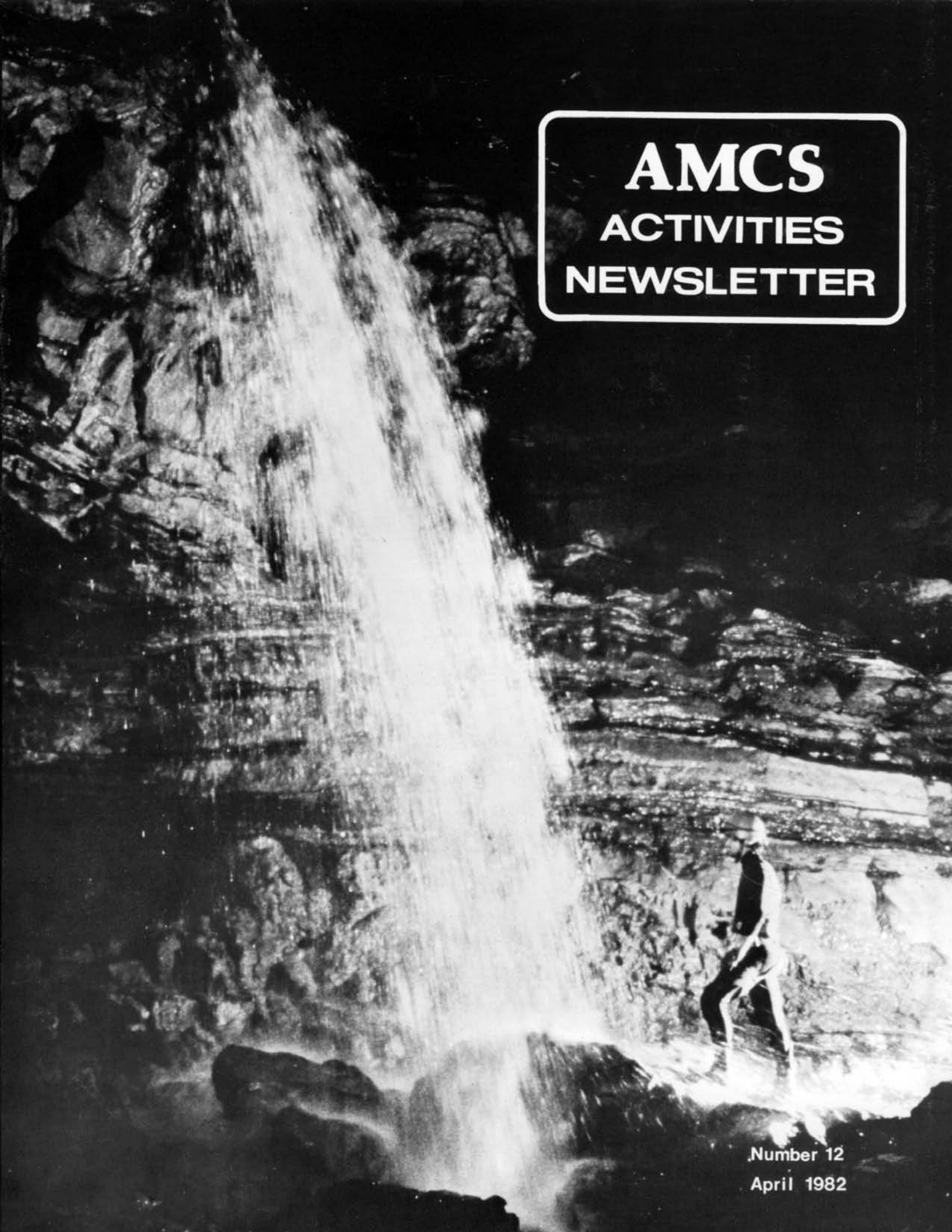
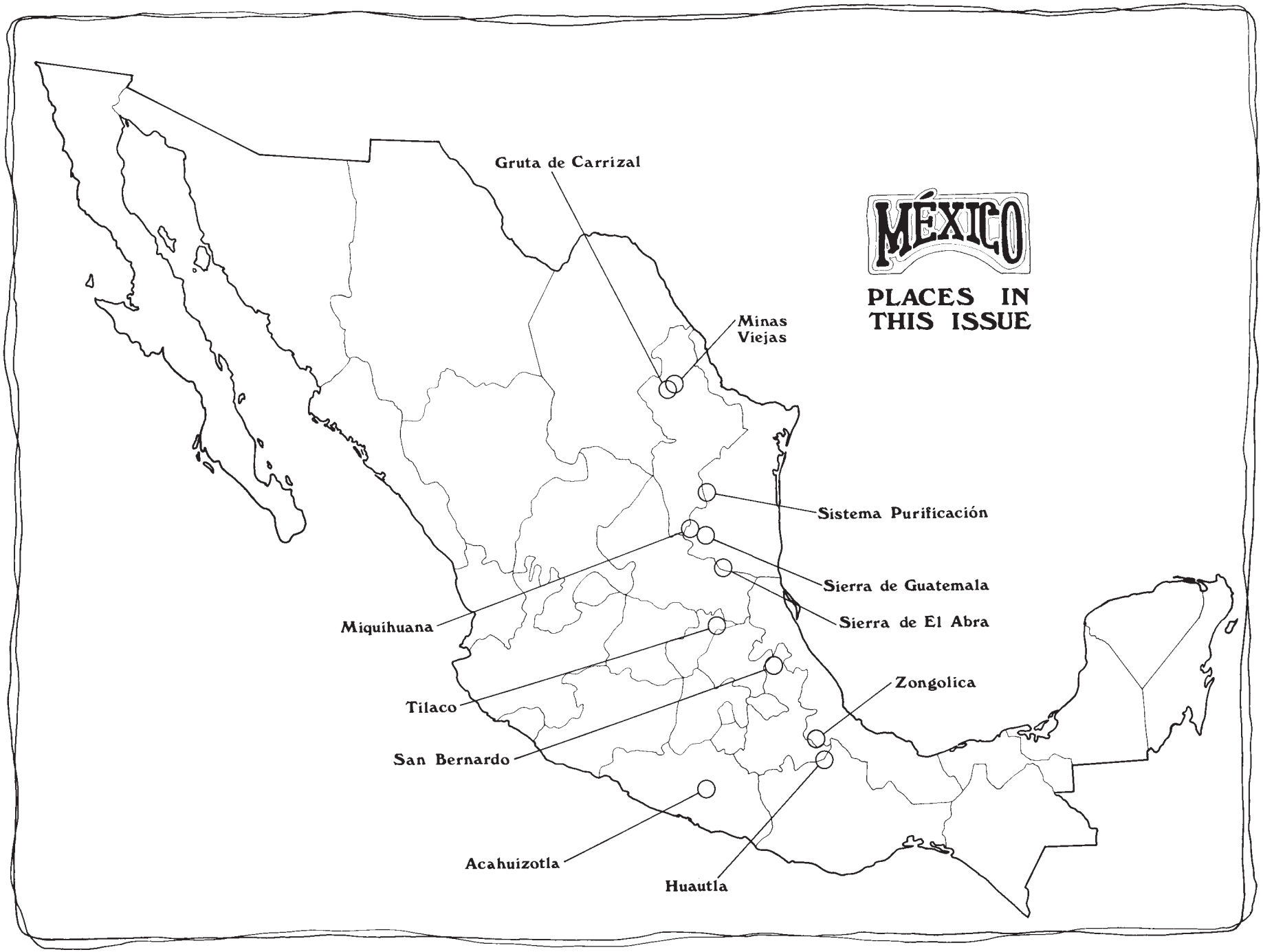


AMCS ACTIVITIES NEWSLETTER

Number 12
April 1982



Cover Photo: Red Ball Canyon, Sotano de San Agustín (Ron Simmons)

AMCS Activities Newsletter

Number 12 April 1982

Publisher
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Translations
Teeni Kern, Steve Robertson, Peter Sprouse

Contents

EDITORIAL

Although it has been over a year since the last AMCS Activities Newsletter was published, the Activities Newsletter is still very much alive. Its publication is entirely a voluntary effort by cavers, and as such it tends to be published irregularly. When the monumental effort of completing one is finished, it takes time before enough enthusiasm is generated to begin the next, and once it is begun there are no real deadlines to meet. The AMCS comprises you, the reader, and all the México cavers who contribute their experiences in writing for your enjoyment. If you have a worthwhile story to tell about your Mexican caving experiences, you are encouraged to send it to us for publication. Even small items which can be included in the México News section will be graciously accepted.

This brings us to another point. You may notice a few changes in this issue which correspond to a change in editorship. It seems that it only takes two issues to wear an enthusiastic editor down to an enthusiastic supporter. In this issue, the México News section has been expanded and the International News has been dropped. *Caving International* can do a better job of international coverage in a more timely manner (they even scooped us on the Tilaco report, recounted herein by Carlos Lazcano). We have also included a map of México (at left) to show you where some of these places that are described in this issue are located.

One of the more interesting articles in this issue is the one by Phillippe Ackerman and Genevieve Rouillon which describes their 1980–1981 expedition to México. We think that you will find it entertaining as it gives an insight into the attitudes of the French cavers. Another highlight is Sheri Engler's story of the exploration of the Boca del Río Apetlanca in Guerrero. Many other interesting and enjoyable articles round out the issue. So, for the last word we can only say—enjoy.

Duwain Whitis

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MÉXICO NEWS

Baja California

California cavers have surveyed Cueva de Agua Caliente in Baja. Carol Vesely reports that the cave had been billed as the "Carlsbad of Mexico,: but actually contained few formations to justify the comparison. The cave is composed of a series of crawls and breakdown rooms. A dig in another cave in the area, Chiquita Bonita, led to 70 meters of well decorated passage.

Source: The Explorer, January 1982

Colima

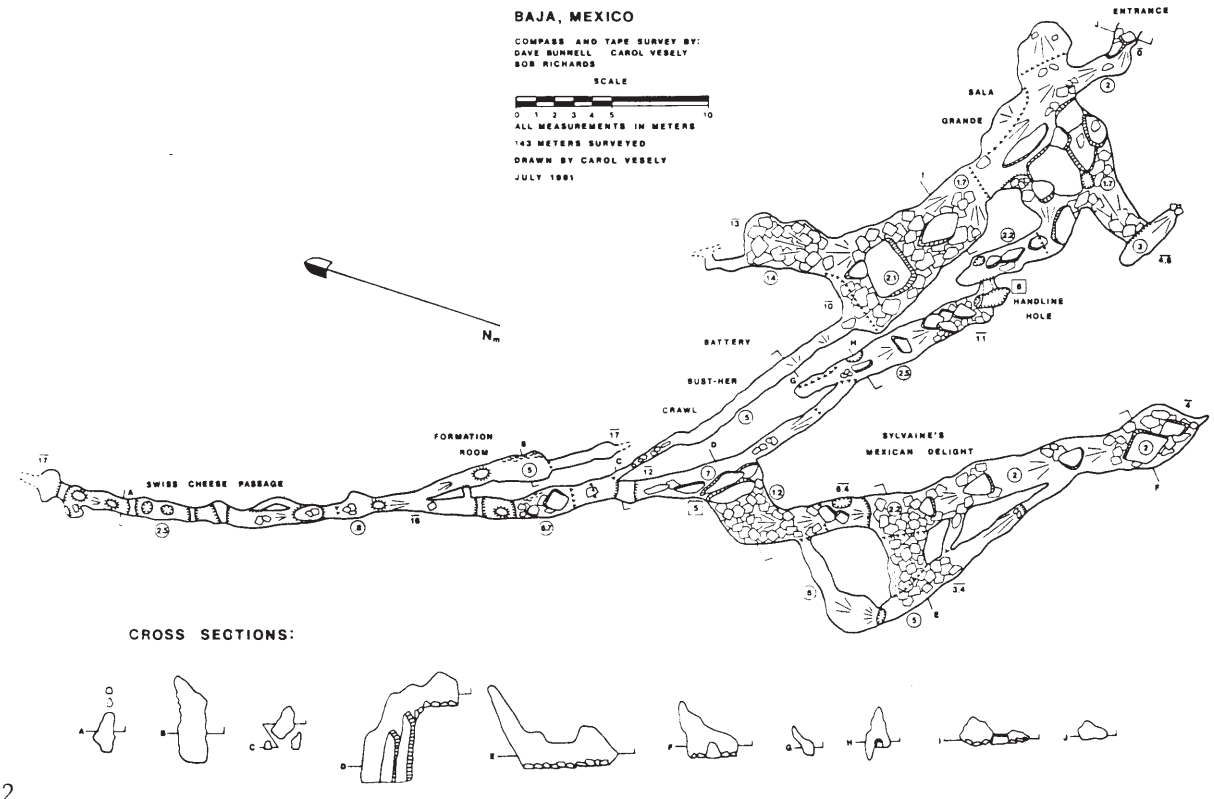
SMES cavers made a preliminary reconnaissance in the Cerro Grande area in September and October of 1981. No major finds were made, but a return trip is planned for February 1982.

Source: Carlos Lazcano S.

Distrito Federal

Training of the National Rescue Organization of the Policia y Transito is being carried out under the instruction of Alejandro Villagomez. An eleven month course on caving techniques has just been completed, and

CUEVA DE AGUA CALIENTE



a second phase of training in cave rescue and organization is planned for 1982.

Source: Alejandro Villagomez

Guerrero

Jose Montiél and other cavers of the Asociación Mexicana de Espeleología have been exploring and mapping caves in the Tlamacazapa area, ten kilometers east of Taxco. Details will be published in their upcoming bulletin.

Source: Steve Robertson

Mexican cavers have surveyed a pit in Guerrero, Sótano Ibarra, which they say could connect with the famed Sótano del Diablo.

Source: Alejandro Villagomez

Hidalgo

A French expedition in early 1980 did considerable checking along Highway 85 between Jacala and La Mision. The group was composed of members of the Spéléo-Club des Causses and the Groupe Spéléologique du Languedoc. They explored a total of 36 caves, the deepest of which was a 106 meter drop, located southwest of Cuesta Colorado.

Source: Expedition Spéléologique au Mexique"

The village of Pinalito, Hidalgo, lies near kilometer post 105 on Highway 10

The village of Pinalito, Hidalgo, lies near kilometer post 105 on Highway 85 north of Jalaca. A small arroyo runs into the pit entrance of Sótano Hondo de Pinalito. (map- p.4). This 45 meter drop leads to a low passage opening into a large room with several climbdowns to a 20 meter drop. Four more short climbs and drops lead to a horizontal section that splits into two passages. The right one leads to an intermittent sump, and the left is a short passage to a 30 meter pit.

A 5 meter long crawl at the bottom leads to a handline drop, followed by a 6 meter shaft. A horizontal canyon beyond narrows to a squeeze where airflow is evident. Below the squeeze is a 25 meter pitch to a low water crawl.

Sótano Hondo de Pinalito was first located by Steven Bittinger, Donna Atkins, and Bill Mayne in December 1974. They explored down to the water crawl at an estimated depth of 175 meters. They made a sketch map and report that appeared in the AMCS Activities Letter No. 3. The cave was visited again in December 1975 by Dino Lowrey, Carmen Soileau, Peter Strickland, and Steve Zeman. They apparently did not succeed in pushing father than the previous group.

The cave was partially surveyed in February 1981 by Jerry Atkinson and Steve Boehm. They found the sump in the right-hand passage to be open, but did not push it. They suspected that this could be the main route of the cave. Some airflow was noticed going across the sump, as well as down the 30 meter pit.

Source: Peter S. Sprouse

Oaxaca

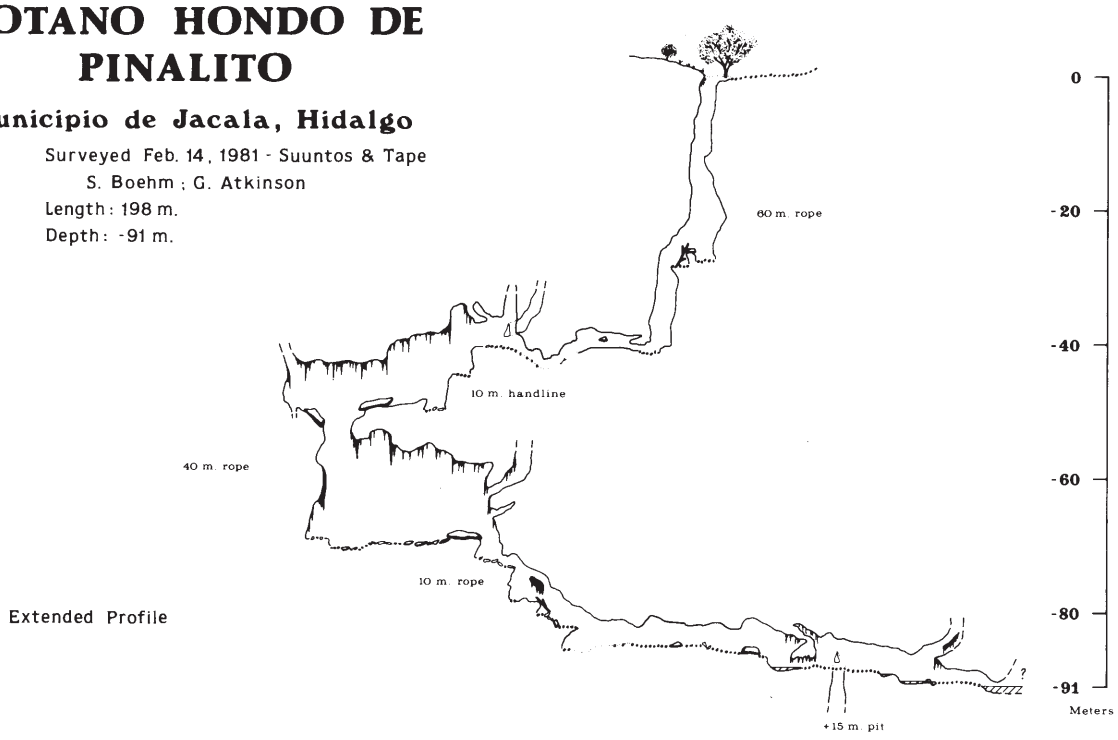
Maciej Kuczyński gives an account of the rescue of the Polish cavers in Huautla in a recent issue of the UIS Bulletin. His conclusion was that "the whole incident provided the opportunity for and manifested a strengthening of international and speleological solidarity." There's an optimistic side to every situation.

Source: UIS Bulletin, May 1981

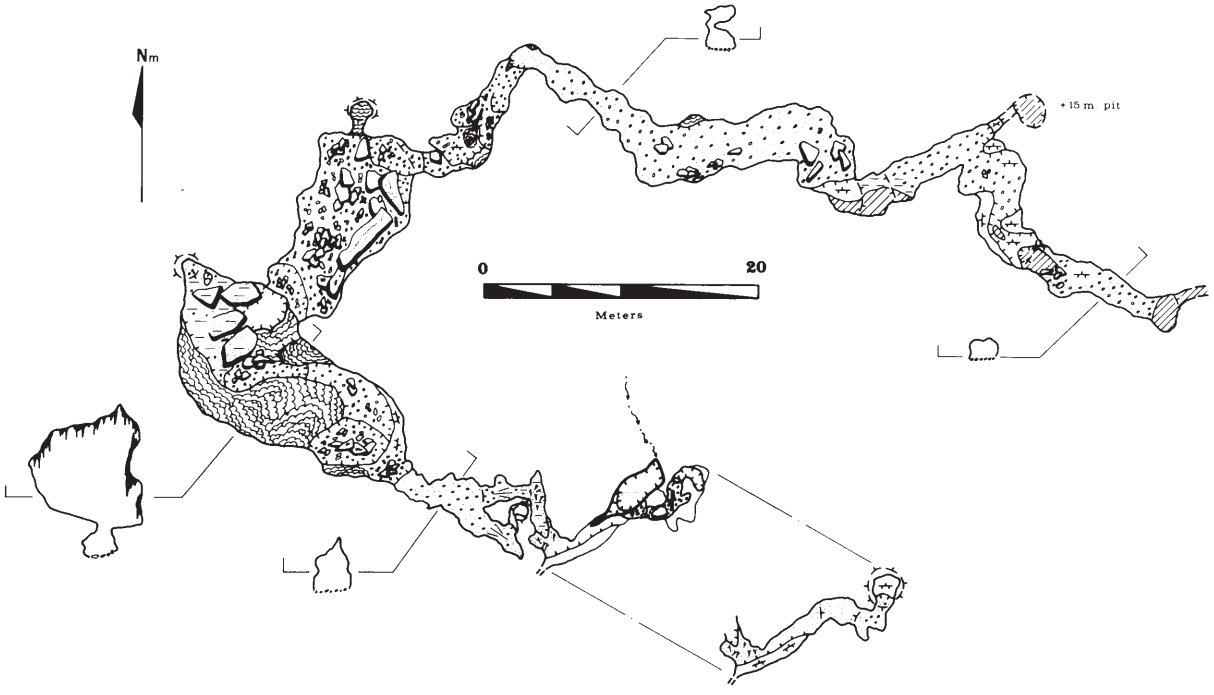
SOTANO HONDO DE PINALITO

Municipio de Jacala, Hidalgo

Surveyed Feb. 14, 1981 - Suuntos & Tape
S. Boehm ; G. Atkinson
Length : 198 m.
Depth : -91 m.



Extended Profile



G. Atkinson - 1981

The recent discoveries in Naj Tunich, Guatemala, prompted Nancy Boice to compile a report on Cueva de la Culebra, a burial cave near Acatlán. Discovered in January 1976 by Jim Rodemaker, the cave was explored and mapped by a group of mostly Austin cavers. One kilometer back from the entrance, they discovered a burial chamber, where a human skeleton was laid out surrounded by pots and figurines. They sketched the chamber and drew pictures of the figurines, but were careful to leave everything undisturbed.

Source: Birmingham Grotto Newsletter, October 1981

Puebla

Alejandro Villagomez reports that he and Francisco Dardon have dived a sump in Sima de la Cruz Verde. The sump turned out to be only a pocket, however. Several caves have been checked that were hoped would connect to Sistema Cuetzalan. Sima Hombre is near the Cuixhal section of Chichicasapar (Steve Robertson reports that there is a breakdown room off the bottom, not shown on the map, that has three narrow fissures leading off). Sima de la Secadora and Sima Informe were thought to be possible connections to the Aragonite Passage in Chichicasapan. Cueva Chivostoc was also investigated in hopes it would connect to Sistema Cuetzalan. North of Cuetzalan, near the Yohualichan ruins, Sima Tortuga was mapped by Villagomez and members of the Centro de Estudios y Exploraciones Subterraneas, A.C. Adolfo Montoya is president of this group, which is based in Cuetzalan.

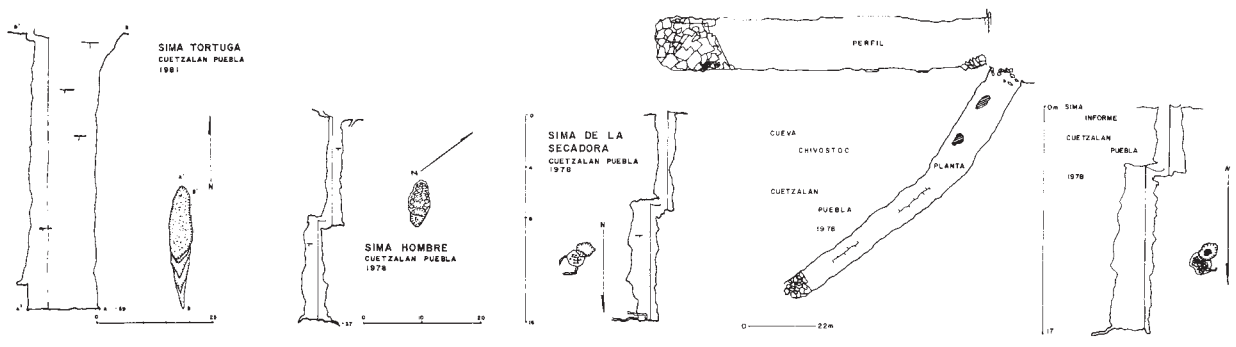
Source: Alejandro Villagomez

In December 1981, a group of six American cavers explored a new cave near Nauzontla, in the Cuetzalan area. Called Cueva de Atecarla, it was surveyed to a length of 2005 meters. Also surveyed was Cueva del Paso de la Borita, a 168 meter deep cave near Cuatapehuatl.

Source: Doug Wilson

Queretaro

The Sociedad Mexicana de Exploraciones Subterráneas (SMES) has published its first bulletin, entitled "Exploraciones en el Area de Las Florida, Querétaro." Fifty-nine caves were explored in this area, including some in adjoining parts of the state of Guanajuato. This work was carried out by the SMES in the spring and fall of 1980. The deepest cave discovered in the area was Sótano del Burro, with a total depth of 292 meters. Burro descends in a series of eight drops to a sloping passage several hundred meters long that ends in breakdown. Two kilometers southeast of La Florida they discovered Sótano Hondo, which has a free entrance drop of 115 meters. Eleven pitches were



descended to a lake at -287 meters, which was not pushed. A third cave over two hundred meters deep was also explored, Sótano de La Codicia (-269 meters). This cave contains eight drops and ends in a mud and breakdown fill. Inquiries about the SMES Bulletin 1 should be sent to them at: Anaxagoras 586-1, Colonia Narvarte, México, D.F. 03100, México.

Source: SMES Bulletin 1

The 1980 French expedition from Languedoc did some brief exploration around Llano de San Francisco, north of Pinal de Amoles. They explored three caves, Hoya Verde (-23 meters), Cueva de la Puerta (-15 meters), and Sótano de la Casita.

Source: "Expedition Spéléologique au Mexique"

A reconnaissance by SMES cavers in October 1981 revealed a new area of numerous pits near Sótano de Tilaco. Returning with a larger group in November, they explored three caves. The deepest was Sótano de la Virgen, approximately 300 meters deep (unsurveyed). This cave had nine drops, two of which were 80 meter freefalls. Exploration stopped at a sump. Sótano de la Troje was explored down three drops to a depth of 110 meters. High concentrations of carbon dioxide were encountered. Also explored was Sótano del Navio, 30 meters deep with a 20 meter drop.

The Grupo Expedicionario Xaman-Ek has been exploring further in Sótano de Tilaco. They have pushed a side lead at -170 meters for another 100 meters vertically, and the lead continues. The SMES cavers plan to push the incoming sump at -409 meters by trying to drain it.

Source: Carlos Lazcano S.

Quintana Roo

Rich Breisch reports the existence of a bat cave among the Tulum ruins in Yucatan. He visited this small cave with Tom Strong on 2 May 1981. They suspect that the bats may be sheath-tailed bats, Saccopteryx leptura.

Source: Limestone Ledger, June 1981

San Louis Potosi

Roy Jameson and Patty Mothes did some extensive reconnaissance in the Papagayos karst in early 1981. Near Diez Gutierrez, they checked five dolinas along the east side of the valley, but all were plugged. Some similar dolinas were also checked near Papagayos. Many small pits and cracks were seen in the Sierra el Bernalito and Laguna de Patos areas, but nothing major was found. They checked some sinks on the Sierra el Pino, and noted some resurgences on the eastern flank near El Platanito. Lower down to the east, at El Rincon de Alamos, several mud choked swallets and one small cave were located.

Source: Patty Mothes

The sump at the bottom of Hoya de las Guaguas continues to reveal spectacular cave fauna. Andy Grubbs and other cavers from the Southwest Texas Grotto visited the cave in November 1981 to try to capture another specimen of the Guaguas blind crayfish, Procambrarus xilitlae, of which only three had been collected. They succeeded in capturing one specimen and transported it live to Texas for study. They were also surprised to find two blind shrimp, possibly the most highly cave adapted shrimp in the Americas. These may be of the same genus, Troglocubenism, as one specimen taken in Sótano de la Tinaja, north of Ciudad Valles.

Source: Andy Grubbs

AMCS members have been continuing field work for the upcoming AMCS bulletin on the Xilitla area. During a trip in late August and early September 1981, several new caves were surveyed, as well as old caves that needed work. Cueva de Potrerillos, a 300 meter long cave west of Ahuacatlán, had been explored in the '60s but never mapped until this trip. A 59 meter pit was discovered a few hundred meters southeast of El Lobo along the side road to Agua Zarca. This opened into a big room containing a large pile of trash from the town. Sótano de El Ranchito, a large pit northwest of Tlamaya discovered by David Honea and Peter Sprouse in 1980 (A.N. No. 11), was explored and mapped. A 44 meter entrance drop opened into a very large, well decorated chamber 120 meters across.

Don Broussard continued to spearhead exploration in the Crevice of Sótano de las Golondrinas. Further exploration revealed that the Nasty Crack drop does indeed rejoin the Grieta drop. More checking was cut short by the continuous heavy rains on the surface, which fed up to ten waterfalls falling into the pit.

Source: Peter S. Sprouse

Sótano de Trinidad, on the Xilitla Plateau, has been pushed by Canadian and British cavers to -827 meters. The cave was discovered by McMaster University cavers in late 1977 and pushed to a terminus at -559 meters in early 1978 (see A.N. No. 8).

A return trip was made at Christmas 1980 to check some remaining side leads. A wet lead at -150 meters ended in a sump at -225 meters after four pitches were encountered. At -450 meters, there was a passage leading to a pitch taking a good breeze. This turned out to be 108 meters deep. Steve Worthington and Nigel Anderton descended this and three more drops, before running out of rope at -622 meters.

A few weeks later Worthington returned in advance of the arrival of the other McMaster cavers. He continued solo down several more pitches to a mud-floored terminal room at -796 meters. After the others had arrived and seen Worthington's finds, Tom Miller and Chas Yonge, while de-rigging, located a narrow canyon at -720 meters taking the draught. This proceeded through crawls, digs, and pitches to a narrow slot, the deepest point in the cave at -827 meters.

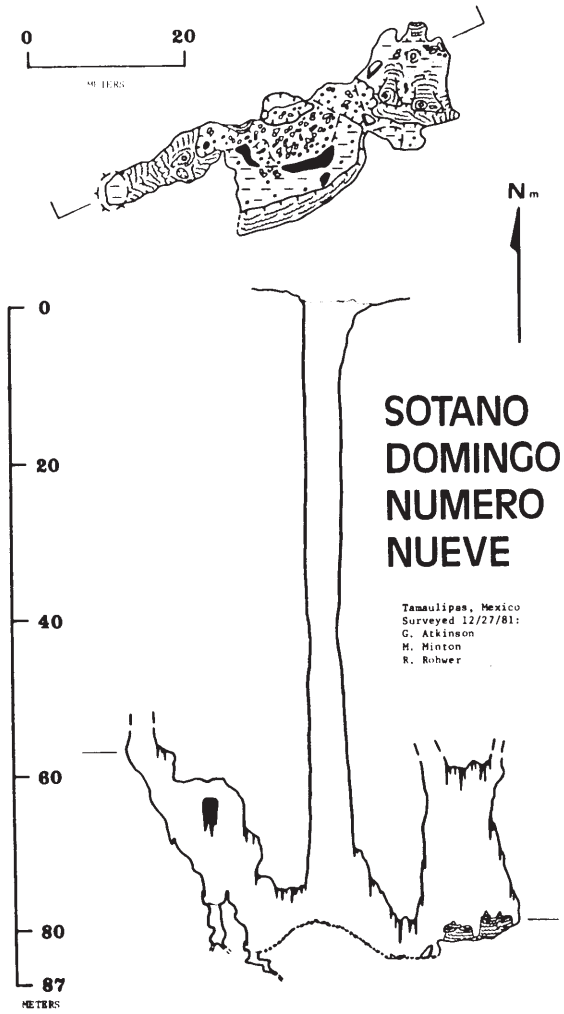
Source: Caves and Caving No. 13

Tamaulipas

In early 1981, Patricia Mothes and Roy Jameson began mapping two caves at Ojo de Agua, at the base of the Sierra Chiquita below Gomez Farias. After surveying about 500 meters in each cave, it became apparent that the caves were quite close to connecting. On a return trip in December 1981, Mark Minton led two climbs that established a connection. Also found were 160 meters of new passage and a deep blue pool believed to be near the present base level. Cueva do Ojo de Agua, as it is now called, is a paleo resurgence cave formed primarily in the phreatic zone.

Source: Roy Jameson

AMCS cavers began a new trail chop in the Sierra de El Abra in November 1981. The goal was to reach a "super sink" shown on the provisional topo map (F14B71) about six kilometers northwest of the Mina Otates. Due to thick undergrowth and rough karst, the group only progressed four kilometers, at which point a wide vertical-walled sink was discovered. Many pits were encountered on the first two kilometers of the trail. The deepest was Sótano Domingo Numero Nueve, which went 78 meters deep to a couple of well decorated rooms. The rest of the pits were 5 to 60



meters deep and all blind.

A return trip in December completed the chop to the big sink. Although impressive in size, the dolina had a broad, flat bottom with no cave entrances. Another half dozen pits were found on the chop there, but were not descended. One near the upper rim of the sink sounded at least 100 meters deep and would be worth checking. An interesting small cave, called Cueva Linda, near the intermediate sink was mapped. It consisted basically of one large collapsed room filled with flowstone and breakdown. Many other interesting features are shown nearby on the topo map, and the trail now established should be useful for reaching these.

Source: Mark Minton

Sótano de Vasquez, in the Sierra Tamalave east of Ocampo, was first surveyed by AMCS cavers in the early 1970s. That survey had never been compiled, so in early 1981, Patricia Mothes and Roy Jameson did a complete resurvey of the cave. Assisted by some South Texas cavers, they took eleven survey trips into the cave. Below the 90 meter entrance drop are five horizontal levels connected by short pits. The final pit leads to a sump containing blind fish. Low water levels enabled the sump passage to be pushed 100 meters farther than was previously possible. Preliminary calculation of the new survey shows the cave to be about 2 kilometers long and 277 meters deep.

Source: Patricia Mothes

Over Thanksgiving of 1980, a group of seven cavers returned to the Mina Otates area of the Sierra de El Abra. Their goal was to locate and explore two "black holes" which had been spotted several years earlier by aerial reconnaisance. A base camp was established in the star-shaped sink near Sótano de la Cuesta, about 5 kilometers south of the Mina Otates road. From there, parties began combing the jungle to the east. Their efforts were cut short when Geoff Robertson left camp one evening to photograph macaws at Sótano de la Estrella and never returned to camp. The rest of the group spent the next two and one half days searching for him before their supplies ran out, forcing their return to Texas. They had hoped that he had rescued himself by finding his way to the main highway.

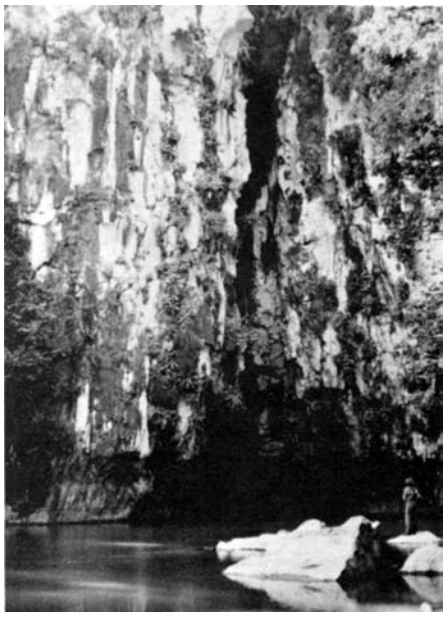
Two days after the group arrived in Austin, sixteen cavers headed for Mexico to continue the search. Soon after they arrived, however, a Mexican Red Cross worker arrived with the news that Geoff had stumbled out of the jungle that morning at the Village of Buena Vista, 10 kilometers to the south. He had spent five and

one half days in the jungle without any supplies except a compass and machete, surviving only on water he collected from bromeliads and other sources.

Source: Mark Minton

In November 1981, the Proyecto Espeleológico Purificación held a week-long mapping project at Sótano de Las Calenturas. Surveying continued in the complex Turas Tubes (similar to Infiernillo's Confusion Tubes), where many new loops were added to the northern section. High in the south part of the cave, a new section of spongework was discovered called the Hong Kong Tube Maze. A tricky dig through the Sand Sump was safely engineered by Pete Strickland and others with the use of a bucket, a shovel, and plywood shoring. Beyond, 350 meters of passage were mapped in Sandialand. A base-level passage off the Thanksgiving Thruway call Scotchbutter Blue was also surveyed. New survey totalled 800 meters, bringing the cave length to 5877 meters.

Source: Peter S. Sprouse



El Boquerón resurges at the head of the Rio Tonto. (Steve Robertson)

Veracruz

A trip to the Zongolica and Atoyac areas by Mexico City cavers resulted in the survey of the Gruta de Atoyac. The cave is 661 meters long and was completely mapped.

Source: Carlos Lazcano S.

In late December 1981, a group of Austin cavers visited the Zongolica area to map and collect in Cañada de Oztoc, a small cave near the large river cave El Boquerón. Several specimens of catfish with reduced eyes were obtained, ranging from five to fifteen centimeters in length. The source at Huitzla of the Rio Tonto, the resurgence of El Boquerón, was also visited. The water emerges from a tall, narrow (50 by 5 meter) crevice in a large, calm pool.

Source: Steve Robertson

PACK IT IN....

PACK IT OUT!

