and Don Broussard did much of the coordinating, and response from deep vertical cavers across the U. S. was phenomenal. No one expected quite the army of cavers which was to descend upon San Juan in a few short weeks.

On Friday, March 12, 19 cavers from Texas, Illinois, and England left Austin. In Mexico they rendezvoused with 18 other cavers from Texas, Tennessee, Arizona, New York, and Indiana. Much advance planning had been made; two group meetings had been held and various aspects of the expedition had been discussed. The planning was to prepare the group for any eventuality and bivouacking in caves had been one of the main topics of the discussions. A tentative Camp I was planned to be installed at the 300-meter level in the horizontal connection passage to the "Big Room" and could support up to two 3-man teams should the need arise. Three survey teams were planned to expedite mapping behind the push team. An advance team of Don Broussard, Shari Larason, Peter Sprouse, Bill Steele, Bill Stone, Terri Treacy, Steve Ward, and Steve Zeman left Austin Thursday evening and drove to Falls City in South Texas where they spent the night at Gill Ediger's. The next day they left Texas in Ediger's truck and drove through Mexico, camping that night at the Río Santa María. Paul Fambro, Pam Lynn, and Mike McKee left Austin in Paul's truck and picked up Ron Ralph at the San Antonio airport. Maureen Cavanaugh, Alexia Cochrane, Andy Grubbs, Robert Hemperly, Logan McNatt, and Terry Sayther left in Terry's truck and Jill Dorman, Andy Eavis, Balke Harrison, Roy Jameson, Thomas Moore, Walt Peters, Peter and John Strickland, and Bob West left in Blake's "Hog of Steel." The various parties spent the night at different camping places in northern Mexico.

Saturday, March 13: The Austin trucks continued driving and camped just past the town of La Purisima where the road toward Conchas leaves the highway. Early in the morning the advance team arrived at the end of this road. They hired two mules to carry up ropes and caving gear, hiked in, and set up camp at the entrance to Hoya de las Conchas. Official permission was obtained in San Juan and arrangements for a local mule driver to carry 30 gallons of water per day the 2 kilometers from San Juan to the Conchas campsite were completed. The campsite proper was a large cleared section within an oak forest that filled the kilometer diameter Conchas doline, more than sufficient for the 20+ tents soon to inhabit it.

Sunday, March 14: While the Austin 19 hiked in, the advance team started to rig the cave. Ropes were sorted and labeled for the known 21 drops in the cave, plus three extra lines for the first push. Ediger, Sprouse, and Zeman returned after rigging to the "sump." Steele, Stone, and Ward continued till they bottomed the cave at a siphon 2 drops past the end of the previous exploration. They returned at 8 AM the next day after 24 hours underground. After setting up camp, Broussard, Jameson, Larason, J. Strickland, and

Camp; Hoya de las Conchas Expedition, March 1976. (Bill Stone)

Treacy started a surface survey to connect all the known caves of the area.

Monday, March 15: Tracy Johnson and Henry Schneiker arrived from Arizona by way of train, bus, and foot. They reached the general area Sunday night, but got lost in the fog only 100 meters from San Juan. Jim Smith, Marion Smith, and Mark Stock arrived from Tennessee in Marion's car. Two teams started mapping in Conchas. Ediger, McKee, Sayther, and Schneiker started at the surface and mapped down to where the second team started. The second team of Cavanaugh, Eavis, Johnson, and Sprouse began mapping at the "sump" and continued to -348m. They bypassed the "Big Room." Hemperly, McNatt, and Ralph started mapping in "El Sotanito," further to the south. They mapped about 75 meters vertically. Cochrane and Grubbs returned to the trucks with a burro for another load of rope and gear. The surface survey crew finished the connection of all the caves.

Tuesday, March 16: In Conchas surveying continued with Smith, Smith and Stock surveying from the bottom of the previous survey to the siphon. They dove the siphon to a depth of 4 meters but found no leads. On the way out they derigged the last 200m of the cave and returned 19 hours after entering. Dorman, Harrison, Hemperly, and Steele took a 100m rope and checked the "Big Room" to its terminus in a silt fill mapped to -380m. Cochrane, Grubbs, and Jameson made a biology, geology, and photographic trip down to about 300m and on the way out they hauled up the 100m rope used in the "Big Room." McNatt, Ralph, West, and Zeman finished the survey of El Sotanito, 225m deep. An attempt to find the Rendijas "fissure," located on the raised central ridge of the plateau, failed because of heavy fog.

Wednesday, March 17: Broussard, Eavis, McKee, and P. Strickland went into Conchas; they photographed on the way down and derigged the cave on the way out to the top of the "Twin Drops." A hiking team of Johnson,

McKee, Sprouse, Treacy, Schneiker, Strickland, and Larason located the Rendijas "Fissure" but found it to be a surface feature 10m deep. Cochrane, Stone, Stock, and Ward checked out a 50m pit near Mojonera. On the way back they stopped at Sotanito de Canoas and dug the log jam out of the base of the entrance drop. They went down as far as their ropes would go. Jameson hiked to San José and mapped a small cave, Cueva de la Mesa. He also found several 20-40m pits and was shown Sótano de Nogal, with an entrance drop of about 80m.

Thursday, March 18: Kevin McGill, Barb Ransom, and Eric Valainis arrived from Indiana. Donald Spear arrived from Texas on the bus. The rest of Conchas was derigged by Ediger, Zeman, Stone and Ward. Smith, Smith, Stock, Johnson, Steele, Stone and Ward returned to Sotanito de Canoas, where they mapped and pushed till it ended in a sump at -95m. Stock and Smith swam to where foul air forced retreat. Broussard, Cochrane, Grubbs, and Jameson hiked to Nogal. They checked the entrance drop and found a going passage, but further exploration was prevented by lack of rope. Biological collections were made and air flow was noticed. Several people went on recon hikes but no caves were found.

Friday, March 20: Cochrane, Jameson, Stone, Ward, and Zeman returned to Nogal and mapped to -247m where they ran out of rope at the top of a 50m drop. Air flow was noticed at several places. Except for Broussard, Ediger, and Larason all the others left camp and hiked out. A burro load of rope and equipment also left. Once the vehicles were reached the first stop was a *tienda* with cold *refrescos* in La Purisima. The next stop was the Río Santa María. From there the expedition split up with persons going in several different directions. The final depth of Hoya de las Conchas was 508m. This made it the 5th deepest in the Western Hemisphere.

SOTANO DE NOGAL EXPEDITION

After the expedition was over most people left confident that the deepest San Juan cave had been bottomed and mapped. The odds of another 500+ meter system in the same area seemed unlikely as all of the big arroyo leads had been checked. The last chance was Sótano de Nogal near San José.

On May 25, Larry O'Loane, Gary Stiles and Bill Stone picked up Tracy Johnson in Jalpan and drove to the end of the road to San Juan. A burro train met the group the following morning at dawn and they packed off to San José with 600 meters of rope and supplies for 2 weeks. Upon obtaining permission in San José the group set up camp in a shaded grove just above the Nogal sink. Work commenced immediately. The "Second" entrance to Nogal, a large entrance pit only 20 meters from the main cave, turned out to be a 43-meter drop leading to a methane lake. Large clouds of gas, released by stirring up the mud, burst into flames as Johnson swam to the other side looking for leads. No connection was made. Ropes were sorted later that afternoon for the known drops in Nogal.

By the next day O'Loane was suffering from a bad case of the turistas and decided to remain in camp. The others, loaded with as much rope as they could carry, quickly rigged to the first Lunch Room, terminus of previous exploration at -247 meters below the entrance. Three large pitches later they arrived in the Second Lunch Room. A quick inspection yielded no leads. However, an obscure fissure on the side opposite the rope opened into a 13-meter free drop. From there Stiles squeaked through a tight fissure crawl to a 10-meter pitch. A downclimb bypass was located which continued to a solution-scoured stream passage. The group exited at this point.

After a day of R&R in camp, expounding on the wonders of Nogal to a large crowd of locals, all four were psyched for a push. The group surveyed in from the First Lunch Room and arrived at the pool-floored passage only six hours from camp.

After negotiating a series of 4-meter downclimbs, a wet crawlway, and a 10-meter pitch the cavers arrived in a small breakdown room. Following careful consideration of the stability of this pile of rubble, which was perched

directly over the next pitch, three of the group decided a descent was too risky. Johnson, intending to demonstrate its stability pinged it gingerly with his rock hammer. Three or four pings and a ton of rock down the pit later it was deemed safe. "Tracy's Reconstruction" dropped 23 meters to a small room overlooking a vast black chamber. Using their last rope they dropped into the largest chamber on the plateau, The Hall of Oztotl. Having run out of rope again they headed back to camp. Upon awaking the following afternoon it was discovered that all the rope in camp had been used in getting to the Hall of Oztotl. The next morning Johnson and Stiles hiked back to the truck for the remaining 300-meter line and further provisions. O'Loane and Stone went lead checking to Milpas Viejas. Sótano de la Calavera, located on the ridge west of Nogal was a miniature Sótano de la Cuesta with dual light rays casting illumination on the floor of the 30-meter diameter chamber. Many other smaller caves and pits were located on the ridge west of Milpas Viejas.

Armed with another batch of rope, work commenced in Nogal again. Three hours after entering, the group arrived at the Hall of Oztotl. Much to their dismay the next 25 meter pitch led to a mud sump. The cave was left rigged for photos and the group headed out. Just above the 10-meter crawlway pitch was a tight fissure lead. Johnson and Stone popped through to a 5-meter downclimb. This quickly led to a deep pit. A 50-meter line with a knot on the end was rigged and Stone dropped in. The drop went free, all the way to the Hall of Oztotl and the 50-meter line proved entirely insufficient to reach the floor!

Back on the surface, Roy Jameson, Don Broussard, Patty Mothes and Shari Larason arrived from Austin and set up camp. While the push crew laid back in hammocks the next day the new group tied in the surface survey from Nogal to Conchas. The surface survey at this time reached an astounding 9 kilometers in length and connected all the major caves of the San Juan Plateau. Average survey shots were on the order of 60 meters.

Everyone descended Nogal the following morning. Broussard, Larason and Mothes took photos down to the 43-meter drop below the Fault Room. Jameson and Stone derigged from the bottom to "The 170" and photographed. The relief team of Johnson, Stiles and O'Loane arrived after giving the advance team a six hour lead. Everything was out by 3 AM the next morning.

During the following two days most of the odds and ends were cleaned up. Jameson and Mothes dropped 3 pits and a cave on the east ridge near Nogal. The rest checked two big pits in Laguna de la Cruz west of San José. The largest was about 15 meters in diameter and 60 meters deep. The next day camp was cleaned up and everyone hiked out.

SAN JUAN, MAY 1977

One final trip to the San Juan Area was made in May 1977. Among the odds and ends remaining from previous expeditions were a few pits and caves located near San Juan and San José. The area map and geology were not complete, and more photographs were needed for the bulletin. So Roy Jameson and Patty Mothes arranged to meet William Russell, Jerry Atkinson, and Rene Shields at San Juan.

Jameson and Mothes hiked up on May 20, several days before the others, and began the geologic map. May 21 was spent photographing in Sótano de Javalín and El Sotanito.

On May 22, after mapping in the morning near San Juan, Jameson and Mothes hiked over to Hoya de las Conchas to re-investigate the upper section of the cave and photograph. The entrance had been re-clogged by small logs, brush, and rock, but this time there were no rattlesnakes. They rigged the upper six drops, worked on the geology, and took about 30 photographs before heading out about 10:30 PM. When Mothes crawled through the entrance squeeze about midnight she yelled down that it was raining hard. By the time Jameson joined her and pulled the entrance rope out, the trickle in the arroyo had grown into a small stream, which was rapidly filling the small entrance room. Judging from the large quantities of water observed on their re-

Showing the San Juan Area Map to residents of El Quirino. (Patty Mothes)

turn to camp, it is probable that the entrance drop soon became a waterfall, possibly siphoning at the constriction.

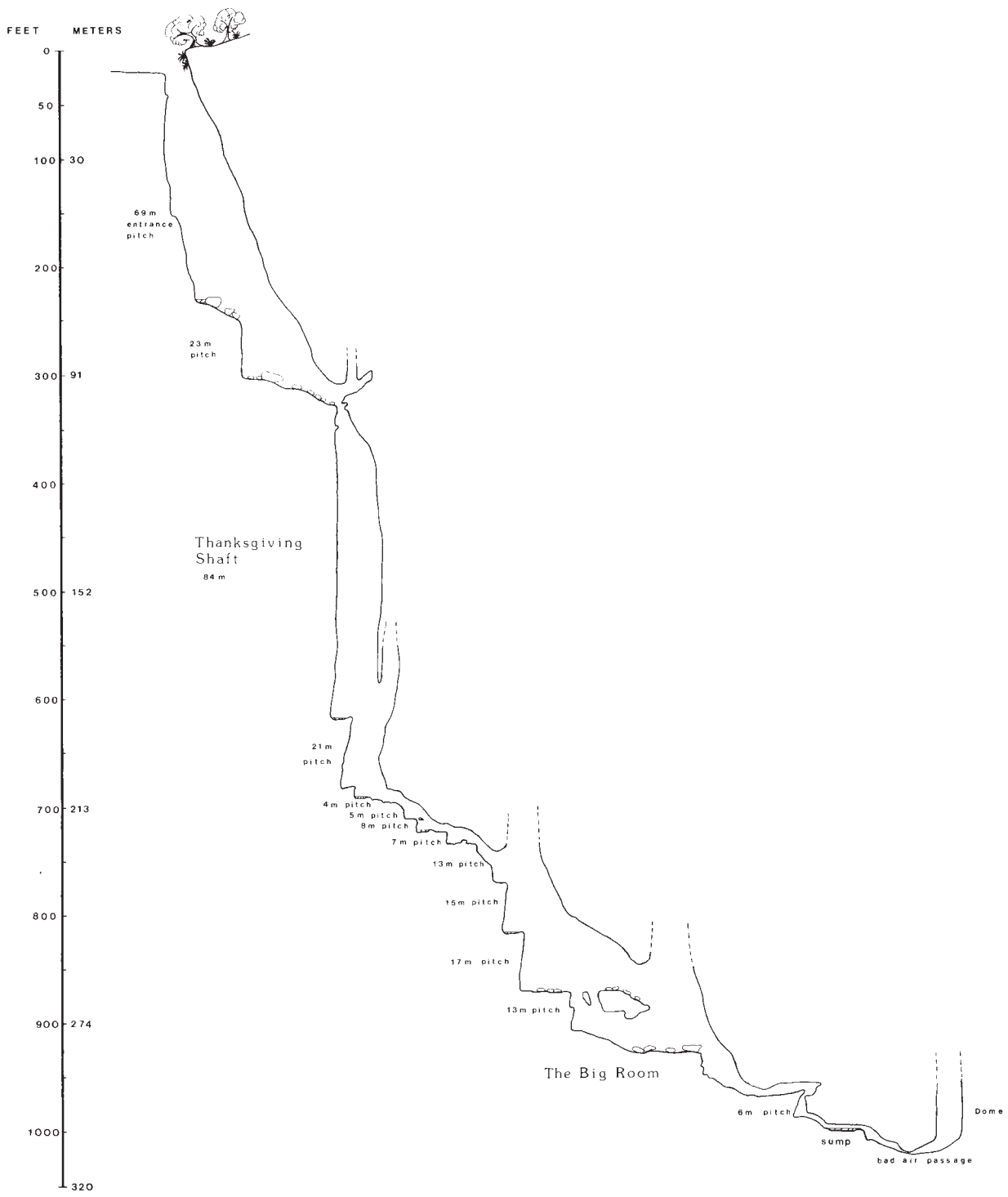
Other arroyos, such as the arroyo entering Sotanito de Canoas, were also flooding. Back at camp Russell, Atkinson, and Shields had arrived and pitched their tent in a small channel leading into a sink and had been inundated when the rain hit. Before the rain a group of Mexicans visited the camp eager to show the new arrivals the entrances they had found since the last expedition. So, even though it was a dark moonless night, Russell, Shields, and Atkinson followed them across the fields, accompanied by guitar music, and tried to remember landmarks so they could return to the caves.

May 22, 23, and 24 were spent working on the geology and photographing. Atkinson and Shields visited El Sotanito and Javalín. On separate days Jameson, Mothes, and Russell mapped north to San José, and Jameson and Mothes located and entered several new pits and caves near San José. Two were mapped to their ends at -23 and -12 meters, but one unentered pit was estimated at 15 meters. Another new cave was located at El Bosque and contains potsherds.

The last night the cavers threw a party for some of the San Juan villagers at the campsite, which had become a gathering place each evening. Twenty cokes were distributed while Atkinson demonstrated rappelling and prusiking in a tree.

The next day they left. As of this writing there has been no further work done in the region, but even though most of the leads have been well checked, it would not come as a surprise if Sótano del Tigre or some other obscure hole connected into yet another spectacular deep system.


JYGORUP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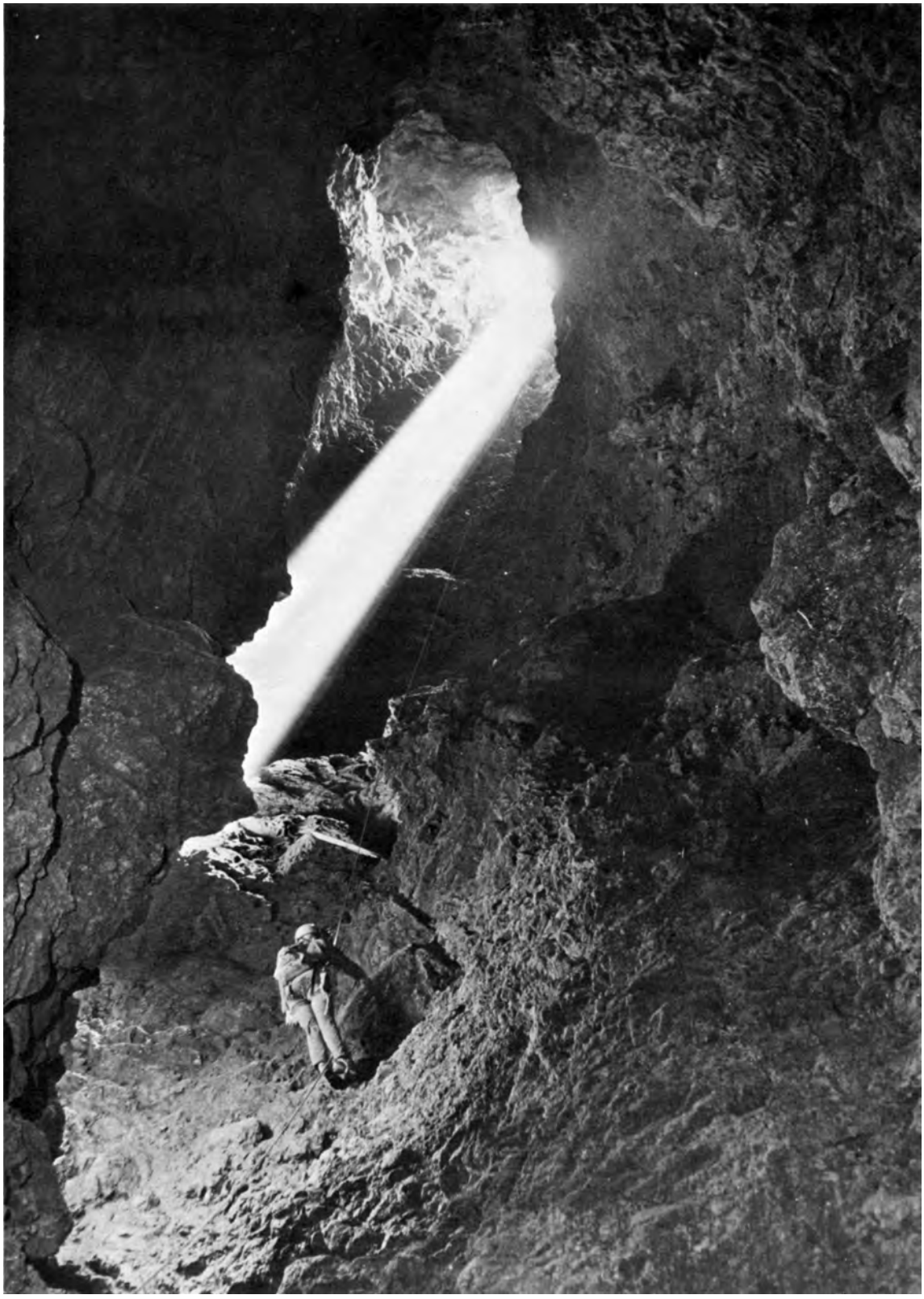
23 m
pitch
Thanksgiving
Shaft
84 m
21 m
pitch
4m pitch
5m pitch
8m pitch
7m pitch
13m pitch
15m pitch
17m pitch
13m pitch
The Big Room
6m pitch
Dome
sump
bad air passage

