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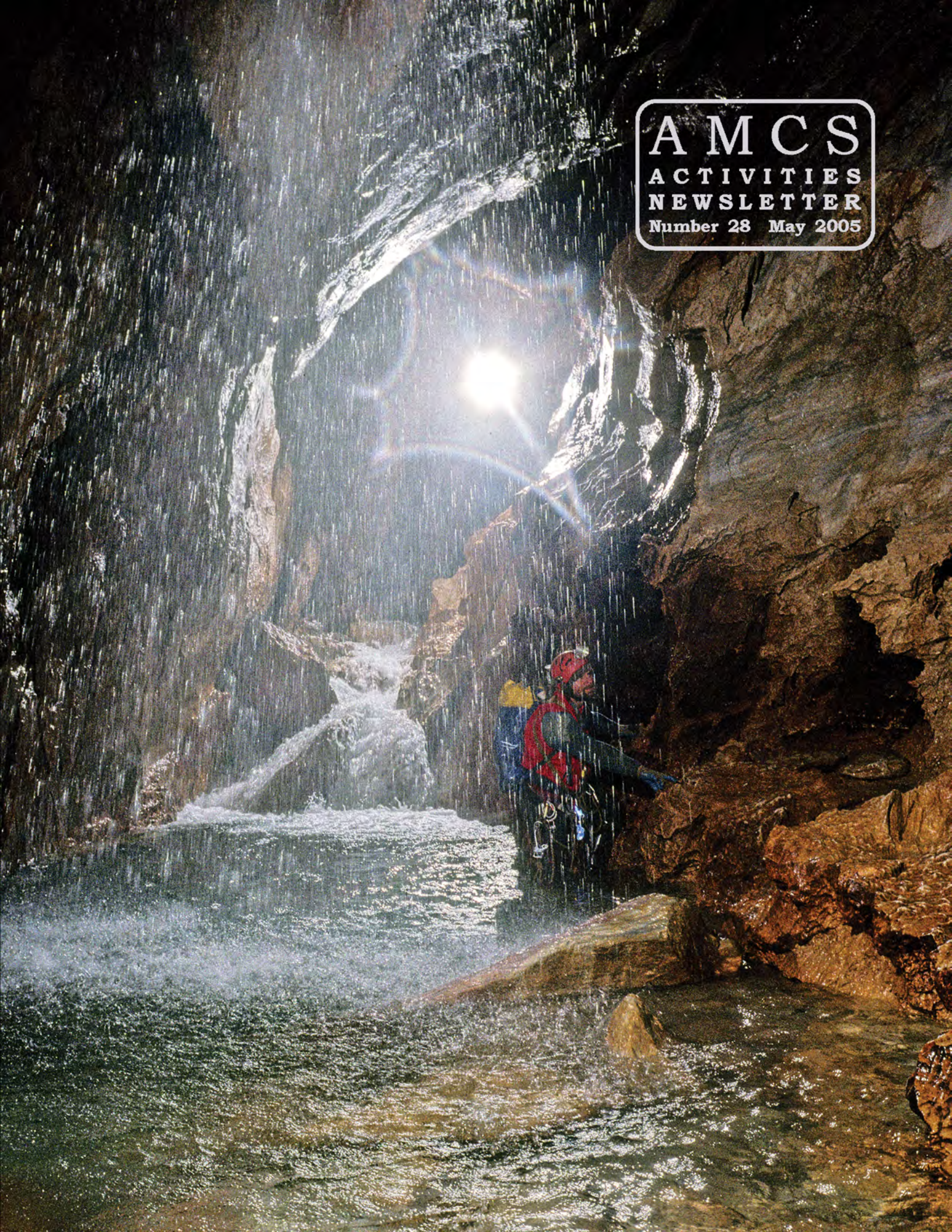

AMCS ACTIVITIES NEWSLETTER

Number 28 May 2005

AMCS

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The AMCS Activities Newsletter is published by the Association for Mexican Cave Studies, a Project of the National Speleological Society. The AMCS is an informal, nonprofit group dedicated to the exploration, study, and conservation of the caves of Mexico.

The Activities Newsletter seeks articles and news items on all significant exploration and research activities in the caves of Mexico. The editor may be contacted at the address below or at editor@amcs-pubs.org. Text and graphics may be submitted on paper, or consult the editor for acceptable formats for electronic submission. Exceptional color photographs for the covers are also sought. They need not pertain to articles in the issue, but need to be high-resolutions scans or digital originals.

This issue was edited by Bill Mixon, with help from Katie Arens, Jim Coke, Yvonne Droms, Rodolfo "Fofo" González, Orion Knox, Mark Minton, Gary Napper, and John "Solo" White.

All previous issues of the Activities Newsletter are available, as are various other publications on the caves of Mexico. Contact sales@amcs-pubs.org, see www.amcs-pubs.org, or write the address below.

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Front cover

Robbie Warke traverses under the big waterfall shaft in Cueva Cheve's Wet Dreams, –1275 meters, during the 2003 Cheve Expedition. Photo by Bill Stone.

Back cover

Mariano Fuentes Silva prepares to cross the Cheve stream at –1200 meters during the 2003 expedition. Photo by Gustavo Vela Turcott.

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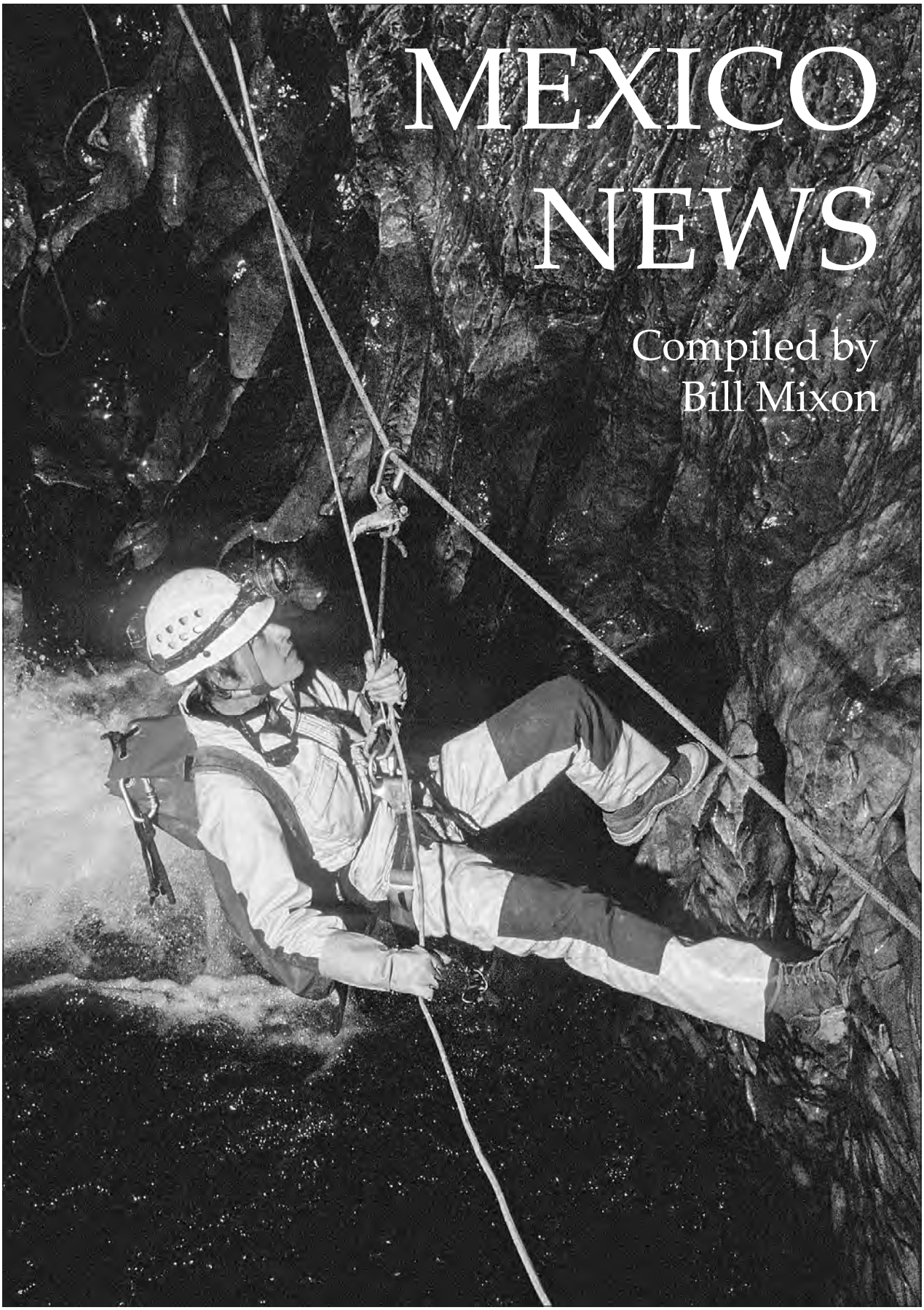
MEXICO NEWS

Compiled by
Bill Mixon



Kasia Biernacka on the highline traverse in the Swim Gym at –900 meters in Cueva Cheve during the 2003 Cheve Expedition. Photo by Bill Stone.

CHIAPAS

The caving community lost a good friend this year when Nela Comstock passed away in February. While Nela was not herself a caver, her son, Ruben Comstock, was instrumental in organizing a lot of the exploration in Cerro Blanco area of Chiapas. Nela lived in Tuxtla, Chiapas, which was an ideal gathering point before and after expeditions. She was always happy to share her house with the hordes of cavers who would show up every year. She gave us a place to camp, fed us, gave us showers, helped us find expedition supplies, and pointed out fun things to do around Tuxtla. Her place was a home away from home for many of us, and Nela was the mother who made it so welcoming. Tuxtla will seem a little bit less sunny without her. *Source*: Taco van Ieperen.

On the night of October 31, 2004, a father and two young sons Miguel and Pascual Saraos were hunting *tepeizcuintes* (pacas) at a cave 500 meters from the village of Jashib (or Joshib or Yochib; not the same Yochib where Sumidero Yochib of Bill Steele's book is located) in the vicinity of Palenque. The two boys were sent into the cave in pursuit of a wounded *tepeizcuinte* and did not come out, according to the father. A large rescue effort ensued that involved widening tight places in the small cave. At one point, the villagers insisted that the rescue people leave the cave, since they were really just looking for gold. The effort resumed after some local men were shown the cave and that there was no gold. Several times rescuers thought that they heard the kids very close by, but upon advancing found no sign of them. On the night of November 4, heavy rain fell and completely flooded the cave. Then there were rumors that the local people intended to take hostages from the rescue workers and hold them until the children were brought out alive. Everyone was escorted away by the police.

The children were never actually seen in the cave. Hunting *tepeizcuinte* at night is frowned upon locally, and the father was disliked in the village for this reason. A village elder claimed that the cave really wanted the father, and that it would not give up the children until the father went in. No word on whether the children were ever found, in the cave or elsewhere. *Source*: ermexico .tripod.com/joshib/joshib.htm or joshib-english.htm.

COAHUILA

On August 21, 2004, the Asociación Coahuilense de Espeleología held an EspeleoCoahuila Conference in the Desert Museum in Saltillo. Here is the program of talks:

Cuevas en Coahuila. Peter Sprouse.
El Abra, la cueva más larga de Coahuila. Aimee Beveridge.
El Tarillal. Ed Goff.
Cuevas y arte rupestre en Coahuila. Terry Sayther.
Rancho Tío Tacho. Norberto de Luna.
Espeleobuceo en el Sótano de Amezcua. Allan Cobb.
Unión Mexicana de Agrupaciones Espeleológicas. Rodolfo González.
Murciélagos en las cuevas de Coahuila. Jim Kennedy and Arnulfo González.
Estudio Arqueológico de las cuevas. Arturo González.
Asociación Coahuilense de Espeleología, A.C. Mónica Ponce.
Espeleobuceo en Quintana Roo. Roberto Chávez.

The following day, Becky Jones and D. J. Walker provided vertical-caving training and rescue demonstrations.