Huautla '81

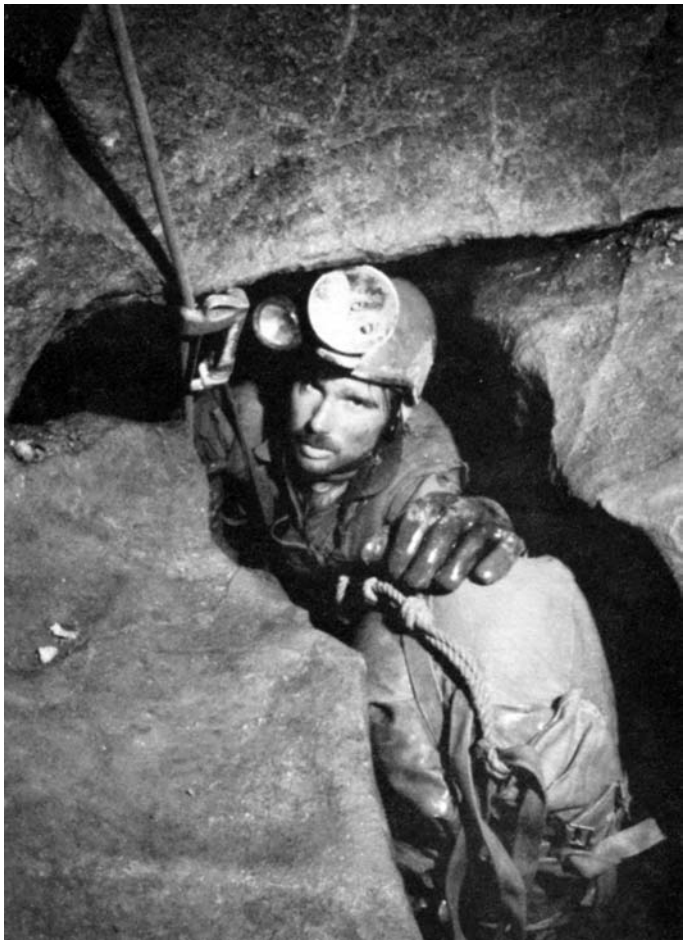
Mark Minton

The massive preparations for the 1981 Agua de Cerro Expedition of the Huautla Project finally culminated with the February 18 exodus from Austin of Dino Lowrey, Mark Minton, Tommy Shifflett, Ron Simmons, Bill Stone, Lisa Wilk, and Steve Zeman. They were met in the field by Neil Hickson, Chris Kerr, Alan Warild, and Tony White and were joined later by Bob Jefferys, Bill Steele, Janet Steele, and a host of shorter term visitors.

Initial efforts were directed toward connecting obscure Nita Nanta, the highest cave in the area, with the Li Nita-San Agustín system, which would yield a total depth of 1357 meters, the second deepest in the world. A camp was established at -400 meters near the previous end of exploration and from there the cave was pushed down tight canyons, crawls and many drops to an apparent end at -800 meters. However, by swinging onto a ledge part way down the last 100 meter shaft and blasting open a constriction, a way on was found. Several routes were explored, including a couple involving climbs, but all finally pinched off. The deepest ended at -927 meters, making Nita Nanta the Western Hemisphere's second deepest cave and one of the most difficult.

The grim task of breaking camp and derigging over forty pitches required several trips, during some of which higher level leads were also examined. To our surprise one of these developed into a parallel canyon and shaft system which was followed to a depth of 750 meters before time ran out. Although two expected connections of upper entrances to Nanta were realized easily (thanks to Nipak), the hoped for integration with the main system was not attained.

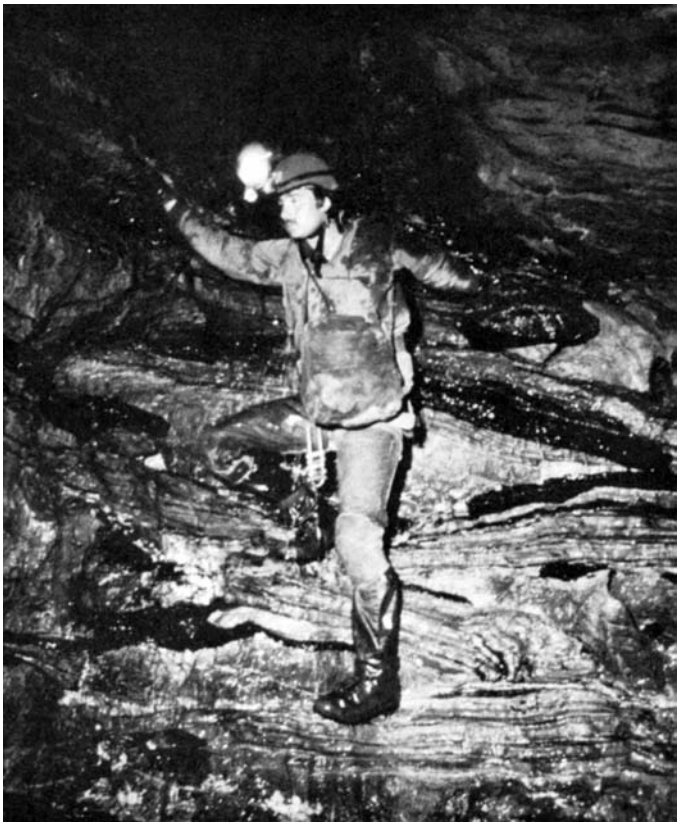
In March, a group of about ten Belgian cavers from the Groupe Speleo Alpin Belge (GSAB) arrived for a quick tour of Li Nita and San Agustín. We had left Li Nita rigged in 1980 and were now in need of the rope for other pushes. The Belgians rigged San Agustín and then a large international party entered Li Nita. Three members of the group (Etienne



Tommy Shifflett negotiating a typical slot-drop with camp gear, -200 meters in Nita Nanta. (Bill Stone)

Degrave, Shifflett, and Stone) took scuba gear for the sump dive into San Agustín. After they disappeared into the water at -1030 meters the rest of the group derigged at least as far as Camp I (-620 meters) on a fairly grueling trip. The first through trip was completed the following day (40 hours underground) and was described by Degrave as one of the finest anywhere.

With the additional rope available from the derig, exploration was continued in the White Room lead (-100 meters) of Li Nita. This independent stream passage was followed down generally tight canyons to a sump at -906 meters. A camp was established in a larger gallery at -600 meters and after derigging up to that level a dry shaft series was explored in search of a connection with Nita Nanta. A tortuous canyon with good airflow disappointingly connected back into the stream route at the sump, ending our hopes for a new 1000 meter deep passage or a connection.



Tommy Shifflett descending a steep slope above the Rifle Slot in Nita Nanta. Note the heavily deformed bedding. (Ron Simmons)

The second major goal of the expedition was a deep penetration dive of the -861 meter sump in San Agustín, the deepest point in the system. It was hoped that either an air-filled passage would be found within a workable distance or a deep dive (down to 70 meters) would be done to significantly increase the depth of the system. Working out of Camp III (-710 meters) with a revolutionary lightweight scuba system (please see separate article in this newsletter) Bill Stone soloed the sump on two dives, each time running out of line. Rather than either of the scenarios envisioned above, the sump went down only 15 meters before going horizontal as an underwater borehole. The passage was surveyed for 285 meters and showed a maximum depth of only 28 meters, which puts the system at -1250 meters, the fourth deepest in the world.

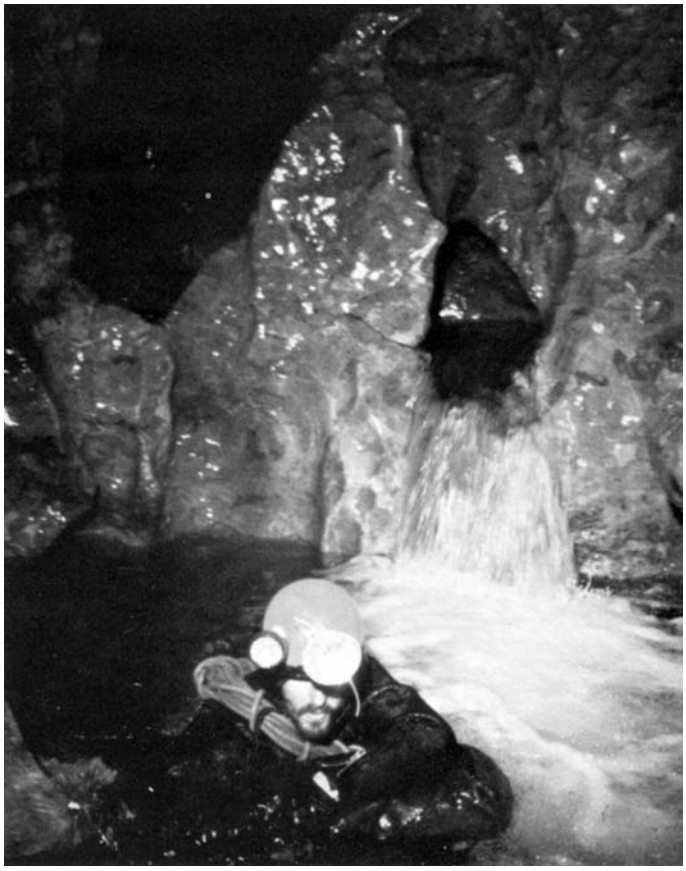
The final push of the season was a year old lead in San Miguel known as Seis Segundos. The entrance pit is the deepest shaft in the area at 150 meters and held hope as an access point to the lower parts of the system. After going nearly straight down for 324 meters however, it came to an abrupt end. Further down the mountain a large resurgence cave was found which may be the long sought resurgence for the Huautla cave system. It lies seven kilometers south of the -861 meter sump in San Agustín and 150 meters lower.

In spite of the lack of connection with Nanta or a deep dive in San Agustín the 1981 project succeeded in finding an almost unprecedented amount of deep cave passage. Eleven kilometers were mapped, and for the second year in a row an astounding three kilometers of accumulated vertical depth were attained by descend-

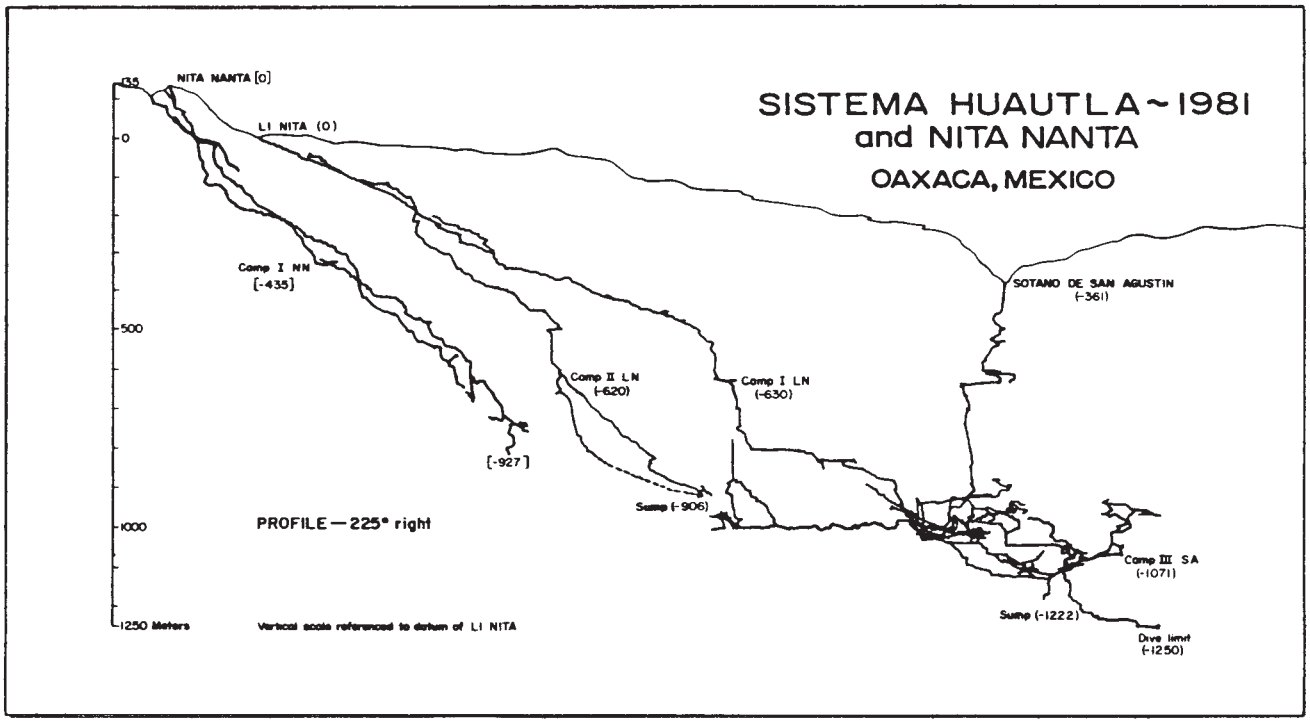
ing well over 100 shafts (an average of over one pit per day for nearly three months!) In spite of the years of effort, one can only get the feeling of just beginning to tap the true potential of the Huautla area.

Sistema Huautla

El Proyecto de la Expedición a Huautla se llevó a cabo en la primavera de 1981. Nita Nanta, la cueva mas elevada en la zona, se exploró hasta una profundidad de -927 metros. Un ramal inexplorado en Li Nita (Sistema Huautla) se exploró hasta -906 metros. Bill Stone entró al sifón de -861 metros en San Agustín, otro parte del Sistema Huautla, con equipo de buceo. Topografió 285 metros de galería subaquatica. Este pasaje añadió 28 metros a la profundidad del Sistema, dandolo la profundidad total de -1250 metros. Un sótano llamado Seis Segundos se topografió hasta su fin a -324. Un manatial grande se halló, el cual podría ser la salida de agua del Sistema Huautla.



Bob Jefferys with a camp duffel and rope at the head of the gorge, -660 meters in Sótano de San Agustin.
(Ron Simmons)



Sistema Purificación

Peter S. Sprouse

During the fall of 1980 and the spring of 1981, Proyecto Espeleologico Purificación teams made advances in all parts of Sistema Purificacion. During this time the length of the system increased from 36,795 to 45,472 meters. In the Infiernillo (lower) section, exploration continued in the three dimensional maze of the Confusion Tubes. Extensions were made beyond long canal swims in the Isopod River and Jersey Turnpike. In the upstream limits of the system, the Dragon River and Rhino Run passages were extended, as was the intriguing Valkyrie River. But by far the most mapping was accomplished from a week-long camp in the central portion of the system. Five kilometers of passage were surveyed in mazes around the Connection Passage and in a major new north-south trending passage at the -600 meter level.

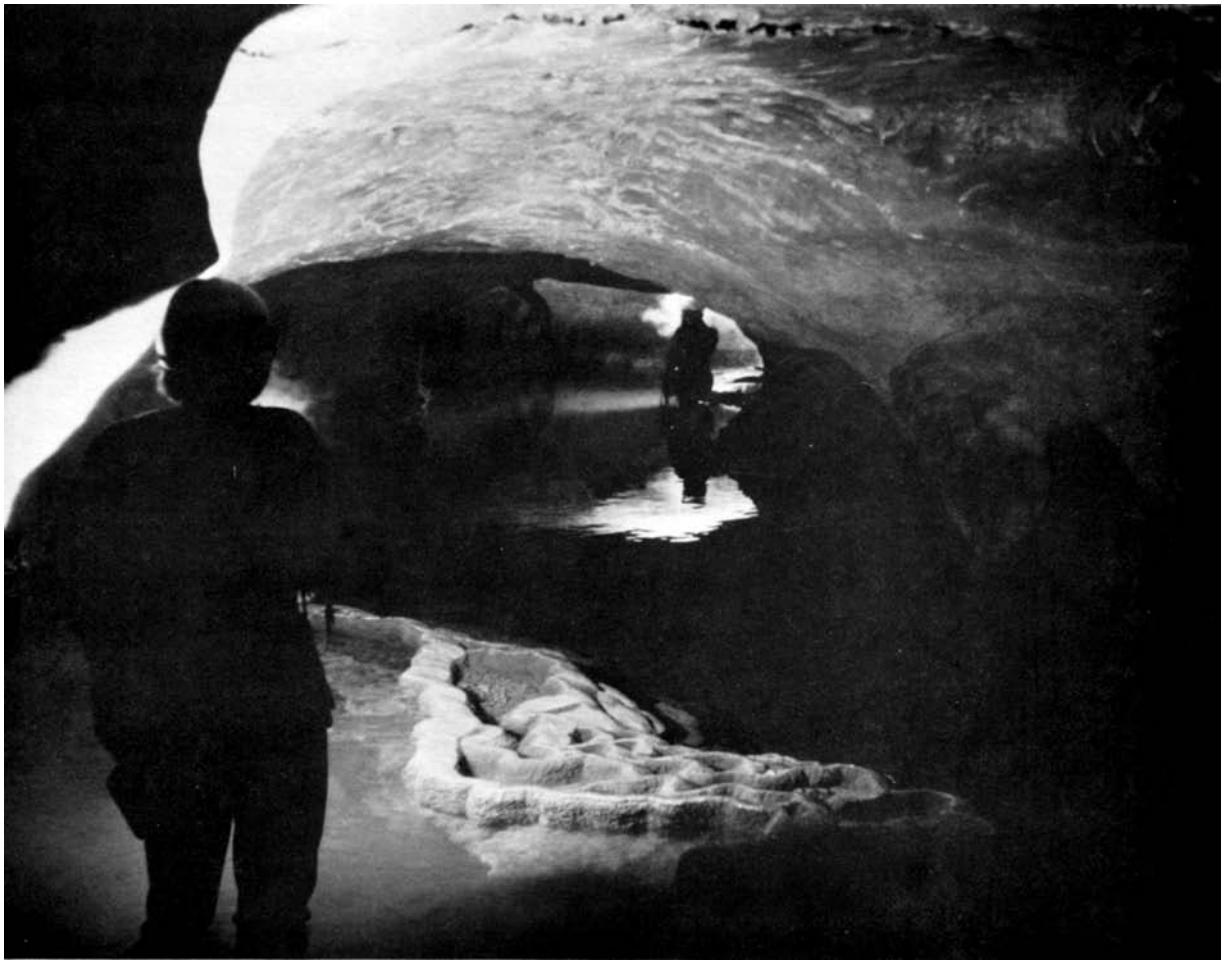
After the successful spring expedition of 1980 (see Activities Newsletter No.11), one of the more interesting leads was the Dragon River, which is a north-trending, upstream extension of the World Beyond, leading off of the area of the connection with Sumidero de Oyamel. So this area was a major objective for the thirteen or so cavers who participated in a week-long trip in late November 1980. The Dragon River was surveyed upstream to two different feeders, one of which ended in a pinch and the other at a twenty meter waterfall dome. A downstream side passage parallel to the Dragon River, the Rhino Run, was pushed 150 meters to another pinch. This was called The Hueys, a tight tube with eight centimeters of airspace. After this area was wrapped up, attention turned to the area around Lisa's Lampfall, the southern-most extreme of the system, at the downstream end of the World Beyond. A camp in this area was planned for the following spring, when the objectives would be to survey known passages and to try to extend the system to the south. A team was put into the cave to scout for a camp and do some probing into southward leads. The first one looked at was Ediger's Lead, which led not south but north, and pinched after 100 meters. A bit lower, at the bottom of Fool's Falls, a chalky tube was surveyed that dropped down into the Gypsum Extension, a dry side passage off of the proposed camp locale. This had a lead continuing south, which was surveyed for 400 meters and continued as a dry walkway. Southward development was possible, and the stage was set for a south camp in the spring.

In mid-March 1981, the Spring Project cavers arrived in the area. Warm-up trips were aimed at the Valhalla area. A 100 meter long loop, Piano Crawl, tied the Coke Straw Passage to the Pre-Attic Phreatic Room in upper Valhalla. Two teams descended into the lower part of Valhalla to map in the downstream end of the Valkyrie River. On the way, an inspection was made of the upstream sump in the Valkyrie. Randy Rumer probed it with a face mask and reported a wide sump one meter high and extending at least ten to twenty meters. Downstream, several small side passages were looked into, one of which gained its name from a reading of the survey tape: "Mud Point Mud Mud!" The main passage was surveyed for 300 meters, up into high

canyons where the river passage became too low to follow.

All eleven cavers present at the time then hiked into Infiernillo for the first major underground camp of the expedition. While duffle bags were being hauled up the tyrolean traverse line into the entrance, one of the bags came loose from the haul line and slid rapidly to the bottom of the traverse. The top blew off the duffle and a stove and some Suuntos were smashed. The remainder of the trip into Camp I was uneventful. (Camp II wasn't used in 1981). During the six days underground, exploration continued at the southwestern limits of the Confusion Tubes, in an area called the Misty Borehole. A down-trending lead was mapped for 260 meters to a spring and sump room that was named Gnome Springs. A dome lead was successfully scaled by Don Coons and led to a south-trending extension called Ithilien, which continued. Some resurvey and new survey was done in the old Confusion Tubes. This is one of the denser areas of the Tubes, known for junctions where six passages converge, but a new high-level maze had junctions where you could see six junctions. This earned the name Rubik's Tubes.

Beyond the Tubes to the south, a kilometer-long side passage, called Jersey Turnpike, takes off of the South Trunk. The 1978 survey had stopped at a large pool, Turkey Lake. Terri (Treacy) Sprouse swam this lake for an estimated 150 meters in 1979 without being able to get out of the



The Rio Verde passage on the route to the World Beyond. (Terri Sprouse)

water. Now the survey was continued across the lake. After 170 meters it was possible to leave the water in a narrow canal and climb into a dry upper level. This was the Lechugilla Expressway, a comfortable walking passage with a death-coral floor and occasional pits dropping back down to water level. This was followed several hundred meters to where it split into three smaller passages on different levels. Other wet leads pursued included the downstream Isopod River. This was a large, deep canal that went 80 meters to a sump. A side canal went another 30 meters to a dry series of about 200 meters of passages. More wet stuff was found underneath the Breakdown Maze, where a half-submerged breakdown maze was explored. Other activities in Infiernillo included an unsuccessful attempt at blasting through a breakdown choke in Moria, in the lowest part of the system, and an attempt to photograph the huge Netherhall, also unsuccessful. It was determined that M3B bulbs are far too small.

Camp III

A week long "duffle free" interlude was occupied with rest and repair, checking caves in other parts of the area and personnel changes. During this time, preparations began for a week-long camp to be put in through Brinco. The 2.5 kilometer route to the planned location involved many swims. This meant camp gear had to be well waterproofed, and it also had to be packed to break down easily at squeezes. An advance supply run was needed to deliver half the camp gear, and the other half was carried down several days later at the start of the seven-day stay. Six cavers - two survey teams - formed the camp crew.

On April 10, we shouldered duffles once again and hauled down to Camp III, a wide cobbled passage at the base of an old flowstone cascade in a dry overflow route. Leads were pushed in order of their proximity, and the south-trending Gypsum Extension, found the previous November, was looked at first. This ended after 117 meters in a formation choke, the Aragonite Sump. Below camp, a connection was made over to the parallel Angel's Staircase below Gonzo Pit, closing an 800 meter loop. A bit farther down, the Saturnalia Loop and Ganymede Passage were added to the mazework. In a large, dry, north-trending passage, Io Way, both teams surveyed leapfrog style. This led to a west-dipping maze area, where the descending surveys converged and diverged - Yawndwanaland. One team stopped at a slippery drop; the other team found a way down to a horizontal

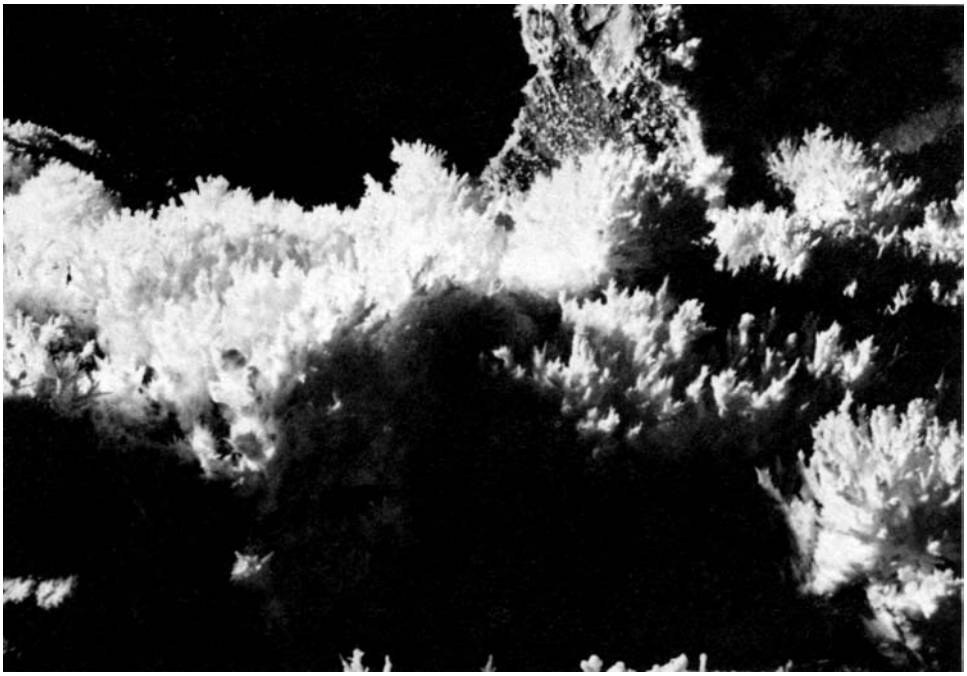
The Io Way is formed in soft clayish rock.(Terri Sprouse)

north-south trending passage. Both teams pushed this on the last survey day. The team going north mapped 760 meters in what has to be the straightest passage in the system, The Columbia. This was a rift-like passage in death coral, changing to breakdown, and finally ending in a breakdown obstruction underneath the Netherhall. To the south the passage continued much the same, and 1266 meters were surveyed in this direction before time ran out. With over two kilometers surveyed, it was a record day for the project, and the five survey days at Camp III netted five kilometers total.

The camp had an exciting ending as 10 centimeters of rain on the surface caused the normally low flow in the World Beyond stream to increase fiftyfold. Concerned about possible sumping of the low airspace at the Canal, the six cavers hurriedly packed up camp and headed up the World Beyond. Fortunately the Canal was only up a few centimeters. The waterfall series in the Río Verde was more sporting than ever, with 25 liters per second flow requiring SRT on the normally free-climbable Flowstone Falls. Everyone got out safely, much to the relief of Jim Pisarowicz, who had stayed on the surface and had seen the rain guage rising.

With the rainy season apparently settling in to stay, surveying in Purificación wound down and expedition members filtered away. Surface surveying and checking other caves occupied the balance of the trip, highlighted by the exploration of Sótano de la Rama, several kilometers to the south of the main system. This had an entrance drop of 105 meters and bottomed out at -150 meters after two more drops. The number of recorded entrances in the area increased to eightyfour.

Cavers participating in the 1980-81 PEP projects (U.S. if not noted) were Jerry Atkinson, Don Coons, Sheri Engler, Paul Fambro, Jim Feely, Margaret Hart, Del Holman, Jeff Horowitz, Louise Hose, Roy Jameson, Peter Keys, Mike Magill (Canada), Patty Mothes, Randy Nutt, Jim Pisarowicz, Mike Poelma, Randy Rumer, William Russell, Mark Shumate, Peter Sprouse, Terri Treacy Sprouse, Andy Waddington (Great Britain), Duwain Whitis and Carol Wilson (Canada).

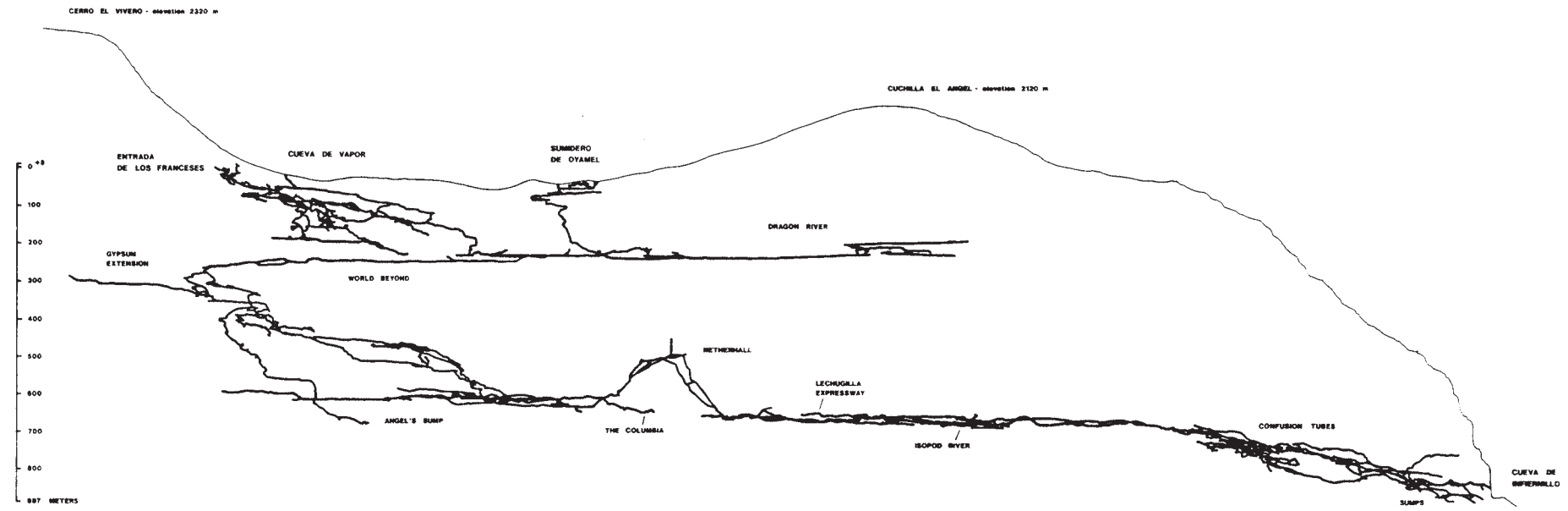


Crystals in the Aragonite Sump near Camp III. (Terri Sprouse)

SISTEMA PURIFICACION

TAMAULIPAS. MEXICO

PROFILE LINE PLOT- 210° VIEW
SURVEY 1973 - 1981 BY THE PROYECTO ESPELEOLOGICO PURIFICACION
TOPOGRAPHY FROM DETENAL
DRAFTING BY P. SPROUSE
LENGTH: 45,472 METERS
DEPTH: 895 METERS



Purificación

A fines del año 1980 y principios de 1981 miembros del Proyecto Espeleológico Purificación progresaron en todas partes del Sistema. Se aumentó el longitud del sistema de 36,745 metros a 45,472 metros. La extensión aguas arriba del Dragon River fué explorado al final. También exploraron más en el Valkyrie River. Un campamento subterraneo se estableció en el Campamento I de Infiernillo durante una semana. Se progresó en todos partes de los Confusion Tubes. Se extendieron el Jersey Turnpike y el Isopod River aguas abajo. Otro campamento subterráneo se estableció en el medio del sistema. Durante una semana en el campamento se topografiaron 5 kilometros de pasajes. Un ramal importante dirigiendose hacía el sur se halló y es el objectivo principal de la expedición de 1982.

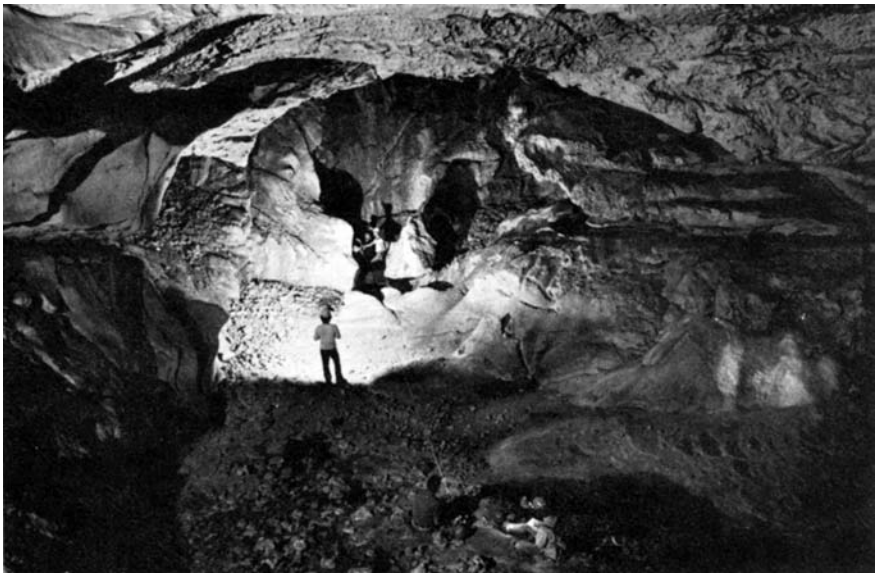
Sierra de Guatemala

William R Elliott

Since my last report on the Sierra de Guatemala project (AMCS Activities Newsletter No. 11), there have been three survey/photography trips and one reconnaissance trip that I am aware of. The year 1981 started out great, but there has been no activity since late spring. The demands of job and family have kept me out of the field and away from the drafting table. My idea of having the proposed bulletin wrapped up by the end of the year has been replaced with the hope that it will be done by the end of 1982.

On December 28, 1980, two truckloads of Texas cavers arrived at the Río Frio campground near Gómez Farias. The Aggie cavers (Duwain Whitis, Barb Vinson, John Brooks, Sheila Jones, Bruce Bradshaw, Darrell Harris, and Tom Hooper) had returned for their second trip to the area after a year's lapse. Frank Endres and Tracy Archie (Austin) and I (Harlingen) came in my old Chevy while Duwain drove his Toyota.

We spent the first two days mapping a fine large fossil resurgence on the face of the range at Rancho de las Peñitas, about 6 kilometers south of the campground. I had gotten the lead from Bill Russell long ago. John Mikels and others of the now defunct PASS group from the Río Grande Valley of Texas may have visited here years ago. Cueva de las Peñitas was surveyed by two teams and came to 809 meters in length. It consists of large strolling passage with some crawlways and a pool at the rear, along with a blind 30 meter pit off in one side passage. The cave is formed on two, possibly three levels, and had three major entrances, with hints of a tiny one at the end of the Green Wings Passage, where we noticed numerous green insect wings on the floor. The most interesting aspect of the cave was the pictograph above the second entrance, along with the polished area on the bedrock in front of the entrance, The polished area I interpret as an Indian "magic spot," as it is incised with deep, semi-organized grooves and looks as if it must have been rubbed by many hands over a long period of time.



A survey team mapping the main passage of Cueva de las Peñitas. (William Elliott)

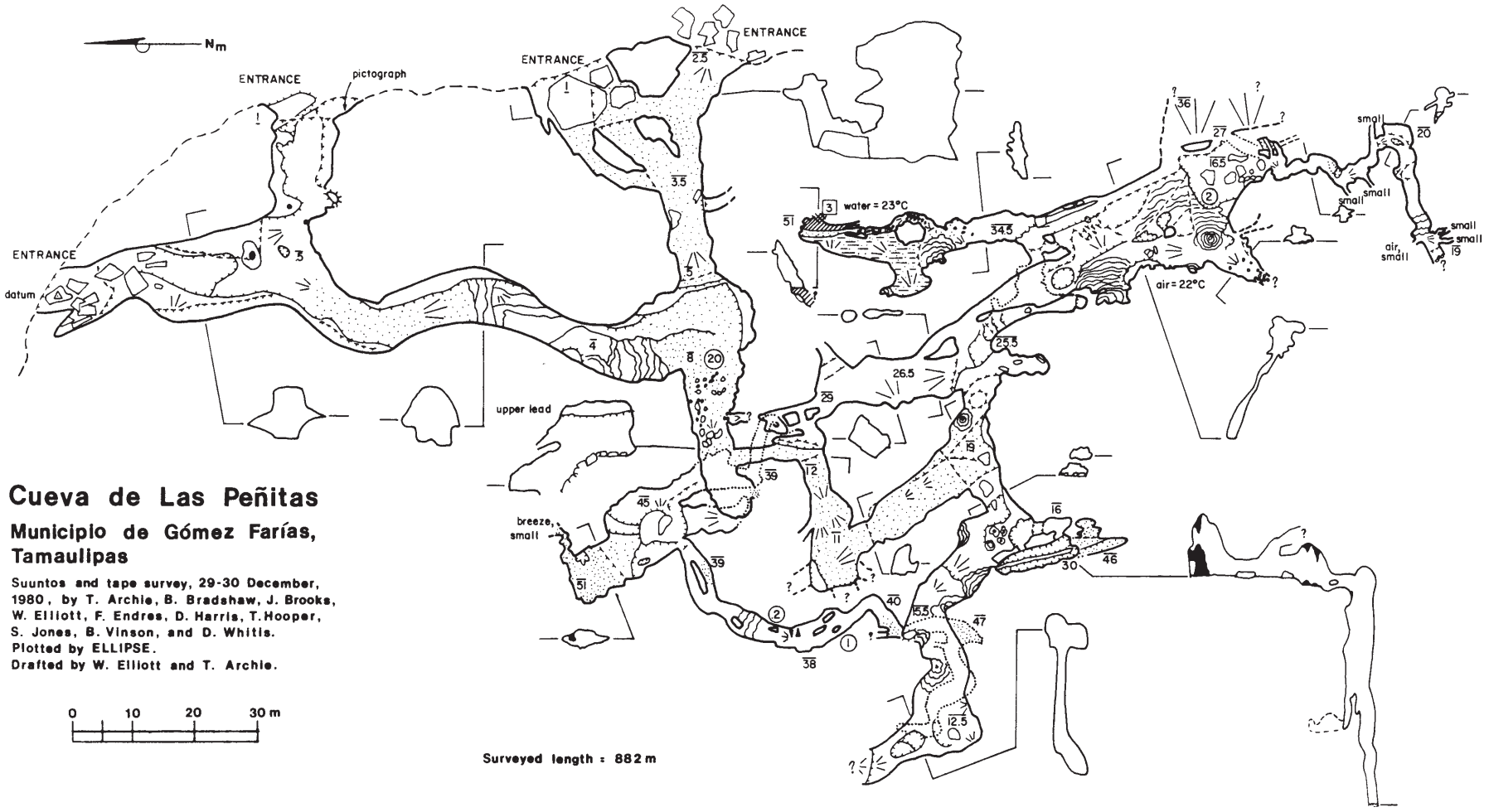
Barb Vinson examines the "magic spot" at the second entrance to Cueva de las Peñitas (William Elliott)

Having finished our Peñitas survey, we photographed the entrance of Sótano de Gómez Farías, which is in a dense grove of trees to the left of the highway to Gómez Farías. No one was tempted to enter because it is the local trash dump and has been mapped twice anyway. The original survey, done by Terry Raines and others back about 1964, was lost. Peter Sprouse and others resurveyed the cave in recent years. We drove on through town and headed up the steep lumbering road to Rancho del Cielo, arriving there by afternoon. We talked to Barbara Warburton, the director of Texas Southmost College's biological field station there. It had been ten years since my last visit to Cielo, so we were lucky Barbara was able to give us directions to Cueva de la Mina and farther up the mountain to El Porvenir (La Perra). I had mapped many of the caves in these places years ago, but now I wanted photos for the bulletin. The roads are extremely rough and steep. On the Aguacates grade before reaching Cielo, we had measured the slope of the road at 21 degrees. I recalled having ruined three tires on these roads back in 1971.