CAVE DESCRIPTIONS

SOTANO DE JAVALIN

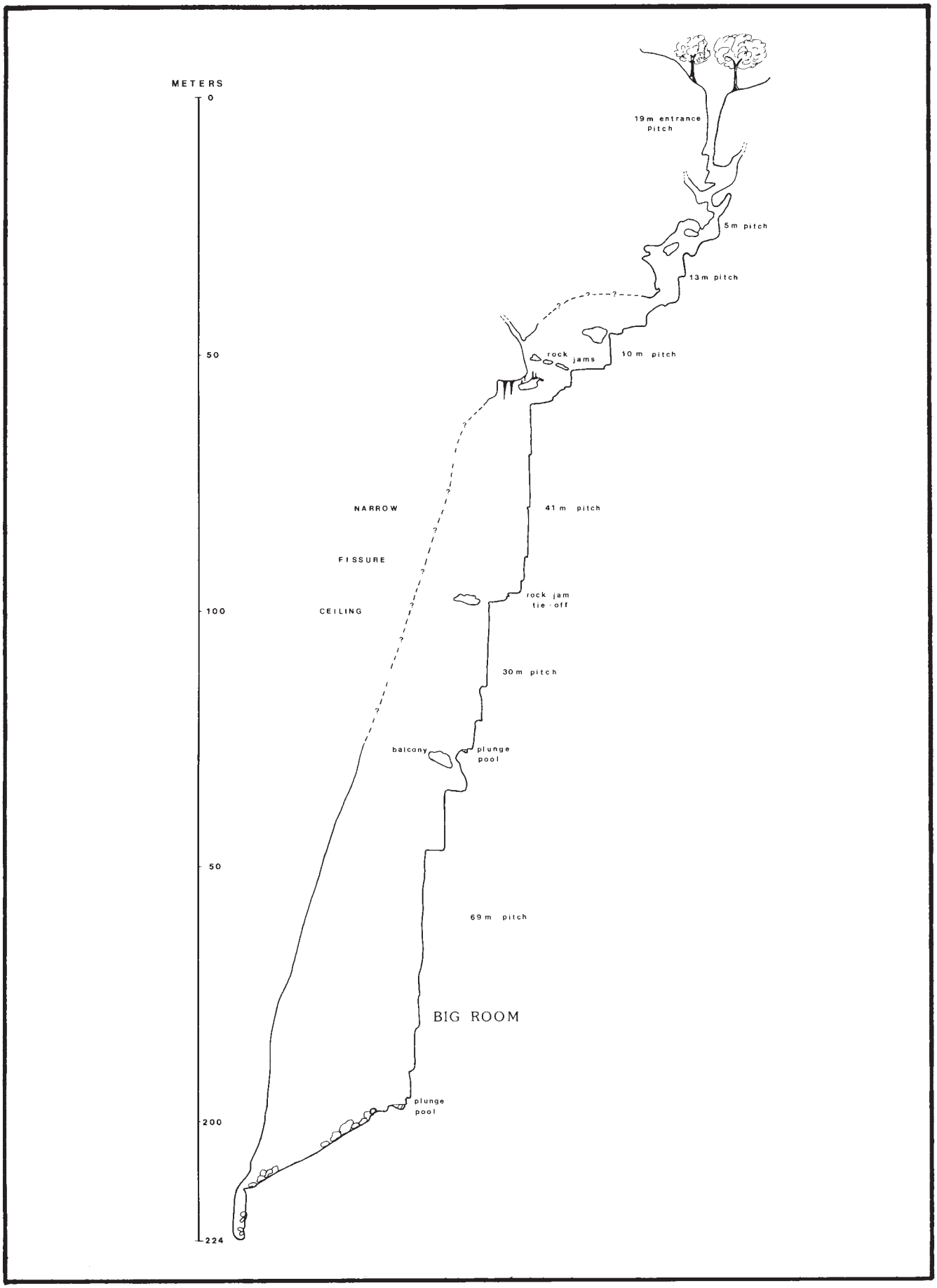
Sótano de Javalín was the first of the San Juan area caves to be entered. It is located roughly 400 meters east of the village of El Quirino in a wooded area at the end of a large corn field. An arroyo makes its way along the south side of this field and increases in size towards the Javalín entrance. One hundred meters from the entrance the arroyo is 10 meters across with steep-sided 7-meter high walls. This arroyo joins another one of similar proportions coming from the east only 15 meters from the entrance forming a "T" intersection. The combined arroyo then drops into the lushly-vegetated 10-meter by 10-meter entrance to Javalín. Though the forest around the entrance is chiefly populated with oak trees, many small palm-like shrubs drape from the overhanging high-side roof and into the hole. The top 10 meters of the pit are covered with a brilliant green moss for most of the year.

The entrance drop is 94 meters and is composed of two stages. The first 69 meters are in a large solutioned canyon 30 meters long and 15 meters wide. This section is extremely dangerous due to the loose rocks embedded in the wall. At minus 69 meters a large ledge is encountered. Rocks dropped from the entrance will quite often land in a pool on this ledge giving the impression of a water-floored passage. Past the ledge a 5-meter wide chute drops 25 meters into a large breakdown-floored room. Light from the entrance is still visible at this point. Fifty meters away, and at the bottom of the room, is a short 1-meter by 1-meter passage leading to the top of the Thanksgiving Shaft. This pitch is 87 meters long, mostly free, and lands in a lake and mud-floored room 10 meters in diameter. A small drizzle is noticeable at this point and is the only active water in the system until the Big Room. A 20-meter drop immediately leads off the bottom and tie-offs are scarce in the rotten rock. A large breakdown block is wedged between the walls on the floor of this drop and overlooks a shallow lake. Beyond the lake a meandering passage leads to a series of three short pitches. Logs wedged in passage constrictions in this area attest to the violent flooding during the rainy season. In considering this one must realize that the Javalín entrance drains well over a square kilometer of area around El Quirino. At the bottom of the third of these drops a smooth solution slot opens into the beginning of the Big Room. In the series of pitches which follow the recemented breccia limestone in which the majority of Javalín is formed is clearly visible. From the slot a 14-meter pitch leads to a wide ledge overlooking the next 16-meter drop. The ceiling in this portion of the cave stretches up beyond the range of a carbide light. Several larger waterfalls drop into the system from these domes and cascade down the next two pitches. A ledge can be traversed along the left wall which leads to a balcony overlooking both pitches. Past the 16-meter pitch is a 19-meter freefall pitch into a large breakdown-floored room. The passage here averages 10 meters wide and soon becomes the top level of the Big Room. Several large holes in the floor open into the lower level un-



Prusiking out the entrance of Sótano de Javalín. (Roy Jameson)

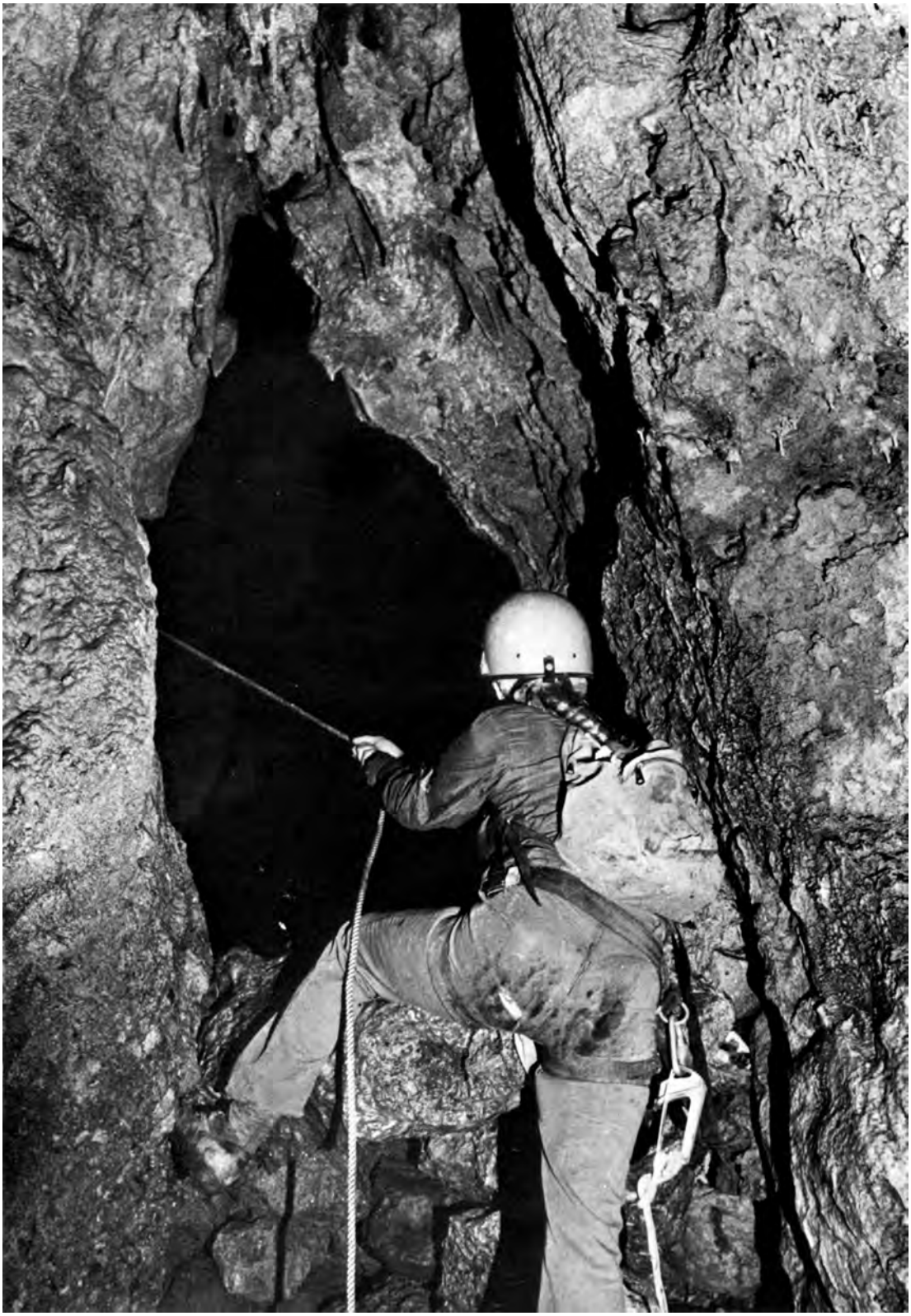
til finally the top level ends 50 meters further on in a 17-meter free drop. Both levels are covered with breakdown, the top part having some notably unstable sections around the collapses into the lower level. All the active water filters through the breakdown at this point and is not seen again. The Big Room is 290 meters below the entrance. A 5-meter climbdown at the end of the room leads to 50 meters of silt floored walking passage and a final 7-meter pitch (12th in the system). From the bottom of this pitch a small meandering passage leads to a grungy sump swim with plenty of mud and organic debris. At this point the air becomes noticeably foul and breathing is difficult. The passage continues, however, for an additional 50 meters to a tight mud constriction which was excavated during the first exploration. The air at this point is so foul that carbide lamps will not burn. The original team used electric lights to push the final 10 meters to the terminal dome. This point is 308 meters below the entrance.


METERS
0
50
100
50
200
224
19m entrance pitch
5m pitch
13m pitch
10m pitch
rock jams
41m pitch
NARROW
FISSURE
CEILING
rock jam tie-off
30m pitch
balcony
plunge pool
69m pitch
BIG ROOM
plunge pool

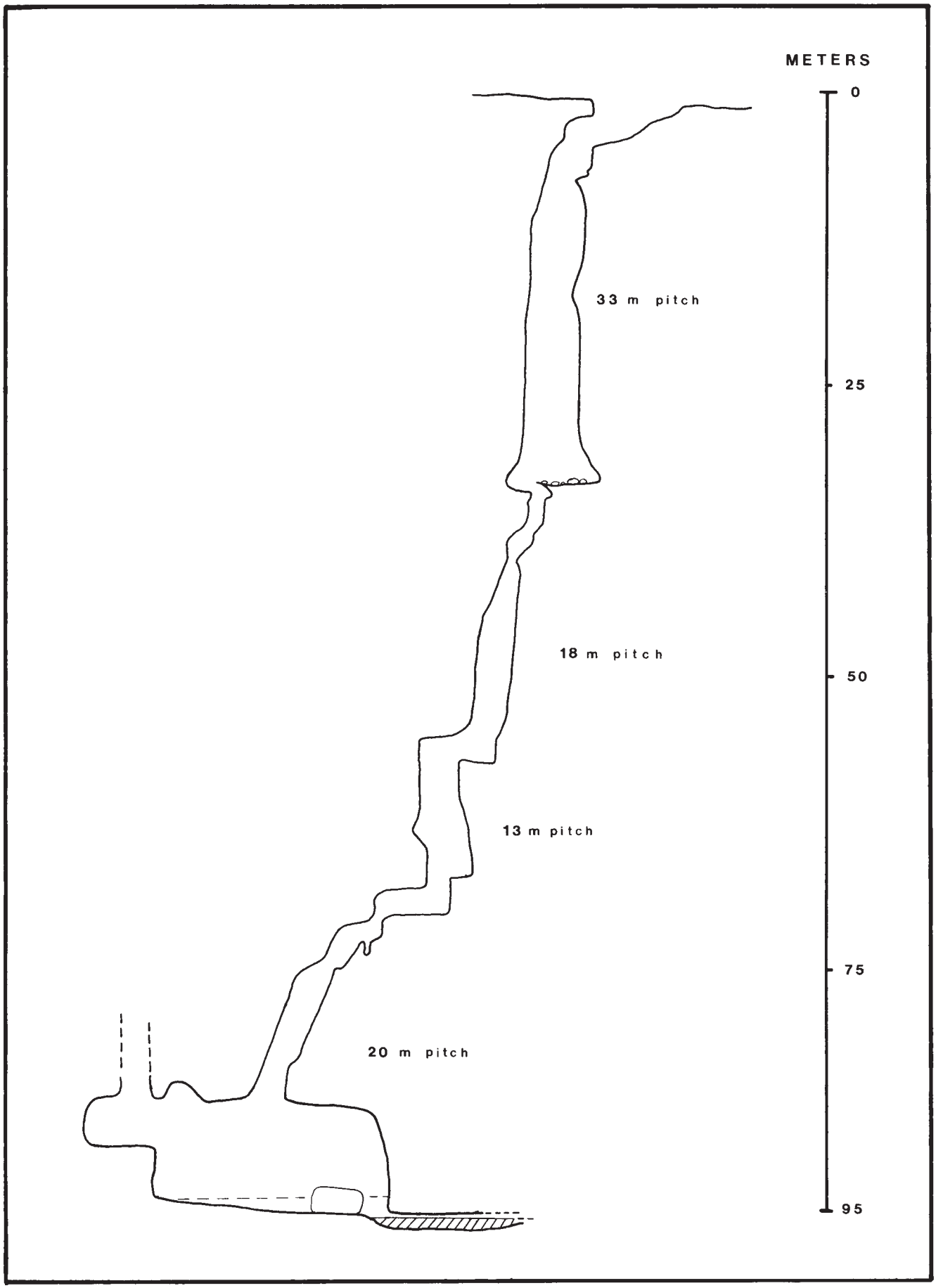
EL SOTANITO

One kilometer northeast of San Juan on the Conchas trail is a large open cornfield flanked by the eastern ridge of the plateau. At this point the trail turns sharply to the north. The first large dolina which appears to the left of the trail contains the arroyo entrance to El Sotanito.

The entrance pitch is 19 meters down a 4-meter diameter tube to a small dirt-floored room. Two 4-meter downclimbs over breakdown blocks wedged in the passage lead to a 5-meter pitch. A few meters distant from the bottom of this pitch is an overhung 3-meter downclimb to a shallow pool. The passage continues through a 1-meter diameter window and along a multi-level fissure for 6 meters to a 13-meter pitch. A sinuous high fissure leads off the bottom for 10 meters to a 10-meter pitch into a shallow lake. About this point the eroded flowstone walls which are prominent in the upper cave begin to disappear revealing the dark grey limestone with recrystallized calcite bands in which the lower part of the cave is formed. This rock is distinctly different from the recemented breccia in which Sótano de Javalín is formed. The high fissure character of the cave continues and the vertical extent of the ceiling cannot be ascertained in the lower passage. A short traverse and downclimb through a constricted portion of the fissure leads to a small well-decorated room. The "floor" of this room consists of several rock jams which span this widened portion of the main fissure. The holes in the floor open into a 41-meter freefall drop in a 10-meter by 15-meter silo type shaft. Large blocks of breakdown at the bottom slope down to the top of a 30-meter pitch only 10 meters from the previous drop. The fissure continues across the top of this drop to a balcony overlooking the Big Room pitch. The top portion of the 30-meter pitch is very loose and large rocks slough off at the slightest disturbance. A short 6-meter pitch off the bottom leads through a tight overhung slot to a small plunge pool at the top of the Big Room drop. The main fissure expands into the blackness from this pool for a 60-meter drop into the Big Room. A small balcony overlooking the room can be reached via an exposed 8-meter chimney traverse from the pool. The drop is broken by two small ledges and ends in a crystal plunge pool on the south side of the impressive chamber. The Big Room is roughly 30 meters in diameter and is strewn with large blocks of mud-covered breakdown, evidencing that this room floods to a considerable depth during the rainy season. At the bottom of the steeply sloping chamber is a crawlway which continues for 10 meters to a 13-meter climbdown ending in breakdown. This is the lowest point in the cave and is 225 meters below the entrance.



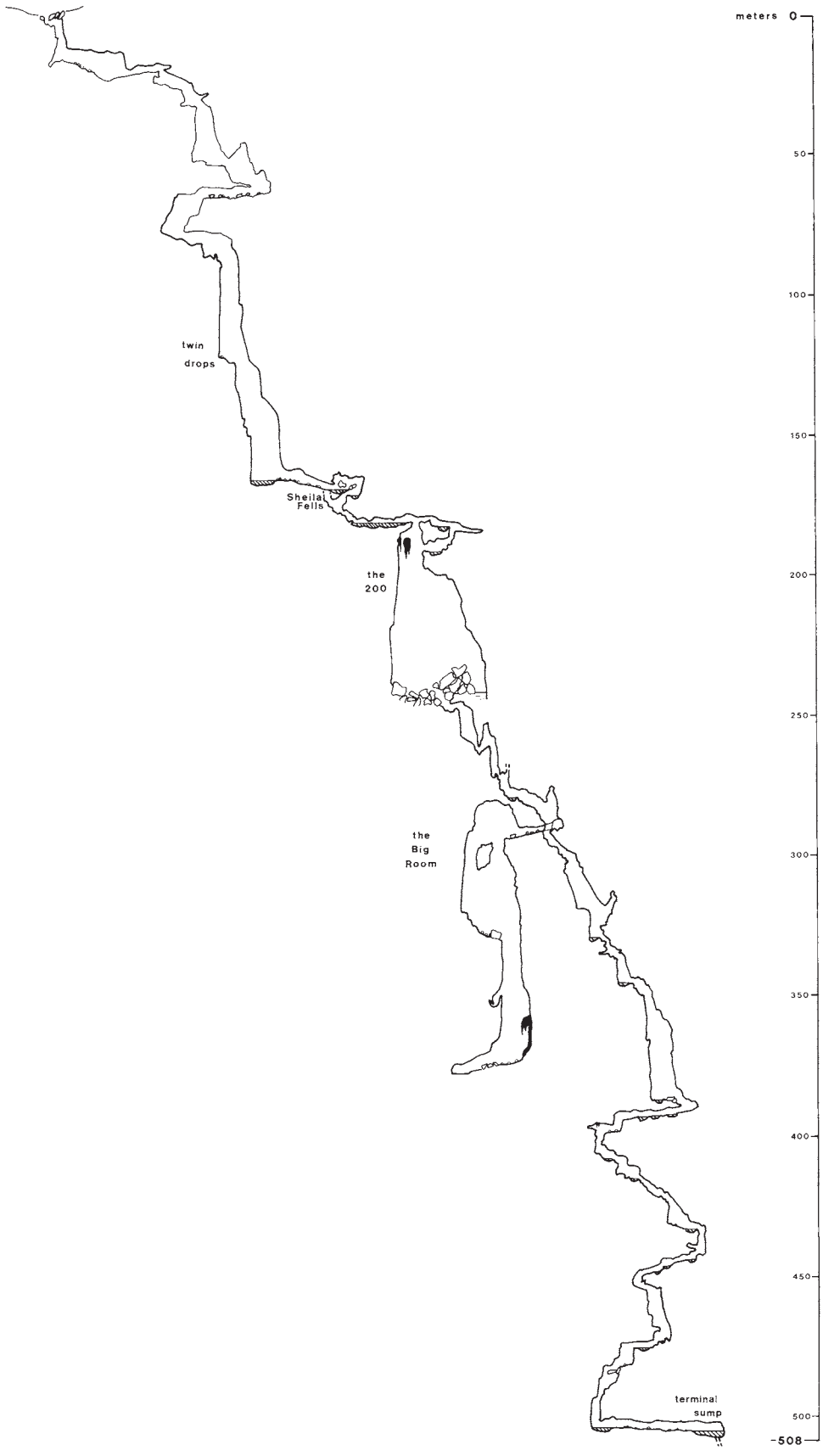
Handline pitch in El Sotanito. (Roy Jameson)


METERS
0
25
50
75
95
33 m pitch
18 m pitch
13 m pitch
20 m pitch

SOTANITO DE CANOAS

One-quarter kilometer southeast of El Sotanito is a large open corn field in a shallow doline. All surface drainage for roughly a square kilometer funnels into two major arroyos which wind down across the doline and eventually dump into the entrance of Sotanito de Canoas on the western edge of the corn field. The entrance is only five meters below the field and measures two meters by two meters. The arroyo continues a short distance under the overhanging roof before dropping 33 meters down a flowstone-walled, 10-meter diameter cylindrical shaft. A tight fissure on the east side at the bottom was originally jammed with logs and given up as a doubtful lead on the November 1975 trip. This was later opened up during the March 1976 Expedition after Conchas, which was also originally plugged, went so deep. Past this squeeze the passage opens into a 3-meter wide, 5-meter high canyon which drops quickly to another constriction where a boulder almost blocks the passage. A 30-centimeter wide squeeze past this boulder leads to an exposed position at the top of an 18-meter pitch. The walls of this fissure drop are only one meter apart and very sharp. A 13-meter pitch of similar nature immediately follows the 18-meter drop. Below the flat gravel floor of this pitch the passage begins to take on the appearance of upper Conchas and El Sotanito. Heavily decorated, flowstone-walled passage has been resolutioned leaving a bizzare sculptured effect. The steeply dipping smooth flowstone floor allows the caver to slide downward to the top of the next pitch. This 20-meter wall drop opens into the silt-floored 10-meter wide, 30-meter long Big Room. The only passage leading off is a one-meter wide sump with 15 centimeters of air space. This was pushed for 15 meters to a point where carbide lamps would not stay lit, though the passage continued. Total depth at this point was 95 meters, far short of what was anticipated for such a large drainage basin.