GUERRERO

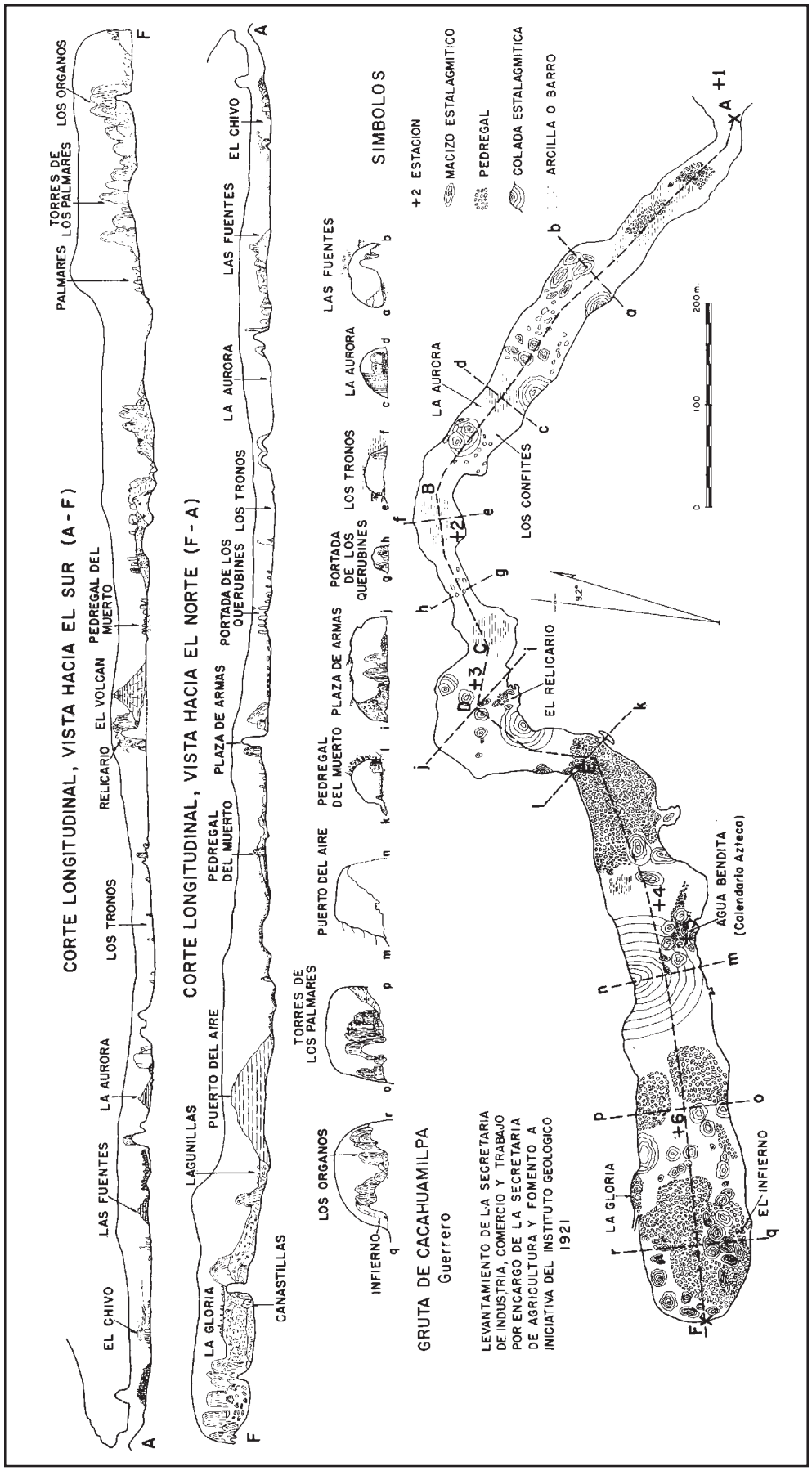
During the months from January 2003 to March 2004, an inter-club group made up of Catalans organized and promoted by the Sección Espeleológica UEC Mataró, in Barcelona, Spain, studied and explored the area of Huacalapan, which is located a few kilometers from Chilpancingo de los Bravos, Guerrero. The area had been reconnoitered by a group of Italians in 1986.

The Huacalapan massif comprises more than 10 square kilometers and is located between 2000 and 2800 meters above sea level. After first familiarizing ourselves with the area and visiting some of the villages on the massif, we decided to establish base camp in Huacalapa, in spite of the fact that the Italians had already checked some of the main sinks there. This turned out to be a good decision, since we didn't have all-terrain vehicles. Huacalapa is the last pueblo on the unpaved road, and the people there welcomed us and made us feel at home.

The minimum altitude at Huacalapa is 2200 meters and the maximum 2800, and it seems to be the town where most of the water on the massif collects; no water flows out from it. Around the town are located large dolines up to 2 kilometers in diameter. We found the caves in many cases to be completely obscured by vegetation, especially at the higher levels, since vegetation is much thicker there, making finding the entrances difficult. Our project was hampered by the heavy rains of 2003, which closed even large entrances. Another major difficulty presented by the area is reaching the higher mountains. Since no road usable by vehicles exists, approach to these areas can take four hours or more.

The caves we found are diverse. They range from horizontal caves with large entrances, like **Cueva de Palmer** (HC109), where the rooms discovered have dimensions of 15 to 17 meters wide by 20 meters high, to caves with deep drops and pits, like HC64, where the base of the 25-meter drop has a 10-meter diameter. Other caves were completely blocked by mud and tree trunks beyond the first 40 meters.

Another of the towns we visited was El Fresno, which is the most populated place on the plateau, and the surroundings are not as rural. The road from Huacalapa to El Fresno is in very bad condition because it is seldom used. We found the resurgences in the area surrounding El Fresno. Water flows out in many places, the vegetation is thicker, and the atmosphere is much more humid than in nearby areas. Although this is primarily a


CORTE LONGITUDINAL, VISTA HACIA EL SUR (A - F)
CORTE LONGITUDINAL, VISTA HACIA EL NORTE (F - A)
EL CHIVO
LAS FUENTES
LA AURORA
LOS TRONOS
RELICARIO
EL VOLCAN
PEDREGAL DEL MUERTO
PALMARES
TORRES DE LOS PALMARES
LOS ORGANOS
LA GLORIA
CANASTILLAS
LAGUNILLAS
PUERTO DEL AIRE
PLAZA DE ARMAS
PORTADA DE LOS QUERUBINES
INFIERNO
SIMBOLOS
+2 ESTACION
MACIZO ESTALAGMITICO
PEDREGAL
COLADA ESTALAGMITICA
ARCILLA O BARRO
LOS CONFITES
EL RELICARIO
AGUA BENDITA
(Calendario Azteca)
EL INFIERNO
GRUTA DE CACAHUAMILPA
Guerrero
LEVANTAMIENTO DE LA SECRETARIA DE INDUSTRIA, COMERCIO Y TRABAJO POR ENCARGO DE LA SECRETARIA DE AGRICULTURA Y FOMENTO A INICIATIVA DEL INSTITUTO GEOLOGICO 1921
0
100
200 m

resurgence zone, we also found sinks. We believe that one of the massif's major karst drainage systems is in the Huacalapa-Ocoshima-El Fresno zone, since the main sinks are in Huacalapa and Ocoshima and the resurgences are found in El Fresno.

Our explorations continued some 20 kilometers to the northeast of Huacalapa, in the village of Coapango. This pueblo is slightly larger than Huacalapa, and rural in character. Coapango is surrounded by hills with pronounced canyons and gorges opening among them, and deep dolines are found at various levels. We found some interesting sinks there, like **Cueva de las Hueretitas** (CP02) and **Cueva del Vivero** (CP01), which has a gallery 15 meters wide, 25 meters high, and 40 meters long and an active stream entering it even in dry-weather periods. The caves found in Coapango would form part of the Coapango-Mojileca system, since the resurgences are located in the village of Mojileca, some 800 meters lower.

This year a lot of time was devoted to evaluating whether or not the area is interesting speleologically, familiarizing ourselves with the villages of the massif, visiting the zones of sinks and resurgences, and the reconnaissance of high-altitude areas that took several hours to reach. This had negative repercussions on the actual exploration of caves, and few of the caves we found were explored. The evaluation was been positive, since in one and a half months 130 new entrances were found in Huacalapa and surrounding villages, of which we explored only 30, mapping three kilometers. More importantly, we are now familiar with the main zones of sinks and resurgences.

Our principal objective in the future should be to explore the caves discovered here. This will require base camps at high elevations in areas like Ocoshima and Chacoalcingo for exploring the sinks there, since the use of vehicles is impossible. At present we are preparing for what will be the second exploration at Huacalapan, from December 2005 to February 2006. *Source*: Susanna Salazar, translated from Spanish by Gary Napper.

The AMCS has never published a map of famous Mexican show cave **Gruta de Cacahuamilpa**. The accompanying map is from Frederico Bonet's *Espeleología de la Región de Cacahuamilpa, Estado de Guerrero, México*, Bulletin 90 of the Instituto de Geología at UNAM, 1971, following page 62.

One Sunday, five divers and five others went to **Pozo de Gavilan**. The dive in the lake at the bottom went well, and at a depth of 40 meters a cave entrance was seen, but not entered. In mid-afternoon, when two people had climbed out and four others were climbing on two ropes, the party was attacked by "killer" bees. The two top climbers were helped to the surface by one person on top, using a third rope. One of the bottom two climbers was removed from his rope by one of the divers, who had on a wetsuit and climbed up to him from the bottom. That climber required treatment for shock when he got to the bottom. Emergency services, including a Civil Protection helicopter, responded to a cell-phone call from the surface, where the bees were attacking everybody within 100 meters of the pit. The remaining climber was hauled to the top. The last person was out of the pit by 1 A.M.

One of those who had reached the surface before the attack spent a night and a day in the hospital and was convalescing for two weeks. One of the climbers got over six hundred stings and spent three days in the hospital. Another received over one thousand stings and was in the hospital for two weeks. A third had about four hundred stings and spent three days in the hospital and two weeks convalescing. The fourth, the last one off rope, got over twelve hundred stings, spent a week in intensive care, two more weeks in the hospital, and then two more days in the ICU for complications, and is still recovering. *Source*: Posting by "Filox" to National Speleological Society discussion board on July 5, 2004 [date of incident unknown], www.caves.org/soupbox/showthread.php?p=1637#post1637.

PUEBLA

Cueva de los Cochinos, **Resumidero de Miquizco**, and **Cueva Lagartijas** were mapped by Italian-Mexican expeditions. *Source*: Article on Tlaloc 2003 in *Speleologia* 49, December 2003. See text about the expedition, also called Tlaloc 2002, in Mexico News in *AMCS Activities Newsletter* 27, under Veracruz.

QUERÉTARO

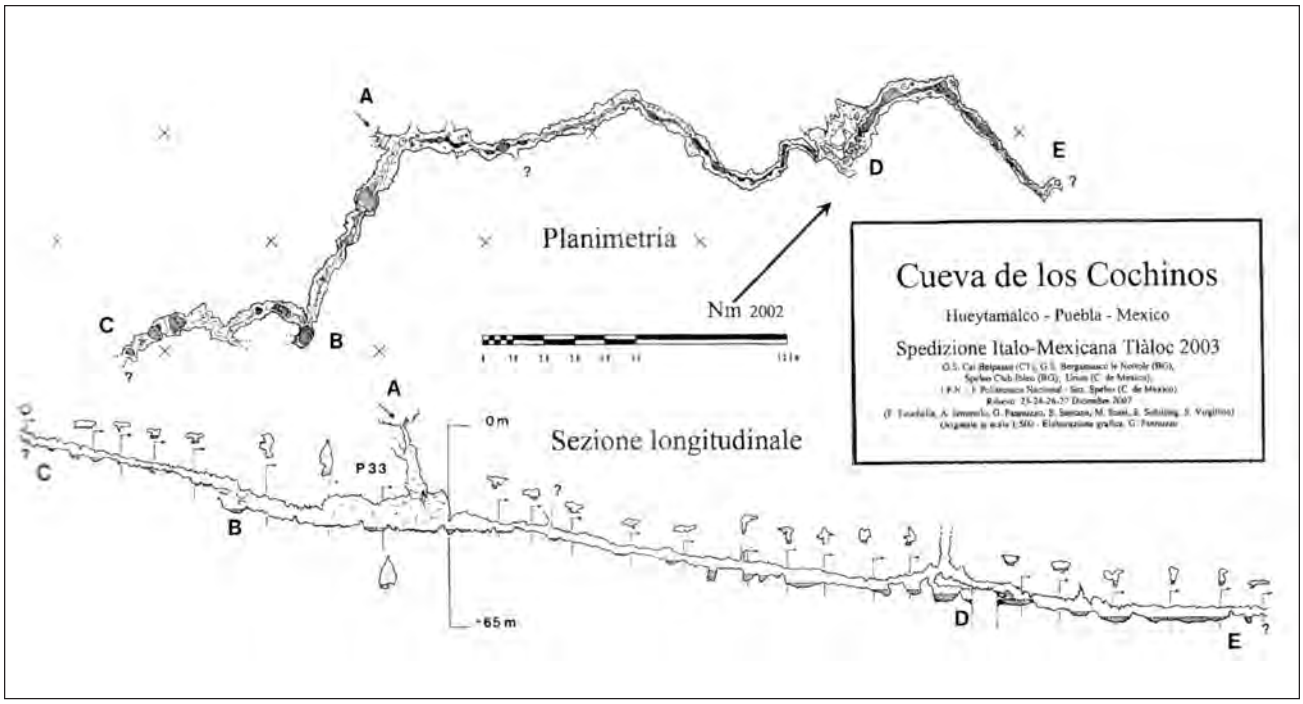
Edgar Mendoza Gualito, member of the caving group at the Instituto Politécnico Nacional, traveled to Querétaro's Sierra Gorda with the goal of doing a bat sampling in Ocotitlán. He found a large number of caves, mostly small and unexplored.