We found Cueva de la Mina late in the day and went in for a photography session. Mina is a very important biology cave, and one of the few caves in the world to harbor troglobitic scorpions. We saw none this time. I spent some time photographing blind gryllid crickets and millipeds and looking for a mammal skeleton that Stewart Peck reported was cemented in the flowstone near the back. I never saw it.

The next day we arrived at El Porvenir and spent several hours searching in the dense brush for the large entrance to Cueva de la Capilla. Since my last visit to this beautiful cave ten years ago, lumbering activities in the immediate area have ceased, and most of the roads have become overgrown. This makes getting around more difficult, but perhaps it has helped conserve the caves. Capilla looked just the same as before, as did Mina. Someday the lumbering will come back to these areas. What will happen to these caves then?

I fulfilled a decade-long daydream of returning to Capilla to photograph the big room at the end of the cave. This took several large flashbulbs, as the room is about 100 meters in diameter. The floor is covered with great expanses of flowstone, and there are alcoves floored with shallow gours inhabited by trog-


Nm
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Cueva de Las Peñitas
Municipio de Gómez Farías, Tamaulipas
Suuntos and tape survey, 29-30 December, 1980, by T. Archie, B. Bradshaw, J. Brooks, W. Elliott, F. Endres, D. Harris, T. Hooper, S. Jones, B. Vinson, and D. Whitis.
Plotted by ELLIPSE.
Drafted by W. Elliott and T. Archie.
0 10 20 30 m
Surveyed length = 882 m

lobitic oligochaete worms, isopods, and diving beetles. We also briefly photographed nearby Cueva de la Perlas.

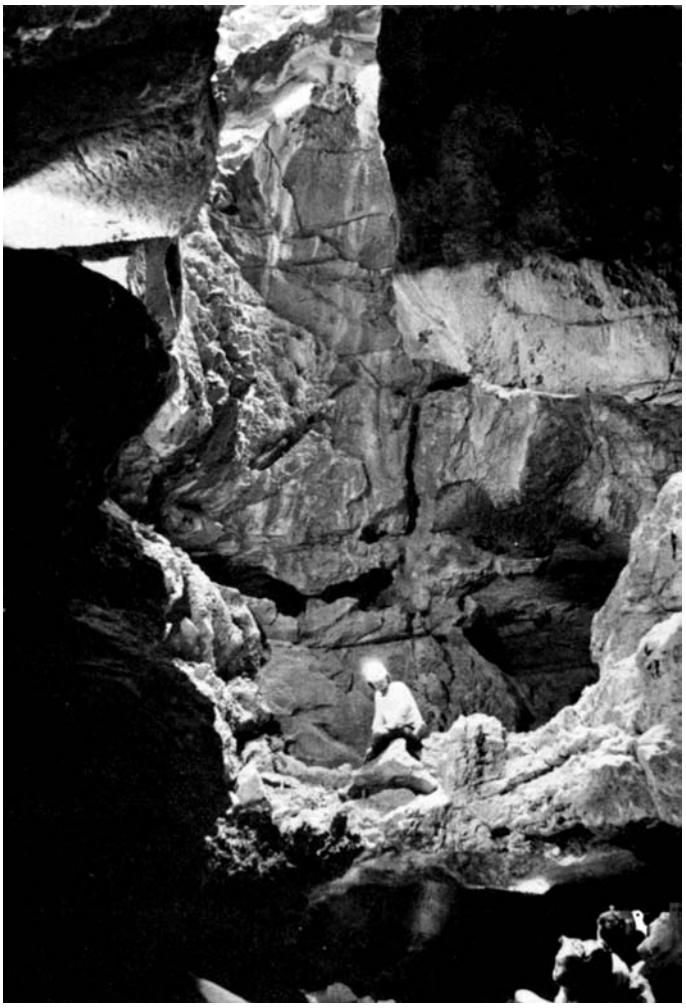
On the way down the next day a steering-knuckle bearing in my truck broke, forcing a trip down the mountain in the other truck to Ciudad Mante, calls to the U.S. to get parts numbers, touring all the refacciónarias in town, finding the parts, and fixing the ailing beast with a pipe wrench and blowtorch. But it worked, and we lost only two days; it could have been much, much worse. This ruined the remainder of the trip, but we went home happy.

In March, Roy Jameson and Patty Mothes came down from West Virginia to spend several weeks in the Miquihuana area and Sierra de Guatemala. Incredibly, the two of them succeeded in resurveying Sótano de Vásquez. This took eleven trips to map 3 kilometers, through five levels to a depth of 276 meters. The cave had been partially surveyed in 1972, but no one was ever satisfied with the effort, so as the saying goes, "If you want something done right...." Roy wanted to do a structural analysis of the cave, but formations and guano obscured too much of the geology. The sump at the bottom of the cave is perched, according to Roy. This sump contains the deepest population of blind fish, Astyanax jordani, in México,(and perhaps the world?). In addition, Roy and Patty mapped three old resurgences in the Cañon de la Servilleta, remapped Cueva de Nacimiento del Río Frío, and mapped two other resurgences at Ojo de Agua, a village on the flats east of Gómez Farías. The last two each contained about 375 meters of passage and were formed in reef breccia.

During this same time, Paul Duncan, of Corpus Christi, and others mapped a lava tube on Cerro Partido southwest of Ocampo. This cave was referred to as Cueva del Piso Colorado before, but has been renamed Cueva Oeste del Cerro Partido. Paul hopes to write an article on the lava tubes of the Cerro Partido for the forthcoming AMCS bulletin.

In May or June a contingent of Canadian cavers made a reconnaissance trip into the hinterland of the Sierra de Guatemala to see if the area looked promising for an annual field project. I have received no reports from that group, but am very anxious to share ideas and information with them. At present I have only received sketchy reports through one AMCS caver in Austin who was in contact with them.

At this point it appears that the Sierra de Guatemala bulletin effort is bogging down. I have not



Bruce Bradshaw sitting inside the third entrance to Cueva de las Peñitas. (William Elliott)

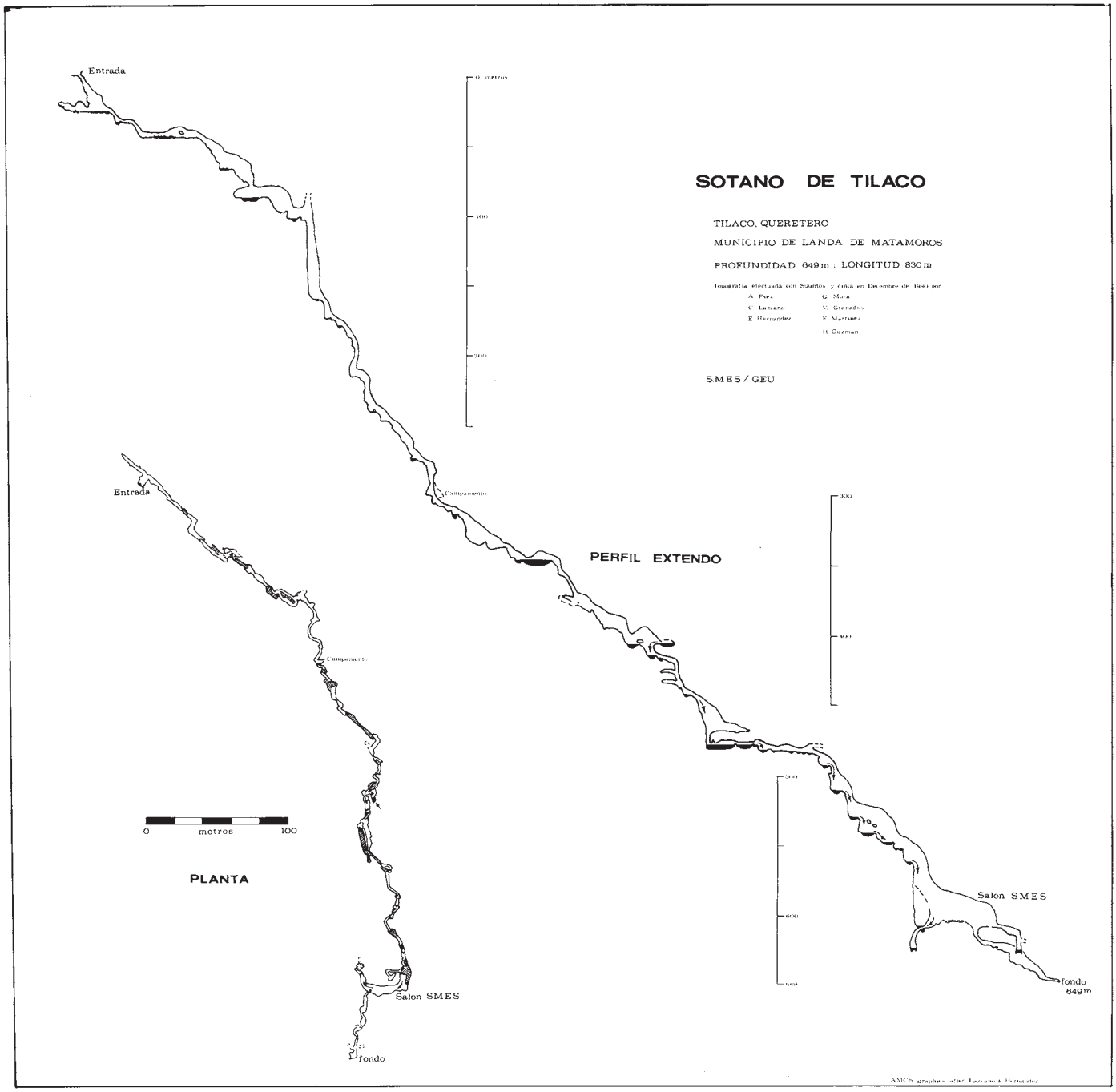
been able to obtain the notes or a map of the last Joya de Salas survey, which was done two years ago. This is the star cave of area, and the bulletin will require an updated map. Other aspects of the project are moving along fitfully.

Logan McNatt and James Reddell have done some literature research on the archaeology of the caves in the area. Several excavations were made in three caves near Ocampo by Richard S. MacNeish in 1953-55. These discovered evidence of four to eight cultural phases in the area, ranging from about 6200 BC to 1700 BC. These people were initially hunter-gatherers, and gradually became more sedentary and agricultural. Before MacNeish's work the Mexican archaeologists Romero and Valenzuela made a brief expedition to the Ocampo area in 1937 to investigate a cave that had been visited by an army lieutenant. According to the officer, the cave contained eight mummies. He sealed the entrance to the cave to protect the find. Apparently this was too effective, because Romero and Valenzuela never found the cave. They did find the three caves, Las Cuevas de los Portales, that MacNeish later excavated. Treasure hunters had dug about in the floor of the largest cave and had indiscriminately scattered some human bones. A female cranium was recovered, studied by Romero, and pronounced prehispanic. Later MacNeish found sixteen stratified occupation layers in this cave. These caves were very important in establishing the earliest ages of cucurbit (squash) use in North America.

Three pictograph caves in the region have now been sketched or photographed by AMCS members over the years. I have this material, and it will be published in the bulletin. Logan McNatt and I would appreciate receiving reports or illustrations of any other archaeologically interesting material for the bulletin. Reports, maps, and photographs of any caves in the area should be sent to me at 2225 North Parkwood, Harlingen, Texas 78550.

Sierra de Guatemala

William Elliott ha cambiado la fecha de publicación del Boletín tratando con la Sierra de Guatamala (una parte de la Sierra Madre Oriental en el sur de Tamaulipas) de 1981 a 1982. Este año pasado ha regresado a varias cuevas ya topografiadas con la meta de sacar fotografías para el Boletín. Otro grupo topografió el Sótano de Vasquez, bien conocido pero faltando una mapa. Este grupo de dos personas se tardaron once viajes a la cueva para topografiar 3 kilometros en cinco niveles hasta una profundidad de 276 metros. Otro grupo topografió una cueva volcanica al sureste de Ocampo llamado Cueva Oeste del Cerro Partido. Si tiene algún interés en la región y el boletín, favor de ponerse en communicación con William R. Elliott, 2225 North Parkwood, Harlingen, TX 78550 EUA.


SOTANO DE TILACO
TILACO, QUERETERO
MUNICIPIO DE LANDA DE MATAMOROS
PROFUNDIDAD 649m ; LONGITUD 830m
SMES / GEU
PERFIL EXTENDO
PLANTA
Entrada
Campamento
Salon SMES
fondo
649m
0
metros
100

TILACO AREA

Carlos Lazcano

Sótano de Tilaco

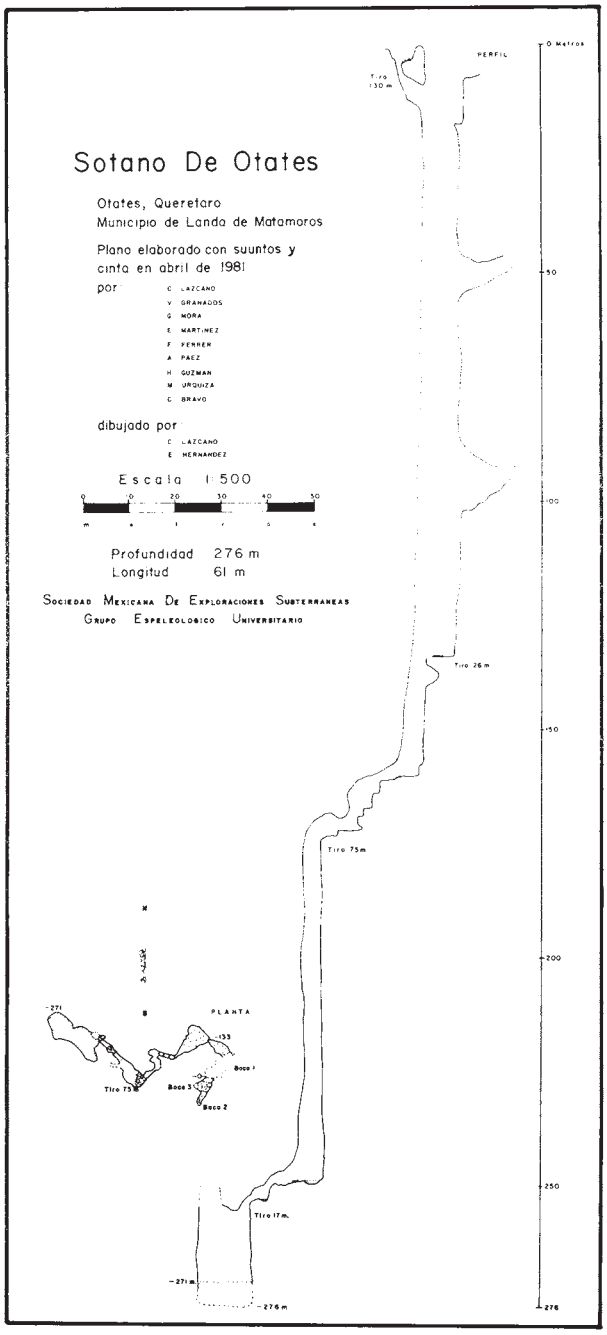
At the end of 1980 and the beginning of 1981, intensive exploration was carried out by the Sociedad Mexicana de Exploraciones Subterráneas (SMES) in the Tilaco area of northeastern Querétaro. A nine-day expedition in December 1980 surveyed Sótano de Tilaco (see Activities Newsletter #11) to its bottom at -649 meters. This group was composed of Victor Granados, Eusebio Hernandez, Guillermo Mora, Eduardo Martinez, Antonio Paez, Hector Guzman, and Carlos Lazcano.

The entrance to Sótano de Tilaco is located in a large polje, five kilometers across and about five hundred meters from the town of Tilaco. Eduardo and Antonio rigged the first part of the cave down to the first lake at -100 meters. This first part of the cave consists of a series of small drops, the largest being the first one of 27 meters. The first lake was quite deep, and a small raft was stationed there. The following day a second group entered, composed of Victor and Hector, who rigged down to the -300 meters level, where a camp was established--the only one used. This section of the cave is not difficult. It consists of several drops, one of which, at 55 meters, is the largest in the cave. Carlos and Eusebio formed the third group, which continued rigging to a depth of -500 meters. In this section they went through a tight squeeze and set a traverse line at a tricky pool. After that there was a series of drops and down-climbs to a second deep lake, 22 meters across.

Beyond the lake, a series of drops led to a shallow lake. Here a side lead that added a good flow of water to the cave was followed upstream to a sump. Below the pool, the cave continued as a beautiful horizontal passage with gours full of clear water. One of these was quite deep and looked very much like a swimming pool. Eusebio swam across this and secured a line on the far side so a traverse could be made across the wall. This section was very wet, and all of the drops were waterfalls. On the far side of the lake was a drop of 35 meters. Twenty-four meters down the drop was a side passage, where Eusebio and Carlos made a bivouac.

The team of Guillermo and Eduardo rigged down to -580 meters, encountering another drop of 35 meters and a deep lake 32 meters across. This was the largest lake in the cave, and at one point the ceiling came within 40 centimeters of the water. Following the lake was a series of short drops that all needed rigging, followed by a 45 meter pitch.

Carlos, Eusebio, and Victor continued on from this point and discovered the largest room in the cave, the Sálon SMES. It was 50 meters across, with the ceiling being over 30 meters high. It also had a 15

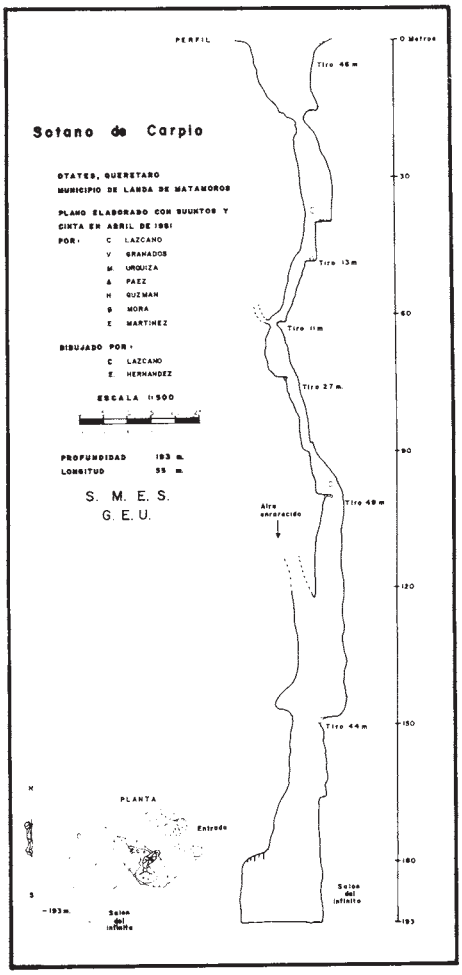


meter wide lake. The floor of the room was covered with breakdown blocks, some very large. This room produced three leads. One of these took all of the flowing water and ended at a sump at -627 meters. The other two were fossil passages, muddy and without water. One ended at -627 meters also, while the other terminated at the deepest point in the cave at -649 meters. Here Carlos, Victor, and Eusebio made a bivouac on Christmas Day, resulting in the name Salon de la Noche Buena.

Otates Area

In April 1981, the group returned to the Tilaco area. Twelve caves were explored near the village of Otates, five kilometers from Tilaco and 300 meters higher. The three deepest were Sótano de Otates (-276 meters), Sótano de Carpio (-193 meters), and Resumidero de Otates (-109 meters).

Sótano de Otates had been located in September 1980 by Guillermo Mora and Carlos Lazcano during the first reconnaissance of the area. In December, Antonio Paez and Hector Guzman did the spectacular first pitch, a free drop of 130 meters. In April, the bottom was reached after four more drops. The third drop is a sheer pitch of 75 meters. The cave



ends in a deep lake. Since it is almost totally vertical, the bottom can be reached in an hour. A new species of Collembola was collected in the cave by Hector Guzman.

Sótano de Carpio is located about two kilometers from Sótano de Otates. It has six drops, the longest of which is 49 meters. Exploration was made difficult by high concentrations of bad air.

The exploration of the Resumidero de Otates, located in the largest of the dolinas in the area, was accomplished through the enthusiasm of Victor Granados. The entrance had been covered with rocks by the locals. The removal of a half-ton of material revealed a very small entrance. The cave is quite vertical, but only has one rope drop of 40 meters. The remainder of its 109 meters of depth is gained in down-climbs and tight vertical fissures. The cave is difficult and very tight, including the only drop, which is 60 centimeters wide. Exploration ended at a 5 meter deep sump.

The SMES has plans to continue exploration in the area in late 1981. At present Sótano de Tilaco is the seventh deepest cave in México and the Americas.

Tilaco

En diciembre 1980, el Sótano de Tilaco, localizado en el Noroeste de Querétaro, fué topografiado hasta una profundidad de -649 metros por miembros de la Sociedad Mexicana de Exploraciones Subterráneas (SMES). La entrada se localiza en un polje grande, de cinco kilometros de ancho y a quinientos metros del pueblo de Tilaco. La primera parte de la cueva consiste en una serie de tiros cortos, el mas largo siendo de 27 metros. Se estableció un campamento al nivel -300 metros. Esta parte de la cueva consistía otra vez en una serie de tiros--los incluyendo el más profundo de la cueva, uno de 55 metros. Al nivel de -500 metros, otra serie de tiros alcanza a un lago profundo de 22 metros de largo. Mas allá de este lago, otros tiros alcanzan un lago poco profundo. Un ramal subía río arriba hasta un sifón. Adelante del lago poco profundo la galería continua horizontalmente en un pasaje muy bello con gours llenos de aguas cristalinas. Este tramo era muy mojado y los tiros posteriores llevan cascadas de agua. Al nivel -600 el salón más grande de la cueva se descubrío. El Salón SMES tiene 50 metros de largo, un techo de 30 metros de altura y un lago de 15 metros de ancho. Este salón tiene tres ramales. Uno lleva toda la corriente de agua y termina en un sifón al nivel de -627 metros. Los otros dos son pasajes fósiles acabando al nivel de -627 metros y -649 metros.

En 1981 el SMES exploró doce cuevas cerca del pueblo de Otates, a cinco kilometros de Tilaco y 300 metros arriba de Tilaco. Los tres mas profundas eran Sótano de Otates (-276 metros), Sótano de Carpio (-193 metros), y Resumidero de Otates (-109 metros).

El SMES va a seguir la exploración en la zona a fines del año 1981. Ya se conoce a Sótano de Tilaco como la cueva septima mas profunda de las Americas.

Long Caves of México

1.	Sistema Purificación, Tamaulipas	45,472
2.	Sistema Huautla, Oaxaca	24,025
3.	Sistema Cuetzalan, Puebla	22,432
4.	La Grieta, Oaxaca	8,782
5.	Atepolihuit de San Miguel, Puebla	7,700
6.	Sótano del Arroyo, San Luis Potosí	7,200
7.	Actún de Kaua, Yucatán	6,700
8.	Sumidero de Jonotla, Puebla	6,381
9.	Sótano de Las Calenturas, Tamaulipas	5,877
10.	Gruta del Río Chontalcoatlán, Guerrero	5,827
11.	Gruta del Río San Jerónimo, Guerrero	5,600
12.	Nita Nanta, Oaxaca	5,100
13.	Grutas de Juxtlahuaca, Guerrero	5,098
14.	Cueva del Nacimiento del Río San Antonio, Oaxaca	4,570
15.	Sótano de la Tinaja, San Luis Potosí	4,502
16.	Sótano de Japonés, San Luis Potosí	4,500
17.	Sistema San Andres, Puebla	4,471
18.	Sistema Zoquiapan, Puebla	4,107
19.	Sótano del Río Iglesia, Oaxaca	4,100
20.	Sima del Borrego, Guerrero	4,007
21.	Sótano de Agua de Carrizo, Oaxaca	3,840
22.	Cueva del Río Jalpan, Querétaro	3,440
23.	Actún Xpukil, Yucatán	3,353
24.	Cueva de la Laguna Verde, Oaxaca	3,350
25.	Sumidero Yochib, Chiapas	3,316
26.	Cueva de El Chorreadero, Chiapas	3,280
27.	Sumidero La Joya, Guerrero	3,100
28.	Sumidero San Bernardo, Puebla	3,100
29.	Atepolihuit de Nauzontla, Puebla	3,066
30.	Sistema de Montecillos, San Luis Potosí	3,022
31.	Sótano de Huitzmolotitla, San Luis Potosí	3,002
32.	Sótano del Tigre, San Luis Potosí	3,000
33.	Boca del Río Apetlanca, Guerrero	2,750
34.	Actún Loltun, Yucatán	2,682
35.	Sistema Santa Lucia, Puebla	2,500
36.	Cueva de Juan Sanchez, Oaxaca-Veracruz	2,493
37.	Sima de la Cruz Verde, Puebla	2,301
38.	Grutas de San Cristobal (Rancho Nuevo), Chiapas	2,250
39.	Xocomanetlán, Guerrero	2,223
40.	Grutas de Estrella, Guerrero	2,100
41.	Sumidero de Atecarla, Puebla	2,005
42.	Sótano de Vasquez, Tamaulipas	2,000
43.	Sótano de Yerbaniz, San Luis Potosí	1,980
44.	Grutas de Tenextepec, Puebla	1,920
45.	Cueva de la Mantilla, Michoacán	1,900
46.	Cueva de la Puente, San Luis Potosí	1,830
47.	Cueva Tecolo, Puebla	1,830
48.	Sistema Guayateno, Puebla	1,782
49.	Cueva San Francisco, Chiapas	1,750
50.	Sótano de Matapalma, San Luis Potosí	1,722

Peter S. Sprouse

Deep Caves of México

1.	Sistema Huautla, Oaxaca	1,250
2.	Nita Nanta, Oaxaca	927
3.	Sistema Purificación, Tamaulipas	895
4.	Sótano de Agua de Carrizo, Oaxaca	848
5.	Sótano de Trinidad, San Luis Potosí	827
6.	La Grieta, Oaxaca	760
7.	Sótano de Tilaco, Querétaro	649
8.	Cueva de Diamante, Tamaulipas	621
9.	Nita He, Oaxaca	600
10.	Sistema Cuetzalan, Puebla	587
11.	Sótano del Río Iglesia, Oaxaca	535
12.	Sótano de Nogal, Querétaro	529
13.	Sótano de la Golondrinas, San Luis Potosí	512
14.	Hoya de la Conchas, Querétaro	508
15.	Sótano del Buque, Querétaro	506
16.	Hoya de la Guaguas, San Luis Potosí	478
17.	Cueva de San Agustín, Oaxaca	458
18.	Sótano del Barro, Querétaro	455
19.	Sótano Itamo, Veracruz	454
20.	Sótano de Tlamaya, San Luis Potosí	454
21.	Cueva de La Peña, San Luis Potosí	448
22.	Atepolihuit de San Miguel, Puebla	399
23.	Sótano de La Joya de Salas, Tamaulipas	376
24.	Sótano Tomasa Kiahua, Veracruz	374
25.	Cueva de El Chorreadero, Chiapas	345
26.	Cueva de Xocotlat, Puebla	339
27.	Grutas de San Cristobal, Chiapas	330
28.	Sótano de Los Hernandez, Querétaro	330
29.	Sótano de Seis Segundos, Oaxaca	324
30.	Sotanito de Ahuacatlán, Querétaro	320
31.	Hoya de Zimapan, San Luis Potosí	320
32.	Sumidero de Atikpak, Veracruz	319
33.	Cueva de Santa Cruz, Oaxaca	314
34.	Sótano de Jabalí, Querétaro	308
35.	Sistema Zoquiapan, Puebla	297
36.	Sótano del Burro, Querétaro	292
37.	Sótano de los Monos, San Luis Potosí	291
38.	Sótano Hondo, Querétaro	290
39.	Sótano de Soyate, San Luis Potosí	287
40.	Cueva del Rancho de Agua Amarga, San Luis Potosí	283
41.	Sótano de Vasquez, Tamaulipas	277
42.	Sótano de Otates, Querétaro	275
43.	Sótano de la Codicia, Querétaro	269
44.	Sumidero La Joya, Guerrero	257
45.	Sótano de Huitzmolotitla, San Luis Potosí	245
46.	Sótano del Macho Rey, Querétaro	244
47.	Sótano de Otates, Tamaulipas	244
48.	Pozo de Montemayor, Nuevo León	236
49.	Sumidero de Atliliakan, Guerrero	230
50.	Pozo Meléndez, Guerrero	229

all units in meters

Peter S. Sprouse

Progress at San Bernardo through 1981

Steve Knutson

Two years ago we visited the valley of San Bernardo, west of the Cuetzalan caving area, which is northeast of Puebla, and began serious work. This continued last year, and considerable progress was made.

At around Christmas time the usual mixture of cavers were visiting Quetzalan, and a few of them decided to make the long commute to San Bernardo. The attraction was a couple of side passages near the entrance of Sumidero San Bernardo that were taking air. The sumidero was pushed last year 600 meters north, which involved ten short rope drops to a spectacular lower entrance in the canyon of the Río Atima.

The side passages were found to quickly merge, and the spacious combined passage began to lead west, descending and picking up a little water. This was taking us toward a large resurgence we had found the previous season, so it raised some excitement. On December 29, Bill Liebman, Norm Pace, and Kyle Walden mapped a little (38 meters) at the start of the side passage, and on the last day of the year, Rick Rigg and Jim Rodemaker got the other branch (324 meters). Also on that day, Liebman, Mark Minton, and Lisa Wilk pushed nineteen stations down the west-trending streamway, mapping 318 meters.

On January 1, Pace, Liebman, Minton, and Rick Rigg pushed on another thirty-five stations (509 meters), stopping at the top of the ninth short rope drop. The passage had turned north shortly after Station 19, and the majority of the water rumbled off into an impenetrable hole. That day Frank Binney, Barb Cannon, and Rodemaker mapped a dry side lead, possibly an old overflow, to a terminus after 518 meters.

At this point, with a hot, going lead, these fine folks ceased activity. This was only due to considerations of priority--I had been a major moving force to get things going at San Bernardo, and they were leaving this lead for me. I had asked them to leave the resurgence cave, which Maureen Cavanaugh and I had discovered, and they were sure this San Bernardo lead would connect with that. I certainly thank them.

Jon Burkig, Todd Rasmussen, and I arrived in late January and set up camp in a field belonging to Hacienda San Bernardo, near the sumidero. We had heard about the lead in San Bernardo, but the resurgence cave was our objective and we went there first.

The resurgence and associated cave had been found by Maureen and me the previous year while we were looking along the Río Ateno in the next valley to the west for the lower entrance of Sumidero San Bernardo. We had pushed a ways up the 10 to 15 cubic feet per second (cfs) stream passage, but had not done any mapping. With flow nearly as large as the Río Ateno, it seemed that this must be the drainage from the entire San Bernardo

valley, which obviously had suffered multiple piracies and now has no comparable surface stream. Thus we expected that the resurgence cave might do great things. Near our point of furthest penetration, several hundred meters from the entrance, it connected with the upper level, adjacent to Grutas Ateno, a 500 meter long dry cave mapped by McKenzie and others years before.

On January 30, Burkig, Rasmussen, and I entered the resurgence via Grutas Ateno and pushed upstream. The stream passage in this cave is smaller than the San Bernardo. At a couple of swims the ceiling was within a foot of the water. The resulting airflow was rather strong. The current was rarely a problem, and we continued through a number of swims, reaching a sump about 500 meters from the connection with Ateno. This was disappointing, but there were higher levels at this point, so we mapped out, intending to return.

We were joined by Bill Bockstiegle on February 1 and pushed the high levels near the sump. One large, dry passage with huge grind holes for a floor had airflow and was surely our continuation. Up this we mapped, finally coming to a sizeable room with a fault trace forming one wall. High on this wall was a lead, but searching produced no other--unless we did an aid climb for at least 15 meters, we were stopped.

Mike Boon had come with Bockstiegle but didn't have a decent wetsuit, so he had gone hiking, finally looking at a cave entrance at the edge of Xochitlan, the town just above our camp. He came back insisting this was a major tributary to our resurgence cave. I refused to believe this, since it is on the opposite side of Sumidero San Bernardo from the resurgence--how could it get by? Surely it would go north to Zempoala Canyon like San Bernardo did. The next day was planned for rest and equipment repair, but Burkig was willing, so he and Boon went to have a real look. After an initial waterfall, they found the streamway to lead southwest, away from Zempoala Canyon. Incredible! Well, now we were in an interesting predicament: the original hot lead in Sumidero San Bernardo, which had been left for us by others, was still unpushed, and another hot cave had popped up. Boon had other commitments and left. The rest of us decided we had a duty to San Bernardo.

On February 3, Jon and I took enough rope to rerig all the drops done over the Christmas - New Years trip and some extra. We would rig while Bill and Todd pushed and mapped a side lead. Then we would all push on to a conclusion the following trip.

After typical San Bernardo passage, a little water but good airflow and a spacious corridor leading on and on with short drops at intervals, we came to the point of furthest previous exploration, which was a 6 to 8 meter drop over boulders. We had at least 40 meters of rope left and were about to rig the drop when Jon moved some rocks and suddenly found a hole leading to a climbdown. Onward, the passage continued as before: stream boulders and potholes, then a short drop, and on to another drop.... When we had come to the top of the thirteenth drop from the entrance, we had chopped up the 40 meter rope and had only 2 meters left, plus 4 meters of webbing. This was enough; by rigging to a small cobble in a crack at the edge, I slid down and boogied on through the passage a couple of hundred meters to a climbdown and to a big pool. After swimming across this, I looked around and there were vines hanging down. Outside! I zoomed back and got Jon, and soon we were

in the jungle of the canyon-side, seeking a way up. A small trail led into coffee trees, and it was only a matter of time and sweat (in those wetsuits!) to reach the road at the top and get back to camp. We had done a nifty 1800 meter, thirteen drop through-trip. On the fifth, we went back with Bill and Todd and mapped from the canyon entrance, de-rigging as we went, the reverse through-trip.

Now we could have a real look at the sumidero at Xochitlan. On the seventh, Bill, Jon, Todd, and I suited up and marched past the ruined coffee mill, along the stream (2 to 5 cfs) and past the mound of coffee husks dumped over the edge of the main road 10 meters above. The large entrance led quickly to a waterfall, still in twilight, but a broad, high, muddy ledge allowed a 15 meter rappel into the lake beyond. The boulder-strewn chamber beyond narrowed to a tall 5 to 10 meter wide streamway, straight and heading southwest for several hundred meters to another drop. This was short and led to another, which Jon and I descended with the rope rigged in the falls. Fortunately, we realized the problem this represented and called a halt. This was good, since it took us an hour and a half of thrashing and splashing to get back up. Obviously it should be rigged with a bolt to one side. We had mapped 553 meters from the entrance.

Our itinerary at this point called for continuing to Guatemala and Honduras, so we had to leave Santa Elena, as the locals at the nearby store called it, until late March.

A while later, Boon returned with Jerry Atkinson and Doug Wilson. We had left no communication, and so they were unaware of the previous mapping trip. They proceeded to map some 800 meters of the cave, stopping at the top of a drop to a swim. Our lack of communication made their mapping futile. I feel badly about this, but had no idea they intended to push the cave. If anyone is interested in this area for the future please get in touch with me so we can work out communications. (See address below.--Ed.)

On March 30 and April 2 Burkig and I returned and pushed on in three trips through numerous swims and short waterfall drops, stopping about 1800 meters from the entrance at the top of the fifteenth rope drop. After the third trip the weather broke, and it rained off and on for a week. Finally we got tired of waiting, went in at double base flow, and rescued most of the rope, leaving about 100 meters still rigged. With the airflow in both Santa Elena and the resurgence cave, we have a definate possibility of a connection, though they are still 2 kilometers or so apart. We'll be back next year. The total new survey for the three caves is:

A rotting mound of coffee beans fouls the entrance to Santa Elena. (Jerry Atkinson)

San Bernardo--2436 meters (plus 600+ last year); the resurgence cave--1146 meters (plus Grutas Ateno); Santa Elena--2556 meters.

If you plan to do any caving in the San Bernardo Valley area, please contact Steve Knutson at this address:

505 Roosevelt Street
Oregon City, Oregon 97045

San Bernardo

El año pasado, 1981, espeleólogos regresaron al Sumidero San Bernardo al oeste de la región de Cuetzalan, Puebla. Descubrieron un pasaje iendo rumbo al oeste, hacía un nacimiento grande que se halló el año anterior. Los espeleólogos, esperando hacer la conexión, continuaron explorando en San Bernardo. La galería era amplia con tiros cortos. Habia una pequeña de corriente de agua y una fuerte corriente de aire, con algunos pasos a nado. Finalmente, después de 14 tiros, los espeleólogos llegaron al Río Ateno--habían salido por el nacimiento descubierto anteriormente.

Una cueva en el Cañon del Río Ateno llamado Grutas de Ateno se exploró río arriba unos 500 metros hasta un sifón. Había varios tramos a nado, techos bajos, y una fuerte corriente de aire.

Otro sumidero, Santa Elena, se descubrió en Xochitlán. Se exploró y topografió bajando 14 tiros y 1800 metros horizantalmente desde la entrada cuando comienzaron las lluvias y se dió fin a la exploración. Los espeleólogos esperan volver a Santa Elena este año para seguir con la exploración.

---

la plaza

A casual team of tall, long haired Americans shuffles
out into the pigeon tile tortilla plaza that smells
of urine and tequila rain, drinking Tecate and clicking
cameras. The mirage of a young girl shimmers in an
oleander bordered window above the plaza, stained glass
dress, face fragmented in a broken pane, and thin dark
boys squat in the peso dust before shoeshine chairs.
They watch the Americans silently, the wind in their
hearts stirring the dust at their feet.

An improved -

Ropewalker

Ron Simmons

The rope ascending system described in this article is what I consider to be an improvement on the standard, shoulder mounted Gibbs ropewalker system. The standard system consists of a Gibbs attached to one foot, a floating Gibbs about knee level and attached to the other foot, and a shoulder Gibbs attached to the seat harness. The system I consider an improvement (figure 1) has the same foot and floating ascenders. Only the shoulder Gibbs has been removed, and a chest roller is used as the top load bearing contact with the standing line. A safety Gibbs or other ascender rides above the chest roller and is attached to the seat harness.

This modified system came about because of my dissatisfaction with the shoulder mounted Gibbs. When the top point of contact with the rope is off the body center line, the back and shoulders are twisted to one side, making climbing uncomfortable and awkward. With a chest roller, the body's weight is centered on the rope. Climbing becomes more comfortable with less strain on the back.