Entrance to El Sotanito de Canoas. (Patty Mothes)


meters 0
50
100
150
200
250
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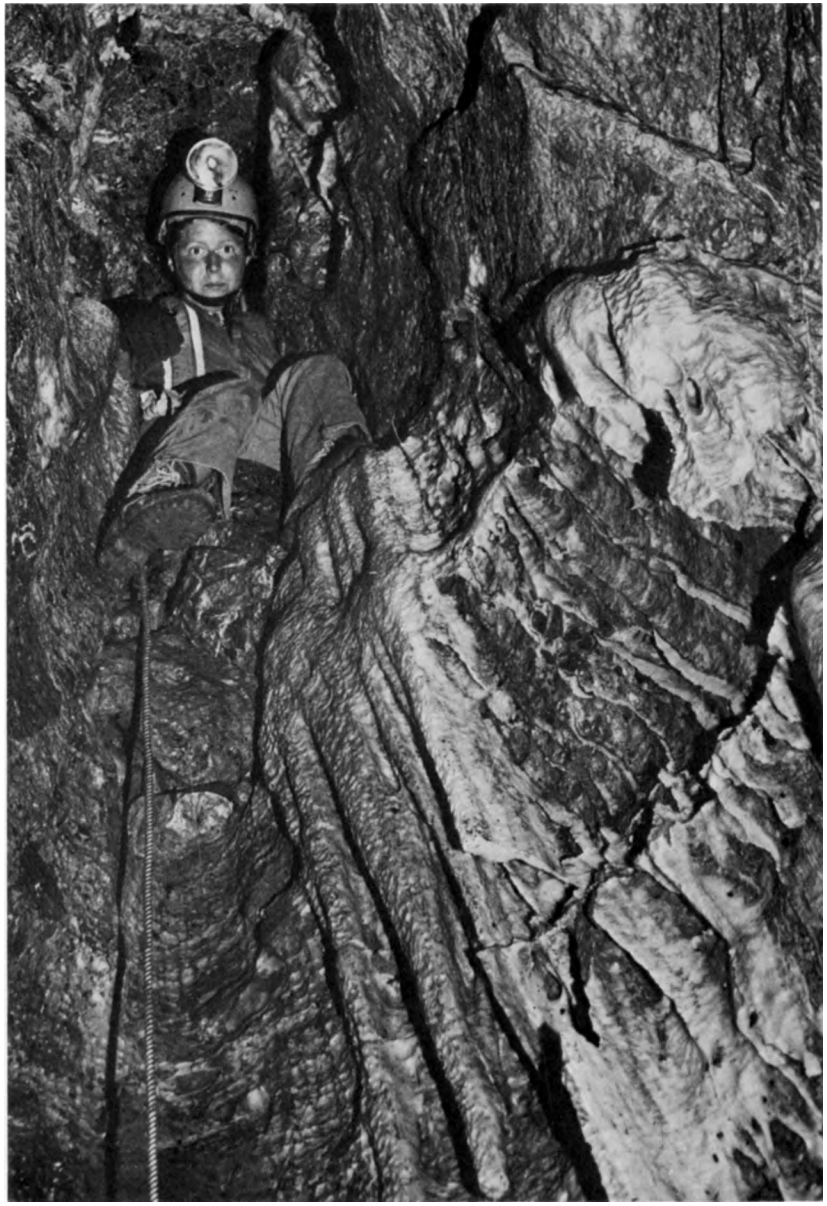
500
-508
twin drops
Sheila Falls
the 200
the Big Room
terminal sump

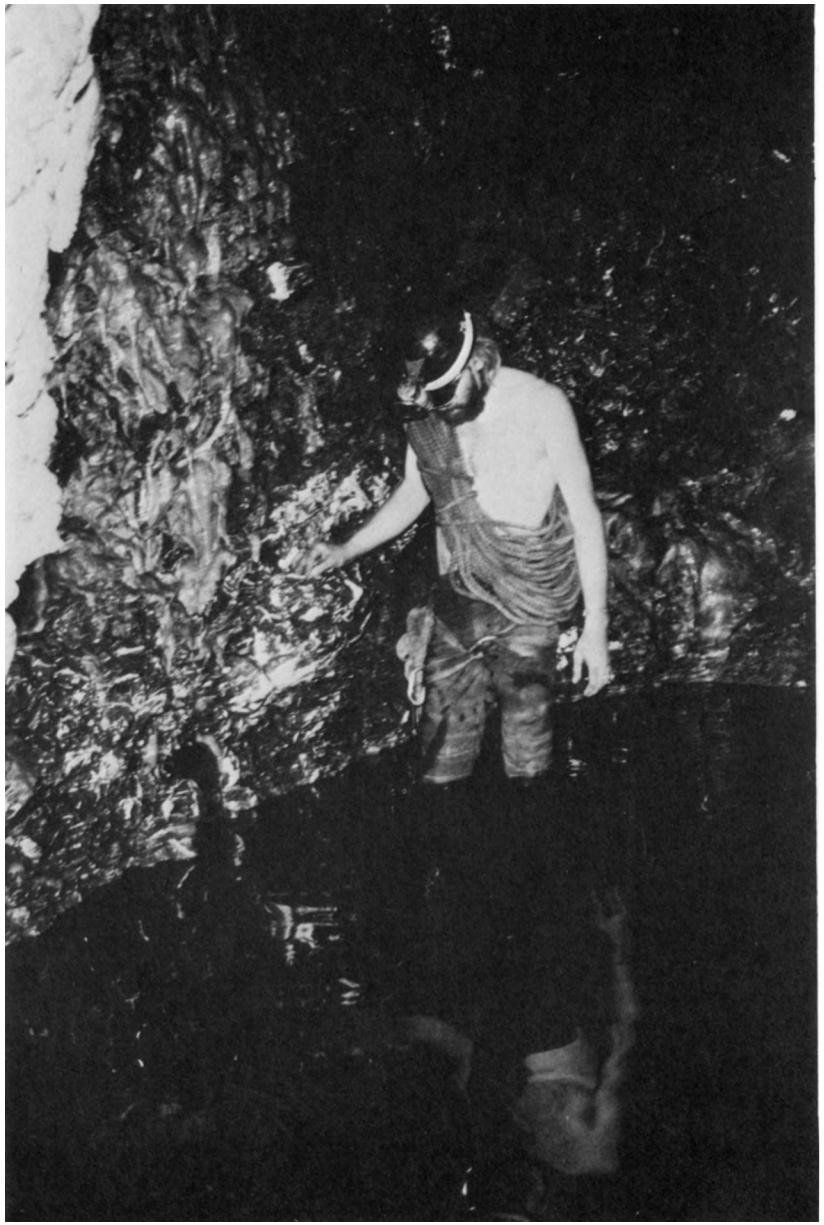
HOYA DE LAS CONCHAS

From El Sotanito the main trail trends to the north for about half a kilometer to the crest of a large gently sloping sink, then continues down the sink and into a small forest. A stream bed is soon encountered which leads directly to the entrance of Conchas. The entrance proper is a small hole in the base of the arroyo. Three additional, smaller arroyos intersect and dump into the same hole. The entrance crawlway, which was originally dug open, leads a short distance to a tight constriction overlooking the first pitch. Rattlesnakes up to 2 meters long have been found in this section on two occasions and discretion is advised. The breakdown-floored room at the base of this drop averages 8 meters in width and continues for 30 meters to a mud-floored constriction which acts as a natural water trap. This section of passage may completely flood during the rainy season. Immediately beyond is a sharply overhung 7-meter pitch into a narrow fissure. Just 10 meters away is a constricted 0.5-meter diameter window which intersects another 7-meter pitch. Four meters from the base of this pitch is a tight slot which opens into a 21-meter free drop to a breakdown-floored room. A 5-meter downclimb at the end of the room leads to a 7-meter pitch and 40 meters of gravel-floored walking passage. Although most of the passage to this point is in clean-walled bedrock, small heavily solution-scoured flowstone deposits become noticeable. A short but exposed 4-meter downclimb leads to the top of a 16-meter pitch at the end of the walking passage. The walls of this pit are entirely flowstone covered with numerous terraces and solution remnants. The floor, once more extensively covered by flowstone, is now potholed. Remnants of once active rimstone dams jut stubbornly from the bedrock base. The next 7-meter pitch leads to the top of the "Twin Drops," actually 37 and 43 meters. The 37-meter pitch goes down the side of an almost cylindrical dome and ends less than 3 meters from the next drop. The 43-meter pitch is broken by several small ledges and lands in a chest-deep plunge pool. Across this pool a sewer passage continues for 25 meters to a siphon. A tight (size 46 will not make it) vertical squeeze leads over the sump and continues as a tight fissure for 20 meters to the top of Sheila Fells. The siphon has been dived and connects with the fissure. Most teams will find that the only way to expedite gear-hauling through this section is to pass it from person to person. "Sheila Fells" is the 10-meter downclimb where the first accident on the plateau occurred (see History of Exploration) and it is advisable to rig a handline due to the unreliability of the holds. During the first exploration the sump at the base of this climb had less than 4 centimeters of airspace. Since then the water level has been lowered. However, one can still expect to get soaked neck deep. Beyond this point the cave stays wet and either wool sweaters or a wet suit top are recommended as exposure gear. The air in the lower cave past this sump becomes noticeably foul, though nowhere as bad as in Java-Ifn. Immediately past the sump is the 2- by 0.5-meter slot entrance to "The 200." The passage which continues across the slot reconnects 10 meters down the shaft. Padding is essential as the rock is quite jagged near the top. The drop bells out past the slot to over 30 meters in diameter and is the most impressive shaft in the system. The upper portion of the drop is draped with extensive flowstone deposits and numerous large stalactites hang

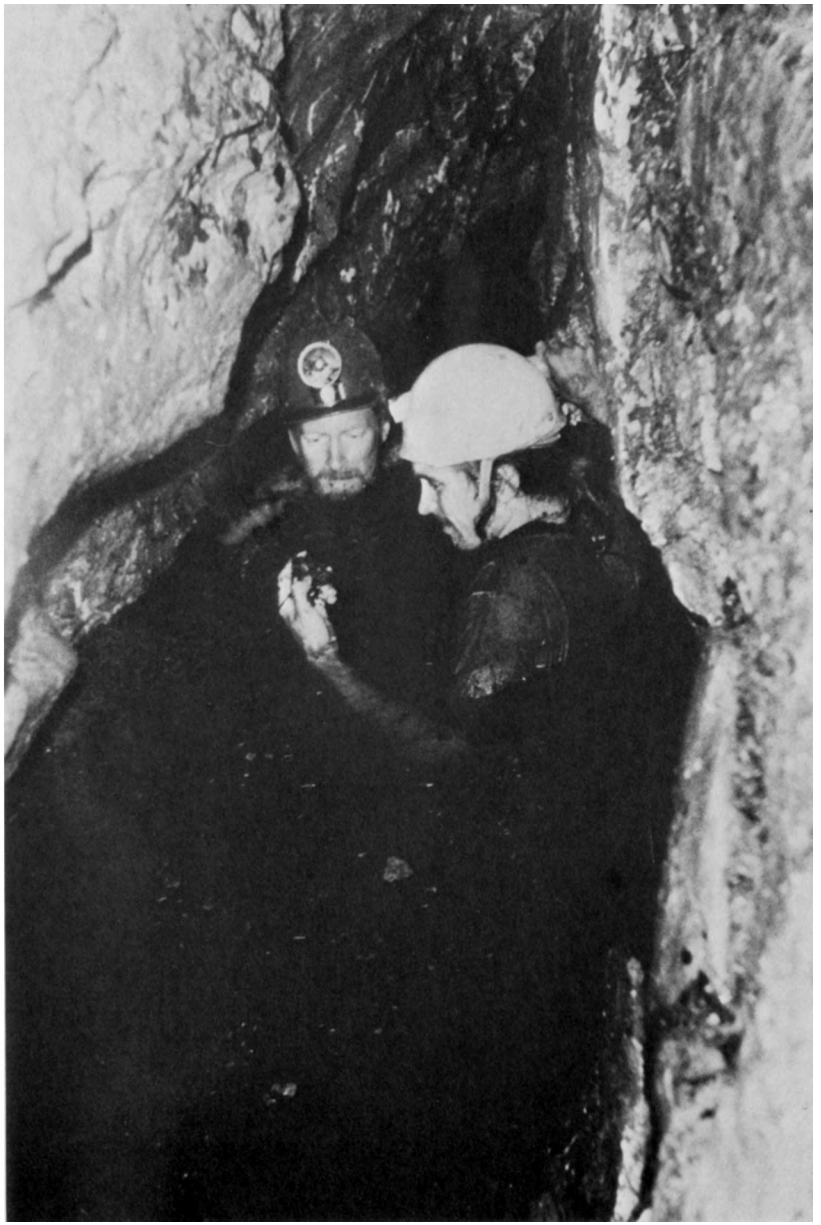
Entrance to Hoya de las Conchas. (Roy Jameson)



Third pitch in Hoya de las Conchas. (Roy Jameson)



Traversing the lake at the bottom of the Twin Drops, Hoya de las Conchas. (Bill Stone)

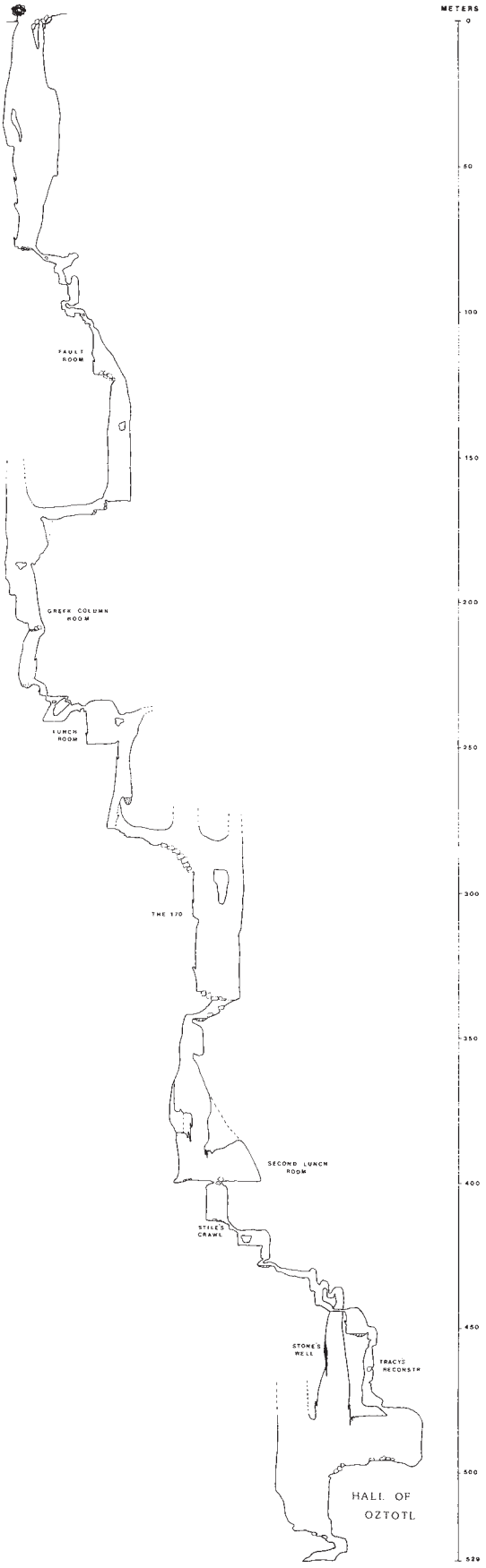


Terminal sump in Hoya de las Conchas. (Jim Smith)

Near sump at -180 meters in Hoya de las Conchas. Note high water marks. (Bill Stone)

from the more undercut sections. In the lower half the rock walls are heavily fractured with little flowstone in evidence. Flame protectors for carbide lamps are useful in the spray from the small waterfall which enters just below the slot. The bottom of this drop is 250 meters below the entrance. A tight vertical crawlway down through the large breakdown on the bottom leads to a 13-meter pitch. This pitch and the one beyond exhibit the same severe rock fracturing as in "The 200." A short downclimb off the bottom drops into a mud-filled chamber. A 1-meter wide window in the far wall opens into a 12-meter pitch. Several 6- to 7-meter downclimbs then lead to an impressive room with re-solutioned flowstone remnants jutting from the vertical walls which cascade into the next pitch. A large horizontal passage is visible across the pit. An exposed traverse along the left wall gains access to that passage which leads to the "Big Room." The Big Room drop (95 meters) is the longest in the system and ends in a silt sump 400 meters below the entrance. The main passage continues beneath the traverse as an expanded fissure. The first 15 meters of the fissure can be downclimbed to the top of a 33-meter pitch. This pitch is broken by several ledges and ends in a small waterfall room. A short climbdown through a narrow slot directly beneath the waterfall leads to a 10-meter pitch. This area of the cave exhibits fracturing similar to that found near "The 200" except that now the cracks are more extensively filled with calcite. Beyond this the passage continues as a narrow fissure crawl which opens directly into a 40-meter pit. This pitch provides a spectacular view while on rappel. Rings of calcite occur about every 5 meters down the 10-meter diameter shaft and reflect light quite brilliantly against the dark grey background. The effect is much like that of looking down an elevator shaft with lights marking the floors. A low solution-scoured passage at the bottom leads through several pools to a series of three 10- to 15-meter exposed downclimbs. Ten meters beyond the last downclimb is a 10-meter free pitch through a waterfall. Below this drop the passage continues as a narrow (0.5m wide) fissure for 30 meters. A 6-meter downclimb at the end leads to the top of a 21-meter pitch, 22nd in the system. From the bottom a short downclimb leads to a boulder choke. This was enlarged to permit passage (barely) during the March expedition and most of those who made it through did so with little more than their pants on. This situation takes on a little more gravity when it is realized that there are 16 meters of free space between the floor and the squeeze. This is the 23rd and final drop in Conchas and its base is 500 meters below the entrance. Fifty meters of walking passage lead to the terminal sump at -504 meters. The final depth of 508 meters was reached by diving 4 meters down into the sump which was not bottomed.

To those readers who have never had experience in deep multi-drop systems, this description may in some ways be misleading. Hoya de las Conchas with all its 23 drops, sumps, bad air and innumerable climbs is one of the West's more challenging systems. The logistics involved with rigging and derigging, with transporting massive amounts of tackle through sinuous passageways and coping with being soaked for long periods are considerable and may leave the unprepared at wit's end. Hoya de las Conchas is the Western Hemisphere's 7th deepest cave (July 1977).