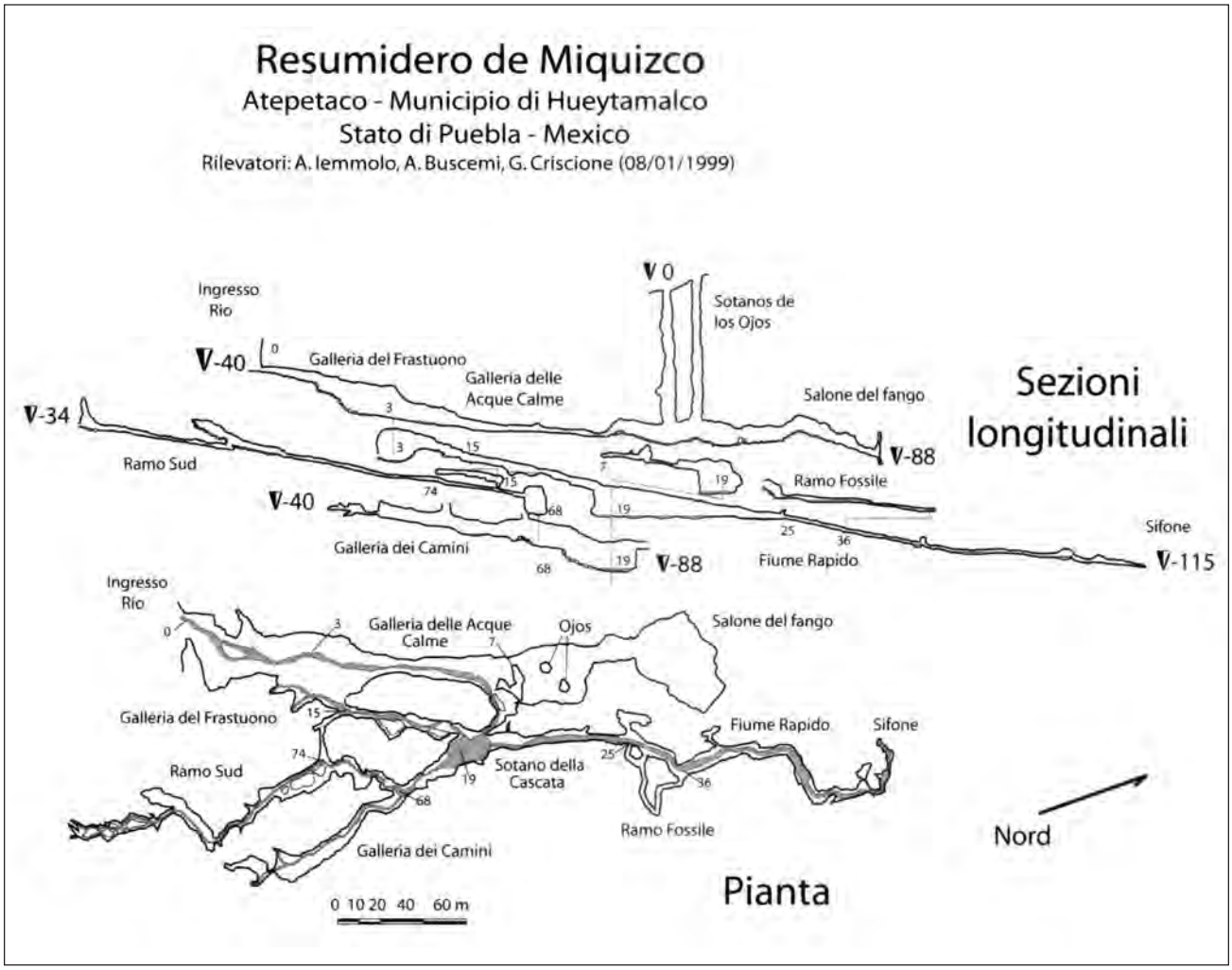
Two years later, based only on Gualito's description, we explored the area. Its potential is significant, and in less than a year we had organized five trips to this area, the last of them with over half a ton of gear, including 600 meters of rope, and seven cavers, Claudia Ruiz, Sandra Morón, Víctor Juárez, Gabriel, Argelia, Gualito, and Alejandro.

The pit in **Sótano de La Culebra** is 337 meters deep, third place in the country in drop length, and the total depth is 362 m.

It is worth noting the presence of fauna in the pit. We noticed two types of frogs, a green, average-sized one and a smaller, brown one. A mouse seen in the lower levels could suggest another entrance in the lower levels. *Source*: Abstract by Argelia Tiburcio and Alejandro Villagrán in the proceedings of the VII National Congress of Speleology in Monterrey (2005), translated from Spanish by Fofo González.

Gilberto Ledesma posted to the iztaxochitla e-mail list a summary of past explorations in the area of San Joaquín, Querétaro. A new survey of the area has so far recorded accurate GPS locations of nine caves. Coordinates are zone 14Q, NAD 27. Lengths are apparently horizontal projected lengths, since


Cueva de los Cochinos
Hueytamalco - Puebla - Mexico
Spedizione Italo-Mexicana Tlàloc 2003
Planimetria
Nm 2002
Sezione longitudinale
0m
-65 m
P33
A
B
C
D
E


Resumidero de Miquizco
Atepetaco - Municipio di Hueytamalco
Stato di Puebla - Mexico
Rilevatori: A. Iemmolo, A. Buscemi, G. Criscione (08/01/1999)
Sezioni longitudinali
Ingresso Rio
V 0
Sotanos de los Ojos
V-40
Galleria del Frastuono
Galleria delle Acque Calme
Salone del fango
V-34
V-88
Ramo Sud
Ramo Fossile
V-40
Galleria dei Camini
V-88
Fiume Rapido
Sifone
V-115
Ingresso Rio
Galleria delle Acque Calme
Ojos
Salone del fango
Galleria del Frastuono
Fiume Rapido
Sifone
Ramo Sud
Sotano della Cascata
Ramo Fossile
Galleria dei Camini
Nord
0 10 20 40 60 m
Pianta

some of them are less than the stated depths.

Sótano de Los Hernández, 1390 meters long, 509 meters deep. 14 438 805E, 2 311 711N, elev. 2418 m

Cueva El Salto, >900 meters long, 215 meters deep. 14 142 754E, 2 310 724N, elev. 2375 m

La Herradura, 297 meters long, 220 meters deep. 14 440 982E, 2 311 280N, elev. 2409 m

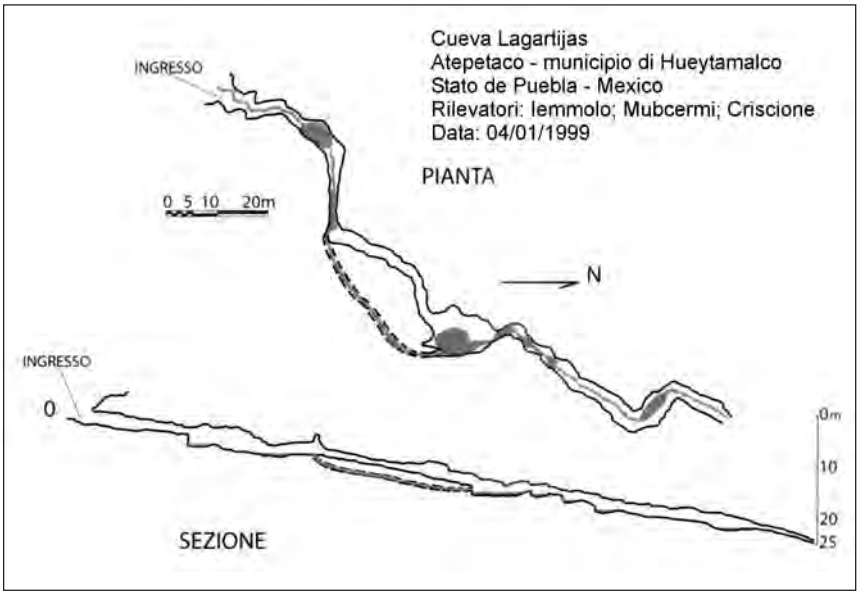
Ardillas II, 440 meters long, 180 meters deep. 14 442 559E, 2 310 633N, elev. 2380 m

Gruta de Los Herrera, 1170 meters long, 294 meters deep. 14 440 115E, 2 310 842N, elev. 2406 m

Sótano de La Carbonera, 30 meters long, 49 meters deep. 14 441 715E, 2 308 949N, elev. 2339 m

Ardillas III, 222 meters long, 212 meters deep. 14 441 341E, 2 309 988N, elev. 2431 m

Cueva de La Sebastiana, 100 meters long, 45 meters deep. 14 441 678E, 2 310 880N, elev. 2511 m



Breakdown blocks in Resumidero de Miquizco, Puebla. From *Speleologia* 49.

Cueva El Palo Grande, 108 meters long, 31 meters deep. 14 442 124E, 2 313 517N, elev. 2340 m

QUINTANA ROO

The Sac Actun Exploration Team has had great success since April 2003 in connecting other underwater caves with Sac Actun. On April 8, 2003, Robbie Schmittner connected the downstream passages from **Cenote Naval**, **Nohoch Ha**, to the rest of **Sistema Sac Actun** upstream from Naval, making the length of Sac Actun over 25 kilometers. On March 27, 2005, **Cenote Chuliab** was discovered by Jim Coke and Schmittner. During April, Schmittner and Steve Bogaerts connected the passages out of Chuliab with **Sistema Nohoch Ki'in**. On April 21, Dave Sieff and Nadia Berni connected a new cenote they had found, **Cenote Equinox**, to Nohoch Ki'in. These connections increased the length of Nohoch Ki'in to 16.5 kilometers.

On October 14, 2004, Davidsson and Schmittner connected **Cenote Ka'as** to Sistema Sac Actun. Ka'as had been explored in September 2001 by Schmittner, who at that time deemed it too dangerous to continue pushing. The following day, Davidsson and Schmittner connected Sac Actun to **Sistema Abejas** through Cenote Ka'as, making the total survey in Sistema Sac Actun 36 kilometers. On October 18, Davidsson connected the Abejas section of Sac Actun to **Altar Maya**, originally explored by a French team, adding 3 more kilometers.

Subsequent efforts by Schmittner, Davidsson, and Bogaerts concentrated on connecting Sac Actun to Nohoch Ki'in in the vicinity of Cenote Equinox, and Steve Bogaerts finally made the connection on November 4. At the end of 2004, surveyed passage in Sistema Sac Actun totaled 61,940 meters, making it the second-longest underwater cave in Quintana Roo and the world, after Ox Bel Ha, and the

third longest cave in Mexico. Sistema Sac Actun has fifty-five cenote entrances.