When I first started using this system, it was intended for long free drops, which is where the system really shines. Climbing is as natural as walking up steps, and a great deal of weight can be hung from the seat harness for hauling without making climbing all that much more difficult. Also, if one wants to rest while climbing, the safety ascender above the chest roller is pushed up and the climber sits down in his seat harness, which hangs squarely on the rope. Although the system was originally intended for free drops, I have used it in all types of situations in the last four years. I have found it to be suited to all types of drops and to be a good general climbing system.

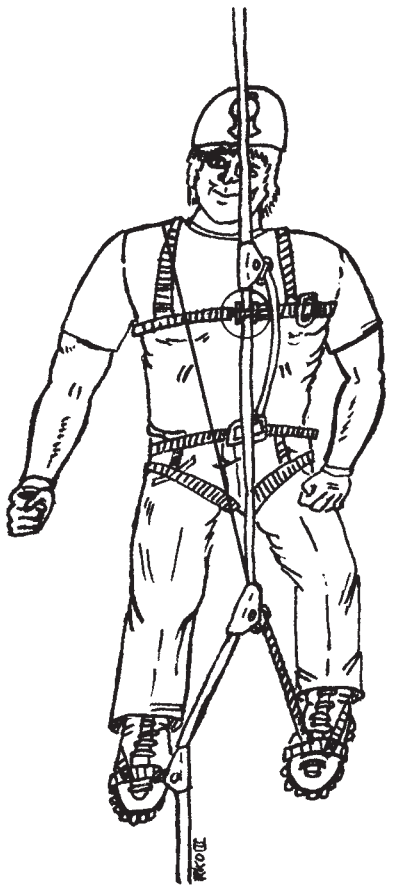


Fig. 1

It still is very effective when a drop is against the wall. For drops inclinded from the vertical by up to 20 degrees, the chest roller can still be used because both arms are free to be used for pushing off of ledges and breakovers. For drops that are inclined more than 20 degrees from the vertical, the chest

roller is removed from the standing line, and one just leans back and literally walks up the wall, using the top ascender similarly to the way the upper Jumar is used in the Texas system. In cases like this a top ascender like a Jumar, Petzl, or CMI proves very handy, because a Gibbs will slide down the rope easily when not loaded. The best advantage of the Gibbs as top ascender in this system is that it will ride up the rope on top of the chest roller by itself. Jumars and other types of ascenders will not always ride up the rope without some assistance. I personally prefer a Jumar as the top ascender despite this slight problem. A Jumar or other easily attached ascender is very handy at pit lips, ledges, or knots.

For the original chest roller I cut down a Gibbs shell and mounted it on a sewn harness. A roller was held in place with a quick-release pin. The main problem with this version was that the roller was not attached to the quick-release pin and could be lost. In the new version the roller is attached to the pin that snaps into and out of the shell and there is nothing to drop.

There are other people who use a climbing system similar to mine except for the chest roller. I have seen Blue Water boxes, Gosset boxes, rescue pulleys, and other similar hardware being used. But all these devices are less than optimum for this particular use. Both the Gosset box and Blue Water box are intended for use in the Mitchell system, which requires two channels; this

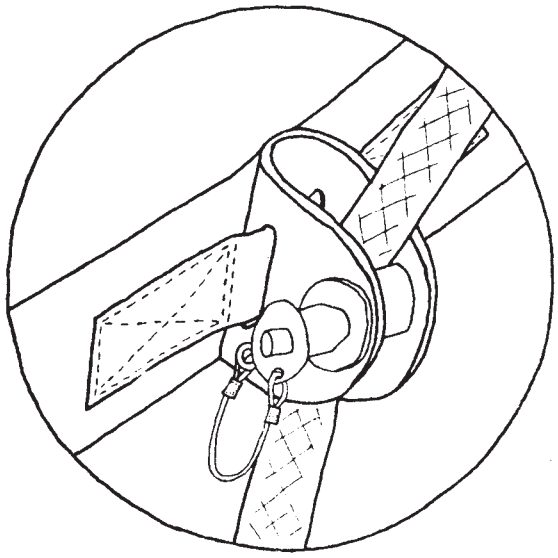


Fig. 1a

makes them overly heavy and bulky when only one channel is needed, as is the case for this ropewalker system. Devices such as pulleys mounted on carabiners let the climber hang far from the rope, making climbing less efficient. The Simmons Roller[1] (fig. 1a) overcomes these problems, since it was designed for the purpose for which it is used.

In summary, I have found this modified ropewalker system to be a very good general ascending system. Although the system was originally intended for long free drops, it is equally at home on difficult, against-the-wall drops. Because of its comfort and ease of use, I would also recommend this system to beginning vertical cavers.

1. The Simmons Roller is available from Custom Cave Gear, c/o Ron Simmons, 2414-4 Barracks Road, Charlottesville, Virginia 22901. The price as of January 1982 is $19.00 plus shipping.

Sistema "Ropewalker"

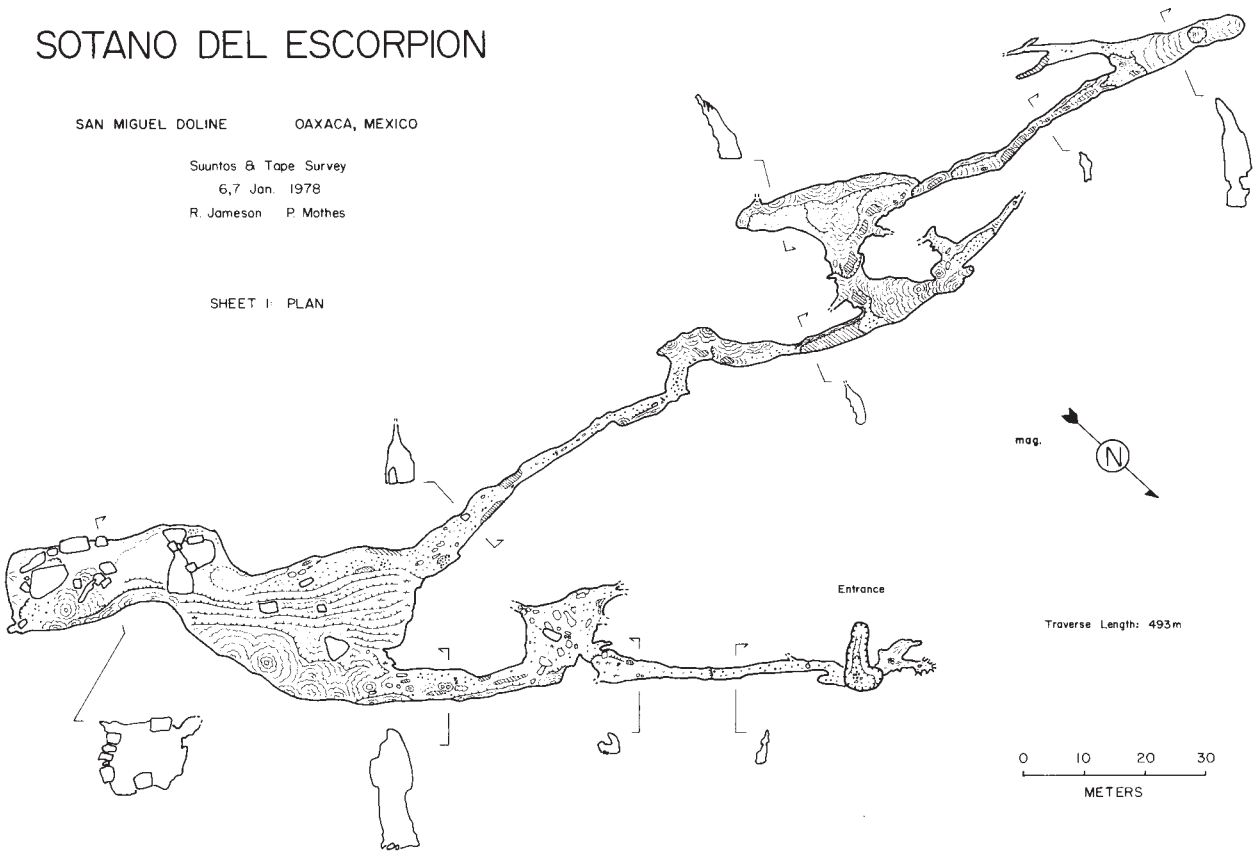
Un acensor Gibbs se puede adaptar para ser usado como una polea al harnés superior con el sistema "ropewalker." Es versatil para todas situaciones de subida de cuerda--tiros libres tanto como tiros pegados a una pared. Un acensor de seguro se debería fijar arriba de la polea Gibbs y se conecta al harnés inferior. La caja de polea "Simmons" se consique de Custom Cave Gear, c/o Ron Simmons, 2414-4 Barracks Road, Charlottesville, Virginia 22901, EEUU. El precio en enero 1982 es de $19.00 U.S. mas envío.

SOTANO DEL ESCORPION

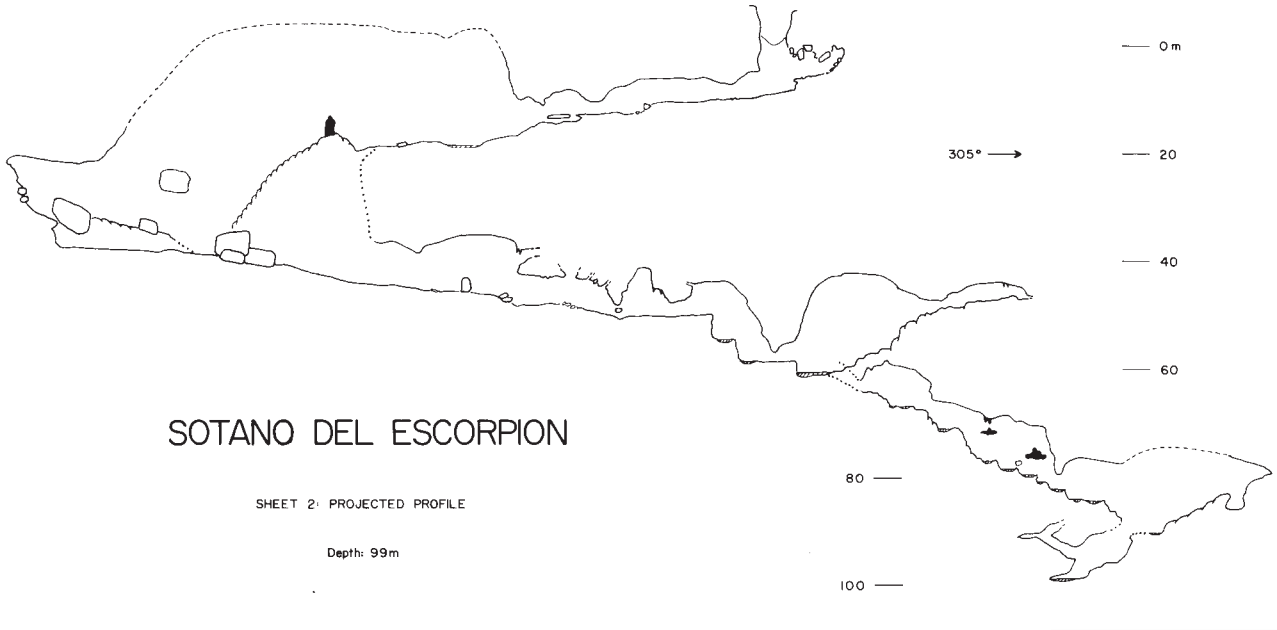
SAN MIGUEL DOLINE OAXACA, MEXICO

Suuntos & Tape Survey
6,7 Jan. 1978
R. Jameson P. Mothes

SHEET 1: PLAN



RAJ



SOTANO DEL ESCORPION

SHEET 2: PROJECTED PROFILE

Depth: 99m

RAJ

Caves of the San Miguel Doline

Roy Jameson and Patricia Mothes

The San Miguel doline lies on the north edge of the town of San Miguel in the state of Oaxaca. Although it has numerous cave entrances and has been known to AMCS cavers since 1965, the San Miguel doline was largely ignored during early explorations. We visited the doline during the 1977-1978 La Grieta Expedition and mapped seven caves which we have labeled Cueva Inclinada, Sótano del Agua, Sótano del Escorpión, Cueva de la Sala Grande, Sótano del Cangrejo, Cueva Chica, and Cueva de las Tinajas. The purpose of this article is to publish the maps, provide cave locations, and describe the better cave leads that remain.

The San Miguel doline is roughly elliptical in shape, perhaps 1 kilometer long, 3/4 kilometer wide, and 125 meters deep. At its northern end, near the Rio Iglesia doline, the San Miguel doline is rocky and uncultivated. Further south there is more soil, allowing cultivation of the steep doline walls, especially near San Miguel.

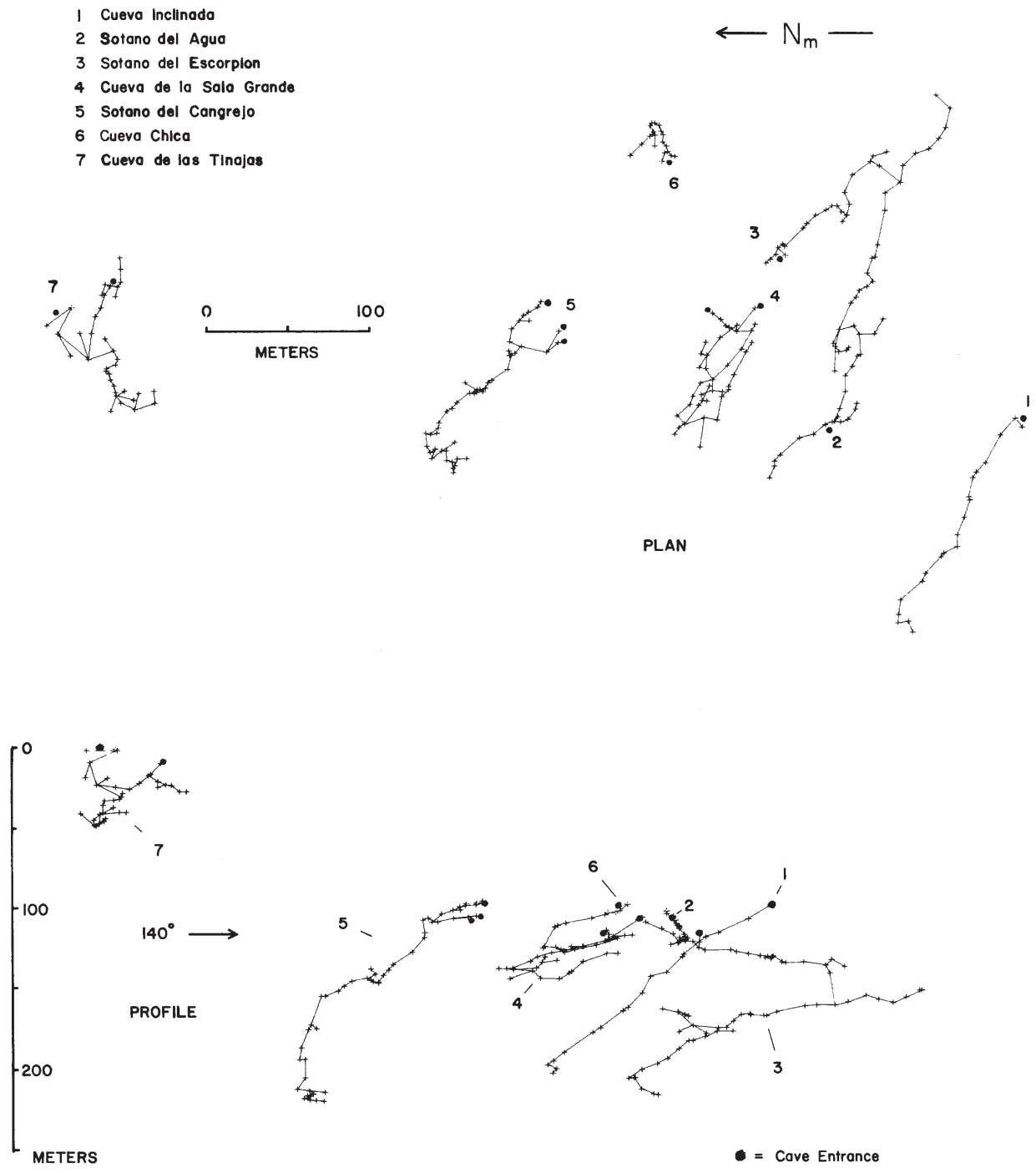
In the bottom of the doline are two milpas separated by an east-west trending ridge. Most of the mapped caves lie on the perimeters of the milpas and have swallet entrances, as shown on the doline sketch map. Only one cave, Cueva de las Tinajas, is located on the doline walls. It is north of the other caves and about 80 meters higher (see area profile). The area cave map shows that the majority of passages trend to the northwest, roughly in the direction of the dip of the outcropping Cretaceous limestones. If the caves can be pushed farther northwest, they may intersect the main drainage of the Sistema Huautla. Consequently the subsurface leads are worth pursuing.

The best leads are in Cueva Inclinada, Sótano del Cangrejo, and Cueva de la Sala Grande, but Sótano del Escorpión and Cueva Chica also deserve to be pushed. Neither Sótano del Agua nor Cueva de las Tinajas are likely to relinquish further passage. The latter cave ends in flowstone-covered boulders, and the former sumps in a constricted crawl. Furthermore, Sótano del Agua comes very close to the upstream sump in Cueva de la Sala Grande, so a push is liable to garner nothing more than a nasty connection.

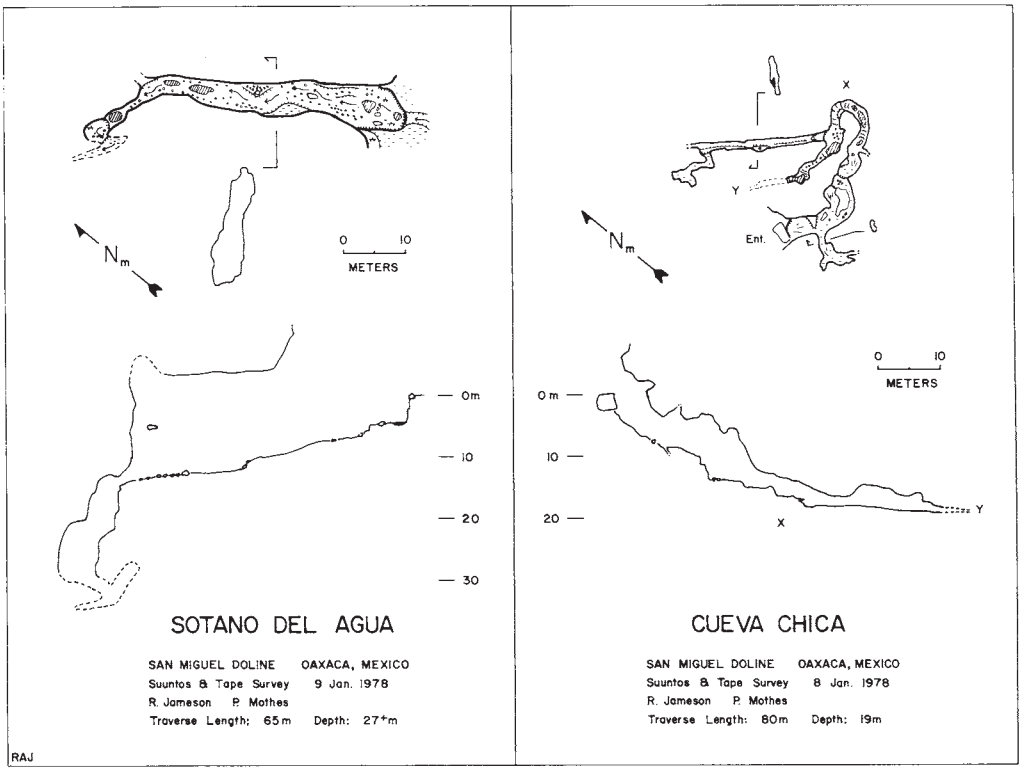
Cueva Inclinada would be the easiest cave to push, but the lead may require bolting. The cave has a swallet entrance and trends steeply down exposed bedrock, which locally dips up to 30 degrees. Thus a long handline would be needed to prevent uncontrolled sliding during wet weather. When we were there in January the streambed was dry, so the only rigging necessary was a 50 meter rope for the drops near the middle of the cave. At about -100 meters the cave becomes a high, muddy fissure, the lower part of which is blocked by a flowstone-covered boulder. It may be possible to climb over the boulder

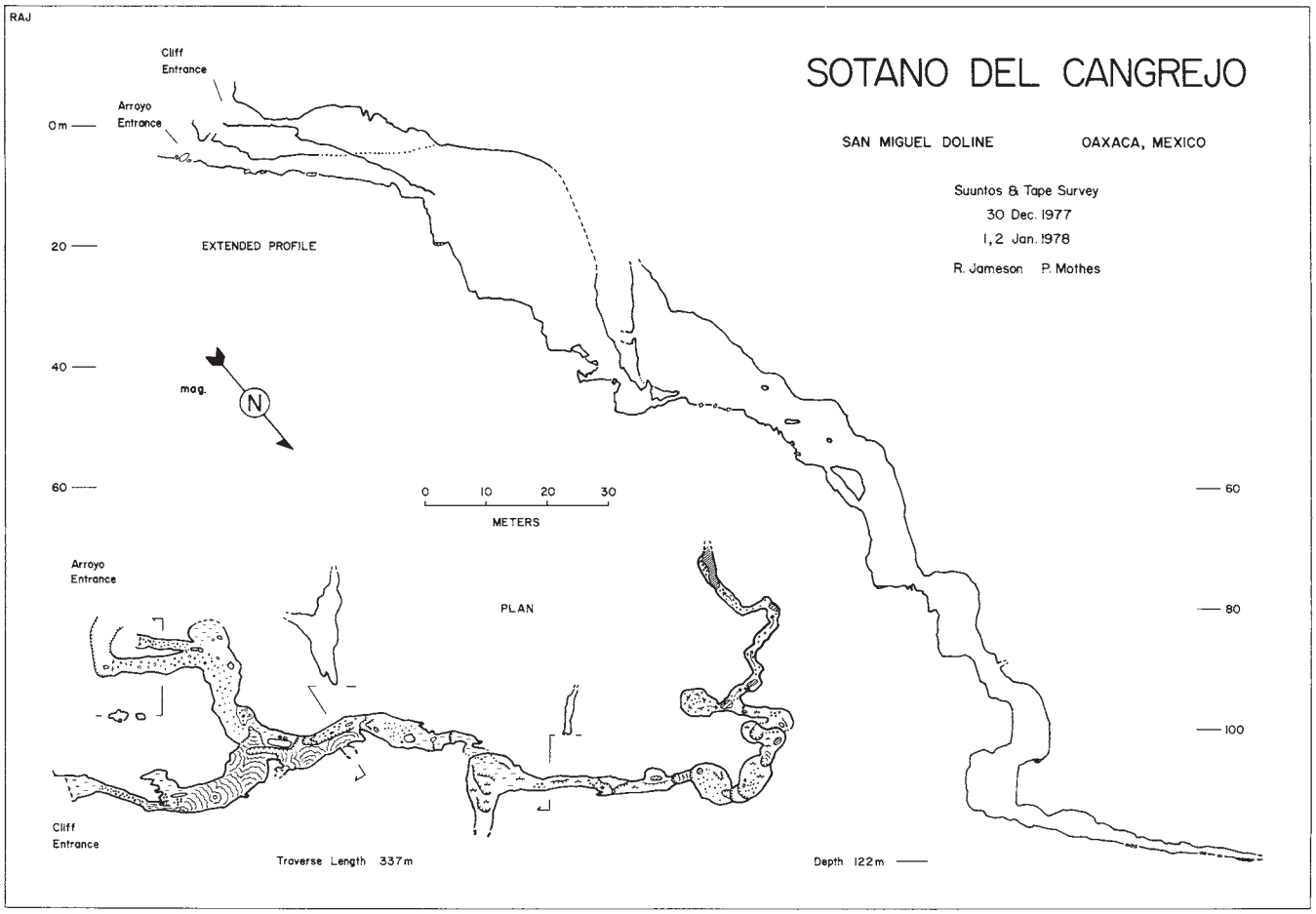
(text continued on page 41)

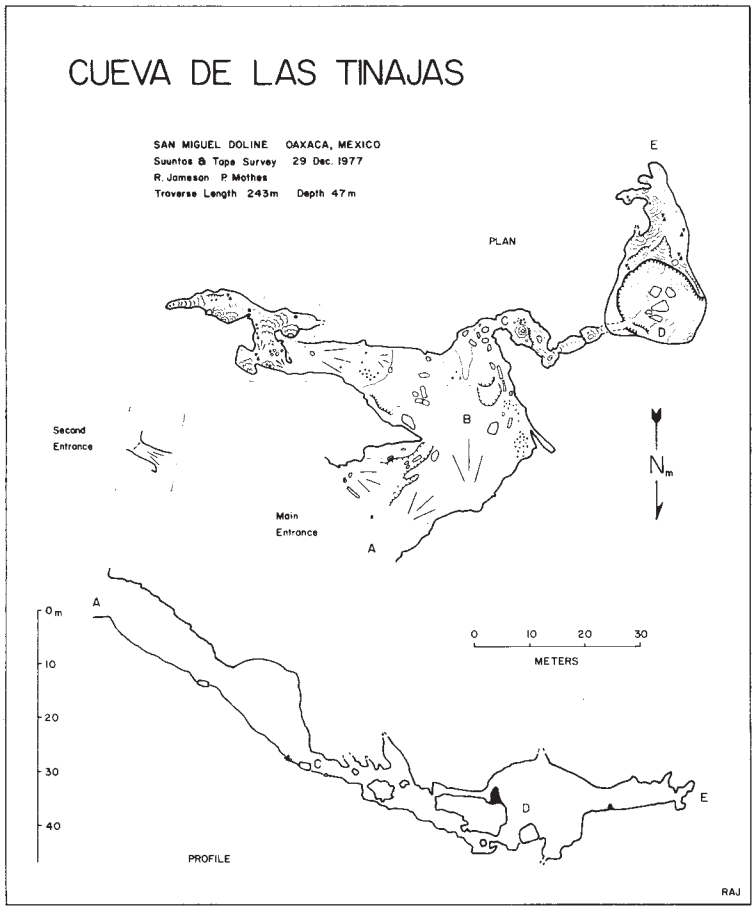
AREA MAPS — SAN MIGUEL DOLINE

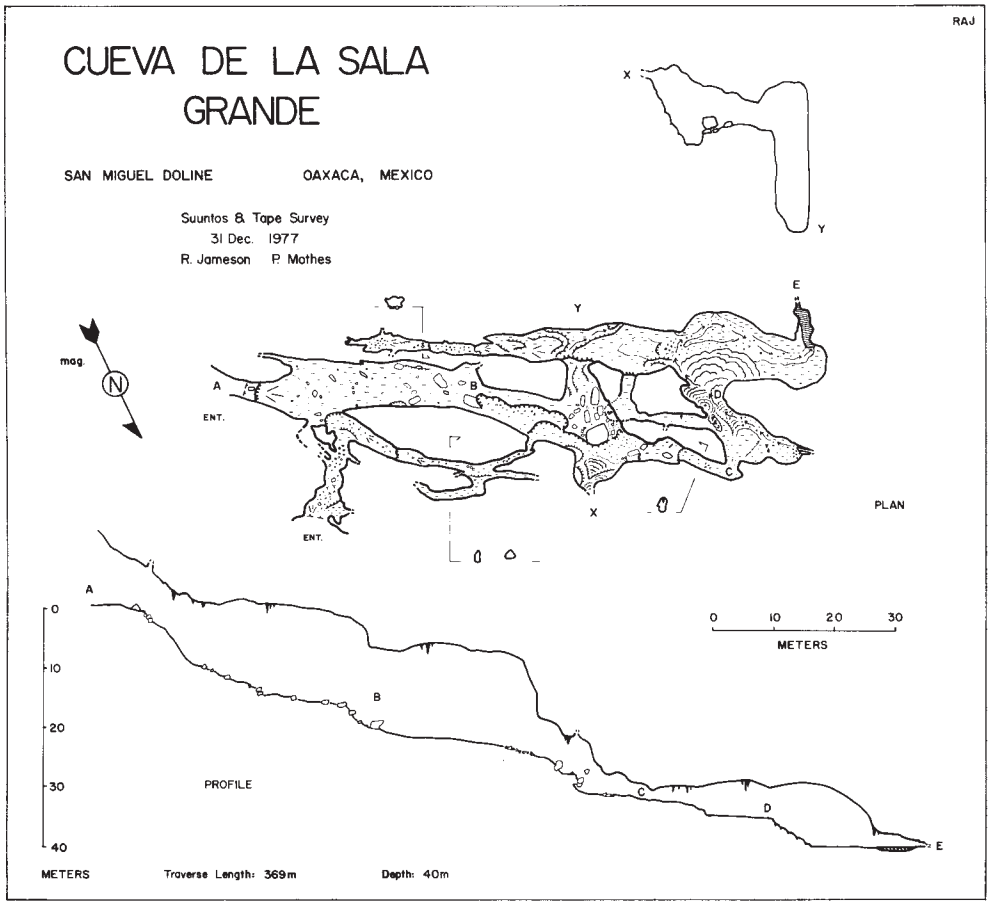


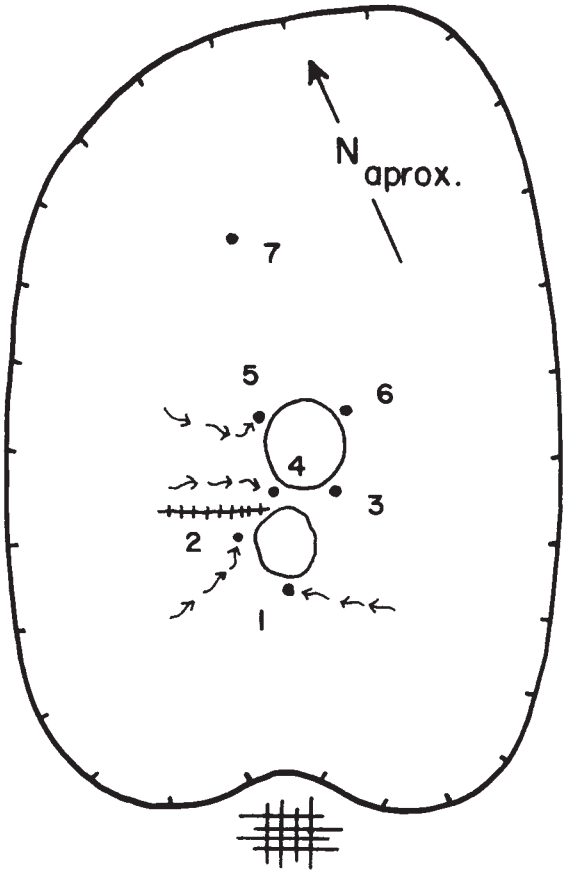
(Supplementary area map on page 41)


0 10
METERS
Nm
0m
10
20
30
SOTANO DEL AGUA
SAN MIGUEL DOLINE OAXACA, MEXICO
Suuntos & Tape Survey 9 Jan. 1978
R. Jameson P. Mothes
Traverse Length: 65m Depth: 27+m
RAJ
X
Y
Ent.
0 10
METERS
0m
10
20
X
Y
CUEVA CHICA
SAN MIGUEL DOLINE OAXACA, MEXICO
Suuntos & Tape Survey 8 Jan. 1978
R. Jameson P. Mothes
Traverse Length: 80m Depth: 19m


RAJ
SOTANO DEL CANGREJO
SAN MIGUEL DOLINE OAXACA, MEXICO
Suuntos & Tape Survey
30 Dec. 1977
1,2 Jan. 1978
R. Jameson P. Mothes
Cliff Entrance
Arroyo Entrance
0m
20
40
60
EXTENDED PROFILE
mag.
N
0 10 20 30
METERS
Arroyo Entrance
PLAN
Cliff Entrance
Traverse Length 337m
Depth 122m
60
80
100


CUEVA DE LAS TINAJAS
SAN MIGUEL DOLINE OAXACA, MEXICO
Suuntos & Tape Survey 29 Dec. 1977
R. Jameson P. Mathes
Traverse Length 243m Depth 47m
PLAN
Second Entrance
Main Entrance
A
B
C
D
E
N_m
0 10 20 30
METERS
0m
10
20
30
40
PROFILE
RAJ


RAJ
CUEVA DE LA SALA GRANDE
SAN MIGUEL DOLINE OAXACA, MEXICO
Suuntos & Tape Survey
31 Dec. 1977
R. Jameson P. Mathes
mag.
N
A
B
C
D
E
X
Y
ENT.
ENT.
PLAN
0 10 20 30
METERS
0
10
20
30
40
PROFILE
METERS
Traverse Length: 369m
Depth: 40m



SAN MIGUEL

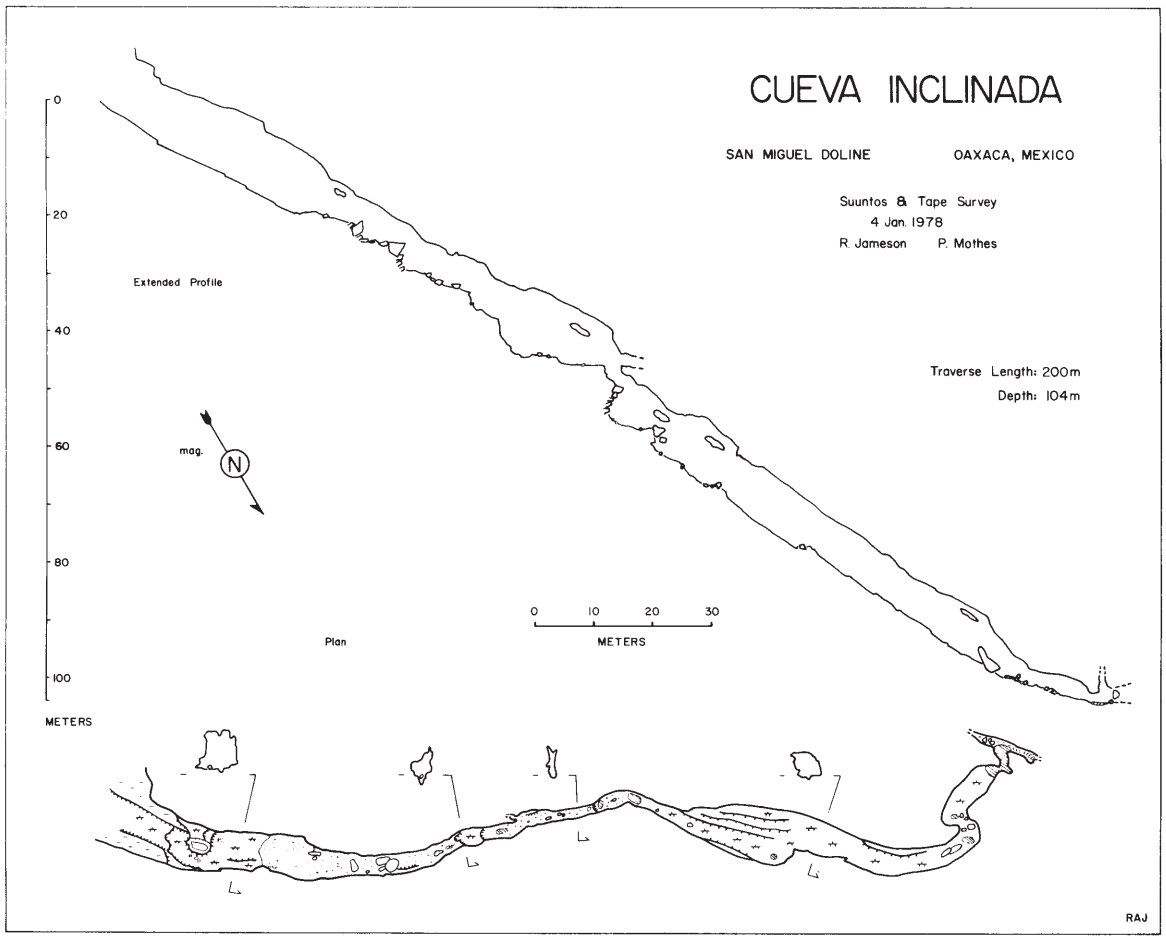
with aid, and a draft suggested that the climb would be worth the muddy hassle.

Sótano del Cangrejo, named for the terrestrial crabs encountered in Crab Crawl, undoubtedly has the best lead. The preferred entrance is the lower arroyo entrance which is rapidly followed by drops of 25,18,13, and 20 meters. Near the bottom of the last drop is a side passage with a wet dome. The water drains into the main passage, which rapidly lowers to a wet crawl. The distinct draft and the sound of a small rapid (or perhaps a small waterfall) makes this an enticing lead. We recommend wetsuits as well as bolts or chocks to reduce rigging hassles on the last three drops.

Cueva de la Sala Grande has the most complex plan of the seven caves. There are several possible routes to the lead, which is a muddy terminal sump. The sump should be checked late in the dry season.

Sótano del Escorpión is easily the most aesthetic of the caves, mostly because of the large flowstone covered rooms, but also because of a spectacular flowstone climb with a relief of nearly 30 meters. The cave is named for a new species of troglobitic scorpion that was first found here but was later collected in other caves of Sistema Huautla. The lead is a muddy climb just above the lowest point in the cave. Bolting gear might be helpful, but this lead is not very promising. Sótano del Escorpión requires at least three 30 meter ropes in order to have lengthy handlines at the tops of the drops. The entrance should be rigged on the low side and the rope carefully concealed. The final drop is into a 1.5 meter deep pool, so getting wet is unavoidable. Note that the previously mentioned flowstone climb does not need to be rigged.

Cueva Chica is a moderately nasty cave in which one crawls over flowstone after negotiating the climb over (or down) the entrance boulder and sliding down a mud slope. We mapped in, ran out of time, and so we did not crawl very far down the main passage. No air flow was noted.



San Miguel

La Dolina San Miguel está situada en el extremo norteño del pueblo de San Miguel, Huautla, Oaxaca. Durante la expedición 1977-1978 a La Grieta, la dolina fué visitada y se topografiaron siete cuevas. De poder encontrar la continuación con dirección hacía el Noreoste, sería posible hacer una conexión al drenaje principal del Sistema Huautla. Cueva Inclinada, Sótano del Cangrejo y Cueva de la Sala Grande son los que más prometen, pero Sótano del Escorpión y Cueva Chica también merecen otra visita.