METERS
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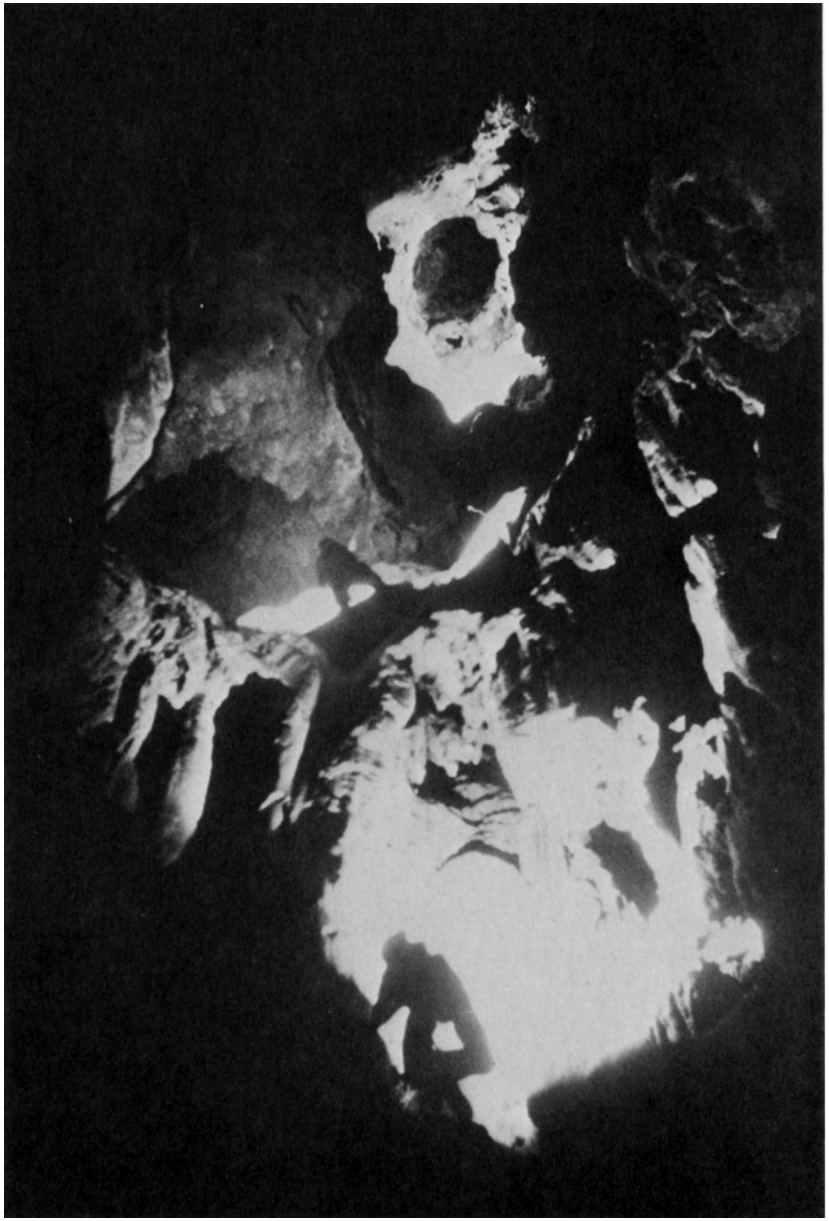
FAULT ROOM
GREEK COLUMN ROOM
LUNCH ROOM
THE 170
SECOND LUNCH ROOM
STILES CRAWL
STONE'S WELL
TRACYS RECONSTR
HALL OF OZTOTL

SOTANO DE NOGAL

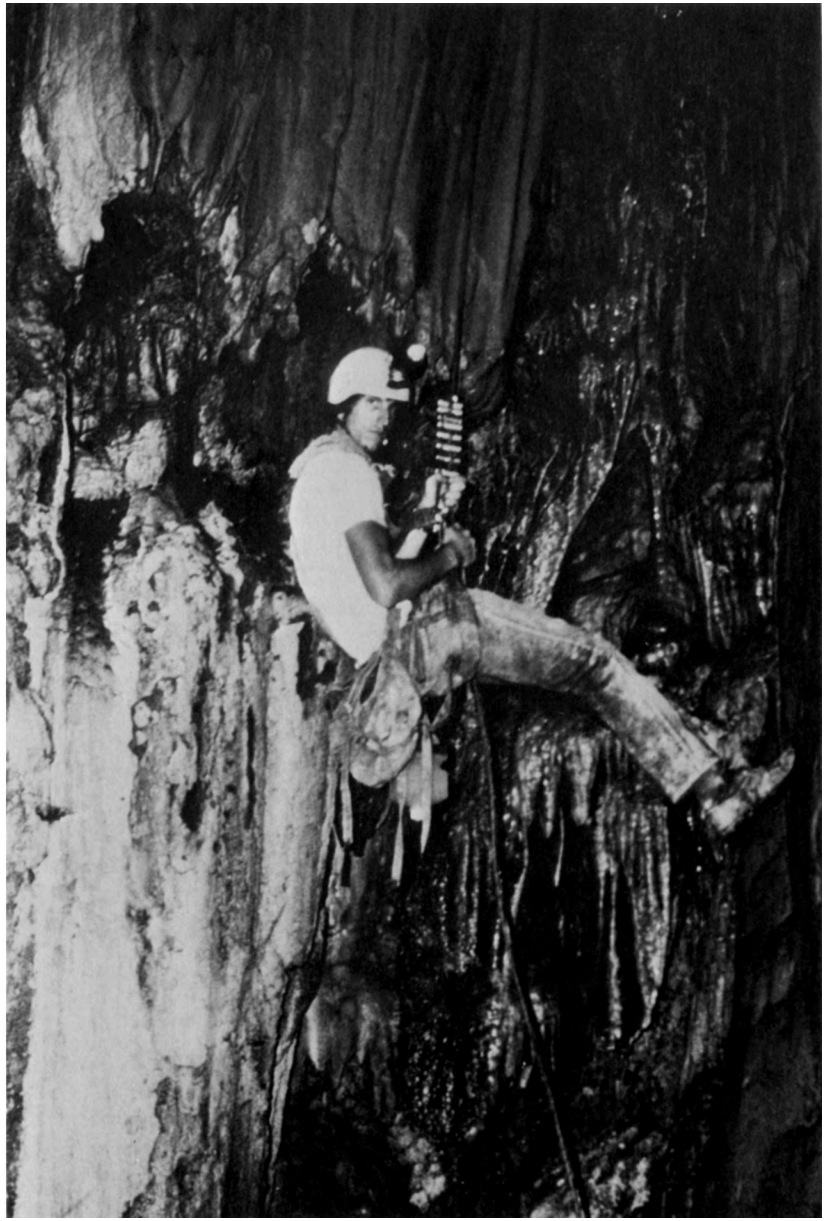
Sótano de Nogal is located 200 meters north of the village of San José in a small sinkhole at the end of a corn field. The hike from San Juan to San José takes about two hours under full pack.

Sótano de Nogal (Pit of the Walnut) was the last of the Thanksgiving '75 expedition's verbal leads to be located on foot, and ironically enough it is the most spectacular cave system on the plateau. The explorer has but to descend only a few pitches to discover that Nogal is an extraordinarily fine cave.

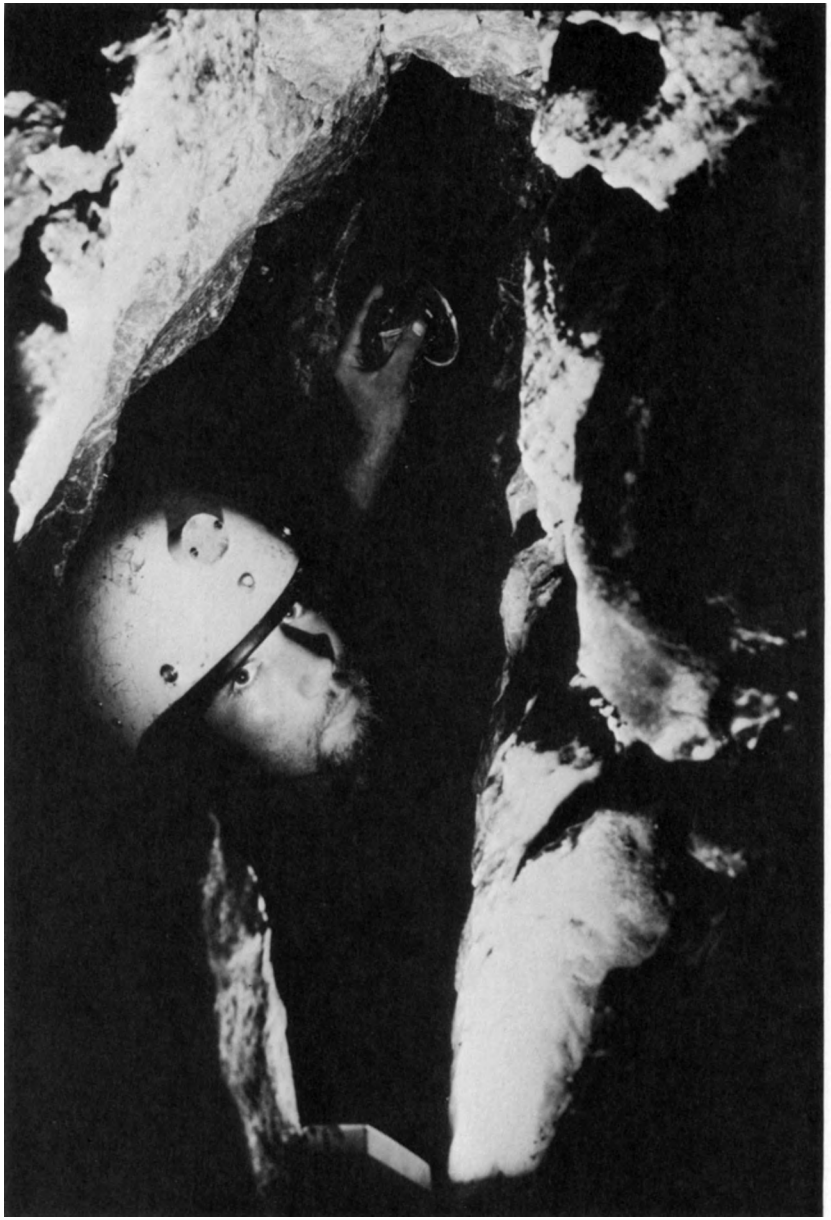
The entrance measures 7 meters across and lies at the end of a dry arroyo entering from the south. This is the largest surface drop on the plateau and goes free for 83 meters to a cobblestone floor. Rays of light enter the shaft during the summer months providing an eye-opening view of its immensity. A 1-meter by 1-meter smooth solution tube leads off the entrance. It is while sliding down this tube that one first notices the big difference between Nogal and all the rest of the San Juan area caves: moving air. There are no traces of foul air throughout the system and wind can still be noticed as deep as Tracy's Reconstruction passage above the Hall of Oztotl, leaving many to believe that the Hall is not the end of the system. Past the tube slide the passage continues 10 meters to two climbdowns. The first can be bypassed by a traverse along the left wall. The second, just below the traverse, is a 7-meter chimney on flowstone. Immediately beyond the climb is a 10-meter pitch through a solution hole into a pleasantly decorated 6-meter diameter cylindrical well. Off the bottom the passage continues to a short downclimb and a climb back up across a potholed shelf. The wider holes near the end open into the fault room drop. The 20-meter rappel lands on a flowstone ledge 2 meters above the breakdown-floored room. The almost vertical slabs of rock which protrude from the floor and walls, along with slickensides on the left wall give rise to the name "fault room." At the end of this room is a 43-meter flowstone-walled pitch, down one side of two interconnected domes. Two short climbdowns at the bottom lead to 40 meters of cobble-floored walking passage. The walking passage soon stops in a large dome-pit complex. The right side of the passage drops off in a 50-meter pitch into the Greek Column Room. The left wall also drops away, but can be downclimbed for 20 meters to a flowstone cascade overlooking a 30-meter shaft. This drop is completely free and also lands in the Greek Column Room. The name of this room comes from the stocky cylindrical formations with fluted sides perched at the edge of the next pitch. There is a slight drizzle on the Greek Column pitch which may be considerably more voluminous during July and August. This drizzle carries over into the next drop past the "columns" and forms a steeply sloping, wet 20-meter cascade to the top of a small breakdown pile. Except for climbing up this pitch on a soaked line one can still stay perfectly dry throughout the upper portion of the cave. At the bottom of the breakdown is the crystal lake traverse, a tricky balance climb across a 1.5 meter deep blue pool. Beyond this is a 4-meter downclimb on a flowstone wall leading to a talus-floored constriction and another 3-meter climbdown. This downclimb is also flowstone covered and ends in a small dirt-floored room. The small passage at the top of this climb also connects via a tight constriction. The passage at the bottom leads upward over a sloppy mud floor. The 16-meter



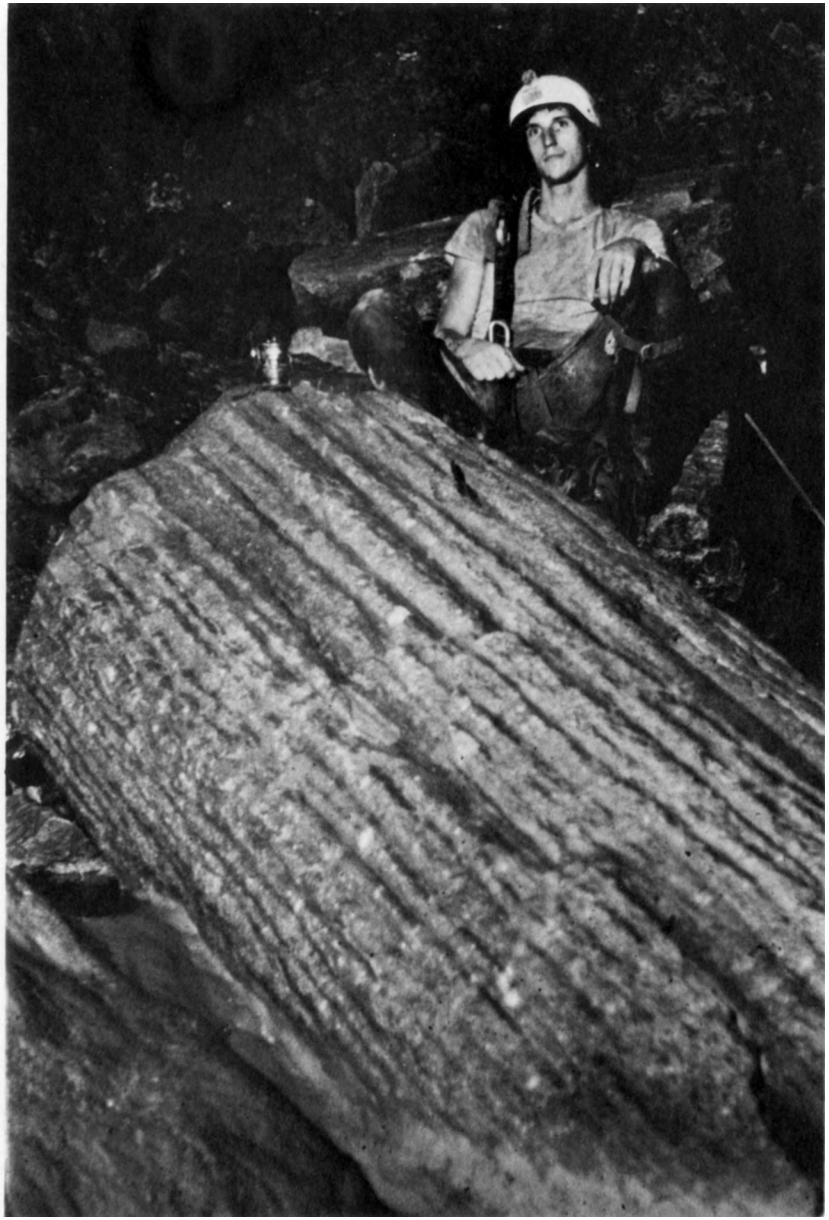
Entrance to Sótano de Nogal. (Bill Stone)



Bottom, Entrance Drop, Sótano de Nogal. (Gary Stiles)



Stiles Crawl, Sótano de Nogal. (Bill Stone)



Greek Column Room, Sótano de Nogal. (Roy Jameson)

"Lunch Room" pitch is entered via a tight crawlway at the top of the mud passage. This short section of the cave is the first place where any alluvial deposits are noticeable. The only other places where fill was noted were in the larger chambers such as the Second Lunch Room and the Hall of Oztotl. The rest of the cave is scoured clean. The Lunch Room is 247 meters below the entrance. This was the furthest point of exploration by the Conchas Expedition crew in March. A 25-meter free drop out of the Lunch Room lands in a crystal blue 3-meter deep plunge pool at the top of a nearly vertical mud-covered flowstone cascade. The plunge pool can be avoided by some judicious penduluming to the top of the flowstone. The drop then continues another 20 meters before landing in large breakdown. The passage leading off is in solution-scoured bedrock, and the dark grey limestone with recrystallized calcite bands that the San Juan cavers have become so familiar with is clearly visible, denuded of the flowstone which covers the upper cave. The tunnel quickly widens into a high arched passage with a breakdown pile of truck-sized boulders descending 20 meters to a large shaft dubbed "The 170." An exposed traverse along the left wall leads to a bridge which overlooks the same drop but rigging is safer in the first shaft as the rock is more stable. This is a fine pitch and the far wall is only faintly visible with a carbide lamp. A short scramble down the breakdown on the bottom leads to yet another deep pitch, which drops 60 meters into the Second Lunch Room. After negotiating the tight 0.5 meter wide, overhanging solution slot at the top, the pit bells out into a large multi-domed flowstone-walled shaft. About 30 meters into the drop is a large flowstone bridge ringed by three pits. The largest of these is a 30-meter free drop into the Second Lunch Room. The others connect but do not give a free drop. This large cobble- and silt-floored room is 30 meters long, 15 meters wide and is 400 meters below the surface. A tight fissure off the east end of the room pinches in some formations but appears to take water at times and a small draft was noticed. The main route to the lower levels, however, is another tight fissure on the west side of the room which abruptly opens into a 13-meter free drop. The rock here is razor sharp and judicious padding is necessary. At the bottom is a tight vertical fissure squeeze for 3 meters (Stiles Crawl). This passage was originally extremely awkward and tight, but has since been cleared so that now it is only tight! A walking passage is visible off the crawl which leads to a 10-meter drop. This can be bypassed by descending through a small tube at the end of the crawl. Another tricky downclimb over slippery rock leads to a stooping rock-floored stream passage. This continues for 25 meters to a series of 5-meter downclimbs. At this point the passage branches for the first time. Continuing down the climb leads to a wet 10-meter crawlway. This opens into a 10-meter flowstone-walled pitch to a 6-meter diameter gravel-floored room and a lake. A short splash across the 6.5-meter deep lake leads to Tracy's Reconstruction passage. Originally the breakdown floor of this room was so unstable that a few hammer blows sent close to a ton of rock down the 26-meter shaft. The large boulder which almost blocks the passage halfway down the drop is a stabilized remnant of the upper floor. A small waterfall enters partway down this pitch giving the whole drop a nasty flavor. The passage at the bottom opens immediately into the yawning blackness of the Hall of Oztotl. The drop is free for 19 meters and lands in the middle of the room. The Hall of Oztotl is the largest chamber in the system measuring 42 meters long, 30 meters wide, and 20-40 meters high. The room is mostly covered with small breakdown blocks, but a flat sandy area in the center would provide an ideal camp site should the cave be pushed further. The final drop in the system is a large oval shaft dropping 27 meters off the west end of the Hall. The passage off the bottom leads only a short distance to a terminal silt sump. This area was searched extensively for leads and ambitious future explorers may find that digging in the sump will be the only way to make Nogal any deeper. This point is 529

Second Pitch, Sótano de Nogal. (Don Broussard)

meters below the surface.

Returning now, back to the junction above the 5-meter climbdowns, a side passage continues across the fissure through a window and into a small chamber. From there a tight squeeze to the left leads to a 5-meter downclimb. The small room at the base of the climb is well decorated and leads a short distance to a circular 7-meter diameter shaft. "Stone's Well" then bells out for a 66-meter freefall into the Hall of Oztotl landing at the edge of the final drop.

The May 1976 Nogal Expedition found that a round trip to the Hall of Oztotl took roughly 8-10 hours with fixed ropes. Those groups unfamiliar with the cave should allow up to 5 days for a trip to the bottom and derigging. No exposure gear is needed The entrance drop is free enough to tandem climb and will save considerable time. The bottoming team had over 600 meters of line rigged (20 total pitches) at one time. Camping is possible in the shaded grove above the entrance sink, but permission from the Jefe in San José must be obtained as a matter of courtesy. Sótano de Nogal is the Western Hemisphere's 4th deepest cave (as of May 1977).