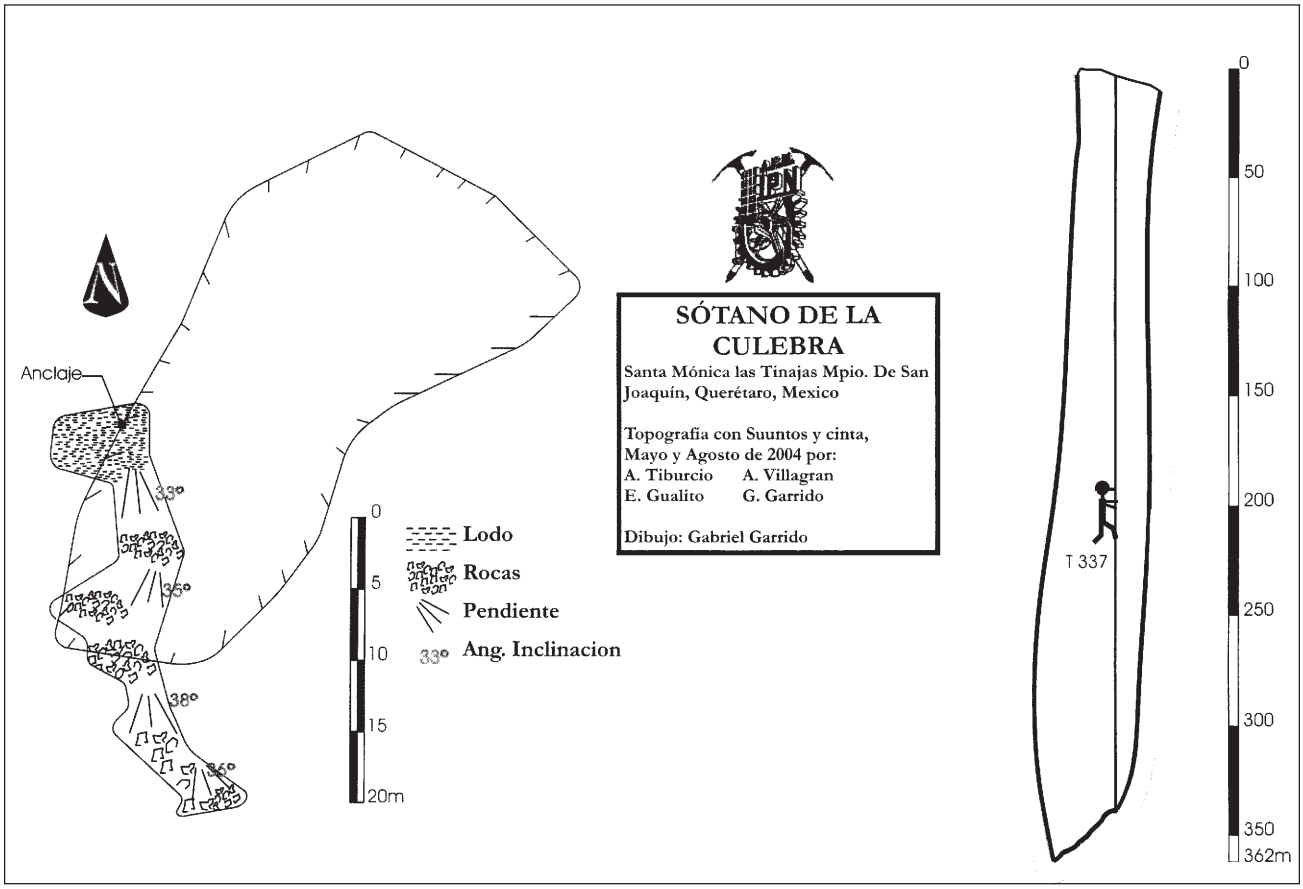
Much of the recent exploration by SAET has been through small, unstable passages, with limited or zero visibility for extended periods. In fact, Bogaerts was once trapped by a collapse on the wrong side of a major side-mount restriction, but fortunately he discovered a new cenote exit a short distance away. *Source*: Sac Actun Exploration Team Report, April 2003–January 2005. The map is by Jim Coke.

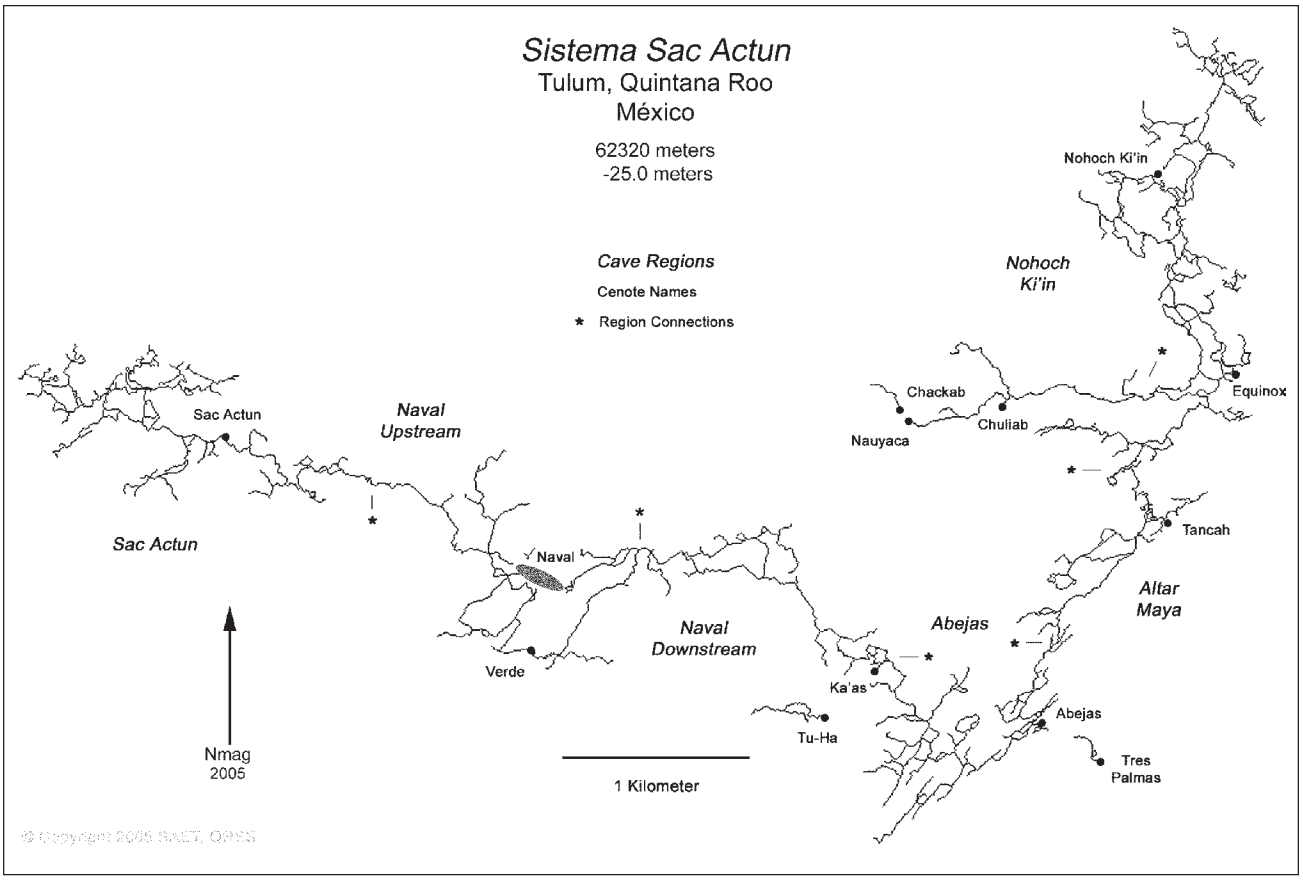
On December 9, 2004, two certified cave divers drowned at **Cenote Calimba**, part of the **Sac Actun** cave system. Nine divers entered the cave in two groups, the second of which was to follow markers and jump lines installed by the first group, which included the guide. The second group turned back before following the entire route of the first group, as planned, but made a navigational error on the way out that took them a long way toward another cenote, where they apparently missed a chance to exit safely. When the first group returned to Calimba, they did not find the second party there. Two members of the second group arrived with tanks nearly empty. When the remaining two divers did not emerge, the guide and two other members of the first team went in and found them with empty tanks about 80 meters from the entrance. The cause of the accident is not known for sure, but the dive plan may have been too elaborate for the skill level of the members of the second group, or they may have been distracted by photography. Long posts on the accident by, respectively, Steve Bogaerts and Steve Gerrard, are at thedecostop.com/forums/showthread.php?t=11452 and t=11632.

On June 13, 2004, the island of Cozumel had a very heavy rain, and a story of water fountaining from a cenote reached cave-diver Diego Romo. In July, warned by locals of crocodiles, he entered the cenote, which proved to lead to an underwater cave. **Sistema Cocodrilo** now has more than 1000 meters of line in it, and stage-tank diving is required for further exploration. Crocodile skeletons, Maya pottery, and speleothems are in the cave, which has an average water depth of 11 meters and a maximum of 20 meters so far. *Source*: Diego Romo C., in *Underwater Speleology*, September 2004.

The winter 2004 issue of *Quest* magazine contains a short article "Coastal Cave Exploration in Quintana Roo," by Fred Devos and Chris Le Maillot. Illustrated with a number of photographs, it briefly describes the history of the exploration of several of the major systems there. *Source*: Fred Devos.

The Yucatán 2005 expedition, sponsored by the Fédération Française de Spéléologie, took place February 4–22, 2005, with Philippe Brunet, Christophe Depin, Bernard Glon, Bruno Delprat, and expatriate Bernard Tomachot from Merida for two weekends, accompanied by





Emmanuel Coutrot, Eymeric and Gaétan Depin, Anne Dutheillet, and Daniella Parot. The expedition returned with 4.5 kilometers of virgin passage and 7.7 kilometers of mapped cave.

Kukulkan produced 3 kilometers of passage, often spacious (8 by 4 meters), all parallel to the coast and connected by transverse passages. This cave is connected to **Altar Maya**, first discovered by Nickolai Toussaint in 2000, which we started exploring in 2001. Altar Maya is the main "spinal cord" that makes it possible to link several systems. Our explorations include Altar Maya, Kukulkan, **Sole**, as well as **Abejas**, which was partially resurveyed. This forms a part of a larger system that is composed of **Sac Actun** and **Nohoch Ki'in** and would total more than 71 kilometers of surveyed passage, including 12,500 meters explored by our group. This would make Sac Actun the second-longest underwater cave system in the world, behind Ox Bel Ha, also in the Yucatan.

The reason for our uncertainty is due to not knowing if the survey of certain parts of the system can be trusted. While resurveying some parts of Abejes, we noticed that the distance between knots varied from 2.2 to 3.05 meters. We evaluated the "average knot spacing" as 2.50 meters. However, the American marking convention consists in placing a knot every 10 feet, or 3.05 meters. This error would proportionately shorten the dimensions of the whole system. It should be noted that we had already noticed this phenomenon in other caves, without knowing whether it was due to not being strict enough or to the explorers being overly optimistic in their figures.

The other caves did not yield significant results, but some exploration was done.

The future looks bright, since a large area remains virgin between the systems Nohoch Ki'in and Sac Actun and since not all the water flow measured in the passages is found at the resurgence in the sea.

This year's expedition again benefited from the friendly support by locals Marco, Lorenza, and the Rotzinger children, who let us stay with them and helped us with the diving tanks logistics. *Source*: Message from Philippe Brunet (March 1, 2005) on Speleos-France Listserve, translated from the French by Yvonne Droms.

A note on the preceding item: Philippe Brunet has organized many expeditions to explore both underwater and dry caves on the Yucatán Peninsula. Within a ten-year period, both he and other team members have pursued numerous investigations in Quintana Roo, including important discoveries such as the **Actun Koh**, **Altar Maya**, **Minotauro**, **Pitch**, **Sole**, **Tatich**, **X-caret**, and **Xel-Ha** caves. I applaud their resolve in maintaining a consistent and enthusiastic study of a karst area that remains fertile for both dry and underwater cave exploration.

Current developments within the area, including a preliminary map of **Sistema Sac Actun**, have been presented above. However, present

survey records do not indicate an underwater connection between the Sole and Sac Actun caves. Both caves remain separated by over a kilometer of unexplored territory. The location and development of the **Kukulkan** cave remains a mystery to all local explorers. Brunet's account suggests that Kukulkan may be a resurvey of the southwestern region of the Abejas cave, which was explored between 1993 and 1998 by Dan Lins and Andreas Matthes.

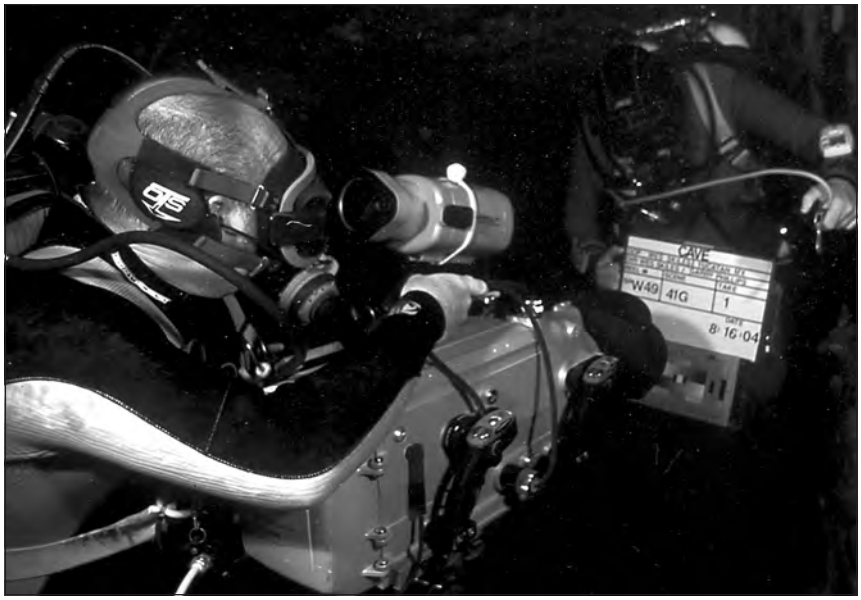
Errors introduced by knotted-line survey are well documented. KLS is a standard underwater-survey procedure that is employed by many explorers to expedite subaquatic cave surveys. Passage depth, deteriorating environmental conditions, or distance from an opening to the surface all serve to encourage KLS surveys. Most explorers strive to minimize these errors to render their survey an honest, rather than misleading, portrayal of explored passage. Errors appear in all survey methods, but using a tape alleviates one source of error in KLS surveys. Historical survey records confirm that the large majority of the Abejas cave region was surveyed with a fiberglass tape.