The Exploration of

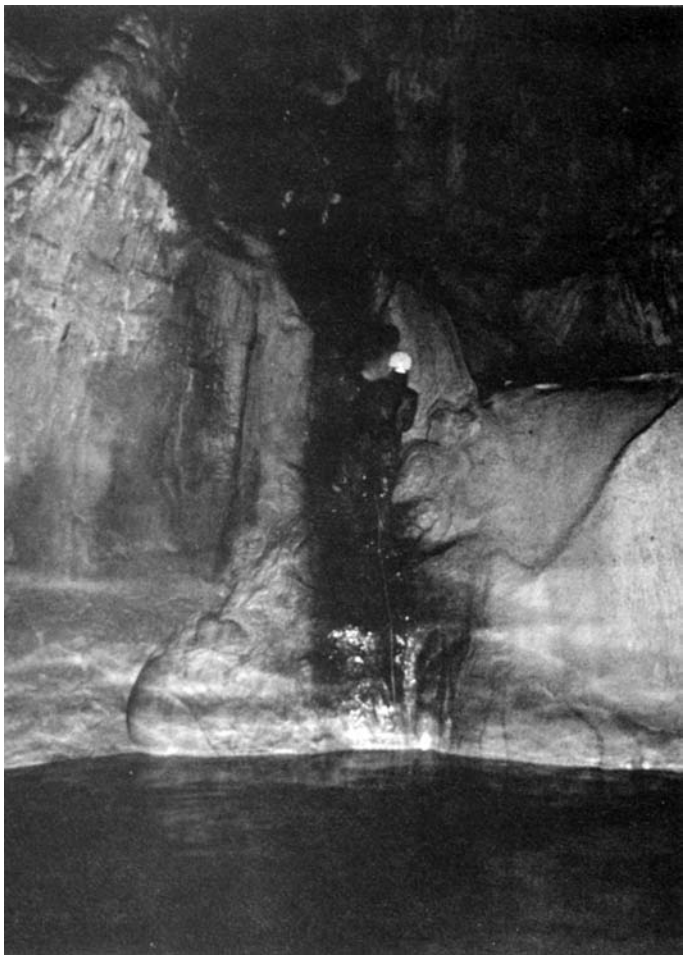
Boca del Río Apetlanca

Sheri Engler

Photos by Dan Quinlan

One morning in March of 1978, 250 meters of rope, three inner tubes, wetsuits, vertical gear, cave packs, helmets, Thom Fehrmann, Don Coons and I threaded our way up a lush arroyo to a cave entrance that we named Sumidero de Acahuizotla. Sumidero actually means sinking stream. In the wet season, water from the surrounding mountains drains into a steep-sided gorge and then drops out of sight into one of three adjacent pits. The tiny town of Acahuizotla is located in southern Guerrero, México, about 60 kilometers north-east of Acapulco, and the cave entrance is located about 2.5 kilometers from the town.

Two years before, Skip Roy had shown Don this entrance and also a large spring entrance 200 meters lower and nearly 2.5 kilometers away. We, of course, were hoping to make this connection. The first day found us lowering our equipment and ourselves down the 23 meter entrance pit and surveying our way to a rather deep plunge pool. We returned the next day, donned our wetsuits at the bottom of the first drop, and a surveyin' we did go. We surveyed our way down a pas-



Calcite-filled fractures decorate the walls of several passages.

sage averaging 16 meters in height and 7 meters in width -- beautiful and stream washed, it was!

The cave was formed basically like a staircase with a trickle of water cascading down. There was a drop into a plunge pool followed by horizontal stream passage, then another drop into a pool, horizontal stream passage, and so on down five pitches. The drops ranged from 23 meters in depth to only 2 meters. We found it necessary to rig even the 2 meter drop because it had overhanging, smooth walls and plunged immediately into 2.5 meters of water. We surveyed our way down three of the drops and explored our way down the others to a cobble beach in a room with two leads. On the right, there was a tiny crawl that quickly became mud filled. The lead on the left was a stoop-walk in a meter of grungy, debris-littered water. The surface mat was alive with beetles that showed a particular affinity for any dry caver who happened along. Luckily, the whole thing ended in a debris choke within 50 meters. We were all sitting on a beach in this final room, feeling glum and casting quizzical looks at a ceiling channel above us, when suddenly there came a low rumbling sound. We all looked at one another. Blasting on the surface? Water? An earthquake? Then we knew for sure as everything started shaking. We managed to stagger to the side of the passage to avoid the possibility of falling breakdown. The shaking lasted about 25 seconds and was followed by 45 minutes of water sounds as waves sent spilling from plunge pool to plunge pool, lapping against the walls, and echoing their way down to us. We decided to call this final room Terremoto Termina (Earthquake End).

What an adrenaline rush! No aftershocks seemed to be forthcoming, so we decided to survey our way out of the cave. We all tried to appear unconcerned as we got to each rope, privately wondering if the earthquake could have dislodged our anchor. Our main concern was the entrance drop, where we had rigged to a large chock stone. We finally got there and all was well. What a relief that no one had to attempt free climbing and bolting up the 23 meter exposure!

The following day we broke camp and decided to investigate the spring entrance that Don had seen 2.5 kilometers away. The entrance was on a small river, and a very impressive maw it was - 30 meters high and 17 meters wide. To our surprise, however, a 4 meter dam had been built in the entrance, a pumping station erected, and workers and engineers were everywhere. This entrance was to supply water, via a pipeline, to the city of Chilpancingo (pop. 50,000), 40 kilometers away. We were told in no uncertain terms that we could not enter the cave (and the city's water supply). Our disappointment was obvious, but a good bath in the river was a compensation.

The following year (March 1979), we returned to check out the ceiling channel at the Terremoto Termina, which we knew required a bolt climb. Our party comprised Don, Phil O'Dell, Rick Schwartz, Dan Quinlan, and me. We found a really nice campsite in a tree-shaded area just above a dry streambed. Chachalacas, raucous trop-

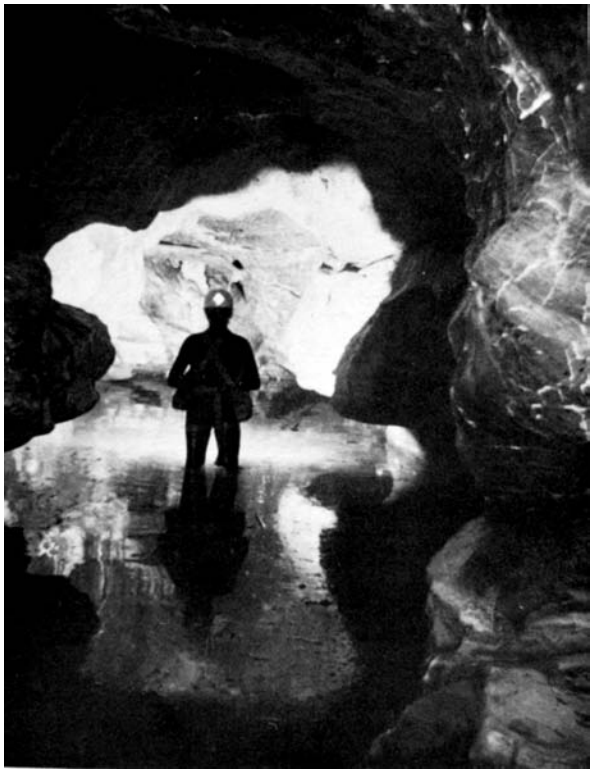
ical birds, were plentiful and woke us early each morning. The plant life near the streambed was rich and varied, even though this was the dry time of year, and the fantastically huge, irridescent blue and black butterflies that floated by in the sunlight were a special delight.

We spent the first day ransacking the truck for bolt kit, ropes, wetsuits, inner tubes, and miscellaneous gear, hoping to get an early start the following morning. Rick was not feeling up to par that day and elected to enjoy "the birds and the bees." The rest of us headed for the sumidero, and, entering the cave at about noon, we negotiated the five drops and arrived at the bolt climb in good time. This climb was truly a sight to behold. Unfortunately, we had neglected to bring an etrier. After setting a bolt or two, Don found that reaching the next bolt point was almost impossible without this three-step ladder. He hung in his sling trying to set the next bolt, while Dan, who had climbed partway up the wall, handed him the necessary equipment. Meanwhile, Phil manned the belay line, while I manuevered a second rope in an attempt to give Don additional balance. While all of this was transpiring, a large stonefly, about 15 centimeters in length and brandishing huge pincers, attached itself to Phil's neck. Phil cringed as he felt the stonefly grab hold, but could do nothing about it without disturbing his belay stance. I managed to pluck the beast off, and Don finished his climb. As soon as the sweat had evaporated from his glasses, Don went crawling off, only to find that the ceiling channel went 7 meters and dropped back into the main passage.

A woeful group we were! At this depressing point, Dan thought that it might be amusing to see all the beetles and the debris choke. So off we went down the stoop-walk, only to find that the debris had been flushed out. There was a flowstone restriction about 0.5 meters wide that led into a 1 meter by 1 meter passage that blew a gale of air. Cave ho! Off we went for 30 meters, and the passage opened to 4 meters by 4 meters. Soon it was 13 meters high and 7 meters wide, with stream-washed walls of black metamorphosed limestone with white fractures. There was precious little time spent in enjoying the beauty all around us, as we went rushing madly down the passage hot on the trail of a connection. After a kilometer, we came to a large fork. The left-hand side, upstream, ended in a 5 meter wide sump bringing in 10 cubic feet per second (CFS) of flow. We continued downstream, and after 500 meters we came to a duck-under with about 10 centimeters of air space.

We came up in a room 3 meters

Phil O'Dell in the passage just past the Terremoto Termina where a log-jam had stopped exploration on the first push.



A crab was found in the stream of the main trunk passage.

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long and 2 meters wide with 1.25 meters of water. Groan. Was our beautiful passage to end so abruptly? Don could feel a space under the back wall with his feet. We had a rope, so why not? He decided to free-dive the sump and told us to pull like hell if he wasn't back in 45 seconds. We counted to 42, and Dan and Phil started pulling like crazy. Glub glub. Don came spluttering up from under the wall. He had just come up in another room when he was jerked rudely back. So under he went again, this time with a better system of signals worked out. The result of the 3 meter dive was only another room similar to the one we were in, with no reasonable prospects for further diving penetration. So we trundled back to camp and a comforting supper.

The following morning saw us all heading for the sumidero, this time equipped with photo equipment and survey gear. Dan and Phil put their energies into capturing the cave on film, while Rick, Don, and I set off to survey the cave we had found on the previous day. It was a most rewarding trip, with over a kilometer of survey tallied and two rolls of film shot. Our only new discovery of the day was a population of freshwater crabs living in the stream.

Reviewing the situation on the following day, we decided to try entering the spring entrance, even if this meant sneaking past an army of engineers at night. We felt that we might be able to survey to the sump from the downstream side, so Don and I did a surface survey, hoping to correlate the segments of the cave with an aerial photo. Late that afternoon, our party adjourned to the spring entrance to assess the possibilities of entering the cave. Much to our happy surprise, we found only one friendly caretaker at the completed pumping station, and he granted us permission to enter the cave.

Since Don had gone a short way from the spring entrance four years before, we knew that we would be climbing (or shall I say fighting?) our way up a series of waterfalls with about 10 CFS of water. We therefore thought it more practical to have some kind of scaling pole, in addition to our normal caving paraphernalia. This is how the NSS Nurd came to be. From the local hillside, Phil and Don procured two 3 meter long saplings. These we took to the entrance, La Boca del Río Apetlanca (the Mouth of the Apetlanca River). We raised a bit of local interest walking across the suspension bridge towards the entrance, clad in full wetsuits, hardhats, and carbide lamps, and carrying ropes, inner tubes, packs, and the two saplings. At the entrance, we threw the smaller sapling into the water--and it sank! Not too practical. This problem was solved by lashing the two pieces together. In this way, we were able to propel and carry the NSS Nurd towards the fourth waterfall, where it might come in handy.

Soon after entering the cave, we were swimming along the bottom of a large keyhole canyon about 30 meters high and ranging from 7 to 17 meters wide. We surveyed 60 meters of passage to the first falls, and were able to attain the top of this 2 meter plunge by swimming to a ledge at the bottom and then chimneying up a narrow chute just outside the main force of the water. The waterfalls that followed reached as much as 6 meters in height, but they all had one thing in common: they carved their way into a narrow chute before dropping the main force of water. Some of the falls we could climb around. Others, we had to swim like hell against the current to reach even the base of the falls. Handlines that Don threw down from the top were very helpful when the rest of us were trying to stay out of the main force of the water and chimney up the chute. As it turned out, the Nurd was installed above the third falls. We climbed up to a ledge and then shimmied across the Nurd to another ledge about 2 meters away and 2 meters above us. At this juncture we abandoned the survey due to instrument failure.

Up and up we struggled through torrents of water. Each waterfall posed its own problem, but there was always a way to the top if we tried hard enough. The fourteenth waterfall almost proved our bane. It practically filled a 4 meter vertical chute as it fell into a deep pool. The current leading to the falls was very swift and flushed Don out twice. On his third attempt, he dove for an alcove, where he was fortunate enough to pick up an eddy current that deposited him at the base of the falls in 3 meter deep water. The walls of the chute were perfectly smooth, and there was precious little room between the downpour and the outer face of the chimney. Treading water, he searched for a foothold, but the walls of the chimney were undercut just below the surface of the water. The only alternative was to plant his hands on opposite sides of the chimney while treading water and wedge himself up inch by inch until he could get his feet into the chimney. After being swept away twice, he was finally successful in this maneuver. He continued immediately to the fifteenth waterfall, which was nearly 6 meters high, overhung, and had walls that were 2 meters apart. Fortunately, however, there was a hole in the wall about 7 meters downstream that led into a chimney. A series of ledges ended within 2 meters of the passage beyond the falls. There was only blackness ahead. A bolt kit was definitely in order.

Our exit from the cave was fast and fantastic. We were able to ride the current, being swept over the falls and into the plunge pools below as though we were riding a giant waterslide. Out and down we sped, reaching the entrance in practically no time at all.

Dan, who had stayed on the surface with a malaise the day before, rejoined us as we returned the next day with the necessary bolt kit and ropes. Don and Dan were able to climb and rig the troublesome fourteenth falls for the rest of us. Then, with the aid of a bolt, they were able to climb and rig the fifteenth falls. After reaching the top, we were all awed to see the blackness that stretched before us.

For the next kilometer, the passage was never less than 10 meters high and 10 meters wide and was at times 20 meters high and 15 meters wide. We were also excited to see the same black stream-washed limestone that we had seen near the upper entrance. Suddenly the walls started closing in, and ceiling came down. Oh no! We found ourselves in a 5 meter wide room with only about 20 centimeters of air space. And then--a sump. I could have cried. Phil however, started poking around and found a tiny airspace,

1 centimeter high, under one wall, through which air flowed and rippled the water surface. Always the engineering type, Phil started everyone digging a channel just below the pool. Within an hour, there were several centimieters of air space. We ducked under the wall and--connection ho! We popped up right into the main passage about 10 meters from our final survey point. What a surprise! From the upstream side, it had appeared to be a blank wall. We were ecstatic. We danced around, thanked the cave god, Oztotl, and broke out the survey gear.

We started surveying our way back downstream and went over five hundred meters to a lead on our left about 15 meters above stream level. After 75 meters, this ended in a siphon, but we found the names: José Angel, Tito, and Agel P. We searched thoroughly, but could find no other upper entrance near the side lead. Apparently they had come in the say way we did. Hmmm? We figured that this would be possible at extremely low stream flow, although unusual for just three unequipped individuals. So this downstream section of the cave had been entered before, but we were almost surely the first people in the upstream end and the first group to establish the connection. We finished our survey at 3 kilometers and went surging out of the cave.

If a group knew where to dive the siphon, and if the water was low enough, they could make a pull down trip, and what a fine trip it would be. Starting from the Sumidero de Acahuizotla and sluicing out La Boca del Río Apetlanca is a dream I hope to realize one day. Till then, cave ho!

Apetlanca

Cerca del pueblo de Acahuizotla, se exploraron y topografiaron dos cuevas y se logró la conexión entra ellos. En Marzo, 1978, se exploró la cueva superior, Sumidero de Acahuizotla. Consiste en de una serie de cinco tiras desde 2 hasta 23 metros de profundidad. Al pie de cada tiro, hay una poza de agua, y hay pasaje horizontal entre cada tiro.

Los exploradores llegaron hasta donde apareció estar tapado con materia organica. Estando allí, todo comenzó a temblar durante 25 segundos. Por eso dieron el nombre Terremoto Termina a este salón.

En Marzo 1979 los espeleólogos regresaron a la región. Hallaron una continuación de Terremoto Termina que se extendía un kilometro hasta al parecer, llegar a un final. Exploraron el resurgimiento a 2.5 kilometros de distancia y un desnivel de 200 metros del Sumidero. Aproximadamente 280 litros por segundo forman las cascadas de la La Boca del Río Apetlanca. Fué necessario usar el tronco de un arbolito para facilitar la escalada de quince tiros con cascadas. Encima del quinceno hallaron un pasaje horizontal amplio, el cual se iba cerrando hasta llegar a un sifón. La conexión se logró por el sifón al salón termina de Sumidero de Acahuizotla.

BOCA DEL RIO APETLANCA
Guererro, Mexico

Suunto Compass and Tape Survey

by

MARCH 17-18, 1978	MARCH 8-11, 1979
Don Coons ; book	Don Coons ; book
Sheri Engler ; compass	Sheri Engler ; compass
Thom Fehrmann ; chain	Phil O'Dell ; chain
	Dan Quinlan ; chain
	Rick Schwartz ; chain

SYMBOLS

passage walls
cross section water
undercut walls
change in ceiling height
dome
dropoff
ledge
cobbles
sand
stalactite stalagmite flowstone column
breakdown
pool rapid falls
streamflow siphon
slope clay fill
near siphon
dam pipeline
ceiling height (air / water)
rope drop (distance below entrance)

N mag

PLAN SCALE

100 0 100 300

feet

cross sections drawn to scale

extended profile 1/2 scale

all dimensions in feet

all drops require 25' extra rope to rig

TOTAL LENGTH: 1.6 MILES

TOTAL DEPTH: 455 FEET

La Boca

Mainstream Siphon

lead

TERREMOTO TERMINO

Sumidero de Acahuizotla

La Boca

Sump Diving in Carrizal

Wayne Russell

La Gruta de Carrizal is located near the base of Pico de Carrizal, about 25 kilometers north of Bustamante, in the state of Nuevo Leon. It was the first cave described in the AMCS Bulletin No.1 (1965) and was, until recently, one of the most visited caves in northern México. Despite this popularity, explorers found few new leads in the cave. The only two obvious leads were blocked by sumps. Recent efforts by cavers using scuba gear led to the discovery of more than 500 meters of virgin cave in and beyond the sumps, with no end in sight.

Wayne Russell preparing his dive gear prior to entering CWS No. 1. (Paul Johnston)

The cave has two entrances. One opens onto a dry, sand-floored upper level. This is mostly walking passage with numerous side leads that, with few exceptions, soon pinch out. Much of the upper level contains sedimentary deposits up to 5 meters deep, and several pits have been dug in the floor, apparently by phosphate prospectors. Some of the pits are deep enough to pose a definite hazard to unwary cavers. Another hazard associated with this part of the cave, as with other dusty phosphate caves in the region, is histoplasmosis.

The second entrance opens onto a lake room that is fed by two different streams, one of which is noticeably warmer that the other. (85.5°F vs. 70°F). These hot and cold springs are the main attractions of the cave. Because the cave hosts a moderate bat population that prefers to roost in the stream passages, the water is definitely polluted except in the immediate vicinity of the sumps.

The warm spring has been popular with cavers since the early 1960s. A small decorated section of dry cave was reached by free diving along the right wall of the sump. In 1971 two novice cavers drowned while trying to duplicate this dangerous feat without a guideline or an air supply. The longest part of the cave is the cold stream passage. It is about 300 meters long and varies from 2 to 12 meters in height, "ending" in a small, uninviting sump.

In September 1980, John Strong and I visited the cave to see if the cold stream passage sump was divable. John tended the line, while I made a solo recon dive. The sump is wide and very shallow, but the ceiling is

Cold water sump No. 1 is a low, wide sump which is rather difficult to negotiate. (Paul Johnston)

so low at first that it was necessary to carry the tank at my side instead of on my back. After 6 meters or so I emerged in a low, air-filled passage. The ceiling gradually rose enough to allow walking, then dipped below the water line again at another sump. The new passage was about 70 meters long, with bare walls and ceiling. No air circulation was detected. Encouraged by this discovery, I returned to Austin to round up more divers.

On the next trip I was joined by Jerry Johnson and Paul and Barbara Johnston. Paul and Barbara are both cavers and divers but, being sensible people, don't cave dive. They came along to see the cave, observe the dive, and take pictures. After stringing Cold Water Sump No. 1, Jerry and I only had 20 meters of line left for CWS No. 2, so we were hoping for another short dive. It didn't work out that way. When the end of the line was reached, the passage continued with no end in sight. Since it is a cardinal rule of cave diving that one never dives in a cave without a dive line, the dive was aborted. Next time we would make certain we had enough line.

The next effort involved Mike Glover, Jerry Coleman, and me. We brought 300 meters of line--just in case. All made it past CWS No. 1, but then gremlins struck. Jerry had lost a strap on his tank, making it awkward to handle, and was having some difficulty developing a positive attitude about further penetration, so he elected to stay behind on dry land while Mike and I dived CWS No. 2. After a few delays we dove as far as an airbell near the previous limit of exploration, where Mike decided to turn back. It was agreed that after Mike was safely back with Jerry, I would continue the dive for a short time and tie off the line if I didn't find air passage. Like its predecessor, CWS No. 2 was wide, very shallow, and occasionally very low, with a flat ceiling and a sand floor. After 50 meters I came up into air passage and established a perman-

ent line through the sump.

A quick recon revealed about 200 meters of winding, well decorated walking passage and large, unstable breakdown chambers terminating in CWS No. 3. This was virgin cave, and pretty at that! The air was also fresher here. No leads were noticed except CWS No. 3.

After I rejoined the others, Mike and I made a quick recon dive in the warm spring, pushing about 30 meters to a small air bell, then left the cave. The warm spring is quite different from the cold water sumps. It is larger and deeper, allowing the use of fins and buoyancy compensators, which aren't feasible in the cold stream passages. The water temperature is also quite comfortable, so wet suits aren't needed.

In January 1982 I returned with Larry Cohen, Mike Clover, Jerry Johnson, Mike Sheffer, and George Veni. We split into two teams. Glover, Johnson, and Veni surveyed 135 meters from CWS No. 1 through CWS No. 2 while Cohen, Sheffer, and I surveyed 144 meters of dry cave beyond the warm spring sump. A dive line was also laid to the back of the first underwater chamber of the warm spring. Here a pit leads to a lower, as yet unexplored level.

The next day George and I tried to continue the survey beyond CWS No. 2. Unfortunately our Suuntos were waterlogged from the previous day's activity so the survey was aborted. Deciding to explore, we successfully penetrated and strung CWS No. 3, 4, and 5 and pushed about 40 meters to the end of our line without reaching air passage so we reluctantly called it a day and returned to the surface.

Much remains to be done in this interesting cave. Several leads remain to be checked and mapping has just started.

The Rancho Carrizal has been converted to an ejido. The gate to the property is now kept locked and access is limited.

Carrizal

La Gruta de Carrizal se localiza cerca de la base del Pico de Carrizal, a unos 25 kilometros al norte de Bustamante, Nuevo León. Este artículo relata varios intentos para pasar varios sifones con equipo de buceo. El primer sifón es ancho con un techo bajo. El buzo tuvo que llevar su tanque a su lado en vez de en la espalda. El sifón era de 6 metros de largo y terminaba en un pasaje con aire de 70 metros de largo. Otro sifón se encontró al final de este pasaje. Este segundo sifón era parecido al primera, pero de 50 metros largo. El pasaje mas allá del sifón #2 era de unos 200 metros de largo con muchas concreciones. Este terminó en un tercer sifón. Este aparece ser mucho mas grande que los otros. En un otro viaje los buzos pasaron dos mas sifones hasta un quinta sifón que fué penetrado 40 metros sin alcanzando un pasaje con aire.

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Piezoelectric Ignitor

Mark Minton

The carbide lamp is generally a very trustworthy light source, as attested to by its nearly universal appeal, in one form of another, to cavers almost everywhere. The basic features have remained essentially unchanged for decades and for good reason: they are simple and reliable under most conditions. However there are times, such as after climbing a waterfall drop or when covered with mud, that a more reliable method for lighting the lamp would be of great value. The French Petzl lamp has solved this problem in an ingenious way by incorporating a piezoelectric ignitor. The French lamps have not caught on well with American cavers, however, and the piezoelectric unit from Petzl, which is of entirely different design, is not readily adaptable to the lamps most Americans use.

Talking with various cavers, I discovered others had had similar thoughts and ideas, but none had been tested. My most recent discussion was with Ian Ellis of the Speleoshoppe, and it turned out he had also been looking into the piezoelectric idea. Soon after, I received from him a relatively small (10 cm x 1.5 cm) cylindrical piezoelectric unit for evaluation. The device comes either with or without a metal mounting bracket and can be used either way as described below. (A bracket could easily be made or removed so that either design may be used.) It produces a hefty 18,000 volt spark and weighs only about 60 grams fully fitted onto the lamp.

One of the electrical contacts is a wire embedded in the side of the unit. When the mounting bracket is included, it contacts this wire and becomes "live." In this case the design of Figure 1 would be applicable. This design was originated independently by Bill Mixon, and a more detailed description is available in the Windy City Speleonews 21(6), 111 (1981). Basically the mounting bracket containing the unit is pop-riveted onto the back of a reflector. The same rivets can be used to secure an electrode made from a narrow strip of sheet metal (aluminum or stainless if you wish to avoid magnetic iron) to the front of the reflector. The other electrode must be isolated from the reflector and this is done using a short length of hollow ceramic insulator. A hole is drilled through the reflector on the opposite side of the tip from the above electrode and the ceramic stand-off is epoxied in place so that at least one centimeter extends in front of the reflector. If a deep parabolic reflector is used, all components on the front side will still be below the rim and thus protected. The piezo unit itself will project only about one centimeter beyond either side and is not easily damaged,

since it is behind the reflector and close to the lamp body. A short length of heavy-gauge stainless steel wire is inserted, and the wire from the piezo unit is either silver soldered on or simply twisted around the electrode, which is then epoxied into the insulator. (The epoxy will insure a good connection even if the wire is only twisted around the electrode.) The spark gap should be adjusted to approximately 7 or 8 millimeters, which is sufficient to keep both electrodes out of the flame and will allow changing of the tip, reaming, etc. The unit is now complete. With this design one must be careful to keep the gap between electrodes shorter than any other path between the insulated electrode and the tip or reflector, or else the spark will jump to the closer point. We in fact tried using the brass around the tip as the other electrode, but since the spark then does not jump directly across the gas jet, it does not light reliably.

If the mounting bracket is not used, the design of Figure 2 would apply. In this case an insulated wire is soldered onto the wire embedded in the side of the unit, and then the entire unit is wrapped with electrical tape or encased in shrink tubing. It can then be attached to the reflector

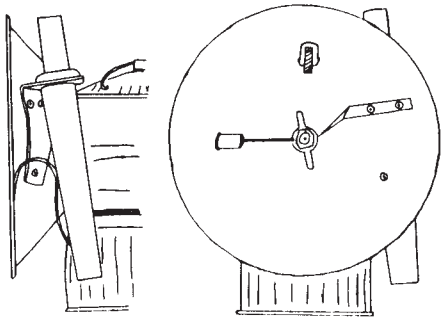


Figure 1
(Bill Mixon)

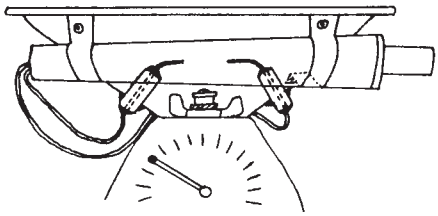


Figure 2

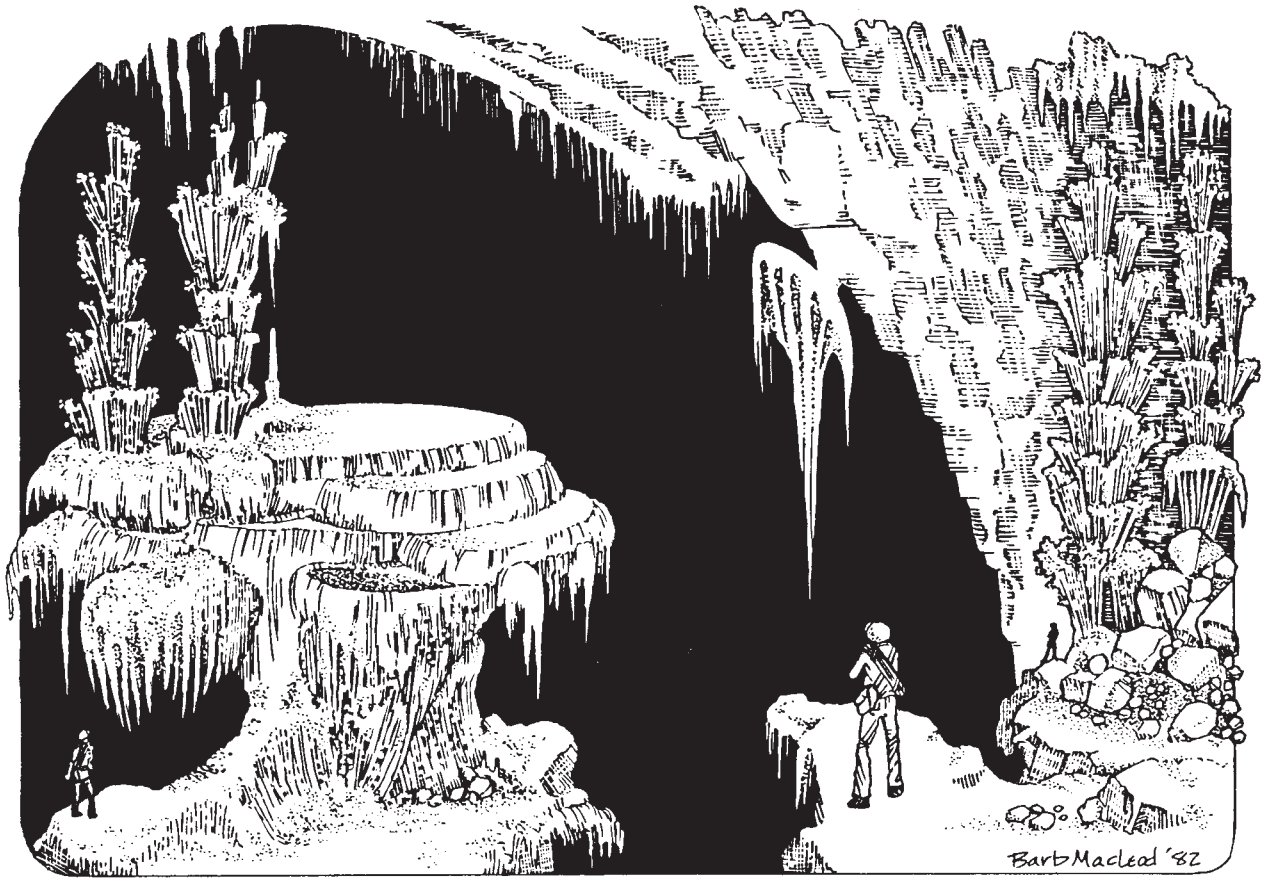
using pop-rivets and two omega-shaped brackets made of sheet metal. In this case both electrodes are isolated from the reflector using ceramic insulators as described above. The unit I received came with a long ceramic insulator and electrode, which I cut up to make the insulators and electrodes shown. In this design the distance between each electrode and the tip or reflector is not as critical, since the lamp itself is not part of the circuit. Another potential advantage is that if some of the insulation gets scraped off one of the wires the unit will not short out as easily.

Both designs involve the reflector only, so the unit can be transferred easily to another lamp. Almost any size flame can be ignited, from only a couple of millimeters to several centimeters in length, without any cupping of gas, by simply depressing the plunger on the unit. In the event of extremely low gas output, placing the reflector against a wall, glove, or pack to catch a little gas is helpful. This technique will also allow ignition even if the electrodes have become bent enough that the spark no longer jumps across the tip, as long as it jumps somewhere inside the reflector. The two designs illustrate both horizontal and vertical mounting of the piezo unit. The choice is probably one of personal preference, as neither interferes with removing the bottom or adjusting the drip rate, although the horizontally mounted unit will be

less likely to get water inside. A little water inside is harmless (the trigger may have to be squeezed a few times before a spark appears, but it doesn't take long), but a lot may cause a short as well as lead to eventual rusting of the trigger spring. Perhaps a finger cut from a rubber glove could be glued over the top of the unit to waterproof it. If the tip itself becomes clogged with mud or water, it will of course still need to be reamed before the spark can light the lamp again. There is ample room for experimentation in design, and it is likely that a smaller unit, more convenient for the purpose at hand, could be designed. The piezoelectric unit described here is available from Ian Ellis's Speleo-shoppe, P.O. Box 297, Fairdale, Kentucky 40118, USA, for about $9.

Encendedor Piezoelectrico

Se describe como montar un encendedor piezoelectrico cilindrico a una lampara de carburo pequeño. Vale approximadamente $9.00 U.S. y se puede pedir del Speleoshoppe, P.O. Box 297, Fairdale, KY 40118. EUA



Cave Exploration on El Rancho

Minas Viejas

Paul Duncan

El Rancho Minas Viejas is located east of Bustamante, Nuevo Leon, north of Sabinas Hidalgo, in the Sierra Minas Viejos. Off and on for the last two hundred years, zinc, iron, lead, and silver have been mined out of the mountain. In fact, the road up to the ranch is built on the bed of the railroad that at one time serviced the mines.

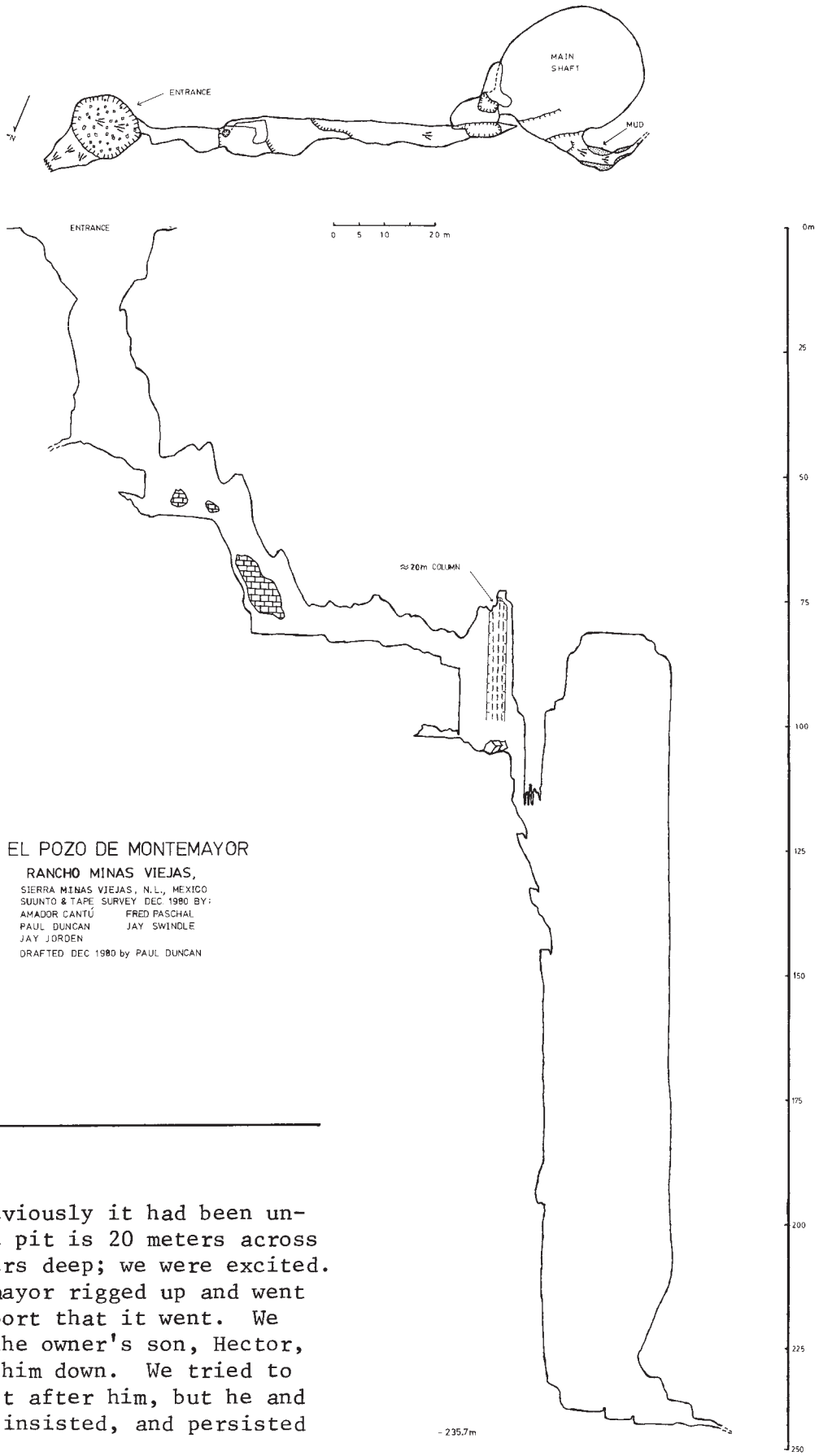
According to a PEMEX geological map, the mountain is called the Iguana Anticline and is composed of Cupido limestone about one hundred million years old. The map shows that the area is fractured by many faults; three of them are running roughly parallel to the east face of the sierra and parallel to one another just south of the hacienda. It has not been determined if the caves Cuchillo and Montemayor are located on one of the faults, but they are in that area.

Cavers have been working in the Bustamante area for a long time, and, of late, have been dismayed that little of note has been found since Illusive Pit and Cueva de Precipicio were mapped. Since the area is within easy weekend-trip distance of Corpus Christi, our group has persistently kept checking for an area of promise that we could work on a weekend basis. The improvement of the Candela-to-Monclova road was an interesting development because it opened a new area to weekend trips. However, due to landowners being difficult to find, changing ownerships, unpromising caves, bad luck, and other problems, the area has not proved fruitful.