OTHER CAVES OF THE REGION

Besides the major caves (Sótano de Nogal, Hoya de las Conchas, Sótano de Javalín, El Sotanito and Sótano de Canoas) there are numerous less extensive caves on the Plateau which merit attention. To the south, near the village of Rancho Mojonera, is Sótano de la Mojonera. Past a 15-meter entrance drop are several 5-meter downclimbs leading to a well-decorated chamber 30 meters long and 6 -meters wide. From the chamber, a crawl through some very unstable breakdown leads to the end of the cave, a small room, at about -50m. The ridge in which the cave is situated offers a fine view of Tancoyol in the valley far off to the east where the first trip to Tierra Fría, and eventually San Juan, was conceived.

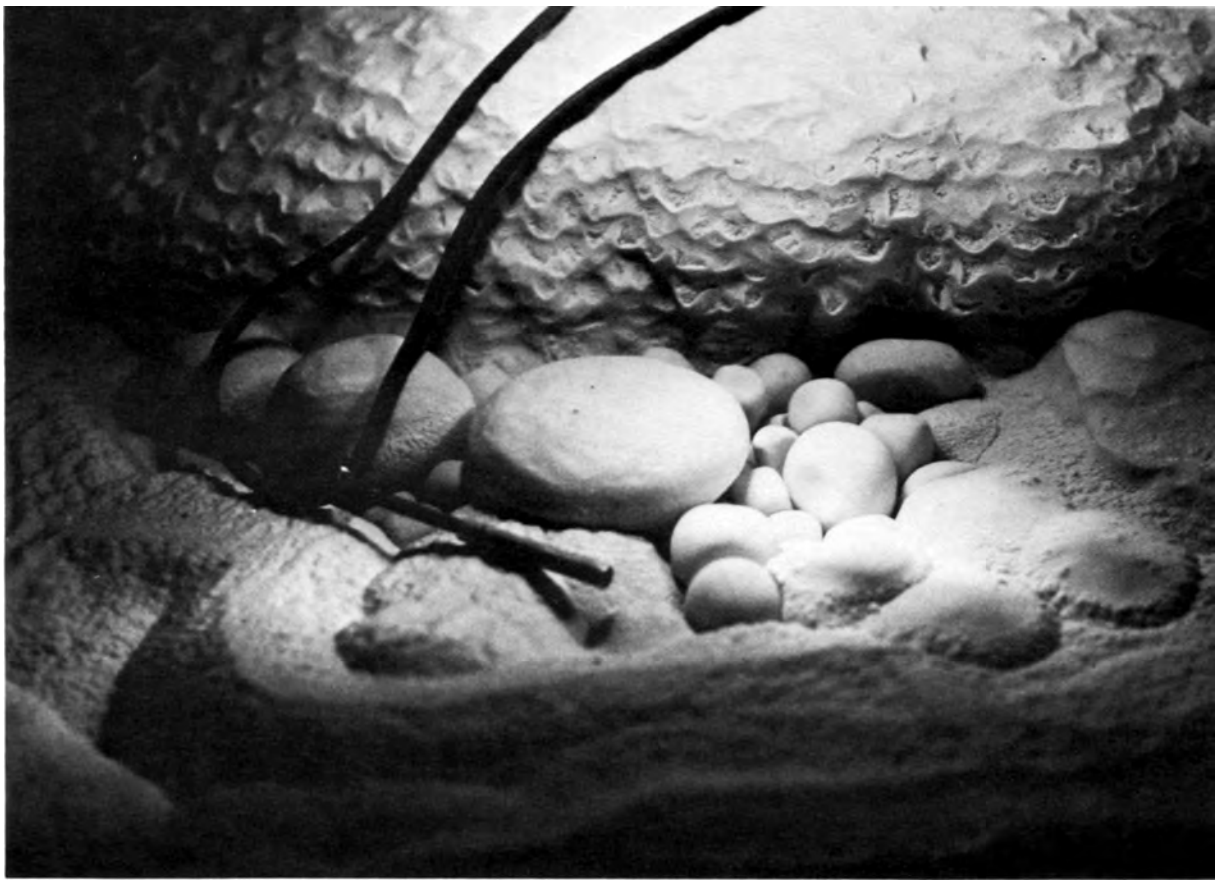
Two, as yet not completely explored caves near San Juan just north of the trail to Conchas merit attention. One of these, Cueva del Encino de la Vega de los Indios, is an almost horizontal cave by San Juan standards. This cave has been explored for about a hundred meters to a small but squeezable hole with air flow. An entrance just to the right of this cave leads to an unchecked 5 m pit. To the south of the Conchas trail is Sótano de Pedregal, a 25-meter blind shaft with some interesting fauna (spiders, beetles).

Further along the trail to Conchas and about 150 meters due south of Sotanito de Canoas is Cueva de Canoas. Several large red clay-banked arroyos lead into the large 25-meter diameter entrance sink. This sink is sheer-walled on three sides for 13 meters, but can be downclimbed on the north side. The main entrance is on the side of the sink and opens into a 6-meter downclimb. The passage continues for 7 meters as a low crawl on flowstone to where it opens into walking passage. This continues for 25 meters to a silt-filled room with a steep breakdown pile leading up to the right. The water goes down a small tube for 8 meters along the left wall to where it is plugged with debris. Digging has not been successful. At the top of the breakdown (15 meters) is a second smaller entrance. The total depth is less than 20 meters, but the cave is well known among the locals.

Roughly 3 kilometers north of Conchas is the most spectacular of the San Juan Plateau's arroyo entrances. Three large arroyos (each larger than the Javalín arroyo) merge to form one 15-meter wide, 15-meter deep arroyo which dumps into the 20-meter deep sheer-walled entrance to Sótano del Tigre. Logs up to 1-meter diameter are stacked about like toothpicks in the bottom of the sink. A slot through the logs leads 4 meters to a 3-meter downclimb into a silt-filled room. A small hole leads down on one side but it is soon blocked by debris. Two other digs on the plateau (Conchas and Sotanito de Canoas) led to substantial caves, and this sink clearly has potential for the deepest San Juan cave.

Several pits up to 50 meters deep are located on the mountain ridge separating the Conchas valley from the San José valley (Mesa de la Rendija). A reported 100 meter deep rift (the Rendija fissure) was found to be a surface feature only 10 m deep.

Located within 200 meters of Nogal are several pits up to 40 meters deep, none of which lead to any significant passage. The large "second entrance" to Nogal which is only 20 meters from the main entrance does not connect. The 5-meter diameter entrance drops 42 meters along a flowstone-draped shaft to a cobble-floored chamber overlooking



Cave pearls, Sótano de la Calavera. (Bill Stone)

a 5-meter diameter, 3-meter deep methane lake. Cueva de Cascabel, a vadose cave, is located on the ridge northeast of Nogal. Following its easily free-climbable 3-meter entrance drop, a 10-meter walking passage leads to a series of rooms developed along a 45-degree fissure, averaging 8 meters wide and 1-1/2 meters high. The lower portion of the fourth room is decorated with stalactites, stalagmites and several narrow columns. Beyond, a 4-meter climbdown, followed by a 7-meter drop, leads to another walking passage 8 meters long. The end of the cave is reached after several more climbdowns and climbups through mud-covered breakdown and narrow fissures. On the other side of the hill to the west of Nogal, near the trail to Milpas Viejas is Sótano de la Calavera, perhaps the most spectacular entrance drop on the plateau. The 4-meter diameter entrance immediately bells out into a 30-meter diameter room for a 32-meter rappel. During the summer months dual rays of light coming in the entrance create the impression of a miniature Sótano de la Cuesta. The entire floor is covered with flowstone and numerous pockets of cave pearls exist. There are no leads off the room. In the same area is Cueva de la Mesa, a small, well known, phreatic shelter cave.

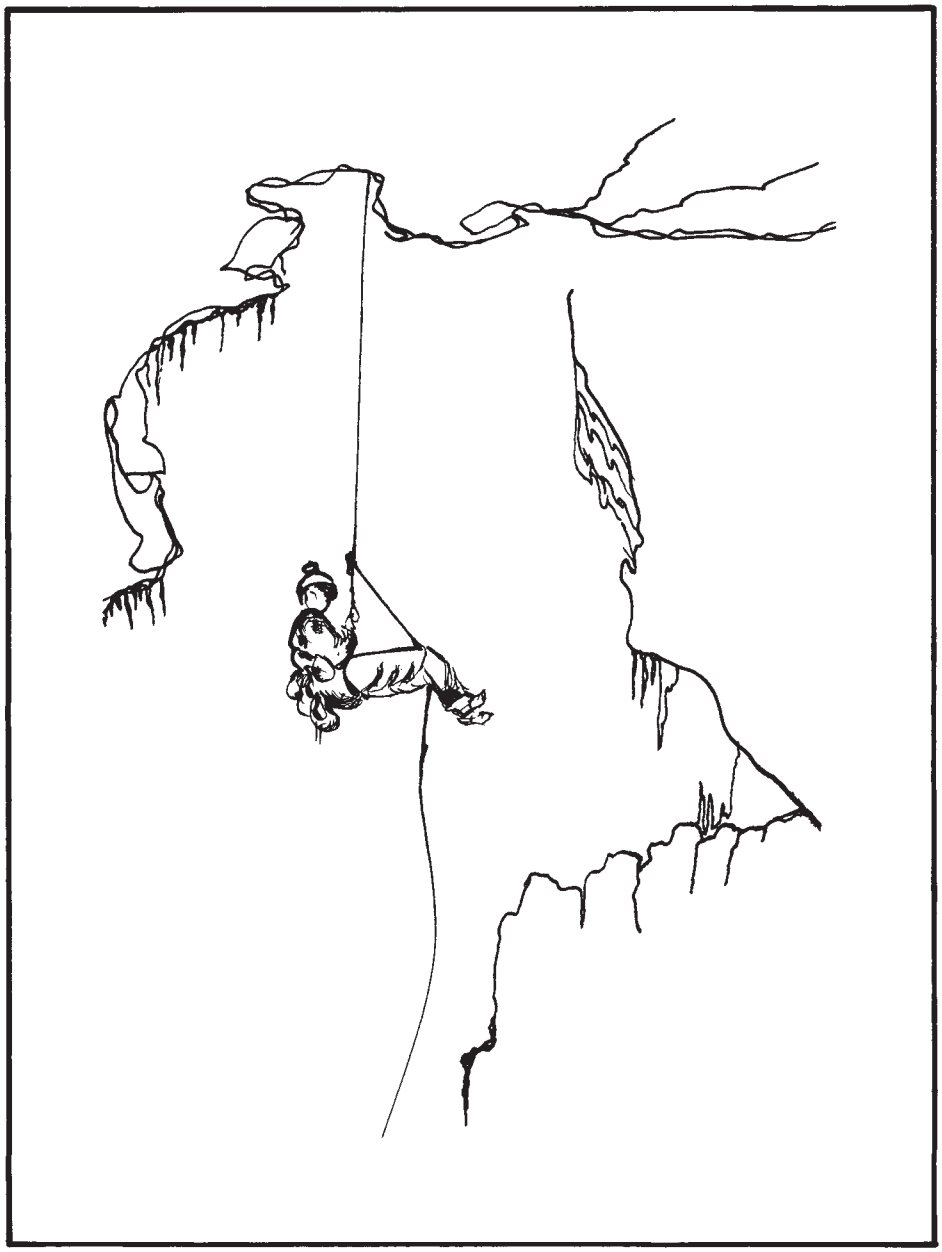
Further to the west, above Milpas Viejas are several multi-drop pits, the deepest being about 50 meters. There are also numerous small horizontal groad holes with vampire colonies. The longest was 100 meters.

South of Milpas Viejas (west of San José) are two large pits near Laguna de la Cruz. The largest, located just north of town, is 14 meters across and 56 meters deep. The other, named Sótano de Piedra de Lumbre, is substantially further away to the south and is also

about 14 meters in diameter with a free drop of 43 meters.

Cueva de Hoja, a 25-meter blind pit, is located in the southwest corner of a large grass field north of Conchas. The first 18 meters may be freeclimbed, but a 10-meter rope is required to negotiate the last 7 meters.

Lastly, Cueva de Guayavitos, is located in the valley below the ridge crest west of San Juan. Not completely explored, this cave is entered via a 4-meter climbdown. Passage is developed along a prominent joint and large breakdown divides the cave into several rooms at several levels. Breakdown in the rooms nearest the entrance is guano covered. Total explored depth is estimated at 15 meters.



MAJOR SYSTEMS

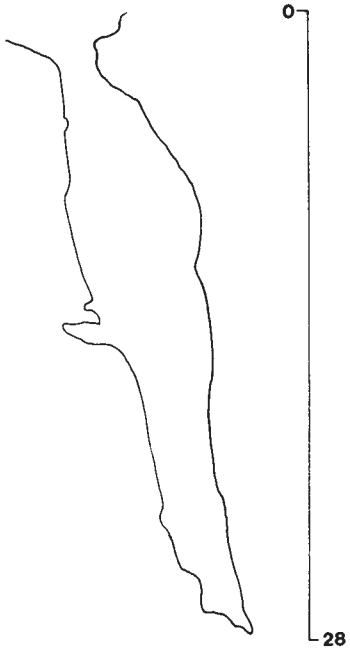
Name	Number Pitches	Depth Meters	Length Meters	Location
Sótano de Nogal	18	529	450	San José
Hoya de las Conchas	23	508	950	San Juan
Sótano de Javalín	12	308	250	El Quirino
El Sotanito	8	225	150	San Juan
El Sotanito de Canoas	5	95	84	San Juan

OTHER CAVES

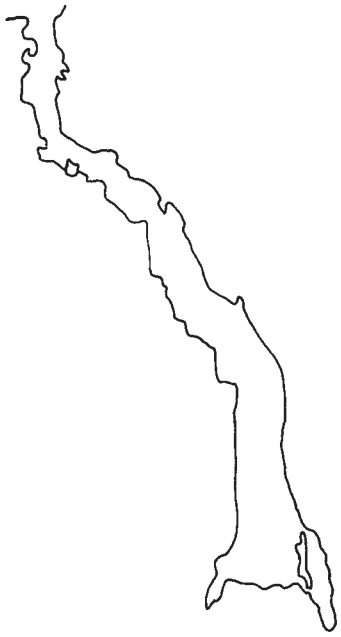
1. Sótano de la Calavera	1	34	37	San José
2. Cueva de la Mesa	0	4	15	San José
3. Cueva de Cascabel	1	40	60	San José
4. Pit	1	4	28	San José
5. Pit	1	24	5	San José
6. Sótano de Nogal No. 2	1	46	15	San José
7. Pit	1	15	15	San José
8. Cave	0	2	2	San José
9. Pit	1	24	5	San José
10. Sótano de Laguna de la Cruz	1	58	19	Laguna de la Cruz
11. Pit	1	15	4	San José
12. Cave	0	10	15	San José
13. Sótano de Piedra de Lumbre	1	41	19	Laguna de la Cruz
14. Cueva de Guayavitos	0	15	25	San Juan
15. Cave	0	3	2	San Juan
16. Cueva del Encino de la Vega de los Indios	0	5	100	San Juan
17. Pit	1	5	2	San Juan
18. Cave	0	3	3	San Juan
19. Cave	0	1	1	San Juan
20. Sótano de Pedregal	1	28	6	San Juan
21. Cave	0	4	3	San Juan
22. Cueva de Canoas	0	18	50	San Juan
23. Pit	1	46	9	San Juan
24. Pit	1	47	9	San Juan
25. Pit	1	15	6	San Juan
26. Pit	1	21	6	San Juan
27. Pit	1	15	5	San Juan
28. Surface fissure	1	12	90	San Juan
29. Sótano de Nonas	1	9	9	San Juan
30. Cueva de Hoja	1	28	5	San Juan
31. Sótano del Tigre	0	5	9	San Juan
32. Pit	2	15	37	Milpas Viejas
33. Pit	4	24	37	Milpas Viejas
34. Pit	1	9	6	Milpas Viejas
35. Cave	0	21	92	Milpas Viejas
36. Sotanito de Mojonera	1	50	92	Rancho Mojonera

Note: Numbers 1-31 are located on San Juan Area Map.

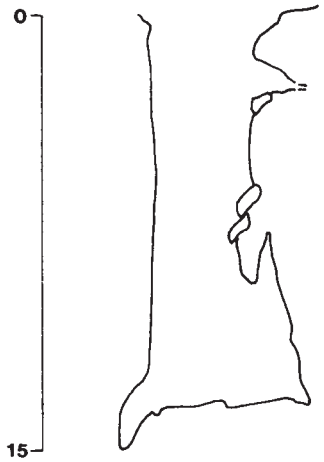
MINOR PITS AND CAVES



Sótano de Pedregal

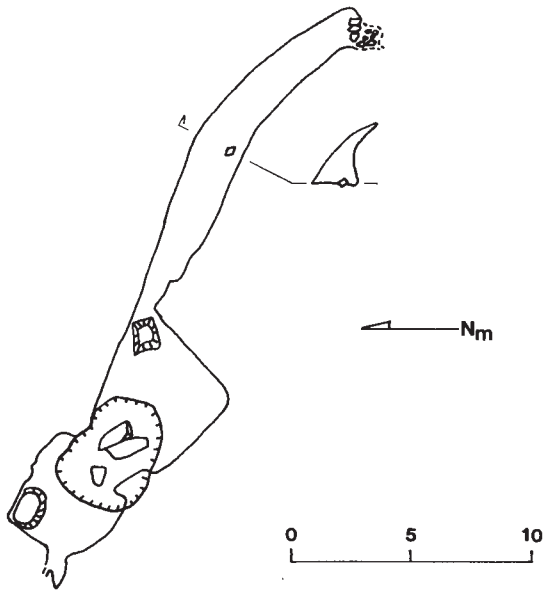


Cueva de Hoja

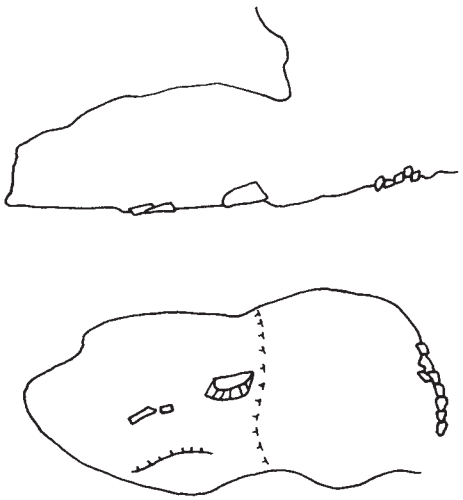


Unnamed Pit No. 5

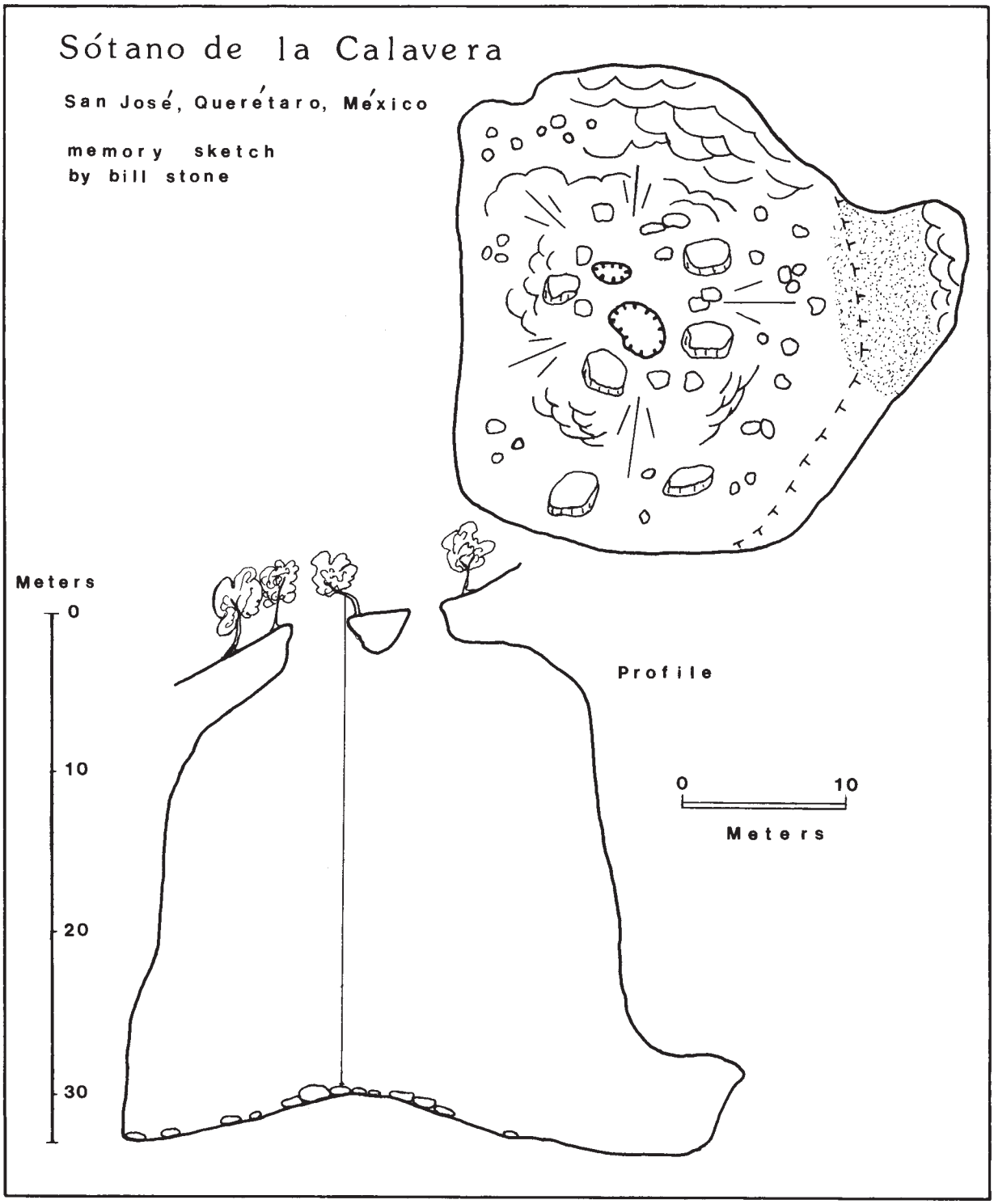
All Units Are Meters
Surveys Dec. 75 and June 76
R. Jameson, P. Mothes



Unnamed Pit No.4



Cueva de la Mesa


Sótano de la Calavera
San José, Querétaro, México
memory sketch
by bill stone
Meters
0
10
20
30
Profile
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REGIONAL GEOGRAPHY

The San Juan caving area is in the western Sierra Madre Oriental, a mountain chain of structural origin about 50 kilometers in width, which extends from Torreón, Coahuila, southwards to the Transverse Volcanic Ranges near Mexico City. It is bounded on the east by the Gulf Coastal Plain, and on the west, near the San Juan Area, by the Central Plateau, a high region marked by volcanic flows and continental deposits of sedimentary origin. The Sierra Madre Oriental averages over a thousand meters in elevation, and is characterized by continuous generally parallel ranges separated by narrow longitudinal valleys. Deep canyons cut by east flowing rivers flank many of the highest regions, which may attain elevations in excess of 3000 meters. Several of the largest and highest ranges of the Sierra Madre Oriental are near the San Juan Area. To the east the Xilitla Highlands dominate the scene, while the Pinal Ridge and the El Doctor Platform lie west and south respectively.