It is not my intent to challenge M. Brunet's observations. I would rather encourage all exploration groups in the area to cultivate avenues for productive and collaborative communications. Contributions by all explorers should be recognized; constructive dialogues between groups will not only further dynamic exploration, it will result in a more comprehensive understanding of the region's caves. *Source*: Jim Coke.

According to the Quintana Roo Speleological Survey web page www.caves.org/project/qrss/qrlong.htm on 19 March 2005, with a minor update from Jim Coke, the ten longest underwater caves in Quintana Roo are:

Sistema Ox Bel Ha	134048	m.
Sistema Sac Actun	62828	
Nohoch Nah Chich	61142	
Sistema Dos Ojos	56671	
Sistema Naranjal	21525	
Sistema Ponderosa	15019	
Sistema Yaxchen East	13090	
Sistema Chac-Mol	9193	
Cueva Quebrada	9000	
Sistema Zapote	7697	

In addition to the various connections integrating the Sac Actun system described above, **Cenote Vaca Ha** has been connected to **Sistema Zaspote** through an obscure tunnel (see length in table above). The **Northwest Arm** and **Laguna Negra** caves in the Xel-Ha region have been connected, yielding **Sistema Xel-Ha Norte**, 6652 meters long. *Source*: www.caves.org/project/qrss/new.htm, accessed April 20, 2005.



Underwater filming for the movie *The Cave*. *Paul Heinerth*.

High Springs resident and filmmaker Wes Skiles knew he had a challenge before him when he was asked to create sustained fire underwater.

And fellow scuba diver and High Springs resident Jill Heinerth knew she was in for an interesting time when she was asked to pose as a white man, a black man and an Asian man.

But she was able to pull off the multicultural transformation, and Skiles was able to create fire where the laws of nature say it can't exist as the two local residents helped create Sony Screen Gem's upcoming movie, *The Cave*.

"This was much more intricate and involved than what we're used to," said Skiles, a world-renowned underwater cave diver and filmmaker. "We're usually working with the environment and a small group of people who are experts in their field."

But for Skiles and Heinerth, they were thrown into a whole new world—known as Hollywood.

"I had originally been promised I'd have the entire cast for three weeks," said Heinerth, who is believed to be the most experienced female cave diver in the world. "I hardly got to train them at all."

The plot of the movie revolves around a group of expert divers who decide to explore a cave in the Carpathian Mountains, in the land of Count Dracula. But during their exploration, the cave collapses and then, well, they learn they are "not at the top of the food chain," said Ross Ambrose, director of marketing for Karst Productions, which is Skiles's movie production company.

Although the movie's plot centers around a cave dive in Mexico, almost all the scenes in the movie come from inside a specially designed, football-field-sized aquarium built specifically for the movie in, of all places, Romania. [The author has this backwards. See previous paragraph above, or the following Mexico News item.]

Labor and other costs are far less in Romania than in the United

States, Skiles said.

After the aquarium was built and before the water was put in, Skiles and Heinerth got to help design the "caves" through which the actors and stunt doubles would swim.

In one cave, Skiles had to direct an underwater avalanche, in which boulders fall through the water, hitting the divers. Skiles used hundreds of fiberglass boulders, filled with enough sand to give them weight and a real look while falling underwater.

He even had people on top of the aquarium, dropping in sand and other material to give the water the look it should have if an underwater avalanche was occurring.

He also pumped special gas into the water so that when it hit the surface, a pilot light would ignite the gas and cause a fire on top of the water.

But creating fire on top of the water was relatively easy, according to Skiles. Creating sustained fire underwater—now that was difficult, Skiles said, if not downright impossible. But he was asked to do the impossible by the movie-makers, who wanted to give the illusion that a volcano was erupting underwater.

Skiles resorted to special effects to pull off the miracle, using a combination of red lights, gas, and bubbles to give the illusion of fire underwater. Skiles laughed out loud when he talked about pulling off that special effect.

"Maybe I'll use that one back home," he said, referring to the multiple springs around High Springs.

Skiles laughed again and said that in the aquarium, he did so many things in the fake caves that he preaches locally not to do in sinkholes—such as throwing debris down them (the avalanche) or putting foreign substances in them (such as the gas and other material used to create the "fire").

"All the things you're not supposed to do, I did," he said, laughing about the fake caves.

Skiles and Heinerth said they enjoyed working with the actors, who gave the two High Springs residents a lot of respect.

"They were very good with us," Skiles said.

In fact, many of the problems the actors run into in the movie are problems that Skiles and Heinerth have faced in real cave dives.

"They knew we were the real thing," Skiles said.

Heinerth said that while she wasn't given much time to train the actors and actresses, she was impressed with their ability to mimic her—using diving lingo and acting like, well, divers.

"Their observation skills are amazing," Heinerth said.

The movie-makers continued to ask more of the actors in the underwater scenes, and Heinerth regularly had to let them know that what they were asking was dangerous or impossible without much more training.

"I had to constantly draw the line," she said.

She joked that at one point the movie-makers wanted an actor to use a particular diving mask because his eyes could be better seen. But Heinerth pointed out that the mask didn't fit the actor's head and was leaking water.

But that didn't matter to the make-believe world of Hollywood. Style, not functionality, was important, she said.

"Functionality always lost," she said. "The debate always boiled down to safety and style."

Because the actors had so little time to prepare, stunt doubles had to be used regularly, and Heinerth was one of them. She laughed out loud when she said that she had to play three men—a white man, a black man, and an Asian man.

There was even a scene where she had to wear a wig to better look like one of the men during her stunt scenes.

"Ugh!" she said of the wig.

Working on the movie was a great learning experience, Skiles said. While he has produced several National Geographic-type movies, his experience with Hollywood was limited.

He said he learned a lot about detailed production and realized how far he could go on his own with special effects, such as the "fire" underwater.

And he said he was particularly proud of his team of divers.

"We had an incredibly resourceful team," Skiles said. "They came together and made it happen." *Source*: Ronald Dupont, Jr., in *High Springs* (Florida) *Herald*, January 6, 2005.

Hidden Worlds Dive Shop in Quintana Roo, Mexico, recently supported the filming of a new Hollywood feature film *The Cave*, which is due to hit theaters this August.

The film's executive producers contacted Wes Skiles and Jill Heinerth to assist them in a Herculean task: to bring the underwater cave world to the big screen. But in the end, it took far more help than they alone could offer. Skiles and Heinerth had to get the support of

The underwater production crew for *The Cave* in Mexico.

over fifty of their closest friends to fill out the Underwater Unit in Mexico. At times, more than eighteen people were underwater, wrangling cables, setting lights, acting as doubles, and ensuring the safety of the entire team.

"We knew that we had to go to a place where we had worked intensively in the past. Few people can handle the logistics and demands of a Hollywood crew, and Buddy Quattlebaum and his Hidden Worlds Dive Shop was the only operation that could fill the bill," said Heinerth.

"We needed to work in a community with lots of local expertise, with caves that had enough flow to clean up quickly, and in an environment that was stunning."

The film traces the journey of a team of rebreather sump-divers through an adventure in the caves of Romania. During their exploration, a collapse traps the entire crew, who are left to fend for themselves while being pursued by a frightening presence.

The bulk of the film was shot in Romania on a series of wet sets that allowed for spectacular stunts, many of which were coordinated by the underwater team. Location shooting took place in two cenotes within Hidden Worlds and in the open water on the island of Cozumel.

Principal actors were trained to use rebreathers in a limited capacity by Jill Heinerth, but the bulk of underwater action was covered by a team of stunt doubles trained by Mark Meadows. Brian Kakuk, Matt Matthes, Jitka Hyniova, Jakub Rehacek, Joel Tower, Jill Heinerth, and Mark Meadows doubled for the cast of nine actors: Cole Hauser, Morris Chestnut, Eddie Cibrian, Rick Ravanello, Marcel Iures, Lena Headey, Piper Perabo, Daniel Dae-Kim, and Kieran Darcy-Smith.

The film is due to be released by Sony Screen Gems on August 19, 2005. A trailer for the film can be viewed at www.enterthecave.com. *Source*: Karst Productions.

Jill Heinerth adds: As Technical Advisor for *The Cave*, I should prepare myself for years of Internet abuse. It is going to be a really fun film to watch, but there will be tons that the caving community will groan and laugh at. Despite all of my objections in many areas, there will be lots of inappropriate gear and techniques that were implemented for lots of great reasons, like "We like the looks of this better." It's a good thing I have a thick hide, but I still am practicing my line: "It's only fiction."

The 2004 Cambrian Foundation expedition to Akumal continued the group's exploration and survey of **Sistema Camila**. Diving was conducted from the **Cenote Mud** entrance, and about 470 meters of new passage was explored and surveyed. A new entrance, **Cenote Kaibab**, was discovered. Ten high-school students from Virginia participated in the expedition as an educational experience. They helped with diving preparations and data gathering, and they learned to survey in a dry cave at Aktun Chen. *Source*: article by Renee Power, *Underwater Speleology*, June 2004.

David McBold and Mauro Maldonado in Yeso Grande, SLP. *Tim Harrison*.

SAN LUIS POTOSÍ

Mauro Maldinado, a middle-aged rancher from Tanchachin, guided five members of the Middle Ozark Lower Earth Society (MOLES) to four unreported caves north of the Río Gallinas less than a half kilometer from its confluence with the Río Santa María at Cascada Tamul. **Cueva Recodo**, within sight of the Gallinas, is a narrow passage that penetrates the bluff face for approximately 20 meters. The three other caves were some distance north of Recodo near a pasture, well away from the river.

A 5-meter pit yielded 25 meters of gypsum-encrusted passage terminated by flowstone. A multi-entrance cave that Mauro named **Cueva Yeso** has several large chambers and a colony of fruit-eating bats. Many attenuated

The petroglyph in Cueva Yesu Cara. *Tim Harrison*.

seedlings rise from the guano mound in the center of the largest chamber. Dozens of herald moths clung to the walls.

The fourth cave, **Cueva Yesu Cara**, has a hands-and-knees crawl entrance. Approximately 100 meters of passage was explored. The sinuous passage is all crawlway, with a number of pottery sherds scattered about the floor, into which there have been several small excavations. Jim Terry noted a petroglyph on the left wall within 8 meters of the entrance. Mauro had never noticed it before. We took several photographs. *Source*: Tim Harrison.

Sótano del Xoconostle has a small entrance about 1.5 meters in diameter that lies a couple of meters from a path that leads to **Cueva de los Caballos**, near a microwave-relay tower also named Los Caballos. The entrance drop in Xoconostle is 24 meters. From the bottom of the drop, a steep and slippery slope leads to a small slot above a second drop, of 19 meters. The cave is well known to cavers in San Luis Potosí and is used for cave-rescue training. A map of this cave, as Sótano del Jonconostle, appears in *AMCS Activities Newsletter* 18, page 13.

Saturday evening, July 10, 2004, a group of young people had a party at the entrance to Cueva de los Caballos. At about 11 P.M., a group was walking on the path without lights, when the one in the lead, who was carrying two plastic bags full of beer, wandered from the path and fell into the pit. The first rescuers at the scene determined that the victim had died immediately of facial and skull injuries. The body had slid down the slope, and some care was required during the recovery to prevent its falling down the second drop. The main part of the recovery operation, by members of Espeleo Rescate México and Cruz Roja Mexicana, took from about 4 to 6 A.M. on Sunday morning. *Source*: www.massagebychris.com/cave/cavingaccident.htm (English); ermexico.tripod.com/xoconostle/xoconostle.htm (Spanish).

Following the fatal accident during a BASE-jumping expedition to **Sótano de las Golondrinas** (see Mexico News in *AMCS Activities Newsletter* 27), BASE jumping and other similar activities have been banned there, but rappelling is allowed. No motorized devices such as the winches that had been used to haul out the BASE jumpers are allowed. That ban had been desired for some time because of a fear that the noise bothered the birds. No ropes may be in the pit when the birds are present, which will severely restrict the timing of visits to the bottom of the pit, with all activity restricted to about 9 A.M. to 3 P.M., with the exact timing presumably depending on the season. Rappelling will not be allowed on days when, due to bad weather, the birds have not left the pit.