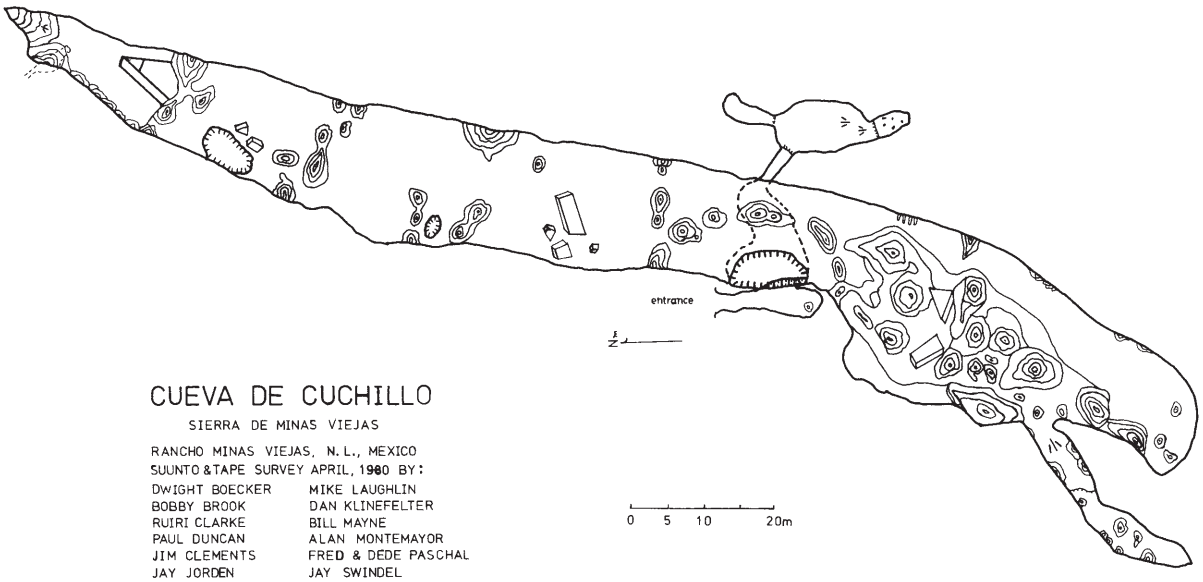
Some time ago, Mark Shumate told me of a mine shaft over 150 meters deep at Minas Viejas that a geology class of his had visited before the area was gated and locked. We made contact with the owner, and since then a close owner-caver relationship has developed. He has spent hours leading our group to various caves. Many of the first leads were mines or caves that had been mined in the past. Soon, though, we were to find what we were looking for.

It is easy to become disoriented on the ranch, so, while looking for a lead, I flagged a major trail intersection. On a return trip, the owner asked me what was in the cave that I had flagged. I was confused. "¿Qual gruta?" I asked. By sheer luck, I had tied a flag within 10 meters of a cave that he had found and lost again ten years before; he had wondered what was in it. It's easy to pass by a cave, since caves don't stick up very high. We went straight away and checked it out. A 27 meter entrance drop leads to a cave composed basically of one large room that contains some unusual helictites as well as two soda straws about 2 meters long that diverge and then converge towards one another, thus resembling a bowlegged person. The main room has a small chamber off its south end that is also well decorated. It was obvious that the cave was virgin. The owner called it Cuchillo.

The owner next took us to a nearby pit or 'tiro', as he called it. (Tiro is Spanish for drop.--Ed.) His men had found it a couple weeks



before; previously it had been unknown. The pit is 20 meters across and 37 meters deep; we were excited. Alan Montemayor rigged up and went down to report that it went. We rigged in the owner's son, Hector, and helped him down. We tried to name the pit after him, but he and his father insisted, and persisted



CUEVA DE CUCHILLO

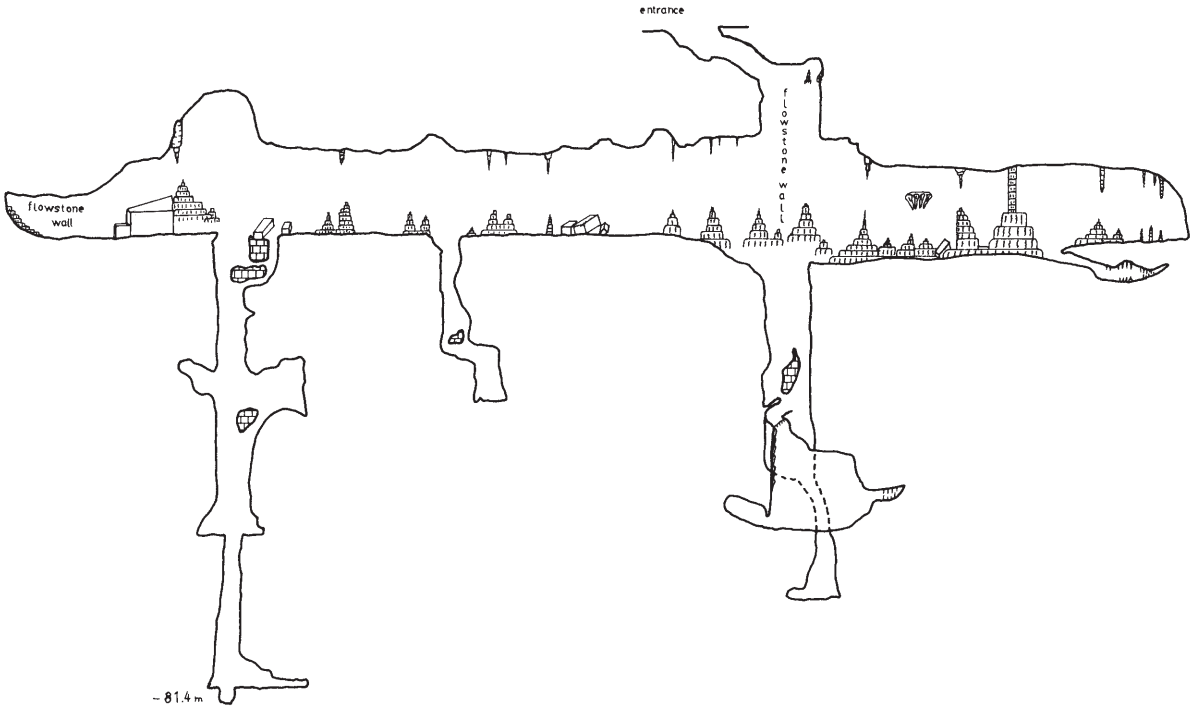
SIERRA DE MINAS VIEJAS

RANCHO MINAS VIEJAS, N. L., MEXICO
SUUNTO & TAPE SURVEY APRIL, 1980 BY:

DWIGHT BOECKER	MIKE LAUGHLIN
BOBBY BROOK	DAN KLINEFELTER
RUIRI CLARKE	BILL MAYNE
PAUL DUNCAN	ALAN MONTEMAYOR
JIM CLEMENTS	FRED & DEDE PASCHAL
JAY JORDEN	JAY SWINDEL

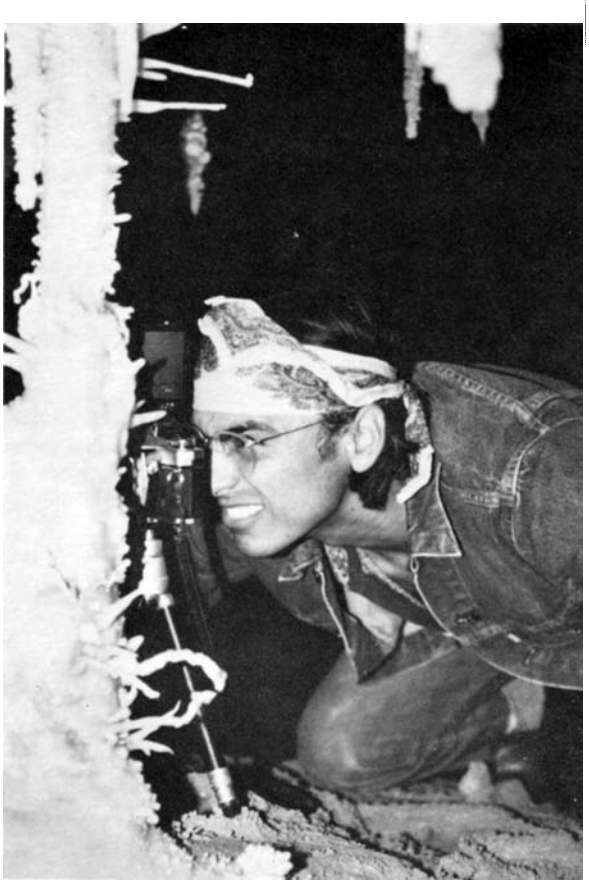
0 5 10 20m

DRAFTED JANUARY, 1981 by PAUL DUNCAN



in calling it Montemayor since Alan had been first in. El Pozo de Montemayor it is. The cave is vertically developed, with a 37 meter entrance drop followed by a short 9 meter drop. After a steep section that must be rigged, one comes into a passage that carries water when the weather is wet. This leads to a 14 meter drop into the antechamber above the main and last drop of 126 meters. This main drop is grand. There is a slight amount of water dripping in, just enough to make the walls shimmer in carbide light. The shape is amazingly symmetrical, resembling a gigantic Contac capsule underground. To one side of the bottom of the pit is a passage leading downward into an impossibly small crawl. Since there is no air movement and since there is mud deposited in the passage, indicating that runoff water from the surface must back up and allow the silt to settle out, we feel sure that there is no more cave. Qué lastima. Perhaps some instant cave may one day prove us wrong. The total depth of the cave proved to be 235.7 meters.

The owner has recently added two thousand hectares to his ranch, and we have yet to exhaust the leads on the original portion. There is at least seven hundred meters of relief from the area in which the leads are being found to the coastal plain to the east or the Bustamante valley to the west. That's plenty of room for development. The Corpus Christi group will be kept busy for many weekends to come.



Amador Cantu in Cueva de Cuchillo. (Paul Duncan)

Minas Viejas

El Rancho Minas Viejas es una región al este de Bustamante, Nuevo León en la Sierra Minas Viejas. Recientemente se ha abierto a exploraciones por medio de relaciones entre los espeleólogos del Corpus Christi Grotto y el dueño de las tierras. La montaña, Sierra Minas Viejas, es rica en minas y ha sido minado esporadicamente durante los ultimos 200 años. Fué una excursión geológico a una mina que resultó en el aceso e interés en el rancho. Recientemente dos cuevas verticales han sido explorado. Cueva de Cuchillo tiene un tiro de entrada de 27 metros hasta un salón grande. Pozo de Montemayor tiene una entrada vertical de mas de 20 metros de ancho. Tiene un desarollo vertical de 235.7 metros.

Highlights of the recent French Expedition

ZONGOLICA

Philippe Ackermann and Genevieve Rouillon of the Fedération Francais de Spéléologie spent twelve months in México (April 1980 through April 1981), with most of their time devoted to caving in the Zongolica area of Veracruz. They set out to prove that a small, low key, low cost expedition could produce results. They developed many close friendships among the people of the sierras of Zongolica and Chilapa, and were especially helped by Padre Felix Vazquez of Zongolica. What follows is their narrative, which was translated and condensed from a longer manuscript sent to Steve Robertson, who joined them for a short period of time.

Atlalakia de Atikpak

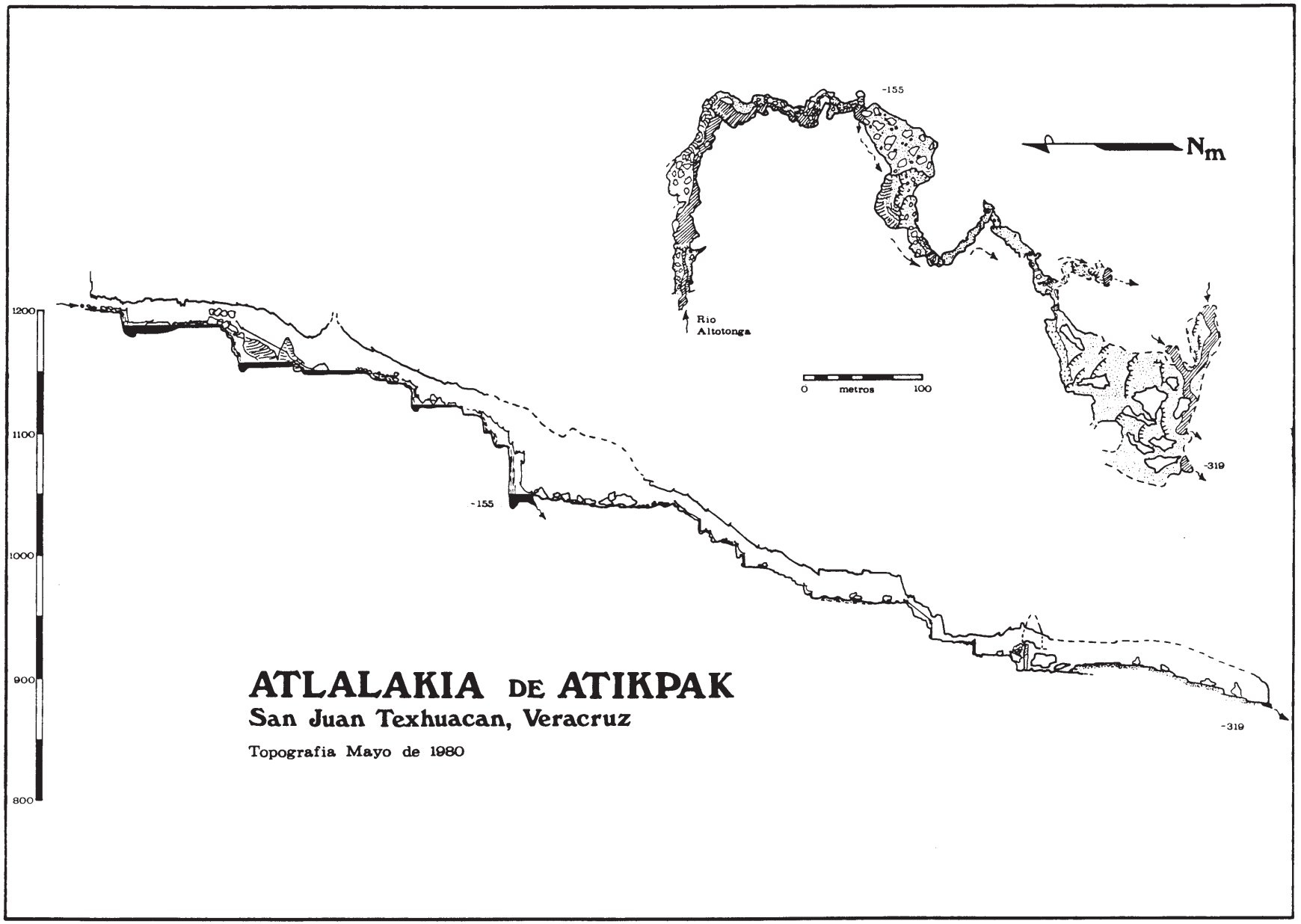
Atlalakia is the name that Nahuatl Indians of the sierra give the large sinkholes that engulf entire rivers, generally in line with the fractures that affect the mountains of the Zongolica karst. Situated two hours by foot southwest from Zongolica, this sink of the Altotonga river represents the largest karst feature we know of in that part of the sierra. Having a large entrance, the Atlalakia de Atikpak (-319.6 meters) opens at the dead end of the Palulca Canyon. The entrance is 25 meters wide and 15 meters high, with travertine formations. Claude Chabert of the Spéléo Club de Paris, along with Jean-Francois Fabriol found the cave in 1977.

In May 1978, a team consisting of Jean-Pierre Combredet, Vincent Fourure, Jérome Krowicki, and myself explored the cave to -100 meters and surveyed down to -85 meters. In May 1980, Claire Chaboureau, Denise Leclerc, Genevieve Rouillon, and I reached a sump at -320 meters and surveyed the cave.

Down to -85 meters, the walls are decorated with breakdown broken by waterfalls of varying heights. At -85 meters the torrent plunges 70 meters in steplike waterfalls. At -155 meters, at the base of the 45 meter waterfall, the river is lost, and the cave continues down a large collapse passage, relatively flat, 80 meters long by 40 meters wide. The breakdown is cemented together and stable.

At the bottom of the Salle Plane a series of small climbs get one down to the base of the breakdown. At -280 meters a breakdown wall forms the last drop, at the foot of which there is easy access to the first sump. A window on the base of the west wall gives access to a meander which increases in size until reaching the terminal rooms of the cave.

At the bottom of these rooms two rivers reappear--one from a cascade and the other from a sump. These join and disappear into a sump at



ATLALAKIA DE ATIKPAK

San Juan Texhuacan, Veracruz

Topografia Mayo de 1980

-319.6 meters. The distance to the resurgence at El Precipicio is a little more than a kilometer. It is probably, but not certainly, flooded the entire distance.

El Popoca

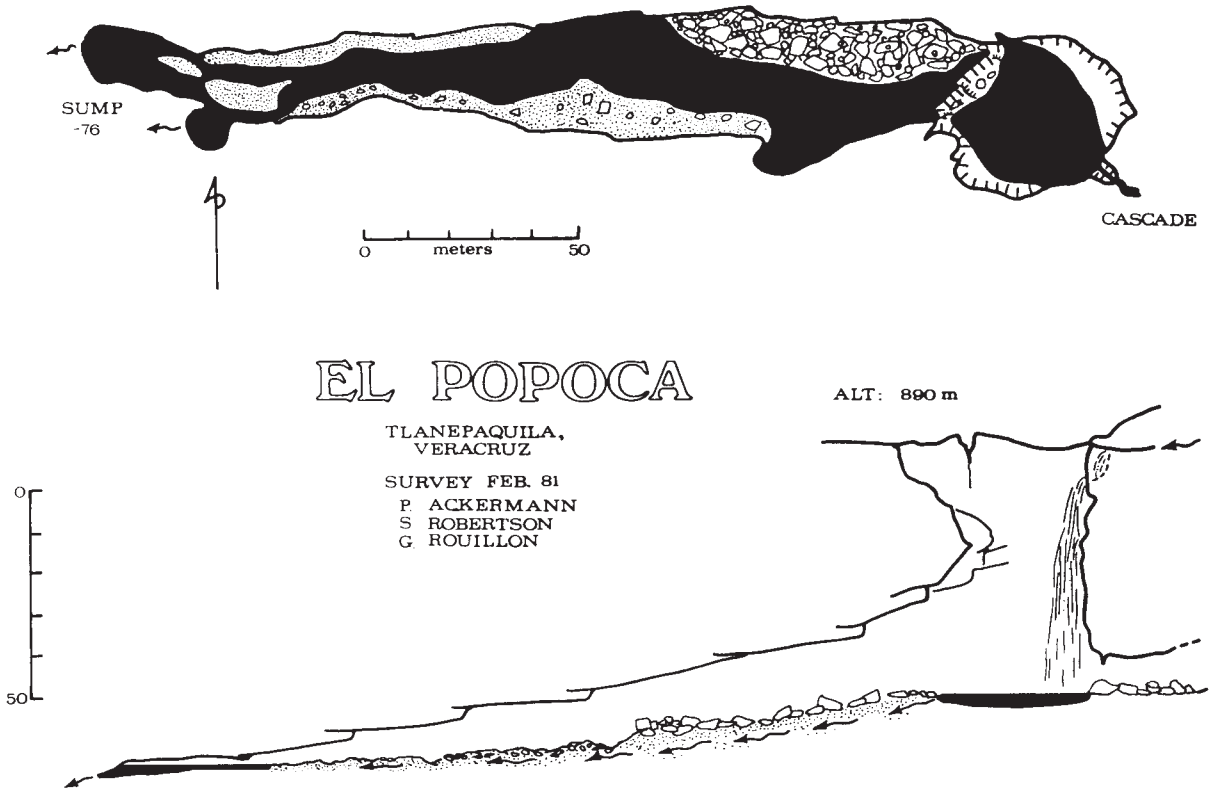
A wall of mist rises to more than 25 meters above the jungle. A 15 meter wide river, full of mud and silt, cascades into one of the most formidable caves we were to come across. This is El Popoca, where the vertical entrance of over 45 meters in diameter swallows a river that falls 60 meters, and the roaring can be hear more than a half hour walk away.

The first time we found ourselves watching this incredible natural phenomenon the rainy season of the Sierra de Zongolica was at its peak. In July 1980 our plans led us to this region in the sierra that we still knew very little of, but we had heard a great deal about its rich caving potential. At this point, it was understood that we were not going to attempt its exploration because of the force of the current. We had written this excursion down on a list of priorities for the dry season at the beginning of 1981. It was therefore decided to wait until March, when we could expect a decrease in the water level in order to attempt our adventure and explore the secret of that mass of water. The following events made us change our plans.

In September 1980, we contacted our Mexican caving "friends" and told them about this lead whose exploration was sure to be great. Seeing their interest and mistakenly thinking that scooping was still not institutionalized there, we told them exactly where the cave was. It was therefore surprising that in December 1980, while returning to Zongolica from Guerrero, we found out that Mexican cavers had scooped us and gone to the Sumidero de Popoca in October, while the heavy rains would still impede exploration. They went down the pit, but had not penetrated any farther. This experience taught us not to commit the same error, and we therefore decided to change the date for our exploration to January 1981.

Meanwhile, some U.S. and Canadian cavers had joined us: Steve Robertson, Mike Boon, Paul Smith, and Doug Wilson. We made our camp in the large Cueva de Totomoxapa at Rancho de Totomoxapa that had a very flat floor, and made a wonderful campsite. After a fast meal we set out on our adventure to Sumidero de Popoca, which was about

A large torrent of water pours into El Popoca, crashing into the rocks at the bottom. (Philippe Ackermann)



ten minutes walk away. It was a marvelous spectacle. The water level had fallen considerably since our last visit, but the waterfall still carried about 2,500 liters per second in an awesome spectacle.

Around us, several locals from Totomoxapa looked on with intrigue. Mike downclimbed to 20 meters below the lip. Clouds of mist rose up out of the pit. The locals felt the spirit of the cave was angered by our intrusion.

At the base of the pit, the rope fell into the agitated lake. Communication was impossible. A little later, Paul, Doug, Steve, Genevieve and I found each other at some breakdown. First, it was necessary to find a way across the river. Paul found a place where the current was not too strong. We found ourselves in the twilight. Unfortunately, the ceiling dipped down, and the water became calmer, and in the sump we observed several pale fish. Then we each performed more technical jobs. Doug and Paul took photographs and Steve, Genevieve, and I began the survey. Mike waited outside, disappointed, like us, that the cave did not fulfill all our dreams of adventure.

Sótano de Tomasa Kiahua

We had gone down to Sótano de Popoca again to photograph and survey. After surfacing, some locals awaited us at the lip. After the usual greeting, the eldest, Luis, told us, "Why don't you go see the sótano located on the top of the mountains?"

Since there are so many sótanos around, I didn't pay him too much attention, but he insisted, "It is very deep. A woman from my village fell into it long ago." Luis asked us to search for her remains. As far as the depth of this sótano, I tried not to get my hopes up, because according to the Nahuatl Indians all pits are bottomless. Experience had taught us that a bottomless pit

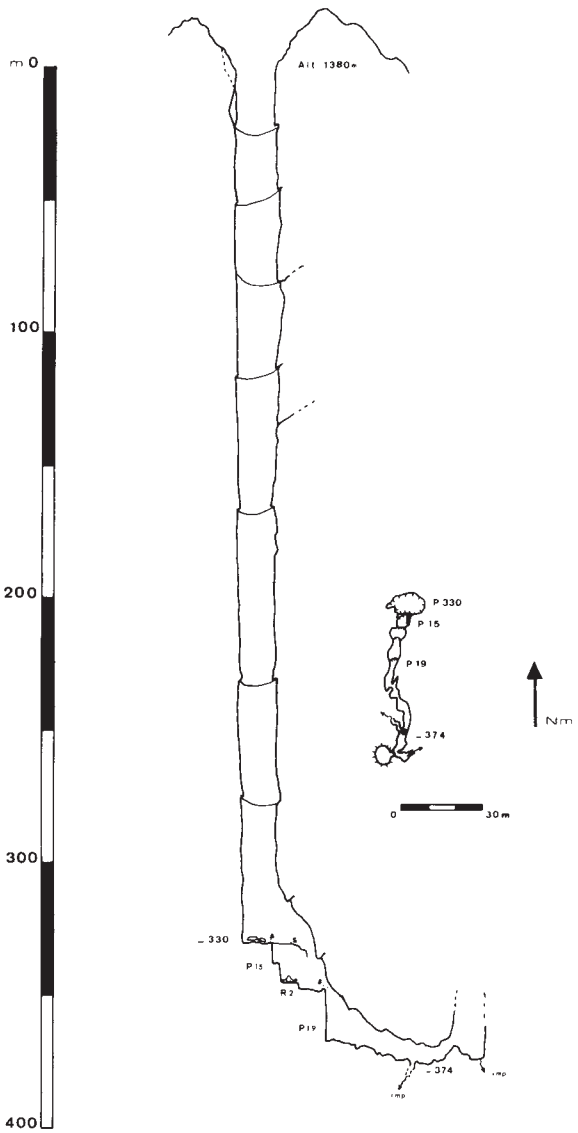
rarely was deeper than 50 meters. All the same, I jotted down the coordinates of the cave underneath those of ten others that we hoped to visit, not on our list of priorities. Seeing my hesitation, Luis insisted, "Señor, if one drops a stone, it takes 13 seconds to hit." He showed me a fancy stopwatch which he had under the folds of his sarape. Suddenly, my curiosity was sparked. It was the first time since we had been here that someone was able to say with such precision the time of the drop of a rock in a pit. In fact, why 13 seconds? Why not one minute, or ten like we had often heard? I promised the old man that the next day, as soon as we finished in El Popoca and derigged we would go to his village and check it out. The latter part of the day was spent surveying Cueva de Totomoxapa and when I informed my American colleagues of the invitation, they were a little skeptical. All the same, they came with us the following day to the village of San Jose Independencia to see the sótano, except for Mike Boon, who was more drawn to the local aguardiente, and who went with some locals with the excuse of P.R.

The sótano entrance, 1400 meters above sea level, was at the bottom of a vast doline situtated between two trails, and bordered by houses. The sides were very steep, and in the middle was the elliptical pit opening of 16 meters in diameter. Coffee plants were grown inside the doline, taking advantage of every inch of arable soil. Being 10 meters from the lip, I was not able to get closer without a rope because of the steep gradient. I threw a stone and then two more. Invariably it took 11 to 13 seconds to hear the impact, proving that they had reached the bottom or a ledge. Full of enthusiasm we went back to Totomaxapa and returned the next day with rope.

Genevieve and I left early, equipped with 170 meters of rope, food and our sleeping bags. We decided to make camp in San José. The Americans, barely having woken up, arrived later. The authorities presented themselves and offered their help. Presently, we arrived at the opening of the cave, which I began to rig. The first rope, of 20 meters, was placed in the doline and the end reached the lip. Then I rigged a sling around a tree in order to place my rope for descent. The latter was composed of a rope of 30 meters to which a second of

sótano Tomasa Kiahua

San Jose Independencia; Ver.



100 meters was tied and a third of 20 meters. This left me with 150 meters of rope, and trying not to be too optimistic, I thought that this length would be sufficient to reach the bottom, or at least a ledge. It was at this point that I looked down for the first time and what I beheld surpassed my imagination. Meanwhile, Steve, Doug, and Paul arrived, and I could hear them asking me what I saw. Partly in English, partly in Spanish, I gave them my enthusisatic description of the enormous tube. The pit was smooth and appeared to be absolutely vertical. Before dropping in, we agreed on a code based on whistle blasts. We decided that if I reached bottom Doug would join me. I began the descent, close to the wall. At -30 meters I placed a piton that displaced the rope away from the rocks. The 120 meters of rope that remained hung into the emptiness and hit the wall of the cave like a giant whip. It no longer touched the wall as far as I could see.

(At this point, Genevieve assumes the narrative)

As we waited above for the slightest sound, we heard the story several times about the woman who disappeared one night and left some traces at the top of the sótano. That was 16 years ago. Suddenly two distant whistles startled us. Phil came back up. The ropes were too short. He had reached -150 meters and had stopped at the last knot on the rope, his feet dangling into space. We hardly dared believe him. Steve, Paul, and Doug, who had left their sleeping bags in Totomoxapa, returned there. We agreed that they would return the following day with 70 meters of ropes we had left there.

Friday, Phil tried once more and reached -220 meters. Once again, his two whistle blasts told us that he had not reached the bottom. We decided to leave for Choapa where we had left some rope. After several glasses of Aguardiente offered to us by our friends, I hardly felt like hitting the road again. Our guides were also a little tipsy and we wondered if they would be able to find their way through the thick jungle in the rain.

Once again back at the pit, Phil was ready to descend with more than 100 meters of extra rope. We waited a long while until we heard Phil's four whistles which meant he had reached the bottom and awaited the next person to follow. Doug had trouble at the -30 meter level, so had to return. Meanwhile, Phil was freezing cold at the bottom and waited two hours, wondering what was going on. At about 4:30 he reappeared--wet from the waterfall and hungry. In his knapsack he had the remains of Tomasa Kiahua. He told us he estimated the pit to be more than 300 meters deep, the rope barely having reached the bottom. After eating a taco that was offered we began to pull up the soaking ropes. It was difficult, but in 10 minutes, we had pulled them up.

The next day we would have to return to Choapa to get some more rope because, after the first ledge, the pit continued below. Our first chore after waking was to measure the rope with the topofil (thread survey tape). We found out the rope measured 330 meters, without taking into account the elasticity.

Phil went to Choapa where he found Steve and Mike, who still had not caught a ride back to Zongolica. By luck, Steve lent us a 100 meter rope which allowed us to continue the exploration. In the afternoon Doug and Paul also left, leaving Phil and I to continue the exploration.

After spending a good night snuggled together under the shelter of Cueva de Totomoxapa, we returned to San José. When we arrived, very tired from the weight of our packs,

we decided not to descend the pit that day. Phil placed a bolt at -30 meters to back up the piton that would bear 300 meters of rope. The next day we felt in great shape to make the descent. We began to fill our backpacks, tying the ropes together end to end. Phil descended to the piton to tie the end of the rope, while I unraveled the rope at the lip. After a while, the rope, which was still wet, became very heavy and I had to use all my strength to stop the rest of the rope which was flying downwards. Finally, the last of the rope unraveled and a whistle accompanied the fall. The bolt placed below the piton at -30 meters had to endure the tremendous shock--that was a mistake.

Suspended in space above the piton for an hour I observed Phil's lamp, asking myself why he was taking so long to let go of the rope. Then I saw him ascend, completely drenched and pale. He must have had to fight like a madman to unravel the 200 meter knot of jumbled rope. After having reached -230 meters he placed a bolt to ease the following attempts and ascended. This must have been a very difficult task. The exploration was over for the day.

The news of the pit had already traveled to Zongolica, which because of a local press correspondant, had reached journalists thirsty for a sensationalist story. Many people from the neighboring villages who had heard the news on the local radio had come to visit the sótano. We were disappointed. The exploration wasn't even finished and there was already talk of touristic development. This was only the beginning...

That morning we prepared for the descent and Paul Smith, who had joined us several days earlier, carefully checked all the gear as we saw in the distance a group of people approaching--fat men in city attire, sweating and breathing hard on their mules. It was impossible to avoid them. They wanted an exclusive interview for their newspaper on the biggest "tunnel" in America. Without even paying regards to the local authorities, who were standing at a respectful distance from the city slickers, they attacked us with grotesque and ignorant questions. Unreceptive to what Phil attempted to explain to them, they were interested only in a sensationalist story. "How many holes, how much money, how much time, how many accidents...?" Phil got angry because they insisted on descending themselves and taking photographs.

Paul and I joined Philippe--the rope which had become very wet was very heavy now and it was impossible for him to descend. He tried to lift it with his ascender, but it slipped down towards the pit on the rope. So Phil was stuck on the piton in an undesirable position. The rope must have recovered from its elongation and the intermediate bolt 200 meters below created too much tension. I sent him another descender and after certain complicated maneuvers while he fought like a fly in a spiderweb he decided to climb up to firm ground to catch his breath before making new plans. After a good meal of beans and chiles with our friend Agustín we talked of returning to the pit. This time Paul would descend on another rope of 50 meters that he would tie at the -30 meter anchor. Having reached the end of this rope, he would try to place his descender on the main rope and put his weight on it. This should allow the rope to stretch enough and was the only solution we could foresee.

So Paul descended careful as usual. The rest of us awaited him. A while later a savage cry, amplified by the echo told us that Paul had succeeded. A few days later we were at the pit again. As usual we did not lack company. A crowd had gathered close to the pit,

which frightened us a bit. Phil went down fist. Once he arrived at the -200 meter level he had to give some slack in the rope hanging from the piton. The attempt seemed unending, and I began to worry when I finally heard four whistle blasts...Rope Free! It was my turn. I pulled up the 50 meter rope which was now unnecessary and attached it to my harness--we would need it for the continuation. I lifted the rope to attach my descender, but I failed. I had to try again. I used my ascender to lift a bit of rope which was very muddy. The descender in place, I couldn't free myself from the piton. At last, certain unorthodox acrobatics later and it was alright. It was necessary to pull the rope towards oneself in order to slide down. Every jolt in space stirred my guts. I reached the first knot at -130 meters--above me the entrance was but a small circle of sky cut out of the massive rock surrounding me. The rest of the descent was long and difficult, but little by little the weight of the rope decreased. At the bottom, Philippe was in the process of rigging the next drop and I could already hear his hammer pounding. I passed the -230 meter point and the last 100 meters were easy to rappel down. One more knot and soon my feet touched the ground. A short moment to share our views and we continued after having whistled four times to tell Paul that he could begin to come down. After a slope of 15 meters, there was a second pit of 25 meters. We were 370 meters below the surface, and once again the cave closed before us. As soon as Paul made it to the bottom I began to ascend, leaving the two of them to survey. The ascent began--long and difficult--I felt alone and small. I moved up slowly, but steadily, and all sorts of bizzarre ideas passed through my mind during this vertical voyage. Two hours later, the last maneuver occured. I was out at last. It was raining, but the welcome was warm. By nightfall, Phil, the last to come up, drank his copita, and although the three of us were very tired we could not sleep. The exploration of Sótano Tomasa Kiahua was finished, but we will return to San José where other caves await us.

Ed. Note: When Philippe, Genevieve, and Paul returned to Zongolica they were greeted by their good friend Felix Vazquez, who showed them headlines and articles from various newspapers about Sótano Tomasa Kiahua. These reports were extremely innaccurate and sensationalized.

Sumidero de El Boquerón

We set off on foot following the banks of the Río Tonto, frequently making our way through thick jungle. We finally arrived at Huitzla, where the Río Tonto is born, at 60 meters altitude, flowing out of a 50 meter high entrance. It was our intention to find where these waters began their subterranean voyage.

One day, we looked over the karst relief which would lead us to the path of red earth that leads into the heart of the sierra towards Camalapa and eventually Zongolica. Suddenly, after thirty minutes on the path a stone bridge joined the two walls of the 200 meter deep canyon. At the bottom flowed the river. Tepanco, the Indian name for the huge natural bridge separating the solar universe and the world of darkness where a modern Styx known as the Río Moyatl and the Río Altotoco are swallowed as frothy, crashing rapids 200 meters below our feet into Sumidero de Boquerón. Every attempt to get near it was in vain.

A couple of months later, Paul

Smith, Genevieve, and I left Zongolica better equipped. We arrived at the river about 500 meters upstream from Sumidero de Boquerón where we got an idea of its imposing height. Carefully, we swam downstream in a violent current. We estimated the flow of the water to be 800 to 1200 liters per second. At the last river crossing, a rope was needed to get across the jade green waters, with very little river bank--mostly shear walls.

Our first goal was to set up camp near the junction of the rivers Moyatl and Altotoco, where there was a small beach, about 1 kilometer from the entrance of the sumidero. A good water source flowed right by the camp, and the San Juanero birds squawked from their lofty perches at us for invading their territory. Sounds of insects at night drowned out the roar of the rapids. Orchids and cacti adorned the walls.

We left to equip the cave, and were preoccupied with maneuvering through the river so that we were inside (beneath the roof) before we realized it.

The first bolt was set just above a 1 meter cascade; we looked for a way over the rapids. After several vain attempts, I finally found a large block in midstream which was 15 meters away. Crossing this rock permitted us to avoid a 2 meter cascade. The rock was very slick and polished by the water. I finally made my way to the right wall, 3 meters above the water, from where I could see the river went down a giant liquid staircase through the narrowing passage. I was now certain that I must follow the current. A floating device would be essential. We had progressed about forty difficult meters. We returned to camp and savored the Franco-American-Mexican cuisine, and for the sake of the reader, we won't describe it. Drizzle began that night.

The following morning it continued raining. We attempted to progress, but returned because of rising water. Paul informed us that he must return to the states and departed in the rain. The rain continued the next day, and further exploration was impossible, so we returned to Zongolica. While waiting for the rains to cease we met Steve Robertson at Comalapa. After several days we returned to the campsite to continue exploration in the Boquerón. Steve and I went to the sumidero; the water seemed to have fallen considerably and the way was much easier. Steve was impressed by the cave. We succeeded in advancing ten more meters in the cave. The end of the day's progress was at a piton, from which we would continue the next day.

The following day's exploration was long and full of adventures. We advanced about 100 meters along the river. I nearly drowned when I was carried away in a waterfall. My air jug (used as floatation) in my pack was pulled by the force of the water, but enabled me to keep my head above the surface, though I did swallow a lot of water. Steve realized what was happening in time and stopped feeding me rope, and I was able to hang on to a rock on which I fixed the next anchor. From there on the river seemed to be a little calmer, permitting us to swim about 50 meters. Soon we stopped in front of another series of waterfalls and decided to call it a day. It was cold and we had had enough excitement and Genevieve was getting hypothermia.

The next day, we reached the terminus quickly. Here the river became truly dangerous. Genevieve left after completing the survey. Steve talked of abandoning the exploration, but I realized that we couldn't give up at this point. I advanced 5 meters along the right wall, which was polished smooth. The continuation would require the use of etriers.

Back at camp, we found millions of butterflies making the best of a moment of sunshine. We spent the rest of the day following the Río Moyatl to the beginning of its cascades. The next morning, the sky was clear and we decided to have a day of semi-rest. Our objective was to rappel from the Tapanco arch for photography.