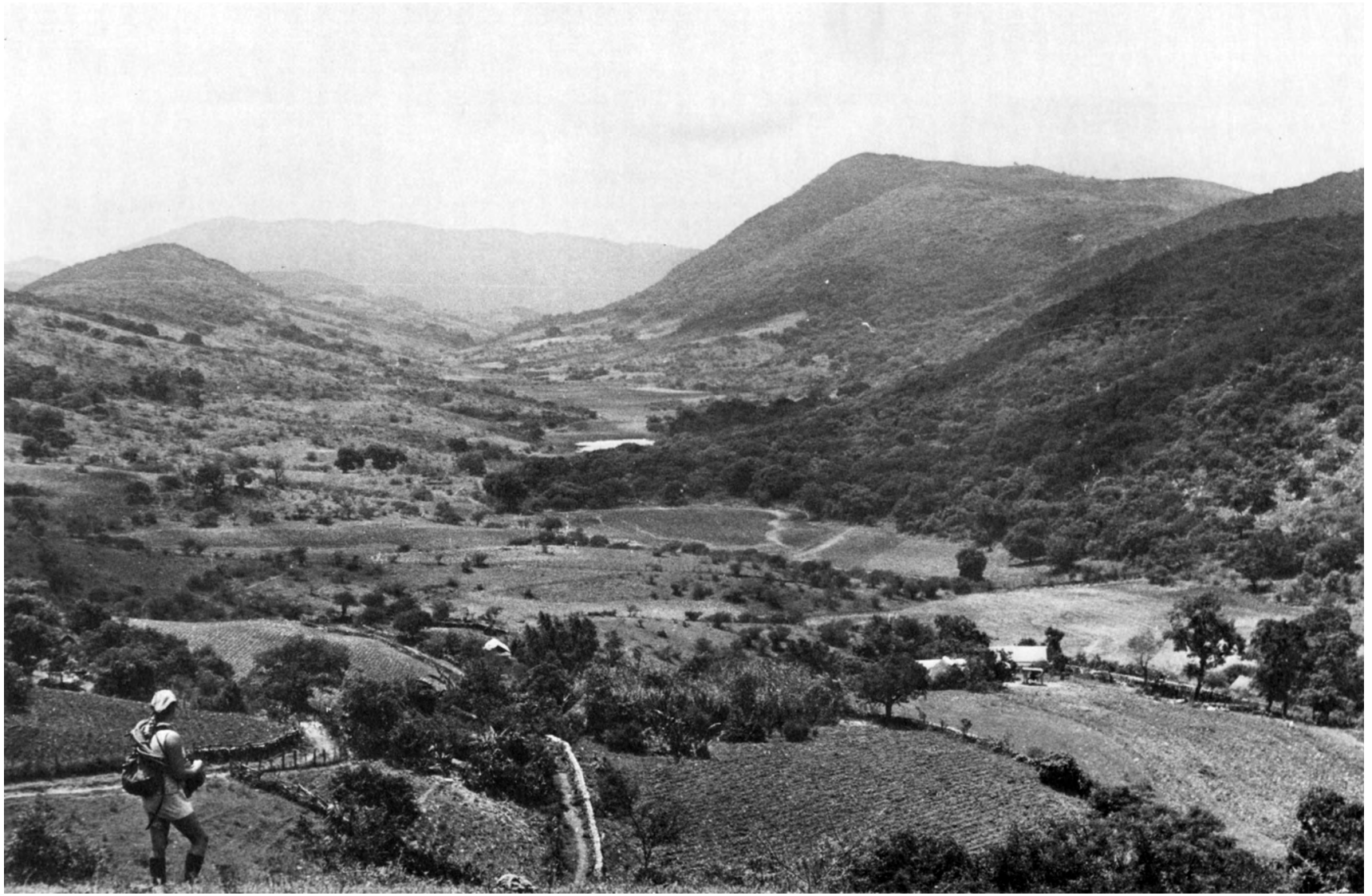
The San Juan Area lies about 1400 meters high on a subparallel ridge system extending northwest from Landa de Matamoros in Querétaro over 100 kilometers towards Río Verde. It averages about 10 kilometers in width and is divided into northern and southern sections at the north edge of the San Juan Area by the 500-meter deep canyon cut by the Río Santa María. The longitudinal valley marking the western margin of the San Juan Area is somewhat wider and deeper than the valley separating the area on the east from the Xilitla Highlands. Elevations along the ridge system range from 650 meters at the base of the Santa María river canyon to over 1700 meters on peaks near Jalpan and just north of the canyon. Three rivers meet at the canyon: The Río Jalpan flows east from the Pinal Ridge, sinks at the impressive cave, Puente de Díos, resurges after several kilometers at the Cueva del Río Jalpan, then flows northwards to the Puente Conca and joins the Río Santa María. The Río Ayutla originates to the west of the Pinal Ridge, then flows past El Sótano del Rancho Barro (455 meters deep) and on to its confluence with the Río Santa María. The Río Santa María originates to the northwest, where it drains a large area of the central plateau south of the city of San Luis Potosí.

The weather of the region is distinguished by wet and dry seasons. Most rain falls between July and September, these two months also being the two wettest (according to informants at San Juan). Rainfall probably averages over 80cm at higher elevations, but is considerably less on western flanks and in valleys. Temperatures during most of the year are high in the valleys (daytime highs average perhaps 25°C) up to the elevations of the San Juan Area, but may sink to freezing at night from November to January. The warmest and driest months are reported to be April and May. In the colder months fog is common, but there is little heavy rain.

Vegetation ranges from thorny scrubs and cactus on the western flanks of the San Juan ridge to open brush and oak woodlands at higher elevations.

AREA DESCRIPTION

Most broadly defined, the San Juan Area might include all terrain west of Tancoyol, south of the Río Santa María, east of the Río Jalpan, and north of La Purisima (Area Map). For the purposes of this bulletin, however,



View looking north down San José Valley. San José in foreground. Sótano de Nogal in finger of trees in center of photograph. (Roy Jameson)

the San Juan Area is best defined as a five-quare kilometer region containing numerous pits and caves near San Juan. Most cave exploration has been conducted within the boundaries of the area map; few caves and pits have been located elsewhere nearby, but several have been entered at Rancho Mojonera and El Bosque, and are discussed below.

The San Juan Area may be divided topographically into two sections: The main plateau and a lower series of longitudinal valleys between the main and a lower parallel ridge crest.

THE LOWER VALLEYS

The lower valleys trend north to the Río Santa María and contain the villages of Laguna de la Cruz and Milpas Viejas. Elevations range from about 1000 to 1300 meters. The valley system consists of a series of sinkholes exhibiting internal drainage and separated by low saddles, although drainage is external into the Río Santa María in the north and into the Río Jalpan in the south. Between Laguna de la Cruz and Milpas Viejas a 150-meter drop off separates the valley system into sets of upper and lower valleys. The upper valley set is dominated by a kilometer long sink and a muddy lake at Laguna de la Cruz, but most sinks measure 100 meters or less in length and 50 meters in width. The lower valley section has not been fully investigated but appears to have a sink several kilometers long. Most sinks are mud plugged.

Six blind pits and one cave are known from this region.

THE MAIN PLATEAU

Most of the San Juan Area lies between two roughly parallel ridge crests at about 1400 meters elevation. The villages San Juan, El Quirino, and San José de las Flores lie within this area; Rancho Mojonera and Tierra Fría are located immediately to the south, while El Bosque overlooks the Río Santa María in the north.

The outer ridge crests rise 100 to 150 meters above the main plateau, which is dominated by large sinks, several lower cultivated ridges, and the large centrally located Mesa Rendija.

As in the lower valley section, drainage is primarily internal. Many small dolinas occur, but large sinks typically have arroyos leading to pits, caves, mud plugs, or small lakes. These arroyos vary considerably in length and range from a few tens of meters to several kilometers. Sótano de Javalín and Cueva del Tigre, for example, lie at the ends of arroyos 3/4 and 1-1/4 kilometers long. The five major pits of the San Juan area all lie at the ends of arroyos, and only a few of over 30 remaining blind pits and short caves fail to regularly take water. Lakes at San Juan and El Quirino fill and overflow into nearby sinks during the wet season. According to local residents the San Juan lake overflows into the lower dolina and cornfield, creating a lower lake which slowly drains. Even small sinks, such as the one draining the San Juan water trough, are said to fill to several meters depth after heavy rains. The entrance of Cueva del Tigre has been described as a huge whirlpool at the height of the rainy season. But a heavy rain at any time will result in considerable water intake into the main pits, with the consequent danger of flooding. The entrance area of Hoya de las Conchas, however, is probably the only major pit that would be affected by flooding after a single heavy cloudburst.

The San Juan Area is in part cultivated. The low rounded hills of the shaley Soyatal formation provide an adequate soil for corn and beans, while the massive limestone of the El Abra formation supports little soil and is very rocky. Springs are common near the contacts of the two formations, but are generally absent elsewhere. Hence with few exceptions villages and dwellings are limited to contact areas.

THE SAN JUAN AREA MAP AND PROFILE

The area map and profile deserve some mention. The new Mexican CETENAL series maps have yet to cover this area, and air photographs of an appropriate scale are unavailable. So they are based upon field sketches, alti-

meter readings, 6 cave surveys, and a 9 kilometer Suunto and tape surface survey undertaken by AMCS cavers in January, March, and June 1976. A final trip in May 1977 corrected minor errors and completed the geology. Surface sketches were made by Henry Schneiker and Roy Jameson. Altimeter readings, taken by Roy Jameson, assume a base of 650 meters at the Puente Conca on the Río Santa María. The overland survey stretched from Javalín past Hoya de las Conchas towards Cueva del Tigre, then looped over to Sótano de Nogal. Don Broussard, Roy Jameson, Shari Larason, Patty Mothes, John Strickland, and Terri Treacy spent over 14 hours on the surface survey. The entire AMCS expedition teams of March and June collaborated on the cave surveys. The final area map and profile, drafted by Roy Jameson, have profited greatly from the advice of Bill Stone, William Russell, and Gill Ediger.

GEOLOGY

INTRODUCTION

This section of the bulletin summarizes the geology of the San Juan Plateau and briefly considers its speleogenesis. Regional accounts of the geology of eastern Mexico are given by Muir (1936) and Heim (1940). Segerstrom (1961) investigated the Bernal-Jalpan region, which borders the San Juan Area on the west. For details on middle Cretaceous stratigraphy and the development of carbonate platforms the reader is referred to Bonet (1952), Wilson and others (1955), Bonet (1963), Carrasco (1970), Carrillo-Bravo (1971), and Enos (1974). Pertinent references in the speleological literature include Russell and Raines (1967) and Smith (1971).

STRATIGRAPHY

REGIONAL SETTING

Eastern Mexico was dominated by the deposition of a thick sequence of carbonates during the Cretaceous. Most of the limestone accumulated on extensive shallow water platforms bordering the eastern continental margin. The largest of these platforms, the Valles-San Luis Potosí Platform (Carrillo-Bravo, 1971), occupied an area extending roughly from Ciudad Valles, S. L. P., in the east, west to San Luis Potosí, north to Ciudad Victoria, Tamps., and south to Zimapan, Hgo. The San Juan Plateau lies near the southernmost edge of the platform.

These platforms consisted of reefs, backreef lagoons, and steep forereef slopes leading down to deeper basins. Sediment was generally plentiful and subsidence rapid on the platforms. Consequently, platform deposits are usually thick, often exceeding 1000 meters.

Reefs grew along the platform edges. They were discontinuous; individual reefs probably attained lengths of only several hundred meters and thicknesses of a few tens of meters. Rudist bivalves and other shell organisms accumulated in place or contributed detrital sediment to the reef and surrounding areas.

Lagoons occupied platform interiors. Fine lime mud sediments dominated deposition, but evaporites were deposited in some areas. Regions of evaporite deposition were subject to solution and removal of evaporites after further carbonate accumulation. This process led to extensive collapse and the consequent formation of evaporite solution collapse breccias.

Forereef slopes received sediment from the reefs in the platform edge and were probably very steep, exhibiting considerable relief. Consequently large slump blocks are a common constituent of forereef slopes. Reef detritus also contributed heavily to a basal forereef breccia.

The dense, pure platform limestones are known collectively as the El Abra Limestone (Carrasco, 1970).

At least five of these middle Cretaceous carbonate platforms have been recognized in eastern Mexico (Enos, 1974). Between them in the deeper basins limestone usually was also deposited. In contrast to the platforms, less sediment was available and subsidence was slow. Basinal sequences are thus relatively thin. Basinal limestones are typically fine grained, laminated and dark gray in color.

In the late Cretaceous an influx of terrigenous silts resulted in partial burial and kill-

ing of the reefs. Although reef development continued locally until the end of the Cretaceous, these clastics dominated deposition over most of eastern Mexico at that time.

Prominent clastic units deposited over the Valles Platform included the Soyatal Formation, in the south and west, and the Agua Nueva, San Felipe, and Mendez Formations in the east. These four formations contain varying amounts of shale and limestone. Only the Soyatal Formation is exposed in the San Juan area.

STRATIGRAPHIC UNITS

El Abra Limestone.—The El Abra Limestone is exposed over most of the San Juan Area and contains all known caves (Area Map). Its thickness was not measured but probably exceeds 1000 meters. Several kilometers to the north of the study area, in the canyon of the Río Santa María, about 700 meters are exposed, while over 1000 meters are present twenty kilometers to the west in a canyon of the Río Ayutla. Hoya de las Conchas, which penetrates the greatest stratigraphic thickness of the San Juan caves, terminates about 600 meters below the upper contact of the El Abra with the Soyatal Formation.

The El Abra Limestone's lower contact is not exposed in the San Juan area. However, it probably overlies the Jurassic Las Trancas Formation, composed of shale and argillaceous limestone. Segerstrom (1961) observed the El Abra directly and unconformably overlying the Las Trancas Formation about 15 kilometers southwest of San Juan near Escanelila.

The upper contact with the Soyatal is gradational.

The El Abra Limestone of the San Juan area consists either of light to dark gray, finely laminated, thin to thick bedded mudstones and wackstones or of poorly bedded breccias. The former are interpreted to be lagoonal in origin, while the breccias are probably evaporite solution collapse breccias. The breccias are composed of a variety of clasts in lime mudstone or dolomite. Clasts include chert, fossil fragments (mostly foraminifera), lime mudstones, and siltstones. Chert nodules are rare. Clast size ranges from less than 1 mm to over a meter. Iron oxidization of the matrix is common imparting a red color to the matrix. Clasts are variable in color. Bedding in the breccias is usually indistinct and primary sedimentary structures are rare.

The upper 100 to 150 meters of the El Abra at San Juan are fine laminated lagoonal limestones. Between 100 and 150 meters below the Soyatal contact, breccias appear and increase in thickness and lateral extent. Below the 150 meter level, especially as exposed underground, the breccia predominates.

Soyatal Formation.—The Soyatal Formation conformably overlies the El Abra Formation and is exposed as low rounded hills and in the valleys on the main plateau section of the San Juan area. It outcrops in a narrow band extending 8 kilometers northwards from Rancho Mojonera to El Bosque, seldom exceeding half a kilometer in width. To the south of San Juan toward Tierra Fría, however, it widens to approximately 1 kilometer.

At San Juan a stratigraphic thickness of approximately 250 meters was measured.

The Soyatal Formation consists of interbedded light colored shale, siltstone, and lime mudstone. The lower 15 meters is generally flaggy and contains abundant chert nodules. Higher in the section yellowish brown to blue shales alternate with silty, thin bedded limestones. Shale beds are typically 5cm to 3 meters thick, the thin bedded limestones 2 to 10cm thick.

As previously mentioned, the boundary between the El Abra and the Soyatal is gradational. Both Segerstrom (1961) and Smith (1972) placed the boundary at the first appearance of conspicuous shale and the disappearance of the thicker-bedded limestone (Smith, 1972). However, since the upper El Abra at San Juan is noticeably thicker than the chert bearing flaggy limestone and contains no chert, a more appropriate division appears to be the onset of abundant chert in thin flaggy beds.

The two formations weather differently. The incompetent Soyatal Formation produces a rocky soil, and the El Abra little soil or a fine terra rosa clay. This difference in weather-

View looking northwest to San Juan lake. Rounded and cultivated hills in foreground are developed on the Soyatal Formation, background ridge is El Abra Limestone thrust over the Soyatal. (Roy Jameson)

ing and the cultivation generally present on the Soyatal quite commonly results in an accentuation of the contact.

STRUCTURE

Compressive forces associated with the Laramide Orogeny have uplifted, folded, and deformed the rocks of the San Juan Plateau. Structurally the area is dominated by the anticlinal San Juan Ridge and the San Juan Thrust.