For any caving in the Aquismón area, you must now first stop at the tourism office, upstairs in the city hall on the plaza in Aquismón. Leydi Medina and Cesario Cedillo work in that office, and they have a form you need to fill out and will give you a letter of introduction from the *presidente*. The office is open from 9 to 2 Monday through Saturday. Then go to Sopope (Zopope) up the road toward Golondrinas and talk to Claudio Yanes, who runs the store in the village. He will give you permission to visit caves in the Tamapatz area. You might also have to see the *jefe* in Tamapatz, if instructed to do so by Claudio. For caves not in the Tamapatz jurisdiction, you will need to go through other local officials; inquire at the tourism office in Tamapatz.

Cesario Cedillo has announced the address espeleogolondrinas@hotmail.com for questions or comments regarding caves in the Aquismón area. (The editor does not know whether the tourism office can respond to messages in English.) *Source*: Barry Cunningham, Mike Walsh, and Jerry Fant.

The road from Limoncita to Tampaxal is being paved, and the trail up to **Hoya de las Guaguas** is being improved. Ring bolts for rigging are being installed at the pit, so additional drilling of bolt holes can be forestalled. *Source*: Barry Cunningham.

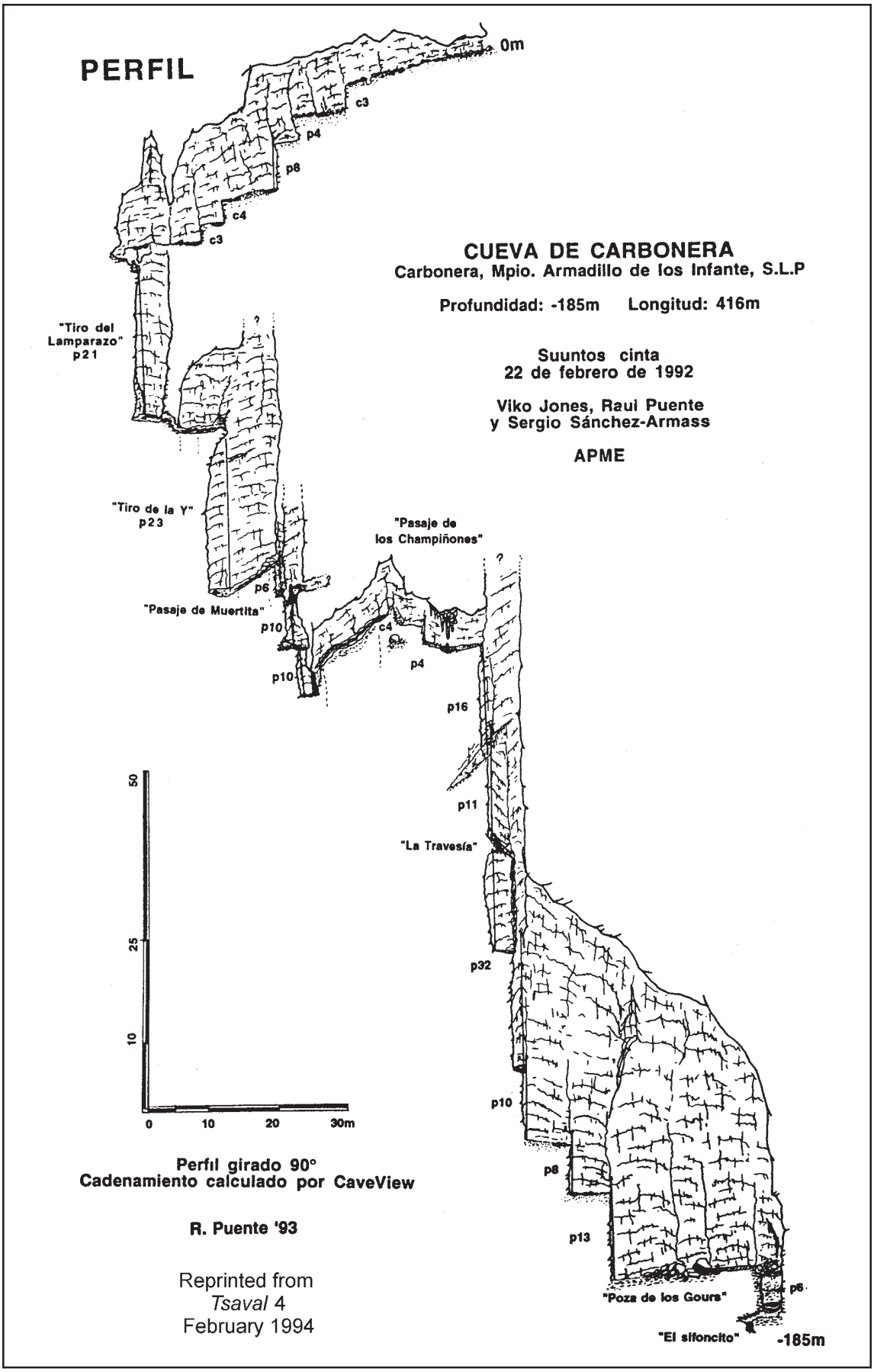
The Asociación Potosina de Montañismo y Espeleología has a web site at www.apme.com.mx.

TAMAULIPAS

Preliminary Analysis of Microbial Habitats and Geochemical Environments of Sistema Zacatón, Mexico, by Marcus Gary, Department of Geological Sciences, University of Texas at Austin.

The deep phreatic caves of Sistema Zacatón have unique microbial communities that appear to interact directly with observed aqueous geochemical conditions. The water-filled sinkholes that extend into the deeper regions of the aquifer—**El Zacatón**, **Poza Caracol**, and **La Pilita**—have the most diverse habitats of microorganisms and are characterized by purple, red, and green biomats that entirely cover the calcium carbonate walls. These biomats are typically thin films of organic matter that likely host sulfur-oxidizing and reducing bacteria capable of utilizing volcanically originated sulfur to facilitate reduction-oxidation reactions. Diurnal fluctuations of colloidal sulfur in the water column coupled with measurable shifts in redox conditions indicate that phototrophic microbes are involved in the complicated geochemistry found in these aquatic environments, and conditions are extremely reducing with typical dissolved oxygen concentrations of less that 0.01 mg/l through the water columns, even at the surface. The function of microbial communities in the cave-forming processes at Sistema Zacatón is presently unknown; however, significant geochemical reactions that occur in this karst system are hypothesized to be influenced by microbiological activity. *Source*: Abstract for 2004 GSA Annual Meeting, *Geological Society of American Abstracts with Programs*, vol. 36, no. 5, p. 259.

(text continues on page 18)



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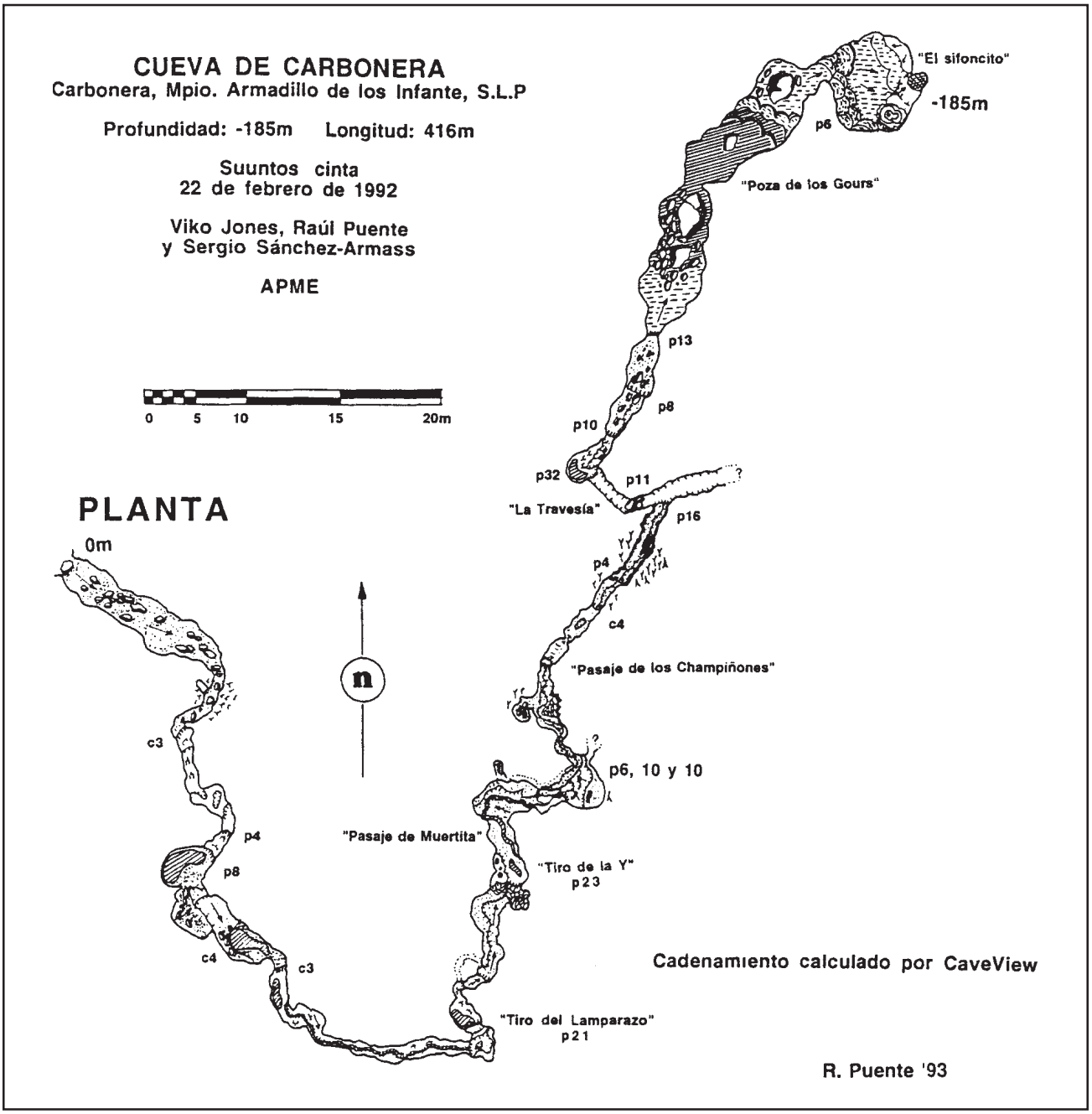

CUEVA DE CARBONERA
Carbonera, Mpio. Armadillo de los Infante, S.L.P
Profundidad: -185m Longitud: 416m
Suuntos cinta
22 de febrero de 1992
Viko Jones, Raúl Puente
y Sergio Sánchez-Armass
APME
0 5 10 15 20m
PLANTA
0m
n
"El sifoncito"
-185m
p6
"Poza de los Gours"
p13
p8
p10
p32
p11
"La Travesía"
p16
p4
c4
"Pasaje de los Champiñones"
p6, 10 y 10
"Pasaje de Muertita"
"Tiro de la Y"
p23
c3
p4
p8
c4
c3
"Tiro del Lamparazo"
p21
Cadenamiento calculado por CaveView
R. Puente '93