The next day, Genevieve and I were back at the terminus of exploration in the cave. I continued to progress along the wall, with the help of two etriers we brought along for the occasion. I followed along a large traverse fissure. The last pitons were a little precarious. I was just about to set a bolt when suddenly the pitons let go. In the following fraction of a second, I found myself hanging 1 meter above the roaring rapids, very frightened. I managed to climb up again and replace the two pitons and place a third and place the bolt that would ensure the ensemble. And then--¡PAN!--the rock explodes. In a very uncomfortable position, suspended only by pitons whose safety I don't trust, I began my slow progress along the rock. I placed another bolt in an even less comfortable position. To rest a little I began to walk back to a small ledge where Genevieve awaited. Then the first piton broke, and again I found myself hanging, this time with both legs in the water, and the current ripped away one of my sneakers. Of my two safeties, only one remained in place, the other having been broken by the shock. Cold sweat ran down my forehead at the thought of what could have happened.

It was surely the first time I had been forced to stop an exploration due to the loss of a shoe. It was in one of the waterfalls near the entrance that I lost my second shoe. Since one was already gone, this was not too regrettable.

Sunday morning Genevieve and I went to Comalapa where Steve lent met a pair of Addidas. Meanwhile, Steve had stayed behind to collect fauna in the Gruta del Tunel where he caught blind catfish. Genevieve went to Zongolica to replenish our Far away she made out what appeared to be rapids or a cascade. Unfortunately, we had run out of rope and so we would have to return. food supplies, while Steve and I went to check the resurgence of the Río Altotoca. We swam 60 meters and found ourselves in a beautiful aquatic room, At the base of which the water emerged; above a fossil passage. We advanced about 100 meters in this passage where the guano reached halfway to our knees. The bats swirled about. We came across breakdown covered with oozy, gooy, icky stuff. Genevieve finally arrived with a pack full of provisions.

We found ourselves in the Boquerón once again with Steve. We were able to resume in the water, swimming from rock to rock. Ahead, the passage narrowed to less than 6 meters wide and the current increased even though there were no rapids. Forty meters ahead, one could see a turn in the passage to the right. Up to there, it appeared to be free of rapids. I therefore let myself be taken by the water, solidly held by Steve. After having progressed about 15 meters, I felt myself being pulled back. Turning around, I saw Steve signalling me to come back. With much difficulty I managed to return the 15 meters against the current.

The first of April I found myself back in the same place. This time we placed a double rope and a pulley system starting from the last anchor. This system was designed to minimize the force required to return upstream. With this, Genevieve was able to go 50 meters ahead without needing any intermediate anchors. As far as she could see, the cave continued.

On the way back, we surveyed and took a few pictures.

The next day we made our last expedition into the sumidero for that year. We derigged the cave, leaving some polypropylene rope in some crucial places, with some doubts they would last through the rainy season. In this type of cave the risks due to the water are great. It is imperative to resolve the issue of safety from the start. These explorations of sumideros bring about a new era in caving. Another problem had been the cold. Being immersed for a long period of time with the energy expended to progress burned calories very rapidly. We were very badly equipped that time, because the Neoprene clothing we had (which is used by the Anglo-Saxon cavers) was inadequate. Our solution to the problem of calory loss was in the way the cave was rigged. Every rock allowed draining and would be used as good anchor points. The proximity of these anchors also helped and this was important because it allowed us to go upstream.

We advanced only 350 meters. From that point the cavern continues-a hostile current descending the grandiose passage. We shall return to Sumidero de Boquerón.

Sumidero de Cuetzaloztotl

Our last caving trip before returning to Europe was to Sumidero de Cuetzaloztotl. Miguel Cruz came with us to take pictures of the entrance. As usual, the trip through the cornfields on a dusty path was very tiring, but after two or three copitas offered by Don Erasmo, a rancher of Totolocatla, the future seemed brighter. We finally arrived at the gigantic entrance of the sumidero. It swallowed two small rivers, one coming from San Sebastian called Atehuantse, and the other draining the peak of Moxala called the Río Ayojapa.

Sumidero de Cuetzaloztotl opens at 670 meters altitude. We spent the first night underneath the entrance, which was more than 40 meters high and 60 meters wide. In the morning I left for the sumidero, leaving my friends to sleep a few more hours. Passing the entrance, the river lazily meanders between the rocks for a few dozen meters and at the first drop it falls sharply down a pit. It was necessary to rig this drop out of the water. I climbed the right wall which was quite easy due to the chock Steve had left for me.

(Philippe Ackermann)

In order to place the first solid anchor which allowed me to descend over 4.5 meters to put in a piton, I was soon in the pit. From there I had an excellent view of the first waterfall that plunged 12 meters into a seemingly deep lake. Further on, a second small waterfall of 3 meters dropped into a downclimb and a chimney. From there, a pool of about 15 meters diameter was able to be climbed around due to a ledge on the left wall. I went back up, taking notes on the way.

I returned to camp to find my two friends had barely woken. We spent the rest of the morning on the surface, enjoying the April sun and taking notes. By mid-afternoon Genevieve and I had a scare when Miguel, trying to take pictures of the heroes in action, got a little too close to the slippery edge of the pool and lost his balance and fell into the water with his camera. Leaving Miguel to dry out, we headed towards the point I had reached that morning. We were forced to go into the water, which didn't please us since we knew by experience the after effects of immersion into subterranean waters, (we wore only shorts and T-shirts). Soon, another waterfall barred our route. Genevieve placed an anchor and I traversed the left wall to deviate the rope as much as possible from the waterfall. We decided to return to the surface.

When we returned to the cave we changed from shorts to a waterproof suit which we usually use in the Alps. After reaching the point of previous exploration a climb allowed us to reach a ledge. From there we were able to cross the next two waterfalls of the cave. The last one was the most beautiful. A few meters from this a largely eroded area in a wall formed a narrow passage which we took to avoid the swim. Ten meters further on we came to more pits. Below the pits the dimensions of the cave became impressive. The walls were very smooth. I descended the next drop, but became suspended 10 meters from the ground. I saw below me another drop. We had only 40 meters of rope back at camp. Would that be enough?

April 15 was to be our last day spent caving in México. The rain had ceased and the river penetrated the entrance of the sumidero. We set out with our last 40 meter rope. The pit we had begun to descend the day before led to a beautiful lake. If there was another waterfall we wouldn't be able to descend because we would have run out of rope. Luckily, after the lake it was a dream. A big infeeder, twice as large as the Metro tunnel in Ciudad México beckoned us onward. The water flowed along between the rocks and calmed down momentarily in the big pools. In these pools there was an incredible quantity of depigmented, and for the most part, eyeless fish. After more than a kilometer, we stopped. Before us, there appeared to be no obstacles. The cave continued with much more mud; the river went on large and clear. We were 200 meters underground, and already far into the mountain that shared the waters of the Altotoco basin and the lesser known Tlacuiloltecatl.

On the way back, we derigged our ropes, leaving the pitons in place in order to allow us to rig faster next time. That night as we emerged from the cave, we found ourselves with a surprise of seeing the inhabitants of the village of Totolacatla who had come to see the goings on. A party ensued. The next day we left.

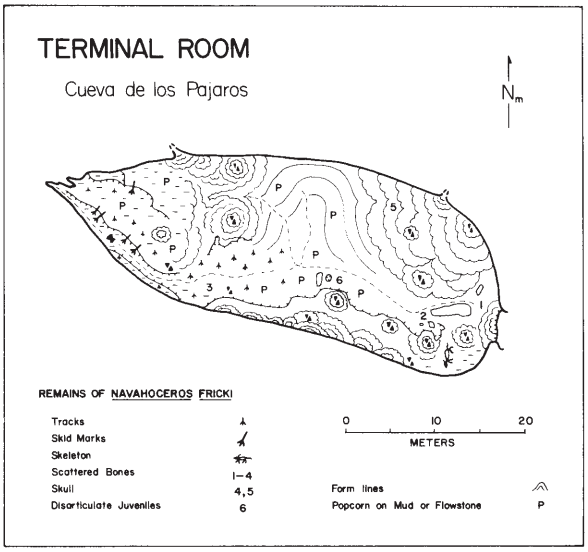
BATS NEED FRIENDS

Deer Tracks in Cueva de los Pajaros, Oaxaca, México

Roy Jameson

Navahoceros fricki (Schultz and Howard) is a late Pleistocene (Rancholabrean) cervid which inhabited mountainous regions of the western United States and México. It is known primarily from deposits in caves. Alvarez (1969) also discusses one surface locality at Tlapacoya, México.

This deer has an unusual adaptive morphology. It is medium to large sized, has thick-set limb bones and short metapodials. The males have simple forked antlers and the females are anterless. Kurten (1975) notes that "the shortened metapodials and plump limb bones of Navahoceros are reminiscent of those in alpine bovids like the chamois and ibex, and have no close parallel among other cervids." On the basis of these morphologic features and the mountainous habitat, Kurten suggests an alpine or climbing mode of life for N. fricki and introduces the vernacular name Mountain Deer.

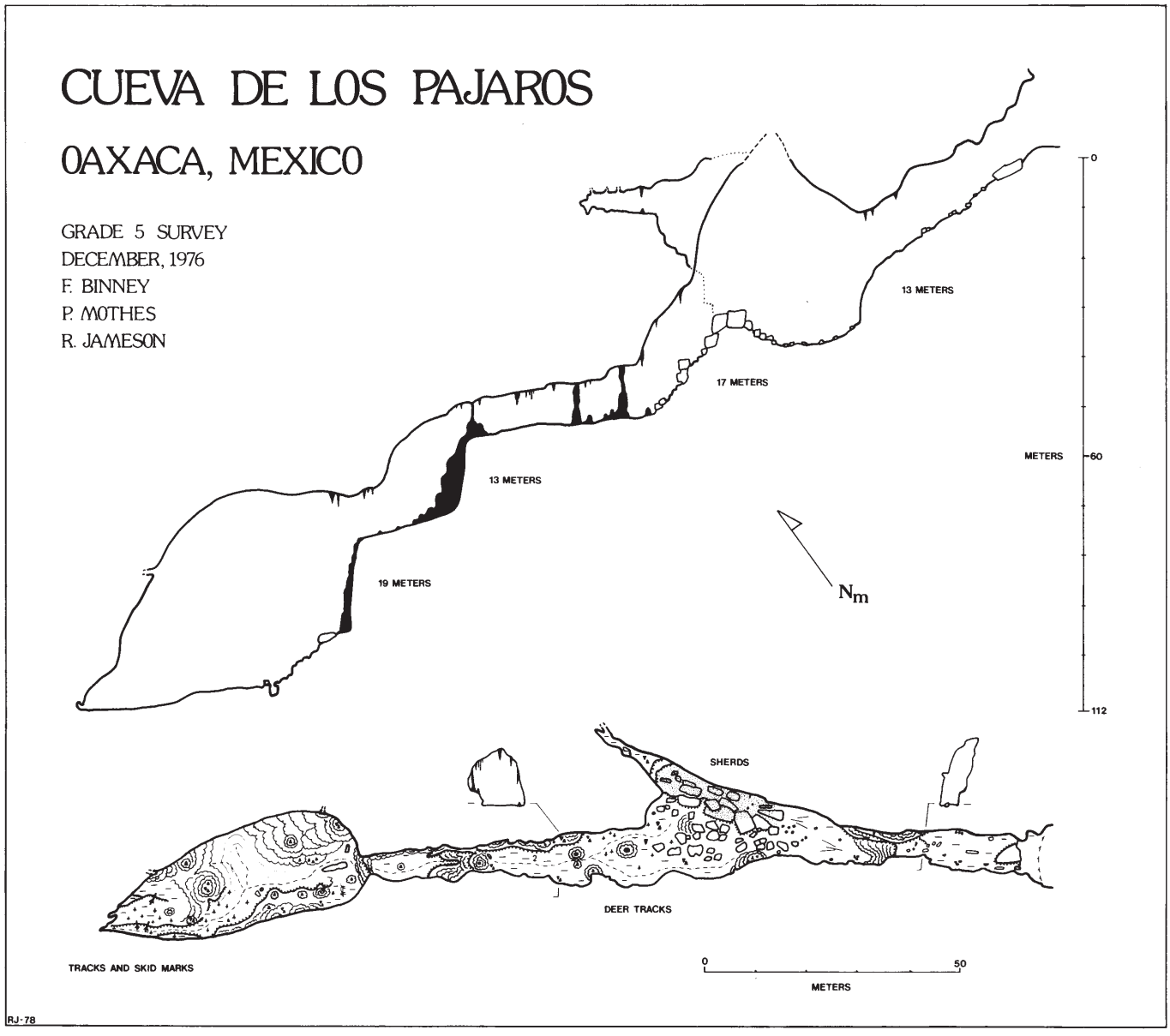


This paper records an additional and remarkable occurrence of the Mountain Deer in Cueva de los Pajaros, a vertical cave at San Agustín in the Huautla caving area of Oaxaca, México. In this cave skeletal remains of the Mountain Deer are associated with tracks and skid marks terminating in tracks. Most of these remains and tracks occur well back within the cave past a rugged series of pits and breakdown slopes. No alternate route can be discerned, nor was one likely in the past, and the presence of deer tracks at several places within the cave support the theory that the deer entered and traversed the same route that cavers use today. If this interpretation is correct, then the remains offer unusual supporting evidence for Kurten's thesis of a climbing mode of life for

Disarticulate skeletons of juvenile deer in the terminal room. (Roy Jameson)

N. fricki.

Cueva de los Pajaros was probably a natural shelter for the Mountain Deer. In any case, it was certainly a death trap. At least four individuals jumped, fell, or perhaps were driven by predators down the entrance pitch of 13 meters, which lies at the back of the natural shelter entrance passage. The deer survived to negotiate a 17 meter breakdown slope and left their tracks on a mud floor en route to a 13 meter flowstone drop and final 19 meter pitch into a Terminal Room measuring 20 by 50 meters. In this last chamber, which is floored by mud, popcorn and flowstone, are perhaps a hundred tracks all of sizes commensurate with the Mountain Deer. Two steep mud banks contain skid marks terminating in tracks. One fully articulated and several partly articulated skeletons of the Mountain Deer are present along with scattered bones of at least one other individual.



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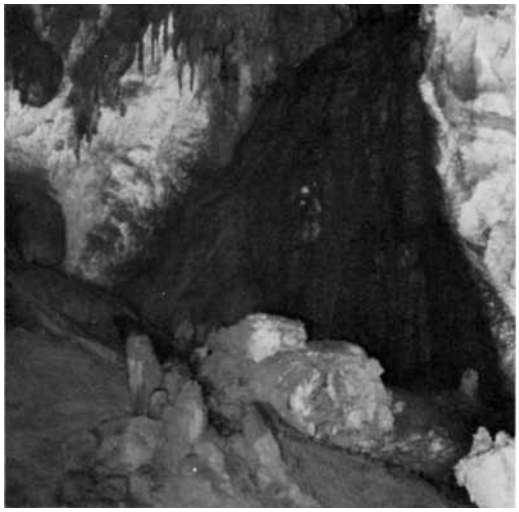
Kurten, Bjorn, 1975, A New Pleistocene Genus of American Mountain Deer, Journal of Mammalogy, Vol. 56, No. 2, pp.507-508.

Popcorn encrusted deer skull and, in the upper right corner, a deer track broken through the flowstone into mud. (Roy Jameson)

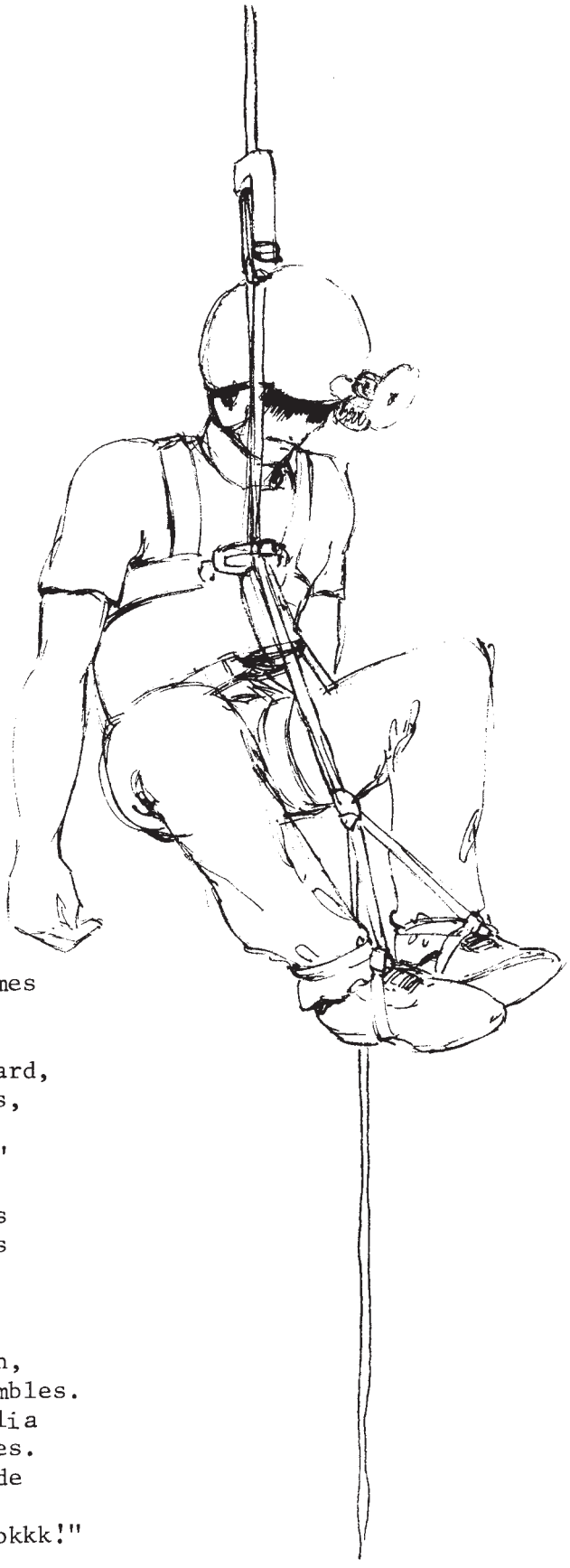


The 19 meter pitch into the terminal room. (Roy Jameson)

Deer tracks in the mud at the base of the 17 meter breakdown slope. (Roy Jameson)

Cueva de los Pajaros

Los esqueletos de unos venados montanas Navahoceros fricki se encontraban en Cueva de los Pajaros, cerca de el Sistema Huautla, Oaxaca. Unas huellas de los venados existen en la cueva tambien. Se creen que los venados entraban la cueva y posible se caian los serios de tiros en el parte posterior de la entrada. El escritor está usando este a apoyar la tesis de Kurten (1975).



A•M•C•S MASS

Road kill slide show/carabiner rope talk.
The latest sotano yawns on the sheet screen
like a sleepy natural wonder. Projector frames
of vulturine travel posters. The hollow eye
sockets and dinosaur ribs of a past tense
burro. The tall priest with the wizard's beard,
Oztotl T-shirt, juaraches, and hypnotic eyes,
explains for the orbiting crowd, "We fought
the coyotes for the best parts of this one."
"They really weren't coyotes though, it was
Carlos Castaneda and Don Juan in drag," says
the shaman with the Medusa hair, wearing his
uniform of wooden bead necklace, scorpion
earring, carnival hat, and combat boots. He
adds, "We burned copal in Merlin's hall, by
the stream where it sinks into the breakdown,
and there were ongas!" "Gonzo," someone mumbles.
Smoky room of copal in ashtray and sensimillia
in hand reminiscent of stone knife sacrifices.
The shaman speaks in tongues beside the slide
projector. The plumed serpent sits upon his
shoulder and squawks when he shouts "Tla-llokkk!"
Aztec epiphanies on the beatnik walls.

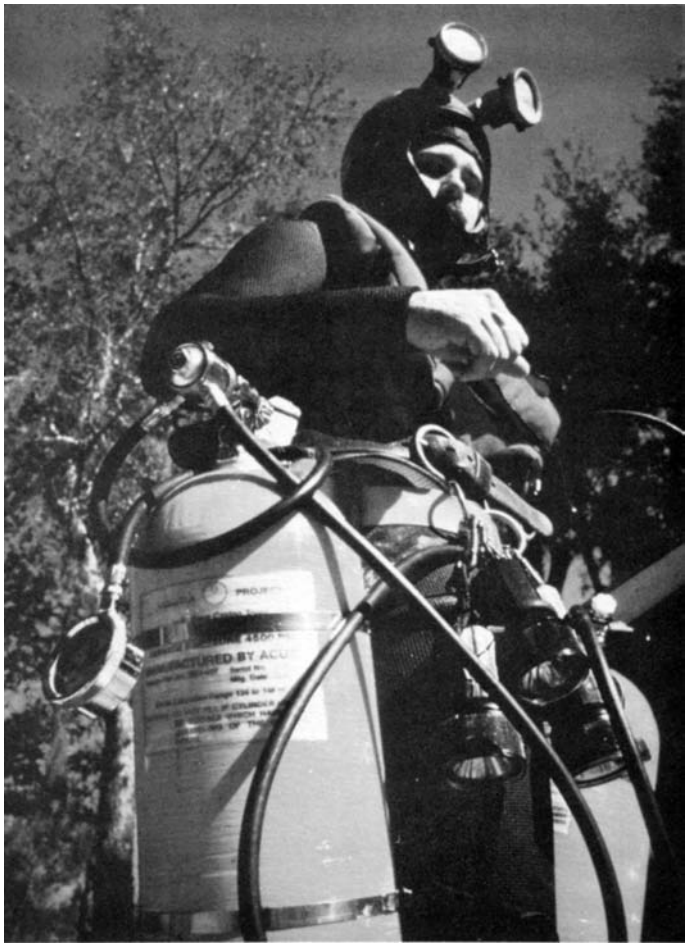
Sump Diving Technified

Composite Tanks

Bill Stone

The idea of using lightweight composite tanks for sump diving is not a new one. As early as 1977 rumors were circulating through the cave diving community of veritably weightless Kevlar[1] tanks that would soon be on the market. By and by it became apparent that such equipment was not likely to be seen in the local dive shop for a long time. This is primarily because the lightest type of composite cylinders have not yet received approval for underwater use from the Department of Transportation, which grants permits for the manufacture and sale of all compressed gas containers in the United States. To receive DOT exemption, experimental evidence must be presented to demonstrate the safe performance of a pressure vessel in a given enviroment. To this date insufficient data has been presented to the DOT. At lease one company, Acurex Aerotherm, has initiated studies to determine the underwater performance characteristics of composite cylinders. This independent action on the the part of Acurex, along with some very fortunate timing on our part, led to the use of composite cylinders on the Sótano de San Agustín dive. Having now used these tanks for more than a year it may be useful to discuss some of their advantages and faults.

All composite tanks consist of basically two parts: a metal liner and an external wrapping under tension of either Kevlar, E Glass, or S Glass fibers dipped in epoxy resin. In recent years it has been discovered that all of these fibers have a tendency to slowly breakdown with age under high stress--a phenomenon known as stress rupture. Laboratory tests of composite tanks filled to a high percentage of their new ultimate burst pressure have been known to explode when left standing for several months. For this reason the service pressure on composite tanks has been conservatively pegged at no more than 30% of their new burst pressure. Furthermore, stress rupture eventually causes a gradual breakdown of the fibers even when the tanks are operating at service pressure. Because of this, all composite cylin-



(Bill Stone)

A complete display of the dive gear assembled for the 1981 dive of the sump in Sótano de San Agustin at -861 meters. (Bill Stone)

ders presently have a rated lifetime of 15 years. The upshot of the above is that large overfills--a now widely accepted practice among Florida cave divers to increase their penetration radius without increasing their equipment volume--are not to be recommended with composite tanks.

In addition to the choice of materials to be used in making the tanks there are two construction processes which may be specified: hoop wrapped or fully wrapped.

In the hoop wrapped version a metal liner (usually aluminum in the case of cylindrical tanks is forged in such a manner that its top and bottom are sufficiently strong to withstand the internal pressure on the basis of the strength of the liner alone. The weight saving in these tanks is achieved by reducing the thickness of the metal sidewalls. Lateral bursting is prevented by wrapping the cylinder with filiment fibers which have a much greater strength to weight ration than the metal. As an example, S Glass fibers typically exhibit tensile strengths in excess of 6 times that of aluminum, and yet are 28% less dense. Since the fibers are wrapped only around the sidewalls of the liner (and not over either end) the minimum thickness of the metal sidewalls is determined so as to keep the tank from pulling apart longitudinally. The weight savings afforded by this method of construction can be as much as 38% less than the weight of a similar capacity steel tank.

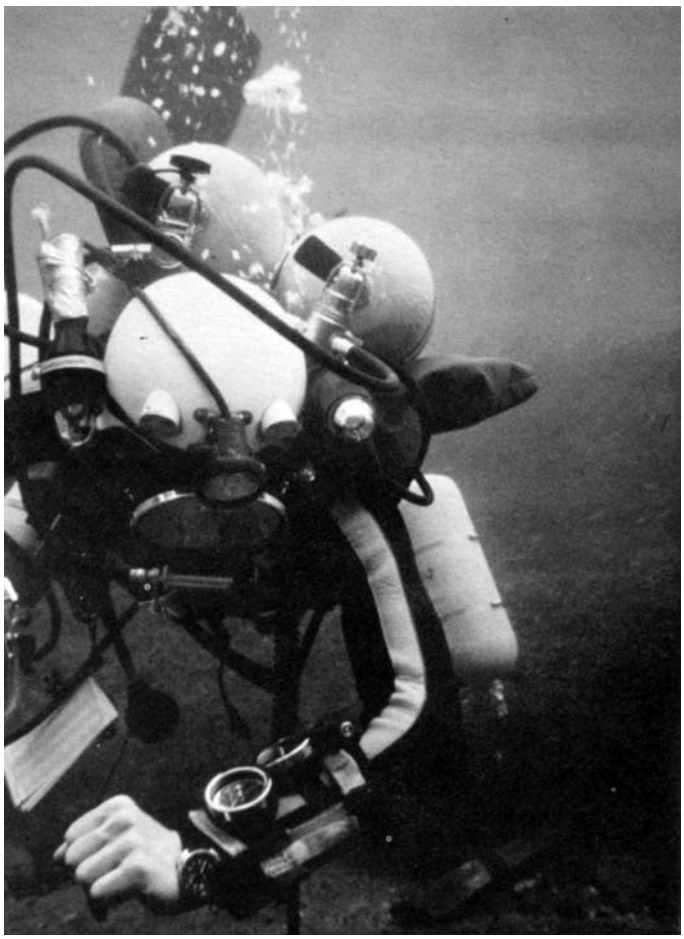
The tanks we used were of the fully overwrapped variety, a term the composite industry uses to denote cylinders which are first wrapped in the longitudinal direction--from the valve post to the base of the cylinder--then later hoop wrapped around the cylindrical sidewalls of the tank. This particular method of construction permits a large reduction in the weight of the cylinder since the top and bottom of the liner need not withstand the internal pressure on their own merit. Additionally, the liner sidewalls may now be thinned below that required to prevent longitudinal bursting, since there is extra support in that direction provided by the longitudinal filiment wrapping. This mode of construction can yield weight savings of up to 65% of the weight of an equivalent steel tank. As an example, the tanks we used held approximately 90 cubic feet of air at the recommended service pressure and weighed 19 pounds when empty. A typical 90 cubic foot steel tank weighs approximately 55 pounds empty.

The DOT has approved certain types of hoop wrapped cylinders for

underwater use, and at one time Luxfer, one of the largest aluminum tank manufacturers had planned to put these into production for Scuba. But after developing a prototype cylinder, the intended retailer, U.S. Divers, assesed that the market did not justify putting them into production. There were several reasons for this. At first the tanks were too buoyant, and would have required excessive amounts of ballast lead. So Luxfer increased the weight of the liner so that the tanks would be neutrally buoyant when half full. In doing so the weight savings over the standard 71.2 cubic foot sport diving tank--which it was intended to replace--was reduced to only 23%. This, in addition to its non-competitive price and the difficulty of obtaining 4000 psi fills--its rated service pressure--convinced U.S. Divers that the market was not yet ready for the hoop wrapped Scuba tank. Luxfer went back to selling aluminum tanks.

The fully overwrapped tanks have a similar problem with buoyancy, but this can be minimized by selecting a low profile, high pressure cylinder. The primary problem with the fully overwrapped cylinders is that the metal liner cannot be inspected for external corrosion since it is completely covered by the composite fibers. After stressing to service pressure it is not uncommon for very fine cracks to form in the brittle epoxy between filiments. While this in no way detracts from the strength of the windings, in theory it might possibly provide a penetration path for corrosive agents (saltwater for example) to attack the liner. Although they are fairly well protected by the epoxy resin there is also some concern that the composite fibers themselves might degrade in corrosive environments. Pending prolonged exposure test results to prove or disprove the integrity of these tanks for general underwater use, the DOT will not issue the exemption numbers which every filling station is required to check before filling a pressure vessel. Although Acurex Aerotherm is conducting such tests, company spokesmen have indicated that they have no near term intentions of applying for an underwater exemption for their fully overwrapped cylinders.

The tanks used on the Sótano de San Agustín dive were made available on the conditions that they be used in fresh water only, and that they be returned on a regular basis for ultimate testing to determine if any dangerous degradation in strength had occurred with time. The tanks were stamped "Experimental - For Test Use Only," instead of with the usual DOT exemption numbers. Bearing this label, there are very few dive shops in the



Bill Stone is shown here exiting Mount Sink, Florida, after a 2.5 hour test dive. (Wiedeman photo)

U.S. that will let you get past the door with such a tank, even if it can withstand five times the highest pressure their compressor can produce: the burst rating on the tanks we used was 16,500 psi; the average Scuba shop fills to 3000 psi.

Even if you do find a cooperative dive shop, the chances are that you will not be able to fill the tanks to the pressures needed to make them efficient. To achieve a 90 cubic foot capacity the tanks used on the Sótano de San Agustín dive had to be pressurized to 4500 psi. During our final state-side organization in Austin we found that only one place in Texas had the ability to pump 4500 psi--the Houston Fire Department, which uses a similar fully overwrapped tank for rescue breathing. To get them to fill the tanks Acurex had to phone NASA, who in turn phoned the fire station with the compressor and convinced the chief to do the fills. That type of cooperation cannot be expected for a weekend sump dive, and we have since been unable to fill the tanks to more than 3500 psi.

It appears that the serious sump diver wishing to use composite tanks will have little recourse but to purchase his own 5000 psi compressor, and the cost of that may well cause him to reconsider going back to metal cylinders. For that matter, the composite cylinders themselves are no bargain: they cost on the order of twice that of a comparable metal cylinder.

Despite these disadvantages, the fully overwrapped composite tank offers a stunning increase in diving capability for a given amount of weight. When filled to 4500 psi the tanks we used had an additional weight of 5 pounds of air, so that each tank weighed 24 pounds full. The weight of the tank carriers was approximately 7 pounds, which gave a total load per team member of 31 pounds: a stout cave pack when doing delicate traverse work, but not unmanagable. On the way out the tanks were completely emptied, resulting in a total pack weight of 25 pounds. If we had used the nearly equivalent single Pressed Steel 104 cubic foot tanks, the filled weight of each tank would be 60 pounds and, because these tanks are at least 50% larger in volume, the tank carriers would have weighed on the order of 11 pounds, for a total pack weight of 73 pounds. If the 104's were over-filled, as they often are for Florida diving, the pack would weigh on the order of 80 pounds: a serious load to be carrying in addition to your normal array of technical gear for a deep caving trip.

The composite tanks we used measured 21 inches long by 7 and 1/4 inches in diameter and were approximately 5 pounds positive buoyant when 1/3 full--the lowest you would want to breathe them down on a normal cave dive--and so additional lead had to be taken down to keep the diver neutrally buoyant. Although this added up to 21 pounds of lead for the four tank set used on the 285 meter dive in the Sótano de San Agustín sump, the individual leads weighed only 3 pounds and were easilly carried on our battery belts and distributed among the team. For multiple assaults, in which fresh tanks are successively brought in from the surface, the lead weights become a negligible consideration, since they need be carried in and out only once. It is this feature, if marketed properly, that would make the tanks attractive to serious sport divers: by designing a detachable precisely weighted backpack, the cylinders would only need to be clipped in and out as they are used. No special modified liner would be needed, and the greater the number of tanks involved per diver, the greater the overall savings in weight.

Far from a disadvantage, however, the positive buoyancy of the composite tanks makes possible a long awaited advancemnt in the art of state diving, the technique developed by Florida

cave divers for extremely long penetrations. In the past, stage diving involved carrying an extra front mounted single metal cylinder--equipped with a regulator and pressure gage read 1/3 down, then unclipped it, attached it to the dive line, and continued on with the back mounted cylinders. If the dive still continued (we are now talking of penetrations greater than 500 meters) there were two options available: either do a set-up dive wherein a full single stage bottle is carried in (while you breathe off your back mounted set) to where you think it would be 1/3 down if you had breathed it from the entrance, and you drop it there for the next dive and exit. On the second dive you breathe a second front mounted single bottle from the entrance to where your pre-set tank is waiting. A switch is then made and you continue on just as if you were doing a single stage dive from that point. Alternatively, if you were a strong swimmer, and had a large buoyancy pack, you could struggle in with two front mounted tanks and successively ditch them along the way as they reached their 1/3 points. Both of the above maneauvers are known as double stage dives.

As the number of stages increase, the logistics and time spent preparing for, doing, and cleaning up after the dive can become staggering. Due to the excessive weights involved (as well as increased drag) nothing larger in capacity than an 80 cubic foot stage bottle, and rarely more than two at a time, has been the accepted tolerable limit of diving capability by Florida divers doing stage dives. Because of this, a lengthy and tiring string of set-up dives become necessary on a major push. Additionally, the large number of shuffling operations--donning and ditching bottles, finding regulators, and monitoring a maze of pressure gages--increases the complexity of the dive, and hence the opportunity for error, particularly when the switching must be performed at depth.

By using dual manifold double composite tanks as stage bottles, in conjunction with back mounted Pressed Steel 104's, which are highly buoyant, all of the above problems can be reduced or, in some cases, eliminated altogether. Because the composite/steele system can be precision adjusted for neutral buoyancy the number of composite stage bottles that can be carried on any given dive is limited only by the projected cross sectional area, the total surface area, and the volume of gear the diver can strap on. The former two items deal with fluid dynamic drag. In simple terms, the diver's thrust must overcome the resistance to motion through the water. This is of considable importance when one is diving against a strong current. Herein again, the composite tanks shine; because of their high pressure design, more gas can be packed into a smaller tank. A typical 100 cubic foot capacity composite tank occupies the same volume as a standard steel or aluminum 50 cubic foot tank. Lastly, using dual manifold double composite tanks for staging means that the number of switching operations is cut in half. The dive is simplified. The safety is also improved, since each double set is equipped with a redundant regulator.

Does it really work? On November 27, 1981 Dr. John Zumrick, from the Navy's Experimental Diving Unit, and I put the theory to a test on a 914 meter penetration dive in north Florida using Acurex stage bottles linked with Sherwood/selpac dual valves. Everything went like clockwork with the distance limited only because of the low pressures available (3100 psi) for charging the tanks. Pending the general availability of high pressure filling stations, as well as some necessary improvements in high pressure regulator systems the composite tank will become the tool of choice for all sump dives as well as for long distance spring diving.

Tanques de Bucear

Con la asistancia de NASA y la compañia Acurex Acutherm, Bill Stone obtuvo unos tanques de peso ligero de bucear. Este tipo de tanque se usaban en los buceos reciente en el Sótano de San Agustín, Oaxaca. Pesan menos de los tanques de acero, pero los pueden resistar a 50% mas de presión. Un problema grande es que es muy dificil a encontrar un lugar que puede llenar los tanques hasta su capacidad máximo. Con unos mejoramientos, haceran estos tanques ideal para bucear sifones y resurgimientos.

Xólotl plays ball

in the emerald land

on the magic field he plays

in the house of mystery

in Yohualichan

Child prince, child prince

you adorn yourself with golden feathers

on the ball playing field

in the house of night

in Yohualichan

(From Fray Bernardino de Sahagún, 1547;
Yohualichan is the archaeological zone
near Cuetzalan with construction like
El Tajín, Veracruz)

285 METERS AND GOING:

The San Agustín Sump

Bill Stone

The dive this past spring at the bottom of San Agustín is part of a story that, oddly enough, had nothing at all to do with cave diving, or Sótano de San Agustín at the beginning. It began almost a year prior to the dive, shortly after one of the more memorable caving trips I have made on the Huautla Plateau.

We were struggling through a jagged popcorn encrusted rift, barely half a meter wide, returning to the surface after an eighteen hour push trip to -240 meters. My pants continually caught on the rock barbs, and slowly ripped, inch by inch, down to the cuff on all four seams. My sweater soon followed the fate of my trousers. Then the mud and grit began to take their toll, grinding on bare flesh. Although the entrance was no further than 400 meters away, the prospect for respite from this torment was remote. At our present pace the entrance was still five hours distant. I summoned my strength to drag myself through yet another 10 meters, rolling my pack along in front of me with one outstretched arm, then rested on my side staring at the odd convolutions on the opposite wall .... 10 centimeters away. I was not alone on this mission. Somewhere behind me an irritated voice was calling out, "Let go. Let go.... damn you. LET GO!" It was addressed not to me but to this godforsaken hole... to humbly permit his passage.

The place was called Nita Nanta, Mazatec Indian dialect for Water Cave. This small, unassuming little hole, with such a breathtaking view from its entrance was proving to be the most difficult deep cave we had ever encountered. Mark Minton had found Nita Nanta near the end of a three month expedition that we had fielded to the Huautla Plateau in the spring of 1980.

The primary objective of that expedition had been the exploration of a cave named Li Nita (Flashlight Cave) which was perched on the high northern flank of the plateau. With considerable luck, and a twenty-seven day underground assault, we had managed to link Li Nita to the Sótano de San Agustín, whose verdant entrance shaft lay 361 meters lower on the plateau. San Agustín was 861 meters deep, and the Li Nita-San Agustín connection produced a combined depth for

Shifflett, Stone, and Warild unloading tanks at the Camp III depot. (Ron Simmons)

Tommy Shifflett tethering a tank up the diagonal line on the forty-second pitch, -855 meters. (Bill Stone)

the system of 1222 meters and marked its rise to the status of the world's third deepest cave. We were thus eager to try for an even higher entrance than Li Nita.