SAN JUAN RIDGE

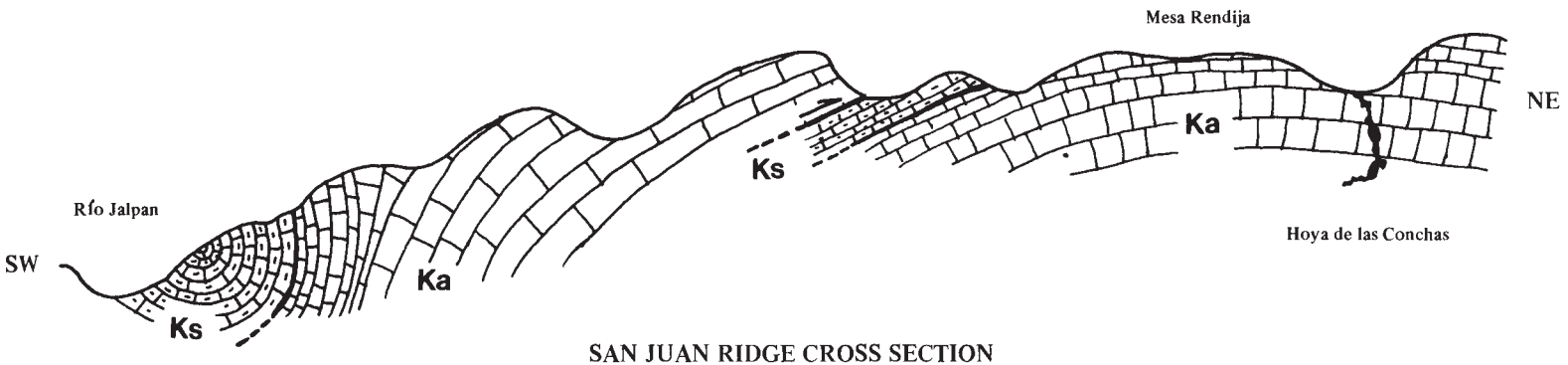
The San Juan Ridge is formed by a broad anticline plunging slightly to the southeast (San Juan Ridge Cross Section). In detail, however, its structure is more complex. On the west a syncline plunging gently southwards overturns the Soyatal and El Abra to the east. Near the center of the ridge the El Abra overrides the Soyatal along the San Juan Thrust Fault. Immediately east of and parallel to the thrust trace, a series of tight anticlines and synclines have formed (San Juan Cross Section and Laguna de la Cruz Cross Section). The eastern portion of the anticline completes the San Juan Ridge. The ridge slopes down steeply to the east with topography conforming to structure, dip apparently being higher than on the west.

SAN JUAN THRUST FAULT

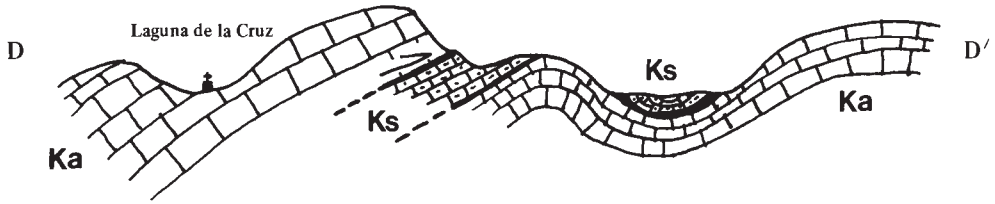
The San Juan Thrust Fault extends northwest through the entire San Juan area. A sheet of the El Abra Limestone, 50 to 100 meters thick, has been thrust eastwards over the Soyatal Formation. The thrust strikes at approximately N50W and dips west between 10 and 25 degrees. The Soyatal, poorly competent, was intensely crumpled underneath. Deformation in the Soyatal appears to have been greatest south of San Juan, where numerous tight folds too small to map were observed.

LOCAL FOLDS

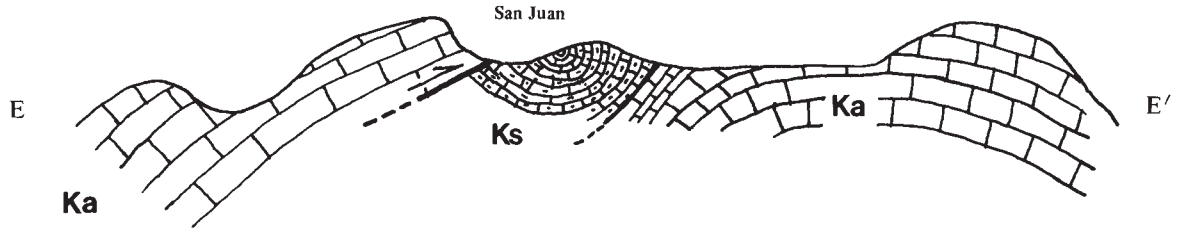
Several local anticlines and synclines associated with the San Juan Thrust were mapped.



SAN JUAN RIDGE CROSS SECTION



LAGUNA DE LA CRUZ CROSS SECTION



SAN JUAN CROSS SECTION

Note: Cross sections D–D′, E–E′ from San Juan Area Map. Ks = Soyatal Formation; Ka = El Abra Limestone.

South of San Juan a syncline, overturned to the east and plunging southwards, parallels the thrust. Between San Juan and San José folding included the El Abra, and a tight, nearly symmetrical anticline was formed. Immediately to the east of this anticline a slightly wider syncline appears in both the Soyatal and El Abra. These folds extend several kilometers along the thrust, but die out past San José just north of Sótano de Nogal.

JOINTING

Joints are not particularly numerous in the El Abra Limestone of the San Juan Plateau, but are locally concentrated by and associated with larger structural features. Fracturing and jointing appear to have been most intense along the San Juan Thrust and below the surface in Hoya de las Conchas. (Conchas lies near the eastern flexure of the anticlinal ridge system.)

At San José near vertical joint sets in the thrust sheet were observed at N51W and N15E. The major axes of many of the sinks aligned parallel to the thrust between San Juan and San José are formed by joints also striking about N51W.

In areas of high joint concentration, especially as observed underground, individual joints tend to be greatly developed vertically. Several of the deeper pits of the plateau, such as the Twin 100's in Conchas, appear to be developed along single joints.

FRACTURING

Both the Soyatal and El Abra have been locally intensely deformed. Many of the fractures in the El Abra are associated with anticlinal axes and appear to be related to tension. These fractures, generally filled by calcite, may be quite extensive, and vary from a few millimeters to 3 or 4 centimeters in thickness. Other, less extensive fractures occur en echelon and are smaller. Both types are common in Hoya de las Conchas, especially below the 300 meter level.

Calcite filled fractures are rare in the Soyatal Formation.

GEOMORPHOLOGY

The Soyatal Formation and the El Abra Limestone produce two distinctive geomorphic terranes in the San Juan area.

The Soyatal Formation, a non soluble unit, is characterized by external drainage. Erosion of the soft shales and thin-bedded limestones is relatively rapid. The Soyatal typically weathers to rounded but highly dissected hills. This topographic form is best exhibited south of San Juan, where the intense structural deformation associated with the overturned syncline and local cultivation have combined to enhance the rounded appearance of the hills.

The El Abra Limestone, a dense but highly soluble unit, is characterized by internal drainage. Water rapidly enters the vadose zone through joints, fractures, and caves. In areas of high joint concentration, especially where sinks have developed parallel to larger structural features, lateral movement of water is minimal. Elsewhere run off concentrated by the impervious Soyatal joins arroyos developed in the El Abra, and eventually sinks in caves, pits, and sinkholes. Sinks, as described above are numerous in the area and range from a few meters to over a kilometer in size. While they occur throughout the San Juan area, they are most numerous where they are aligned parallel to, and are associated with structural features.

HYDROLOGY

Resurgences receiving water from the San Juan Area have not been located. The two nearest rivers, the Río Jalpan and the Río Santa María, appear to lack resurgences of sufficient size to accomodate the large quantities of water involved. Nonetheless the proximity of the Río Santa María is suggestive of drainage to the north.

SPELEOGENESIS

VERTICAL CAVE DEVELOPMENT

The San Juan Plateau, a relatively small region (5 km^2), contains an impressive number of deep vertical pit systems. Seven of about 30

Evaporite solution collapse breccia, Hoya de las Conchas. (Roy Jameson)

pits and caves contain multiple drops, the two deepest, Sótano de Nogal and Hoya de las Conchas, measure over 500 meters deep. Most other caves are blind pits, and very few caves are either horizontal or contain significant horizontal passage. Only two pit systems exceed 500 meters in surveyed length, and no cave on the plateau has a passage lying more than 230 meters horizontally from its entrance.

The most important factor leading to the development of San Juan's deep pit systems appears to be the pattern of locally concentrated but extensive near vertical joints. Water, concentrated by the Soyatal Formation, has been able to rapidly descend along these deep joints in relatively uninterrupted fashion and take advantage of the great relief provided by the San Juan Ridge.

Since joints are generally vertical so are pits. In a few cases, however, pit development along joints has been controlled by steeply dipping bedding planes. Sótano de Nogal exhibits numerous pits of this type since dip in the El Abra Limestone at Nogal generally exceeds 60 degrees. Bedding plane pits tend to be relatively shallow and connect larger pits formed on vertical joints.

Most of the pits in the San Juan area caves are relatively narrow and represent enlargement along single joints, but the precise factors influencing their morphology are not well understood. A few of the larger pits occur in zones of intense deformation and are huge bell shaped rooms. These latter pits formed largely by collapse of wall and ceiling rock and are floored by giant breakdown. The "200" of Conchas provides the best example of this pattern of formation.

INFLUENCE OF LITHOLOGY ON PASSAGE MORPHOLOGY

Two distinct passage morphologies were observed. In evaporite collapse breccia passage cross sections tend to be rounded, while cross

sections in lagoonal bedded facies are more angular.

Passage developed in breccia exhibits a complex surface texture. Clasts and matrix weather differentially, the less quickly removed clasts standing out slightly. Nonetheless the surfaces appear generally smooth, and walls tend to be solutionally rounded. Hoya de las Conchas, especially at 250 meters, provides the most striking example of this type of passage morphology.

Passage developed in lagoonal facies is more irregular and angular than breccia passage. Distinct, relatively thin beds separate along bedding planes and are removed from the walls and ceiling, forming irregular, blocky breakdown. The walls lack the complex surface texture and variable color of passages formed in breccia. In caves developed in areas of high dip, such as most of Sótano de Nogal, the floor may take on a stairstep appearance.

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BIOLOGY

Biological collections made in five caves on the San Juan Plateau have included several new species of cave-adapted animal. Troglobitic centipedes, millipedes, and isopods have been found. Troglophilic crickets, beetles, and spiders were also found. To date, only the spiders and snails have been identified.

Spiders.—The spider *Eidmannella pallida,* a species which ranges throughout North and South America, is recorded from Hoya de las Conchas and Sótano de Nogal.

Isopods.—Troglobitic isopods of the family Trichoniscidae found in Hoya de las Conchas probably represent a new species. Similar species of this family have been recorded from caves in Tamaulipas, San Luis Potosí, and Querétaro.

Centipedes.—Also found in Hoya de las Conchas was a new species of troglobitic centipede in the order Scolopendromorpha. Troglobites of this order are rarely found in Mexican caves. A Similar species has recently been found in Cueva del Brinco in northwestern Tamaulipas.

Millipedes.—Several types of small (20mm) millipedes were collected in Sótano de Nogal and Hoya de las Conchas. They will probably prove to be new species of troglobites. Cave-adapted millipedes are found in great variety and abundance in Mexican caves. An epigean (surface-dwelling) species is also recorded from El Sotanito.

Crickets.—Crickets belonging to the genus *Paracophus* were collected in Hoya de las Conchas and Sótano de Nogal. They may be a new species. *Paracophus* is an abundant genus of cave crickets in caves in northern Mexico and several species are known from caves in this general region. Some species are blind but most are not. The crickets from San Juan are not troglobitic. Epigean crickets of an undetermined genus were collected in El Sotanito and could also be a new species.

Beetles.—Two different families of beetle have been collected under the San Juan Plateau. Beetles belonging to the families Carabidae and Staphylinidae have been collected in Hoya de las Conchas and Sótano de Nogal. None are cave-adapted. Beetles of these two families are common in caves all over Mexico.

Snails.—The snail *Zonitoides arboreus,* a common surface type that ranges thru the USA, was collected at the bottom of the entrance drop of Sótano de Nogal.

Summary.—The known cave fauna of the San Juan Plateau is sparse, especially when compared with other nearby karst areas that have been more intensively studied. So far biological collections in the San Juan Area have been made in only five caves: Hoya de las Conchas, Sótano de Nogal, Cueva de Pedregal, Cueva de Guayavitos, and El Sotanito, none of which are particularly good collecting caves. Conchas and Nogal are very impressive vertical systems but cave fauna in them was very sparse. As more different types of caves on the San Juan Plateau are examined more new species of troglobite should turn up. Several groups which make notable contributions to the cave faunas of nearby, similar, cave areas have yet to be found near San Juan. Harvestmen, amblypygids, pseudoscorpions, scorpions, and other groups could be discovered by additional collecting.

—Andy Grubbs

SAN JUAN CAVING

One aspect of the San Juan area not discussed in the main context of this Bulletin is what these caves are like from the explorers' viewpoint. In contrast to the great systems of the Huautla plateau (San Agustín, -869m, La Grieta, -665m, and Río Iglesia, -535m) which are characterized by large passage dimensions, a few large pitches, cold running water and considerable horizontal extent, the caves of the San Juan Plateau are smaller and tend to be more vertically oriented. Typically little depth is gained in the connecting passageways between pitches as in Huautla, but is made up in the shear multiplicity of drops which require rigging. Conchas, with its 23 drops, is undoubtedly one of the more complex caves in Mexico from the rigging viewpoint. In all the San Juan caves exclusive of Conchas, T-shirts and blue jeans proved suitable for exposure gear in the 65°F passages. Most cavers who went past the "Twin Drops" in Conchas wore wet suit tops, but a fast paced crew could wear wool sweaters and stay comfortable.

Although bivouack camps had been planned for, following the Canadian assaults on the Huautla area caves, they proved unnecessary. The exploration tactics of using strong, fast paced rigging and survey crews permitted shuffling to work at -500 meters on a day on-day off basis. In contrast to the 37 person expedition which bottomed Conchas, and the typical 20+ person Huautla expeditions, Nogal was bottomed, surveyed and derigged in ten days with only a four man crew.

In Conchas below the sump and in the lower sections of Javalín foul air is distinctly noticeable and can cause slowed reactions in tense situations, especially in the exposed climbs in lower Conchas. Rotten rock occurs in several places in Conchas, El Sotanito and Javalín, most notably from the "Twin Drops" to the Big Room in Conchas and the entrance pitch of Javalín. Downclimbs and pitches in these areas should be cautiously rigged, otherwise, natural tie-offs are abundant and safe.

Although few pitches required padding in any of the caves, what appeared to be a smooth breakover nearly severed the Second Lunch Room pitch rope in Nogal 60 meters above the floor! All the major caves on the plateau take massive amounts of drainage during the rainy season and should not be attempted from July through October.

During the ten months of active exploration on the plateau the local relations could only be described as excellent. Many of the town's people became familiar friendly faces over the months and few of us will forget the overwhelming gifts of food which were brought to our camp on more than one occasion. With this in mind, we hope that all newcomers to the San Juan plateau will appreciate the region for its people as well as its spectacular caves. It goes without saying that all groups should introduce themselves to the Jefe in the villages near the major systems and obtain formal permission to camp in the area and explore the caves.


JYGGRUP

Hoya de las Conchas

Ejido San Juan, Querétaro, México

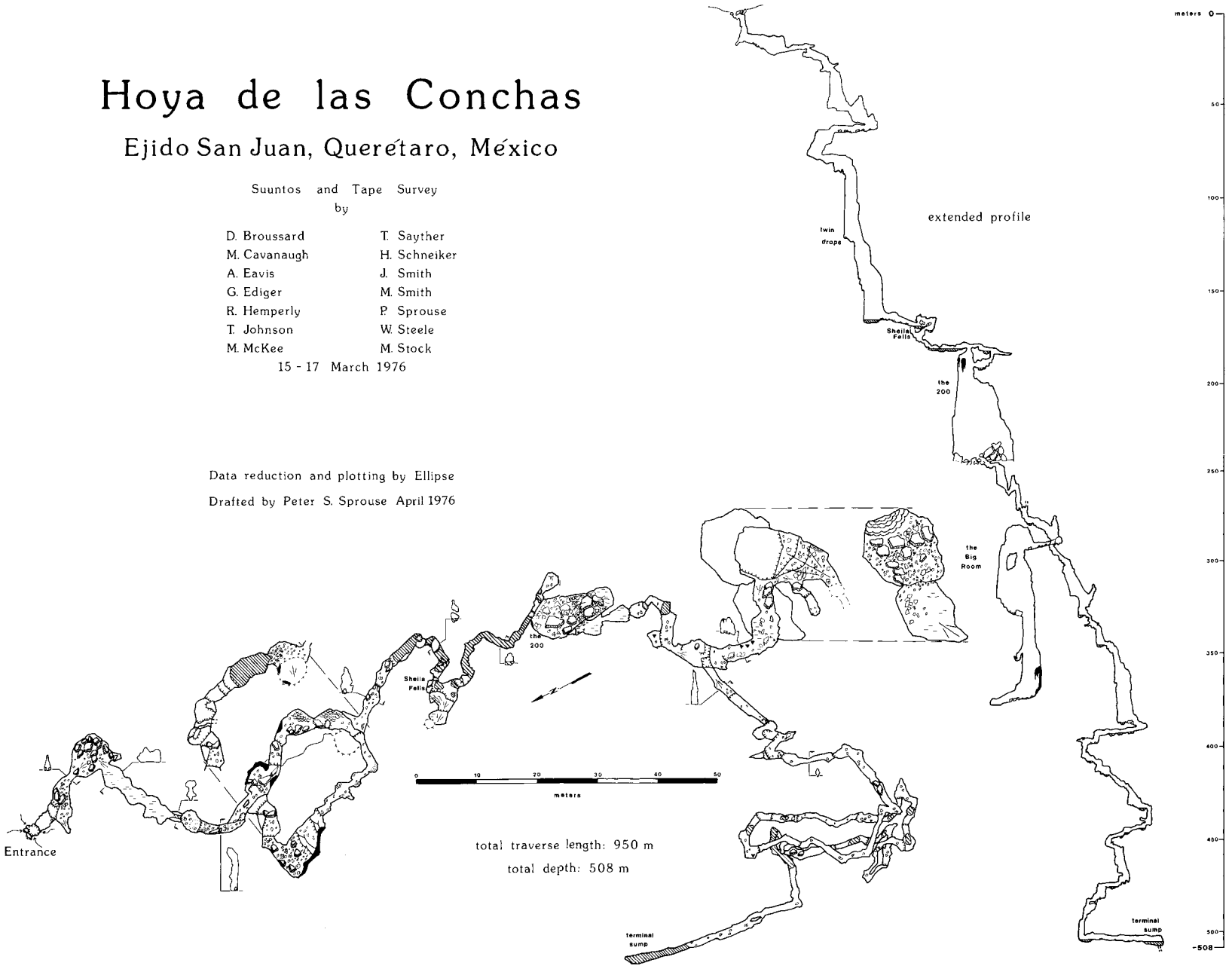
Suuntos and Tape Survey
by

D. Broussard	T. Sayther
M. Cavanaugh	H. Schneiker
A. Eavis	J. Smith
G. Ediger	M. Smith
R. Hemperly	P. Sprouse
T. Johnson	W. Steele
M. McKee	M. Stock