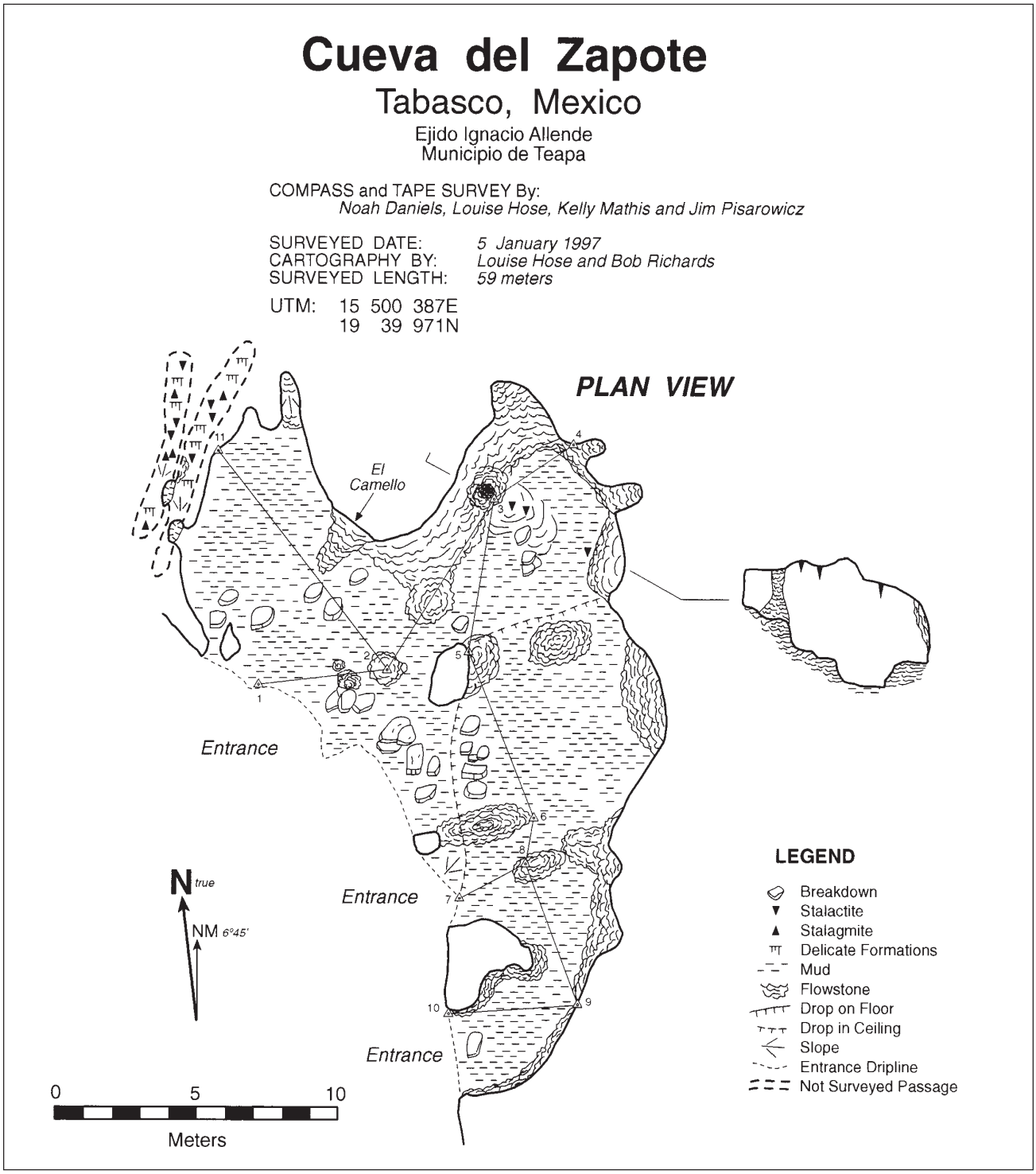
VERACRUZ

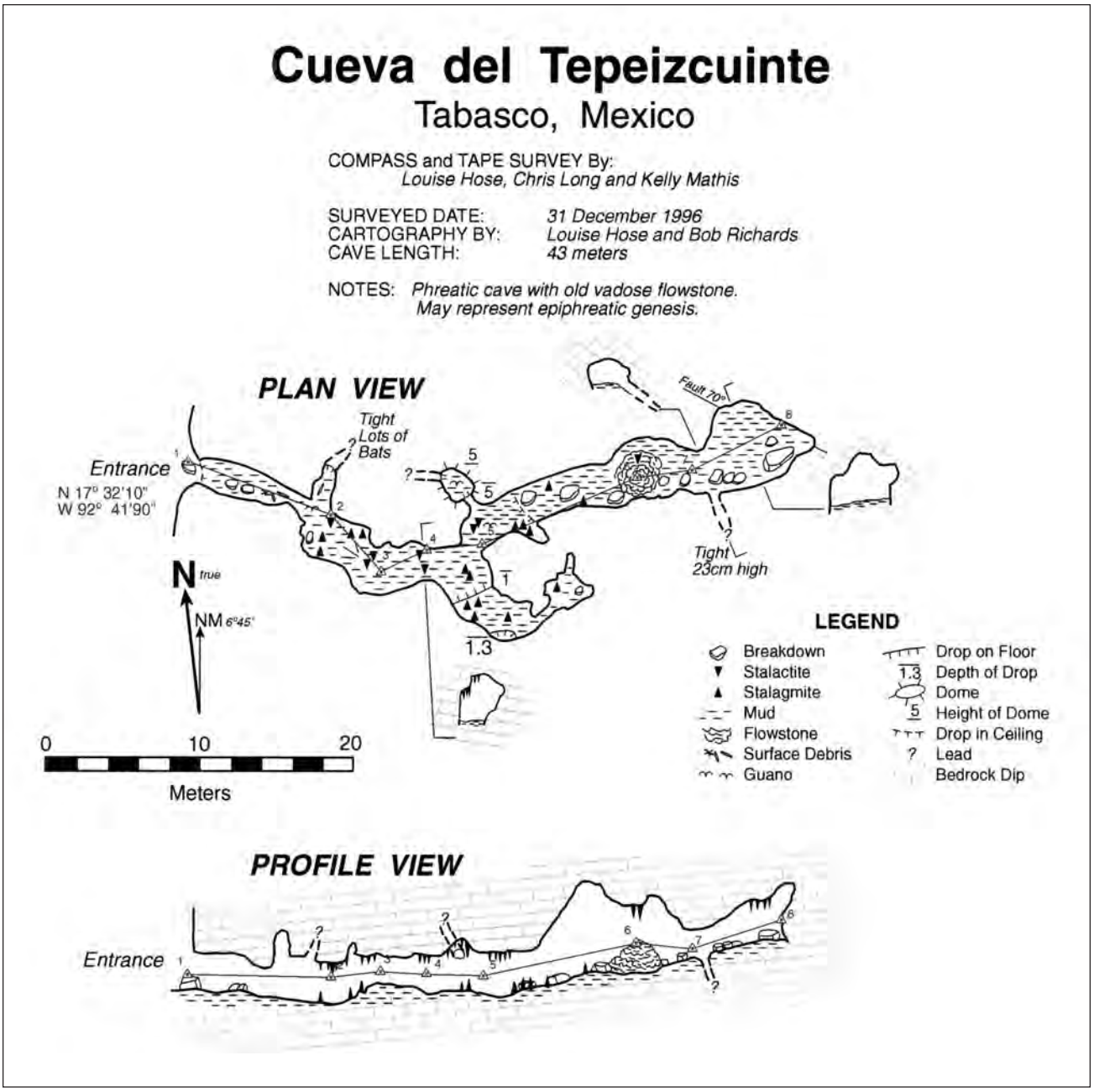
Sótano Tepesila and **Sótano Capaka** in Mpo. San Andrés Tenejapan, Veracruz, were surveyed during the Tlaloc 2003 Italian expedition to Mexico. *Source*: *Speleologia* 49, December 2003. See also material under Puebla.

YUCATÁN

The November 2004 *National Geographic* contains an article on the Maya underworld by author David Roberts and photographer Stephen Alvarez. The article describes the **Grutas de Balankanche**, as well as sites and contemporary Mayan rituals in some other countries in the Maya area. The magazine's web site contains some brief field notes by the author on adventures in Chiapas and Quintana Roo at magma .nationalgeographic.com/ngm/0411/feature2/assignment1.html.

Some local Maya at Dzitnup objected when two of their neighbors tried to sell two cenotes near





Valladolid to an ecotourism business. The two were about to be burned alive when police intervened, according to an article at www.jornada.unam.mx/2005/ene05/050121/038n1est.php.

The Yucatan 2004 expedition visited western Yucatán state to investigate the cenotes there. They worked mainly near the towns of Chochola, Kopoma, and Mukuyche. At Kopoma, they got permission to unseal the concrete cap over a well near the church and found that the hole dropped into a room 100 meters in diameter and 5 meters high. Diving failed to disclose any passages from the room. Near Mukuyche, **Cenote Chi Chin** has a large dry cave with a pool, where diving led to passages that include one with a tight side-mount restriction to over 150 meters of underwater passage. *Source*: Article by Curt Bowen in *Advanced Diver Magazine* 17, 2004.

Archaeologists from the Instituto Nacional de Antropología e Historia in Mérida made a trip on February 17, 2005, to the **Gruta del**

GPS Coordinates

Cenote	North	West
Pool Box	20°41.40	089°48.90
Manttas	20°40.57	089°47.51
Xkulam	20°45.29	089°48.13
H'ondzonot	20°44.70	089°46.31
Chanko	20°43.83	089°49.69
Dzem-polom	20°40.91	089°49.09
Kopoma	20°41.23	089°52.26
San Titeo	20°41.20	089°52.29
Sanbula	20°38.62	089°54.21
Chen Ha	20°41.37	089°52.55
Chul Me	20°36.63	089°53.47
Chululila	20°38.47	089°36.34
Kopochen	20°34.63	089°34.87
Chi Chin	20°34.20	089°37.69

Jaguar near Ticul in order to assess both the condition of the site and any possible archaeological and historical value that exists and deserves more thorough study. Ticul is located approximately 80 kilometers south of Mérida. The four professionals, apparently speleologists, arrived at the town in the morning and were assisted by the mayor, Frame Pérez Medina, who had arranged with the members of Ticul Mayan Travel to have the investigators taken to the caves, located four kilometers from the city. Farmers in the area had recently shown the cave to members of that local tourist company. Luis Sierra Valladares, spokesman for Ticul Mayan Travel, said that the group was had been led there by Raul Magaña, a guide who was one of the first to enter the caverns.

During a recent trip by members of Ticul Mayan Travel, as well as other caving experts, the potential of the grotto to be converted into a tourist attraction was assessed. They spoke of the remains of a jaguar that had apparently died some time ago in the cave, and also trenches that were supposedly dug during the Guerra de Castas (War of the Castes). Also noted were the remains of several Pre-Hispanic pots that were scattered around the cave, one of which was found almost intact. The group noted what appeared to be a human bone, but it was not apparent how it had gotten into the cave.

The visit by the investigators from INAH lasted several hours, and it was determined that a more thorough survey of the cave was needed. It was not specified if the study of the cave would take place immediately or sometime in the future. The cave is located near the ruins of a Pre-Hispanic city. *Source*: Nidia Esther Rojas Durán, www .yucatan/com/mx/noticia.asp, accessed 3 April 2005 (English summary by Jerry Atkinson).

MEXICAN NATIONAL CONGRESS OF SPELEOLOGY

The Unión Mexicana de Agrupaciones Espeleológicas and the Grupo Espeleológico at the Instituto Tecnológico y de Estudios Superioures de Monterrey held the Seventh Mexican National Congress of Speleology at Monterry Tec on February 2–6, 2005. The following papers were presented.

Unión Internacional de Espeleología—Breve historia y situación actual. José Ayrton Labegalini, International Union of Speleology.

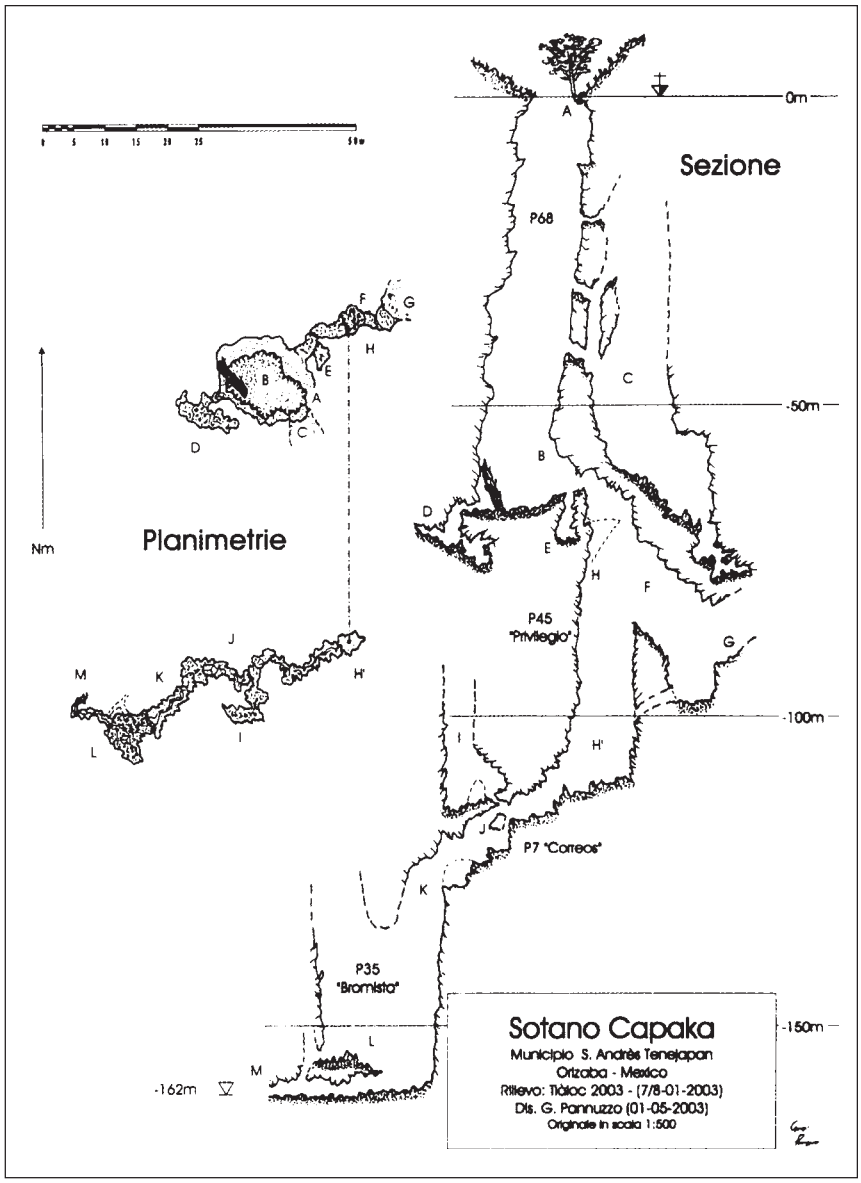
Historia de la Sociedad Espeleológica de Cuba. Ángel Graña, Sociedad Espeleológica de Cuba.