Nita Nanta, with its obscure little entrance near the top of a grassy rock studded knob, was 135 meters above and less than one kilometer distant from the entrance to Li Nita. A connection between the two would put the system at 1357 meters deep, sufficient to surpass the French Reseau Pierre Saint Martin, and take its place as the world's second deepest cave.

We knew precisely where the two caves were located from the computer plot of the system. From the moment their proximity was known it was tacitly assumed that we would begin preparing for the next expedition directly. Further study of the map revealed a stunning, and previously unforeseen, opportunity; a mechanism by which not only the Pierre St. Martin, but the Reseau Jean Bernard itself, could be surpassed. We would have to make a major vertical extension at the bottom of the system. In this case it would not be a simple matter of reverse mountaineering, for exploration in Sótano de San Agustín had terminated in 1977 when the lead team reached a sump at -861 meters. In the spring of 1979 a short penetration dive revealed it to be a deep underwater canyon sinking beyond the range of the diver. The original hope had been to

pass the sump to airspace beyond, using a miniature diving rig, and descend to much greater depths using standard caving equipment. With the dive going deep, however, there was no choice at the time but to abandon the lead. This remained the state of affairs until June of 1980, when it was realized that a vertical drop of only 53 meters at the bottom, given a successful connection with Nita Nanta, would take the world depth record. If the flooded canyon went very deep--too deep for a diver to pass the loop and reach airspace beyond--we could still achieve the 53 meters by doing a deep dive. Several extremely experienced cave divers in Florida had recently made forays to depths in excess of 100 meters in the large springs near the Suwannee River. Special techniques had been developed to muster physiological and psychological tolerance to diving at depth on compressed air.

Following the derigging of Nita Nanta and the White Room lead in Li Nita in early April of 1981 (see the Huautla Project Report) the diving operation in San Agustín got into full swing. Since the connection between Nanta and the main system had not been achieved, the primary hope was now to pass the sump; a depth record by means of a deep dive was no longer a possibility. A considerable amount of effort had been spared us at this time as the cave had been left rigged from Camp I to Camp III following the Li Nita to San Agustín traverse in early March. One brief rigging trip from the entrance to Camp I, by Bill Steele, Tommy Shifflett, and myself, was all that was required to prepare the cave for heavy traffic.

As with the 1979 diving effort, Camp II (-536 meters) was again keyed out to act as a midpoint equipment depot on the way to the bottom. By April 12, this site had been stocked with all the necessary technical equipment and compressed freeze-dried provisions for an extended underground stay. Eight of us then moved in for a ten day assault on the sump using Camp III as the advance staging platform. Shifflett and I were the resident divers; the rest--Neil Hickson, Alan Warild, Tony White, Chris Kerr, Ron Simmons, and Bob Jefferys--had kindly offered to help haul the equipment to the sump. By the time we got to Camp III with four air tanks, one oxygen tank (for high altitude decompression) and assorted peripheral gear, provisions and tackle it became apparent that Plan A would have to be scrapped. The original idea was to have both divers make a dual tank recon dive, then, if it went, i.e. we broke into airspace and could follow that passage, less tanks, to much greater depth, we would have a two man team there ready to carry on immediately. On the other hand, if it went deep we would have to ferry in four fresh tanks so that one diver (using four tanks) could try to pass the deep loop or go for our depth limit of 70 meters.

The problem, however, was that the tank hauling had not been quite as simple as we had envisioned. Tank carriers consisting of short, capped lengths of PVC pipe with shoulder straps had been fabricated. Although the tank carriers worked well for their intended purpose, (several of them took 6 meter falls yet sustaned no damage to the contents), they were uncomfortable and awkward to work with. On one haul run between Camp II and Camp III, Shifflett was flipped upside down in a heavy cascade while rappelling and landed head first in the plunge pool below. The carrier, airtight and positive buoyant, twisted sideways when he hit the water so that he could not free his hands from the backpack straps to swim out of the foam. He would likely have been in some serious trouble had Simmons, his partner not looked back and heard his yell.

While having the tank on your back was a somewhat tenuous propo-

sition in heavy water conditions, it was to be preferred over trying to tether the load below you. For when the carrier hit the current at the base of a pitch it was invariably drawn downstream towards the next cascade. Unless you were quick enough to prevent this before the momentum built up, you stood a better than even chance of going over with it, or having to cut loose at the last minute. At one point on the final descent to the sump, Kerr and I were out in front, he travelling a ways behind as I rigged each pitch. Having not seen him in a while I held up near the -840 meter level. A light soon flashed in the distance, backlighting the spray and foam boring down from the last pitch. Chris arrived somewhat ashen faced, less his tank carrier.

Equipped with four tanks, Bill Stone is shown preparing to begin the first dive attempt. (Ron Simmons)

"What happened?" I asked. "I lost it," he replied. "You what...?" "It's OK! It got sucked over two pitches, but I found it again in a back eddy. I want to scope out the rest of this route before bringing it down." Similar stories came back with the others.

To compound matters it had been a wet spring in Huautla, hence the high water in the gorge where Shifflett's mishap had occurred, and it was likely that the rainy season would arrive early this year. Time was now a critical element in our planning.

The day after we arrived at Camp III with the remaining diving and camping gear a violent storm topside sent in a half meter high surge of silt laden water making it impossible to descend the final shaft series to the sump. During the two days spent in camp waiting for the water to subside we decided that it would be best to have one diver go for the limit using all five tanks on the first dive, rather than risk having to restock should the recon dive fail to get through to airspace. Since I was the only one who had done long and deep dives with four tanks, Shifflett generously offered to switch from diver to sherpa and let me make the dive solo.

On the morning of April 18 we checked the river below camp and, finding the water down and running clear, decided that it was time to make our bid for the sump. We arrived at the -861 meter level late that afternoon with all equipment intact. It required a full two and one half hours to kit up and run down the pre-dive check list of over thirty separate items. This long start up time was primarily because the last rope pitch landed directly in an eight meter deep, sheer walled canal which led to the sump. Between the rope and the sump there was but one small underwater ledge which would accomodate two persons. Using this, Shifflett and I assem-

bled the gear while the others, who were either treading water, or straddling those floating PVC tank carriers, cautiously passed the components a piece at a time. As I prepared to swim off, Hickson added a touch of levity to the situation. "Would you look at all this space age junk. I mean.... all we have are Jumars and racks!" he said feigning a pained expression.

After staging the oxygen at 6 meters, I laid out 155 meters of line during a fifty minute round trip. Quite apart from the deep dive I had been expecting, it averaged only 15 meters in depth and took off like a bat.... in an underwater railroad tunnel. Unfortunately the visibility was down to less than 2 meters. The storm had brought in a considerable amount of silt and it still had not settled out. This complicated things somewhat in that it was often necessary to bounce around from wall to wall to find the best route on. With the line tied off to a solution hole in the wall I began the long swim out, ticking off the line markers which indicated the distance to base every 10 meters. It was a very odd feeling to pop up from decompression, from a cave dive that in every respect could have been one of those training dives in Florida, only to realize I was still at the bottom of San Agustín. Kerr and Shifflett were waiting at the sump when I returned. The rest had grown cold and had climbed back to camp. We had a long discussion there concerning whether or not to pack all the gear up. I had only used the majority of the air in one of the four tanks on the dive and the passage was still going. To leave the cave at this point would not be, as Jefferys was fond of saying, "a 100% effort." We did have, in fact, an additional 140 meters of dive line back at Camp II. After discussing this with the others when we arrived in camp Alan Warild generously made a solo trip to Camp II to retrieve the dive line while Shifflett and I caught some sleep.

Bill Stone checks tank pressures to insure that no tanks leaked. (Tony White)

Armed with a fresh spool of line we returned on April 20 for a second attempt using the remaining air in the tanks. Sixty meters beyond the previous line limit the route dropped down a shaft to a depth of over 28 meters and "T" junctioned with a larger passage, perhaps 10 meters tall and 8 meters wide, going in both directions. Working in the murk, I chose to follow the route which appeared to be heading up, since this would maximize the odds of hitting an airspace before running out of line. The tunnel gradually ascended to a depth of 15 meters before leveling out. A short distance further on a breakdown collapse blocked the passage to where I would have had to dismount my back tanks to get through.

The visibility was somewhat better here and things clearly got bigger again on the other side. But there were only 10 meters left on the spool and the air supply was running low. The line marker registered 285 meters from base. It was going to be a long, cold swim back. With a maximum depth of -28 meters each extra minute spent trying to weasel through the breakdown would mean a substantial decompression penalty when I finally reached the oxygen bottle. Things were beginning to stack up.

I tied off the line and surveyed out--taking compass and depth gage readings at each survey station, then measuring the linear distance between stations, and recording this all on a dive slate. With this information we knew where the passage was headed, and how far we had traversed. Even with pure oxygen for decompression the dive lasted one hour and forty-five minutes. Counting the depth reached on the dive, the overall system depth is presently -1250 meters.

At this point we had no more dive line, which is an absolute prerequisite for finding the way out should a zero visibility silt out occur, and all five tanks had been blown down. It was becoming time to pull a safe retreat from the lower cave; the flood pulse of five days ago had raised the water in the upper gorge above Camp III enough to fray several ropes.

The effort of getting all that stuff down there and back, including the lead weight, was really monumental and the folks who came in just to sherpa deserve a credit that goes beyond words. The final de-rig in San Agustín came towards the end of April and everyone pitched in for the haul from Camp II to the surface. Although we did not pass the sump, the underwater survey now shows this passage to be the southernmost extremity of the system, and the closest point to the primary resurgence, which Pat Wiedeman and I located on May 3. The overland survey puts the spring at 272 meters below the San Agustín sump.

El Sifón de Sótano de San Agustín

Durante la primavera de 1981 unos buzos regresaron al Sótano de San Agustín con el fin de bucear el sifón y alargar el profundidad de Sistema Huautla. Despúes de preparaciones extensivos, hacieron dos buceos. El sifón tenía 15 metros de profundidad. Abajo rio el pasaje Bill Stone encontró un estrechez demasiado pequeno a pasar facilmente. Rio arriba exploró hasta un bloque de rocas. Un distancia de 285 metros se mapeó en el sifón.

TAKE NOTHING BUT PICTURES

LEAVE NOTHING BUT FOOTPRINTS

An Updated List of the Caves of the Sierra de El Abra

Gerald R. Atkinson

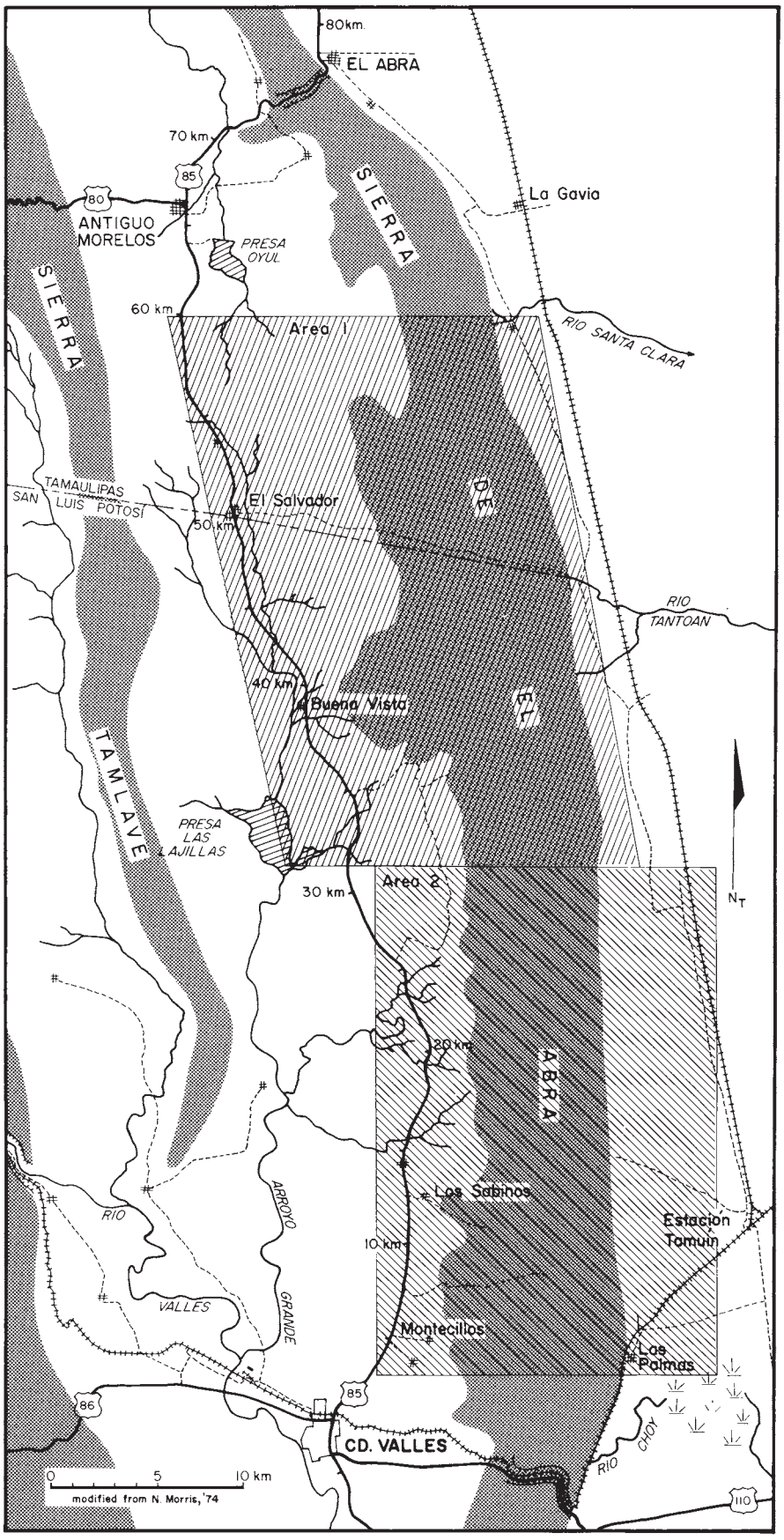
Since Russell's (1972) listing of the caves of the Sierra de El Abra, much has been accomplished in the region. A major increase in the number of known caves occurred after the development of the Otates Mine road and easy access to the range crest. The most notable of those new discoveries were Cueva de Diamante (-621 meters) and Sotano de la Cuesta, a large phreatic void with a 175 meter entrance drop. New caves were continually discovered by those that ventured away from known roads and trails and into the wilderness.

A past hindrance to making new discoveries was the problem of determining one's location in the dense vegetation. Many good leads generated by air reconnaissance or aerial photos have never been checked because it was impossible to obtain reliable bearings from known points. Recently, however, DETENAL released the provisional editions of the Saucillo (F14-B71) and Ceiba (F14-B81) 1/50,000 topographic maps, portions of which are reproduced in this article. Their future use as base maps should facilitate ground reconnaissance immensely.

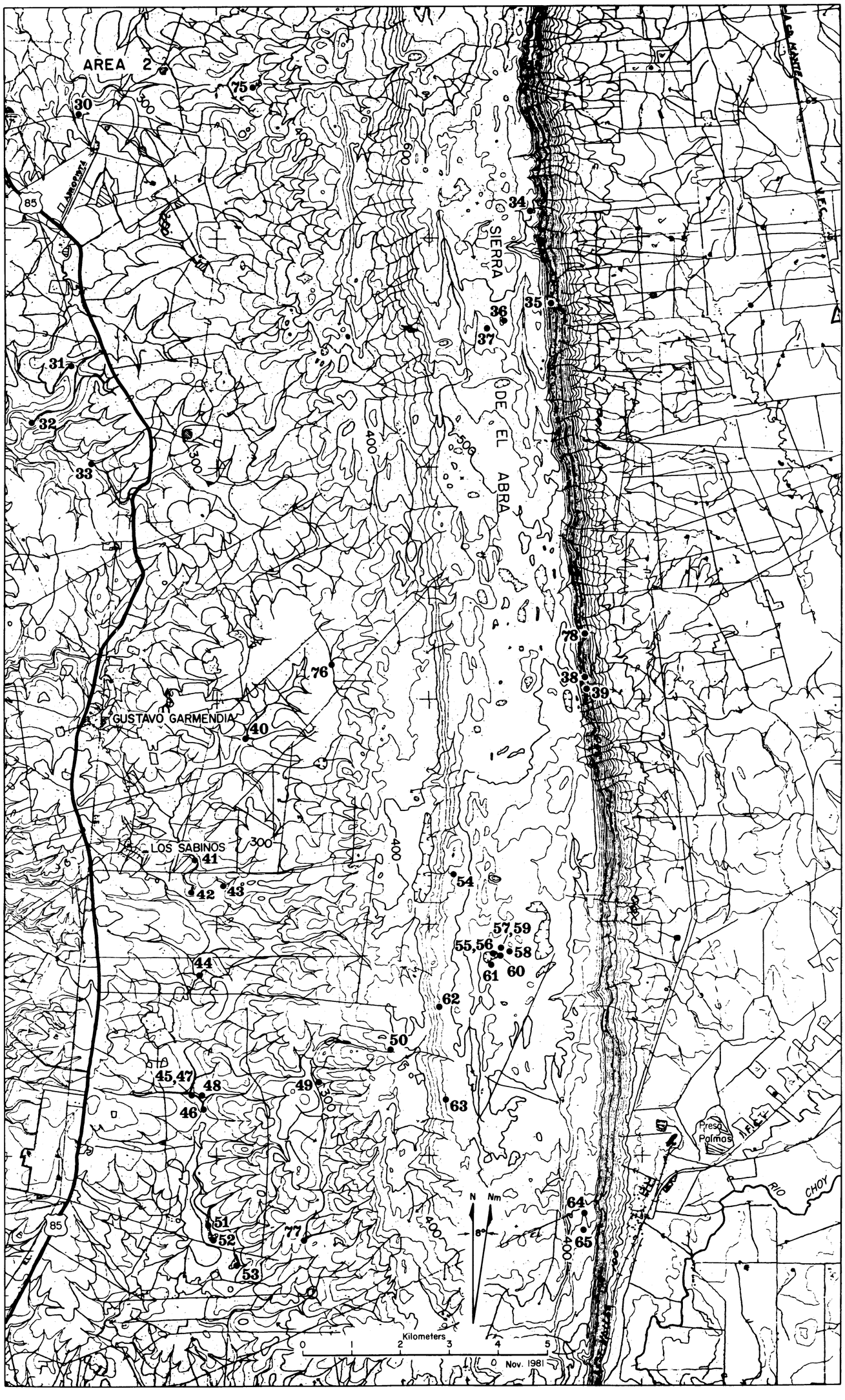
The purpose of this article is to update the list of known caves within the area outlined by the new topographic maps and locate these caves accurately. In compiling the list, the object was to include all significant caves in this area. The El Abra contains literally hundreds of small, blind pits and cavelets, so a subjective distinction of "significant" had to be made. Unless they possess some noteworthy characteristic, caves or pits that are less than 20 meters in both length and depth are not included in this listing.

In researching this article, I was assisted by many individuals. I would like to thank Jeff Horowitz, Mark Minton, Dale Pate, Peter Sprouse, and William Russell for their help in varying capacities. I also made extensive use of Neal Morris's unpublished maps that indicated cave locations.

The base maps used in this article were produced by the Dirección General de Geografia del Territorio Nacional (formerly DETENAL).


80km.
EL ABRA
70 km
85
80
ANTIGUO MORELOS
PRESA OYUL
SIERRA
SIERRA
SIERRA
La Gavia
60 km
Area 1
RIO SANTA CLARA
TAMAULIPAS
SAN LUIS POTOSI
El Salvador
50 km
RIO TANTOAN
40 km
Buena Vista
TAMLAVE
PRESA LAS LAJILLAS
30 km
Area 2
N
20 km
ABRA
Los Sabinos
Estacion Tamuin
10 km
RIO
VALLES
ARROYO GRANDE
Montecillos
Las Palmas
86
85
CD. VALLES
RIO CHOY
110
0 5 10 km
modified from N. Morris, '74


AREA I
SAN JOSE
EL SALVADOR
BALCARMINO
TAMAULIPAS
SAN LUIS POTOSI
(Approx.)
SIERRA DE EL ABRA
RIO TANTOAN
BUENA VISTA
PRESA LAS LAJILLAS
SAN ANTONIO NUMERO UNO
SAN ANTONIO NUMERO DOS
EL ESTRIBO
PUERTA DE MEXICO
PUERTA DE AGUA DE LEON
SANTA MARTA
LAS GOLONDRINAS
FLOR DE MAYO
ESTAMBULIQUE (LA FLOR)
85
N
Nm
Kilometers
0 1 2 3 4 5
Nov. 1981


AREA 2
30
75
85
34
SIERRA
35
36
37
31
DE EL ABRA
32
33
400
300
78
76
38
39
GUSTAVO GARMENDIA
40
LOS SABINOS
41
42
43
54
57,59
55,56
58
60
61
44
62
50
45,47
48
49
63
46
Presa Palmas
RIO CHOY
64
51
52
77
65
53
N
Nm
8°
Kilometers
0 1 2 3 4 5
Nov. 1981

Caves of the Sierra de El Abra

The numbers that precede the cave names correspond to those on the maps. Several sótanos have little or no horizontal development, and any data pertaining to length is either nonexistent or equivocal. Similarly, some short horizontal caves possess little vertical information. These pits or caves have bars (---) listed in the appropriate length or depth column.

Name	Length (meters)	Depth (meters)	Reference
La Noria Area:			
1. Cueva de Joya de Aguacate #1	30	4	Russell (1972)
2. Cueva de Joya de Aguacate #2	9	2	Ibid.
3. Sótano de la Noria	37	30	Ibid.
4. Sótano de Descanso	---	32	Raines (1965)
5. Sótano de la Tarantula	6	34	Russell (1972)
6. Sótano de Venadito[1]	1500+	183	Mitchell, et al. (1977)
Otates Mine - Tanchipa Area:			
7. Las Cuevas del Arroyo Seco:			
Cueva del Arroyo Seco	18+	5	Russell (1972)
Cueva Chica del Arroyo Seco	30	6	Ibid.
Cueva Grande del Arroyo Seco	114	18	Ibid.
8. Cueva de Diamante	730	621	Minton (1978)
9. Sótano de Casi Media Mil	---	151	Morris (1976)
10. Cueva de los Indios[2]	270	76	Ibid.
11. Sótano de Otates	---	244	Ibid.
12. Sótano de Locut	---	30	Russell (1975)
13. Sótano del Techo Cristal	---	46	Morris (1976)
14. Sótano de Soúkup	---	160	Minton (pers. comm.)
15. Sótano de Montículo	117	223	Ibid.
16. Sótano del Arbol Sangre	---	216	Morris (1976)
17. Hoya del Hoyas Grandes	---	67	Ibid.
18. Sótano de Sendero	---	223	Russell (1975)
19. Sótano del Arbol	---	165	Morris (1976)
20. Sótano de la Cuesta	330	217	Fish (1977)
21. Sótano de la Estrella	300+	61	Morris (1973)
22. Sótano de la Pipa	---	82	Ibid.
23. Sótano de Alegría[3]	(unsurveyed)		Minton (pers. comm.)
24. Cueva	15	---	Ibid.
25. Cueva de las Piedras Amarillas	?	?	(no information)
26. Sótano de Coatimundi	---	219	Morris (1973)
27. Sótano de Coatituesday	---	147	Russell (1975)
28. Cueva de Tanchipa	130	157	Fish (1977)
29. Sótano de las Quilas	46	61	Russell (1972)
Ponciano Arriaga Ranch - Yerbaniz Area:			
30. Sótano de la Raíz	41	28	Russell (1972)
31. Sótano de Yerbaniz	1980	95	Walsh (1972)
32. Sótano de Matapalma	1722	86	Ibid.
33. Sótano de Japonés	4500	140	Fish (1977)

Footnotes:

1. Mitchell notes that only 760 meters have actually been surveyed.
2. These figures were scaled off Morris's isometric block diagram included with his article.
3. Alegría was descended in December 1980, but not surveyed at that time.

Name	Length (meters)	Depth (meters)	Reference
Zimapan Area:			
34. Cueva de las Cuates	102	---	Fish (1977)
35. Cueva de la Ceiba	350	197	Ibid.
36. Sótano de los Loros	330	76	Ibid.
37. Hoya de Zimapán	480	320	Ibid.
38. Ventana Jabalí	380	153	Ibid.
Cueva Ceramica	23	---	Greer (1977a)
39. Cueva de las Manos	95	---	Ibid.
Los Sabinos Area:			
40. Sótano del Tigre	3000+	162	Mitchell (1977)
41. Sótano de la Roca	5+	40	Russell (1972)
42. Sótano del Arroyo	7202	134	Mitchell (1977)
43. Cueva de los Sabinos	1502	96	Ibid.
44. Sótano de la Tinaja	4502	82	Fish (1977)
pit	---	46	Russell (1972)
Sistema Montecillos[4]:	3071	115	Mitchell (1977); Fish (1977)
45. Sotanito de Montecillos			Ibid.
46. Sótano de Pichijumo			Ibid.
47. Cueva de las Ratas	46	34	Russell (1972); Morris (1971)
48. Cueva de León	30	---	Morris (1971)
49. Sótano de Soyate	206	287	Russell (1972); Fish (1977)
50. Sótano Escondido	120	15	Russell (1972)
51. Sótano de Jós	338	85	Mitchell (1977)
52. Sótano de las Piedras	405	48	Elliott (1974)
53. Sótano de la Palma Seca	164	53	Mitchell (1977)
Monos Area:			
54. Cueva de Sacatale	70	---	Coons (1974)
55. Sótano de las Orquídeas	69	41	Russell (1972)
56. Sótano y Cueva de los Monos	840	291	Fish (1977)
57. Hoya de Higuerón	153	74	Greer (1977b)
58. Sótano Sin Nombre	---	48	Morris (1974, unpub.)
59. Sótano de la Culebra	---	128	Russell (1972)
60. Sótanos Dobles:			
Sótano Doble Norte	12	23	Ibid.
Sótano Doble Sur	8	9	Ibid.
61. Sótano del Nopal Grande	14	88	Ibid.
62. Cueva Pinta	300	51	Fish (1977)
63. Cueva de los Ojites	107	61	Russell (1972)
64. Sótano Cicuenta y Seis	---	156	Ibid.
65. Sótano de Gadsden	---	135	Ibid.

Footnotes:

4. Sotanito de Montecillos and Sótano de Pichijumo were connected in 1971 through a waterfilled passage.

Cave Leads

(topographic features, aerial sightings, and/or unentered caves)

66. possible stream-capture
67. large Diamante-like solution doline with about 70 meters of closure
68. pit; aerial photo lead on Morris's (unpub.) Tanchipa Area map
69. pit; similar to #68
70. pit; 60+ meter deep, located near flagged trail east of Star-shaped Sink
71. pit; aerial photo lead on Morris's (unpub.) Tanchipa Area map
72. pit; similar to #71
73. pit; 30+ meter deep, located near flagged trail east of Star-shaped Sink
74. pit; similar to #71
75. possible stream-capture
76. possible stream-capture
77. possible stream-capture
78. cave, mined for phosphates

Miscellaneous Caves of Uncertain Location

Sótano de Don Pedro, located in La Noria area, length ---, depth 37, Russell (1972).

Cueva de Santa Elena, located in La Noria area, length 183, depth 61, Russell (1972).

hoya, located at 3/4 kilometer south of Otates Mine near mine road below the east crest, length 15, depth ---, Minton (pers. comm.).

cueva, located at 1/2 kilometer south of Otates Mine near mine road below the east crest, length 300, depth ---, Russell (1972)

Cueva Verde, located near Ponciano Arriaga Ranch, length 15, depth ---, Russell (1972), Walsh (1972).

Sótano de Sacatale, located near Cueva de Sacatale at base of western crest, length 120+, depth 113, Coons (1974).

Sótano del Este, located in the Monos area, length ---, depth 48, Russell (1972).

Sótano de Collins, located above Sótano de la Tinaja, length ---, depth 40, Russell (1972).

Sótano de la Lajita, located near Sotanito de Montecillos, length 12, depth 6, Russell (1972).

Sótano del Lagarto, located south of Sótano de Soyate near trail, length ---, depth 55, Mikels (1972).

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Sierra de El Abra

Lameta de este artículo es hacer una lista corriente de las cuevas conocian en la Sierra de El Abra, San Louis Potosi, y a mostrar donde se localizan en la mapa topografía.

Recon To
Miquihuana

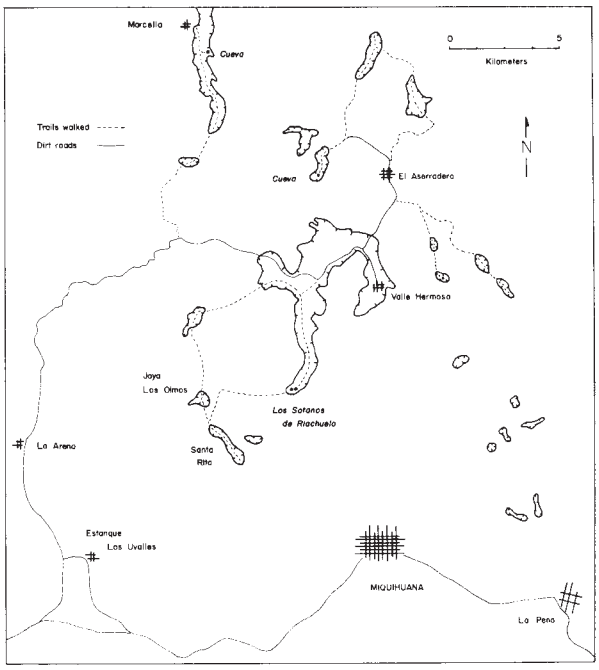
Patricia Mothes

Miquihuana is 300 kilometers by road west-southwest of Ciudad Victoria. (DETENAL topographic map F-14 A-27). It is a highland area, part of the northeastern extension of the Valles-San Luis carbonate platform. The town of Miquihuana is in a valley on clastic rocks; however, the plateau immediately north of Miquihuana is composed of about 1000 meters in thickness of El Abra type limestone, and is internally drained by large karst valleys found at 2500 to 3100 meters elevation. The plateau's maximum elevation is 3300 meters. At the base of this massif, at 2000 meters elevation, two large springs resurge at the limestone-clastic contact, providing Miquihuana's water supply. Roy Jameson and I went to this unexplored area in February of 1981 hoping to find deep caves.

To reach Miquihuana we left Highway 101 near Palmillas and drove west 42 kilometers on a well maintained gravel road. Miquihuana (pop. 5000) is nestled in the narrow corner of a large agricultural valley surrounded on three sides by the escarpment of the plateau. Here we bought gas for our VW, then drove 30 kilometers west and north in an arid outwash plain, through Estanques los Uvalles and La Arena, and finally up the rough, steep road onto the plateau. On the plateau there is a great amount of relief between the high, pine-cloaked ridges and the large alluviated dolines. Well developed arroyos drain off of these ridges into the dolines.

Valle Hermoso, 4 kilometers long by 2 kilometers wide and the largest valley on the plateau, is extensively used for agriculture, being grazed by hundreds of animals and cultivated for seed crops. Although plenty of water enters the valley's numerous sinks, no entrances were open since they are covered by a thick blanket of alluvium. Dolines near Valle Hermoso at Santa Rita, Joya Los Olmos, and a doline north of Los Olmos also have plugged sinkpoints.

The few people who live on these ejido lands were helpful and showed us several caves. Sótano de Riachuelo, near the southern end of Valle Hermoso is a 60 meter deep cave with three pitches that takes a small amount of water from a shallow arroyo. At the second drop a large manganese encrusted human skull was seen. It appeared ancient. Another pit near Riachuelo is 20 meters deep. We mapped and



collected insects in both caves. From our campsite near Riachuelo we saw what seems to be a cave opening near the peak of Cerro El Nacimiento. This feature was not checked.

Five kilometers north of Valle Hermoso at El Aserradero a man took us to a cave in a doline that is a smaller version of Valle Hermoso. We were disappointed that the cave was only 15 meters deep and plugged with rubble.

There is a good water supply at El Aserradero so we camped on the outskirts of town for several nights-nights when the temperatures fell below zero degrees centigrade, snow fell, and packs of coyotes yapped until dawn. Each day we took long hikes to look at the dolines developed near the 3000 meter high ridge tops. It is obvious from the vegetation that more rain falls on these high ridges than in the valleys, therefore the chances of finding caves seemed better. We followed trails and old abandoned logging roads from one doline to the next. Each doline was littered with timber from the logging operations, and grazed by cattle, but no caves were found and looking in between the karst pinnacles yielded only plugged solution niches. In consideration of what little we'd found, some dolines to the southeast were not checked.

Our last hope was to go to Marcella where we were told there was a sumidero. The road to this ejido is presently being built, so we left the car at the pass. The secretary of the road building committee offered to guide us to the cave. The one way distance was 10 kilometers.

The Marcella valley is 4 kilometers long and 1 kilometer wide. The sinkpoint in the east central part of the valley had a debris line from flooding that was several meters above the small hole. Roy entered and stoop-crawled over large, sharp rocks down a slope. At the bottom the way on was blocked by fill but could have been dug open. There was no airflow. The other cave we saw was a 17 meter blind shaft. Our guide knew of no other caves and it seems unlikely that there were any, so we hiked back to the car and proceeded in low gear down the steep road towards Miquihuana.

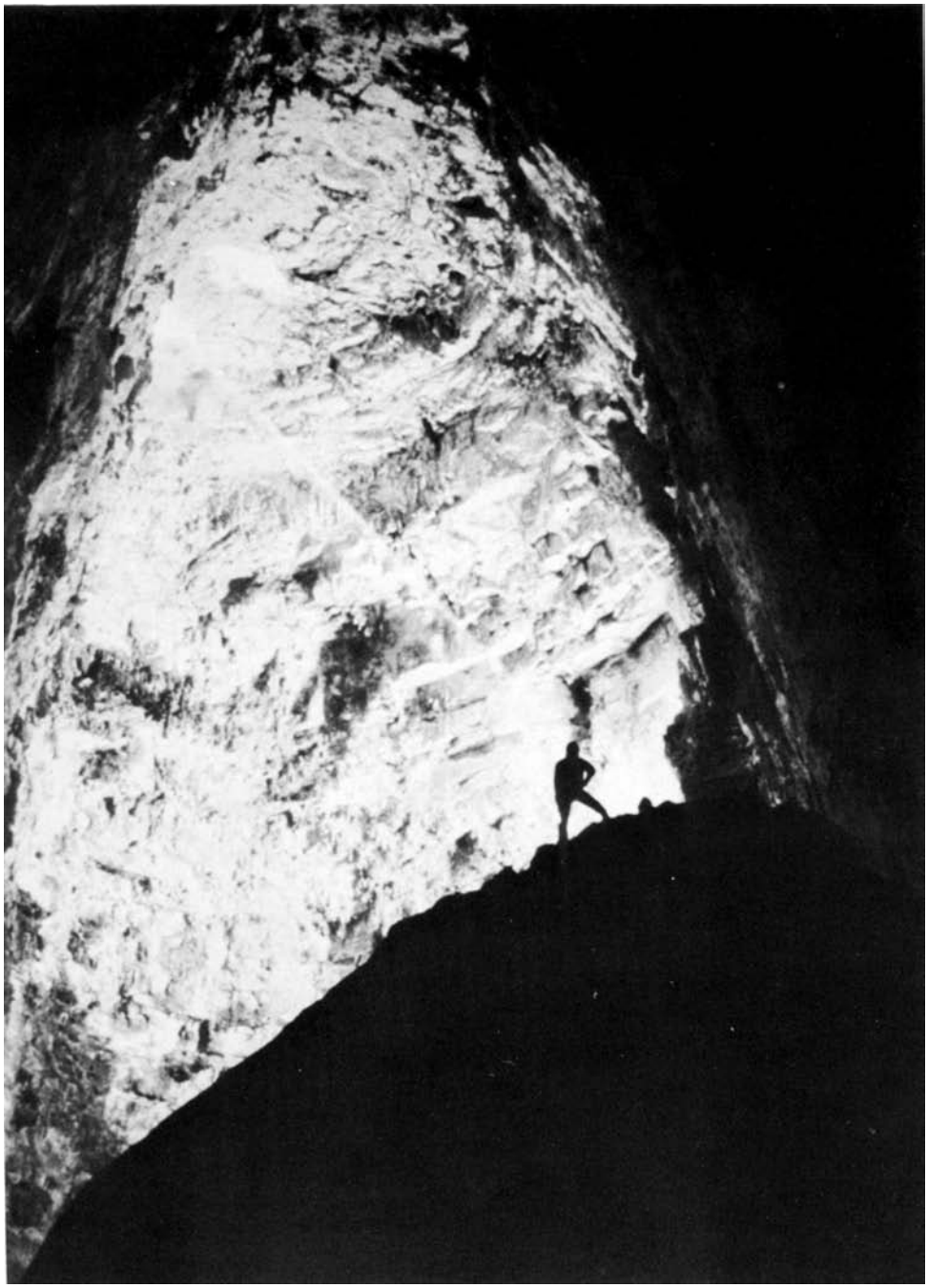
If there is a return trip to this area, the high-ridge dolines closest to Miquihuana and the two openings seen in the cliffs above La Peña (a community east of Miquihuana) should be checked. These two cliff caves may be paleo resurgence caves. The new road being built up onto the plateau from La Peña will provide more direct access to this high karst area.

Note: The DETENAL geology map F-14-A-27 shows more dolines on it than the corresponding topographic map.

Miquihuana

La zona de Miquihuana, al oeste de Ciudad Victoria, fué visitada para buscar cuevas. Hay mas de 1000 metros de calizas, con dos manantiales en la parte interior.

Varias pequeñas cuevas de hasta 60 metros de profundidad fueron explorados y topografiados. Si se regresa a esta zona, valdria la Peña investigar las dolinas mas cercanas a Miquihuana y las dos entradas en las peñas arriba de La Peña (al este de Miquihuana). El nuevo camino bajo construcción a la mesa desde la Peña facilitará el acceso a esta zona karstica a gran altura sobre el nivel del mar.



Inside back cover: Sotano de la Cuesta in the Sierra de El Abra by Jerry Atkinson.
Outside back cover: Travertine dams in Cueva de la Capilla in the Sierra de Guatemala by Duwain Whitis.