15 - 17 March 1976

Data reduction and plotting by Ellipse

Drafted by Peter S. Sprouse April 1976



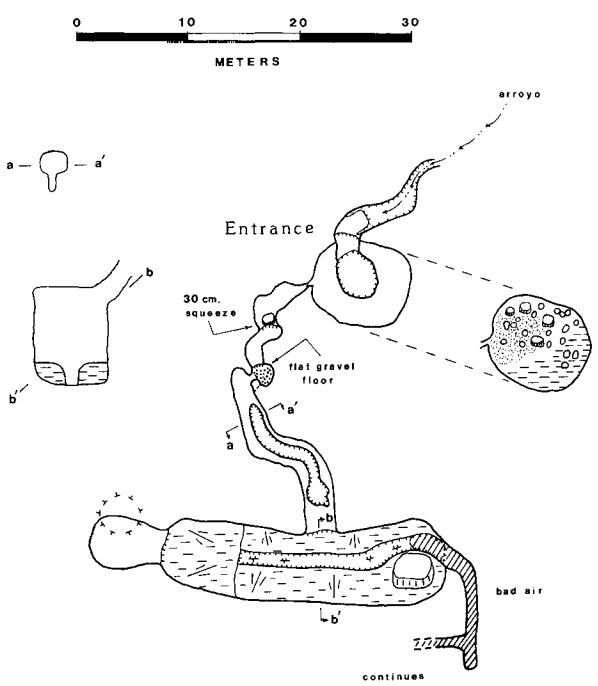
Sotanito de Canoas

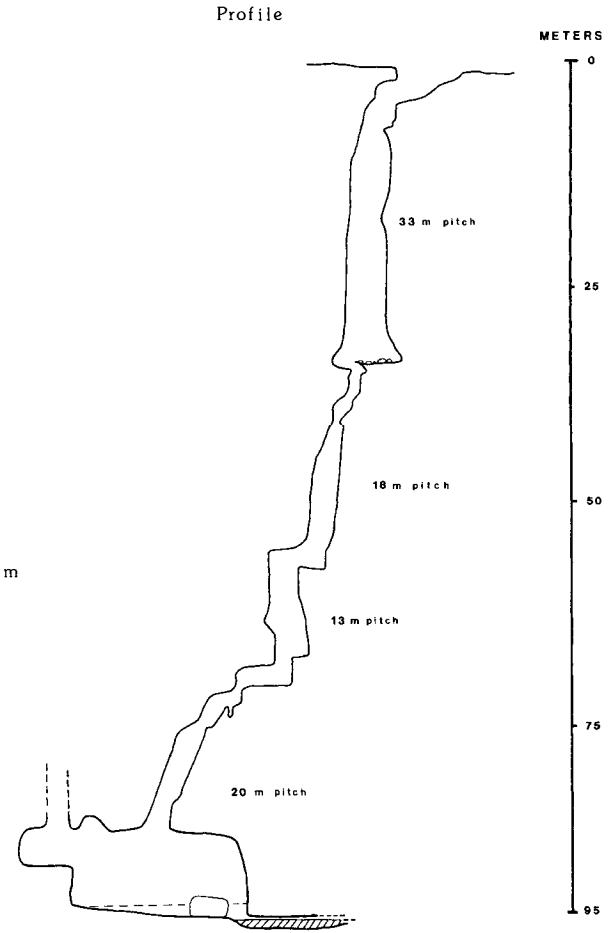
Ejido San Juan, Querétaro, México

Suuntos and Tape Survey, March 1976
by

T. Johnson
J. Smith
M. Smith
W. Steele
M. Stock
B. Stone
S. Ward

Drafted by Bill Stone
October, 1976





EL SOTANITO

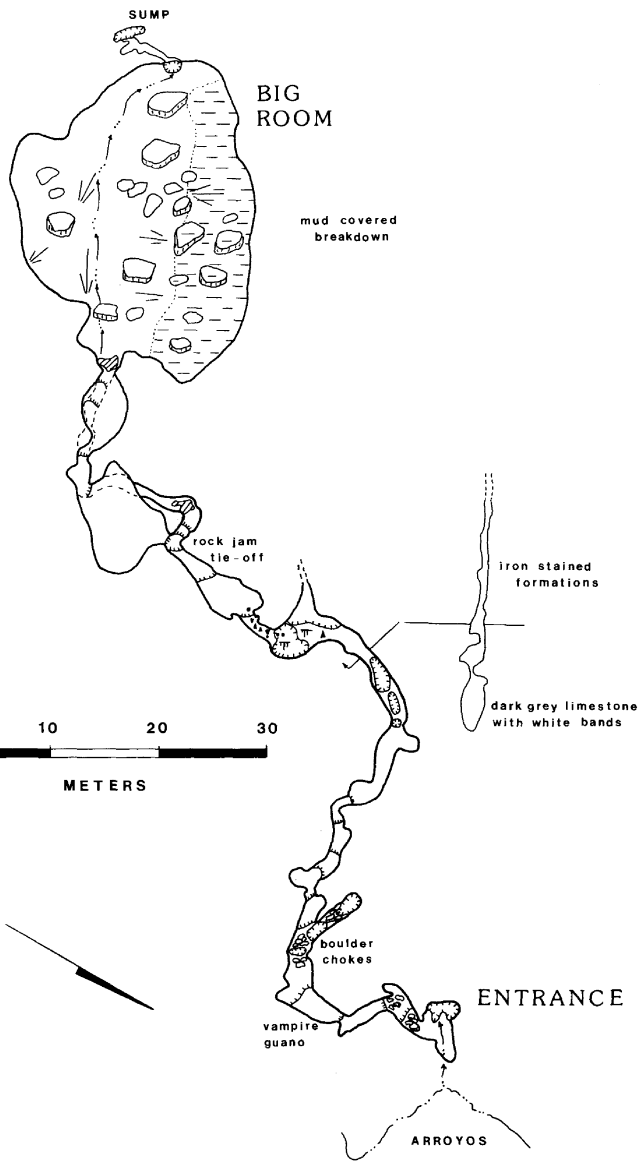
Ejido San Juan, Querétaro, México

SUUNTOS AND TAPE SURVEY by

R. Hemperly
R. West
L. McNatt
S. Zeman
R. Ralph

March 15-16, 1976

Sketch by Ron Ralph
Drafted by Bill Stone
Data Reduction by Ellipse
Sept. 1976



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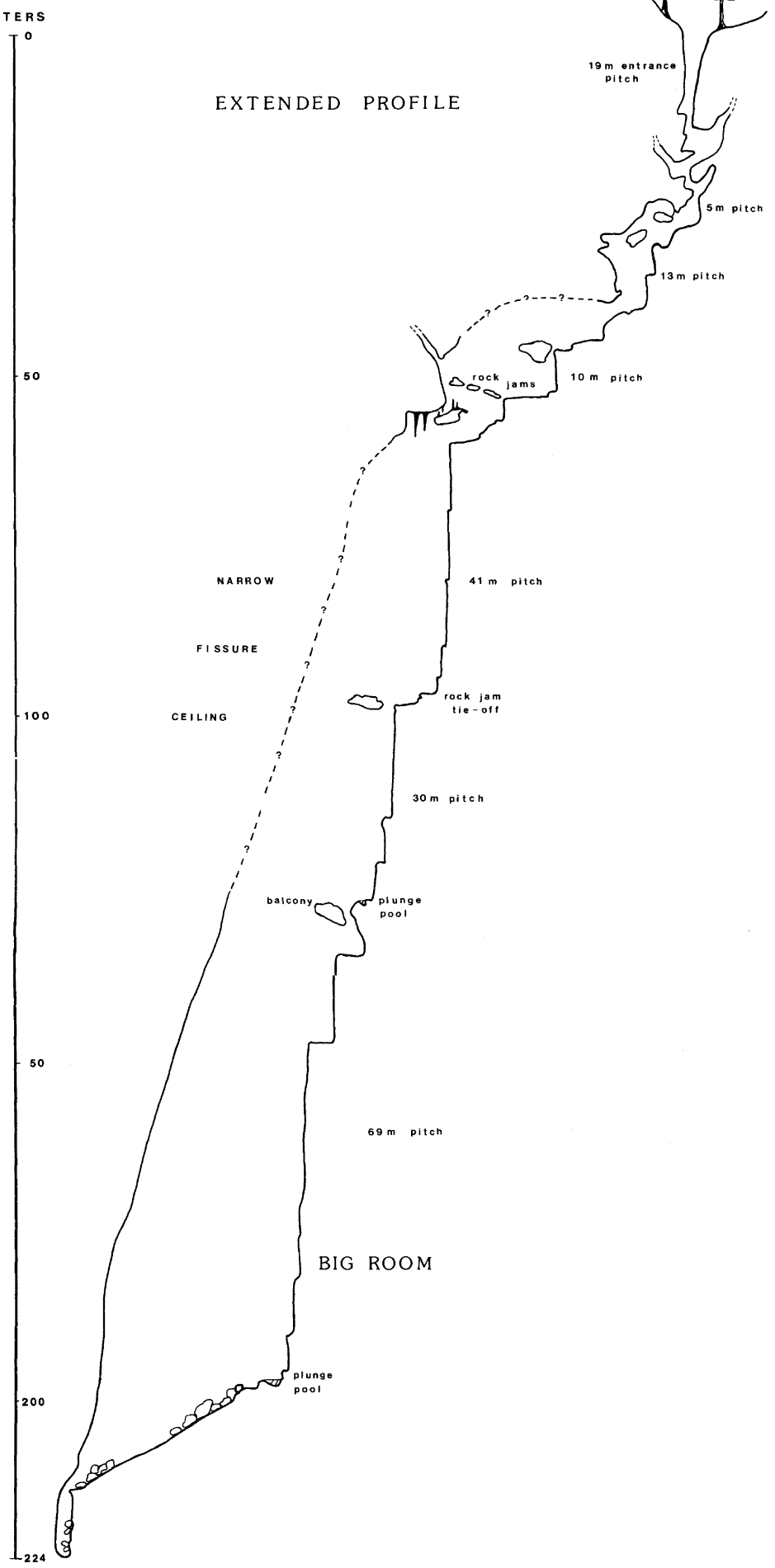

SOTANO DE JAVALIN

El Quirino, Quéretaro, México

BRUNTON AND TAPE SURVEY by

R. Day	T. Johnson
J. Fike	E. Means
J. Jacobs	B. Stone

Nov. 1975

Drafted by Bill Stone

Data Reduction by Ellipse

April 1976

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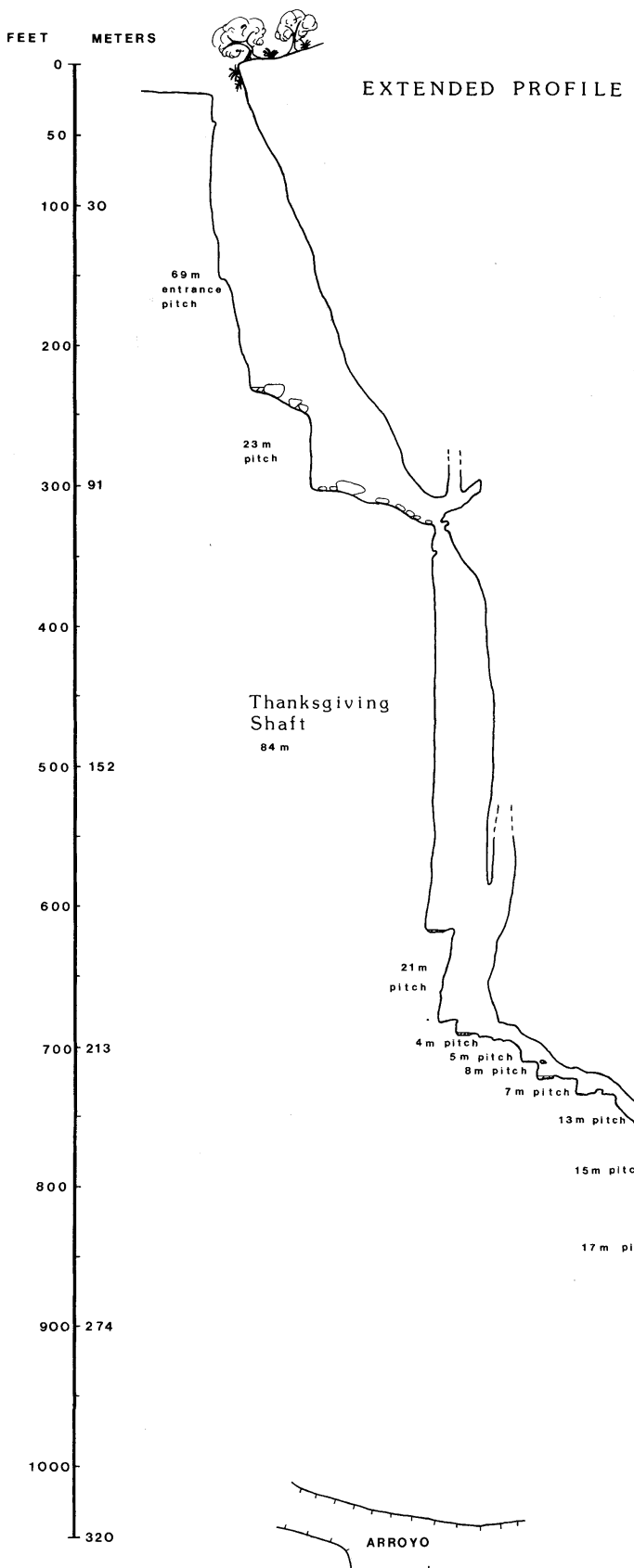

SOTANO DE NOGAL

RANCHO SAN JOSE, QUERÉTARO, MÉXICO

SUUNTOS AND TAPE SURVEY BY

R. JAMESON G. STILES
T. JOHNSON B. STONE
L. O'LOANE S. WARD

MARCH - MAY 1976

DRAFTED BY BILL STONE JUNE 1976
DATA REDUCTION BY ELLIPSE

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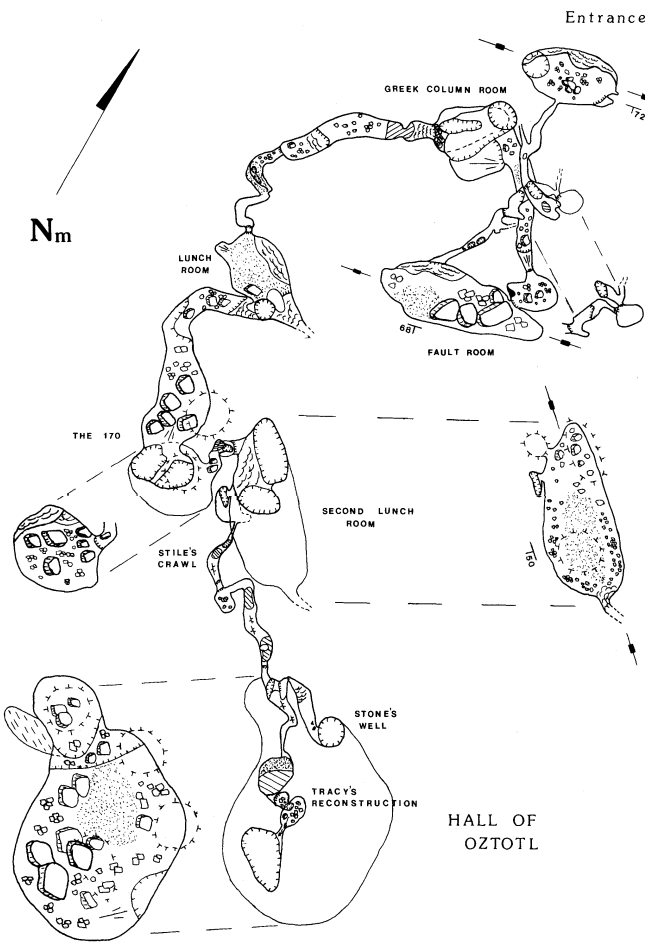
meters



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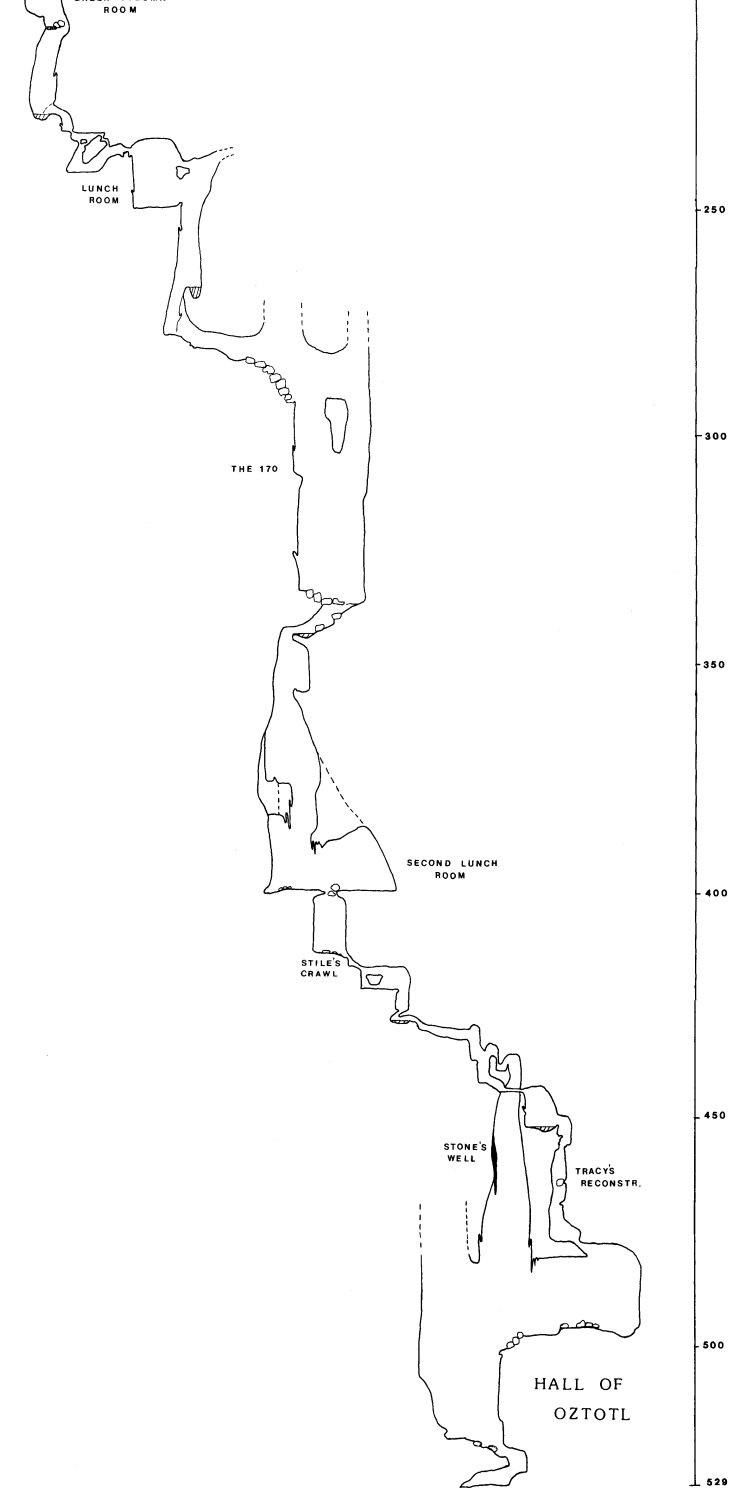


SAN JUAN AREA

QUERETARO, MEXICO

AMCS

MAJOR CAVE SCALE EXAGGERATION 3X

0 1/2 1 KILOMETERS

N_m

HOYA DE LAS CONCHAS

EL SOTANITO DE CANOAS

SOTANO DE JAVALIN

EL SOTANITO

SOTANO DE NOGAL

SAN JOSE

SAN JUAN

EL QUIRINO

LAGUNA DE LA CRUZ

GEOLOGY MAPPED BY ROY JAMESON, 1977

SEDIMENTARY ROCKS

CRETACEOUS

SOYATAL FORMATION — Ks

EL ABRA LIMESTONE — Ka

CONTACT

PLUNGING ANTICLINE

PLUNGING SYNCLINE

OVERTURNED PLUNGING SYNCLINE

EDGE SAN JUAN THRUST

STRIKE AND DIP — 20

EXPLANATION

HILL

MAJOR PIT

INTERMITTENT STREAM

LAKE

SINK

PIT, CAVE (SEE TEXT) — 8

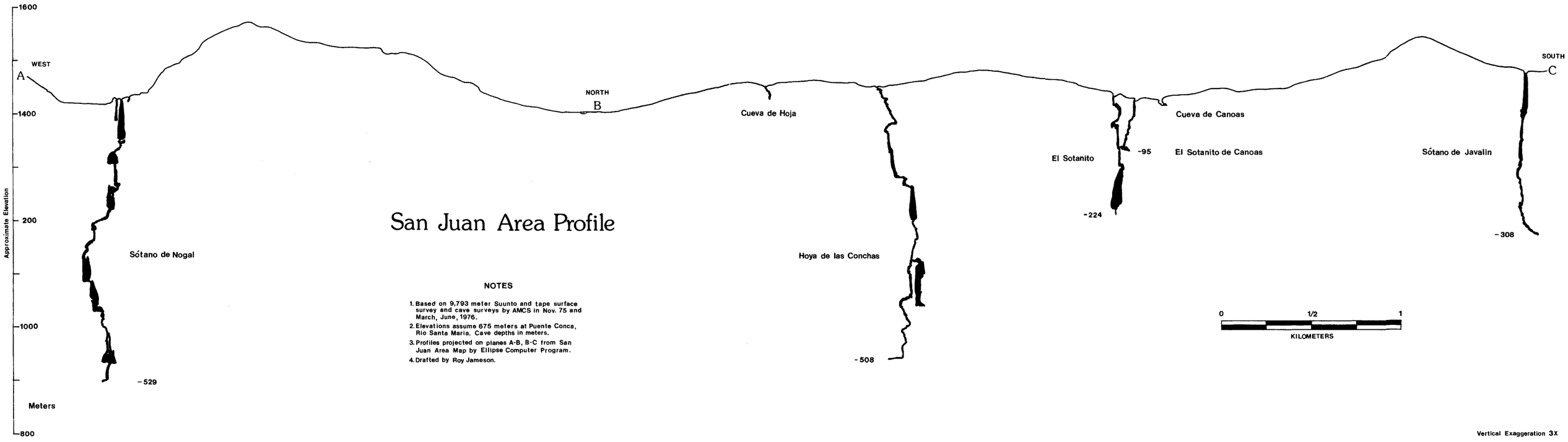
SURFACE FISSURE

TRAIL

DIRT ROAD

HOUSES

San Juan Area Profile



NOTES

1. Based on 9,793 meter Suunto and tape surface survey and cave surveys by AMCS in Nov. 75 and March, June, 1976.
2. Elevations assume 675 meters at Puente Conca, Rio Santa Maria. Cave depths in meters.
3. Profiles projected on planes A-B, B-C from San Juan Area Map by Ellipse Computer Program.
4. Drafted by Roy Jameson.