Área Natural Estatal Government Canyon: un enfoque multidisciplinario y asociado para el manejo y educación sobre el karst. George Veni, George Veni and Associates.

La educación ambiental y el mundo subterráneo. Amado de Anda, Juan Carlos Gómez, and Julio Ríos, Grupo Siempre Montaña Adentro.

Estudio de accidentes y riesgos en cuevas. Antonio Aguirre Álvarez, Espeleo Rescate México.

Fuente e importancia del ácido sulfhídrico en la Cueva de Villa Luz, Tabasco, México. Laura Rosales Lagarde and Penelope J.



Boston, Department of Earth Sciences and Environment, New Mexico Institute of Mining and Technology.

Turismo espeleológico en la región de la FEALC. José Ayrton Labegalini, International Union of Speleology.

El Proyecto Espeleológico Purificación. Beverley Shade, Proyecto Espeleológico Purificación.

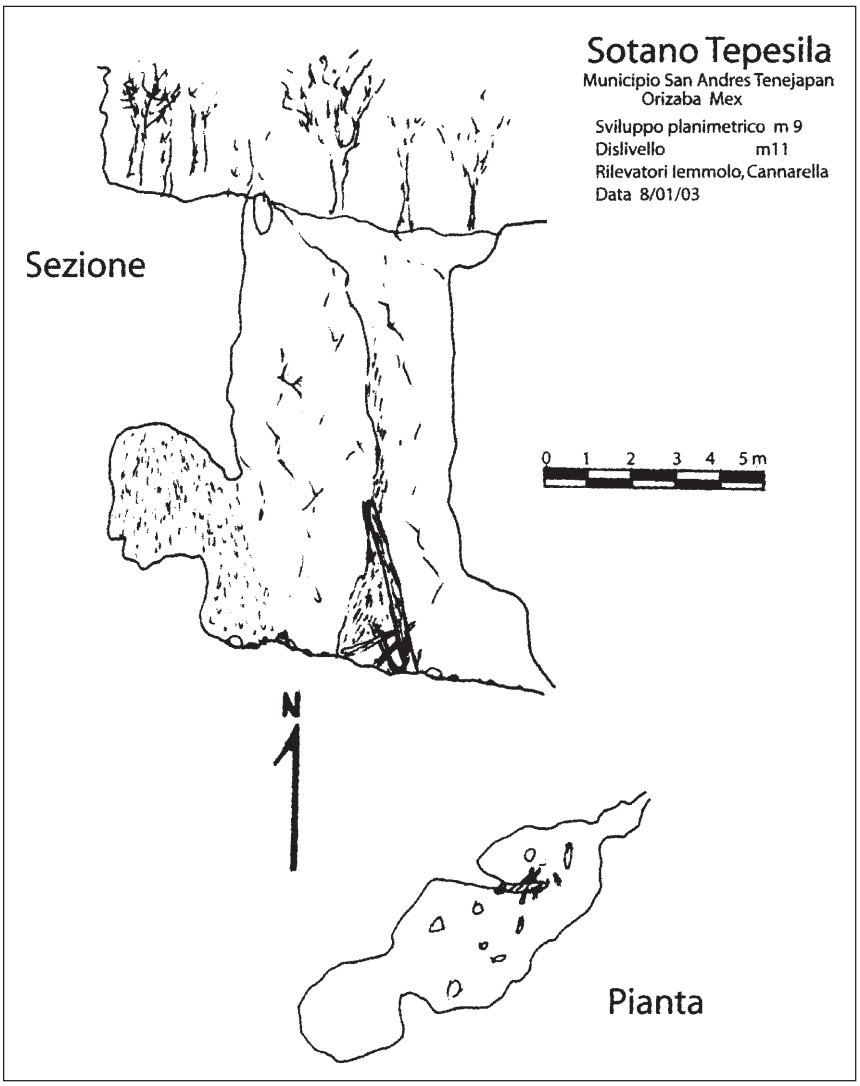
Exploración e investigación del Sistema Zacatón: pasado, presente y futuro. Marcus Gary, U.S. Geological Survey and Department of Geological Sciences, University of Texas at Austin.

El Sistema Ox Bel Ha. Sam Meacham, Centro Investigador del Sistema Acuífero de Quintana Roo.

Conservación y manejo de recursos kársticos. Peter Sprouse, Zara Environmental.

El ambiente cavernícola y la legislación mexicana. Alejandra Domínquez Álvarez and José G. Palacios-Vargas, Laboratorio de Ecología y Sistemática Microartrópodos, Departamento de Ecología y Recuros Naturales, Facultad de Ciencias, Universidad Nacional Autónoma de México.

Estudio preliminar de los Cryptostigmata (Acari: Oribatei) de los sótanos "El Tepozán" y "El Venado", del Valle de los Fantasmas, San Luis Potosí, México. Héctor Guzmán-Sánchez[1] and Ricardo Iglesias Mendoza[2], [1]Colegio de Ciencias y Humanidades, Plantel Sur and [2]Laboratorio de Ecología y Sistemática Microartrópodos, Departamento de Ecología y Recuros Naturales, Facultad de Ciencias, Universidad Nacional Autónoma de México.



Fauna asociada a las entradas de cenotes, Tulum, Quintana Roo, México. Marilyn Mendoza Ramírez and Mariano Fuentes Silva, Labratorio de Ecología y Sistemática Microartrópodos, Departamento de Ecología y Recuros Naturales, Facultad de Ciencias, Universidad Nacional Autónoma de México.

Nuevos registros de fauna cavernícola en Chimalacatlán, Morelos. José G. Palacios-Vargas[1], Giberto Varo de la Rosa[2], and Alan Rodríguez[2], [1]Labratorio de Ecología y Sistemática Microartrópodos, Departamento de Ecología y Recuros Naturales, Facultad de Ciencias, Universidad Nacional Autónoma de México and [2]IEBEM, Morelos, México.

Cunaxidos de la Cueva de las Sardinas, Tabasco, México. Daniel A. Estrada B. and Blanca E. Mejia-Recamier, Labratorio de Ecología y Sistemática Microartrópodos, Departamento de Ecología y Recuros Naturales, Facultad de Ciencias, Universidad Nacional Autónoma de México.

El nuevo Instituo Nacional de Investigación de Cuevas y Karst: su papel en la comunidad internacional de cuevas y karst. Louise D. Hose[1], Penelope J. Boston[1,2], Megan Curry[2], and Laura Rosales Lagarde[2], [1]National Cave and Karst Research Institute and [2]Karst Studies Program, New Mexico Institute of Mining and Technology.

Condiciones de la vegetación en algunas zonas kársticas de México obtenidas mediante percepción remota. Saúl R. Castañeda Contreras, Labratorio de Ecología y Sistemática Microartrópodos, Departamento de Ecología y Recursos Naturales, Facultad de Ciencias, Universidad Nacional Autónoma de México.

El Sótano de la Culebra. Argelia Tiburcio and Alejandro Villagrán, Grupo de Espeleología del Instituto Politécnico Nacional.

Desarrollo de karst eogenético en ambientes costeros y de islas: aplicación de modelos de islas de carbonatos a Yucatán, México. Kevin W. Stafford, Department of Earth Sciences and Environment,

New Mexico Institute of Mining and Technology.

MISCELLANEOUS

At the present time, the official position of the Instituto Nacional de Migración about caving by foreign visitors to Mexico can be seen from the following statement from the web site of the Mexican embassy in Canada:

"Canadian Speleologists who travel to Mexico with the object to carry out their scientific activity should be documented as non-immigrant visitors and must obtain an FM-3, given that their activity in Mexico is of scientific nature, and considering that speleology is 'the science that studies the nature, origin and formation of caves, their wildlife population and flora,' with the help of other disciplines such as: geology, biology, archaeology, anthropology, and hydrology, among others.

"Similarly, foreigners that travel to Mexico to explore caves or caverns and perform technical activities without a scientific purpose, such as topographers, should also be documented as non-immigrant visitors.

[A summary of how to apply for an FM-3 appears here.]

"Canadians who wish to travel to Mexico to engage in the type of activity defined as spelunking, in other words the visitation of caves for sporting, recreational or appreciative purposes (or any other recreational or sporting activity related to caving, such as cave diving) without entailing the development of scientific activities, he or she should be documented as non-immigrant tourist and may obtain a tourist card and must consider the same requirements as any other tourist are allowed to bring sport equipment." [sic]

It is likely that the second paragraph of that has been a recent development to justify the treatment of the British cavers who were in Cuetzalan in March 2004. Efforts are being made by both Mexican and American cavers to convince the government that cave mapping is an inherent part of the sport of caving. Stay tuned. *Source*: www.embamexcan.com/CONSULAR/Spelunking%20.shtm, accessed March 2005.

The Latin American Archaeology Publications group at the University of Pittsburgh distributes the publications from Mexico of the Instituto Nacional de Antropología e Historia (INAH). Their catalog is at www.pitt.edu/~laap/publist/inah.html.

Terry Raines begins a rappel into the 85-meter entrance drop in Sótano de Tlamaya, San Luis Potosí. This is the first in a series of old photographs by Sam Young taken during a trip to Tlamaya in July 1966. Others appear on pages 103, 170, and 187.

This trip was reported in the *Association for Mexican Cave Studies Newsletter*, volume 2, number 4, pages 73–80, March 1967. It also figures prominently in Squire Lewis's delightful book *Chronicles of the Old Reading Grotto* (1993), in which he and two friends went to Tlamaya after the 1966 NSS Convention in California.

DEEP PITS OF MEXICO

Mark Minton
April 2005
Depth in meters

1	El Sótano (de El Barro)	Entrance drop	Querétaro	410
2	Sótano de las Golondrinas	Entrance drop	San Luis Potosí	376
3	Sótano de la Culebra	Entrance pit	Querétaro	337
4	Sótano de Tomasa Kiahua	Entrance drop	Veracruz	330
5	Sótano de Alhuastle	P'tit Quebec	Puebla	329
6	Zacatón	Entrance drop	Tamaulipas	329
7	Nita Xonga	Psycho Killer	Oaxaca	310
8	Sotanito de Ahuacatlán	Second drop	Querétaro	288
9	Sótano del Arroyo Grande	Entrance drop	Chiapas	283
10	Sistema de la Lucha	Entrance drop	Chiapas	280
11	Sima Don Juan	Entrance drop	Chiapas	278
12	Sima Dos Puentes	La Ventana	Chiapas	250
13	Hálito de Oztotl	Entrance drop	Oaxaca	250
14	Sótano del Aire	Entrance drop	San Luis Potosí	233
15	Resumidero del Pozo Blanco	Entrance drop	Jalisco	233
16	Sistema Ocotempa	Pozo Verde	Puebla	221
17	Sótano de Eladio Martínez	Entrance drop	Veracruz	220
18	Sótano de los Planos	Puits Tannant	Puebla	220
19	Live in Busch	Entrance drop	Oaxaca	220
20	Sótano de Coatimundi	Entrance drop	San Luis Potosí	219
21	Sótano de Sendero	Entrance drop	San Luis Potosí	217
22	Resumidero el Borbollón	Tiro Grande	San Luis Potosí	217
23	Sima de la Pedrada	Entrance drop	Chiapas	217
24	Sima del Chikinibal	Entrance drop	Chiapas	214
25	Cueva del Tizar	Third drop	San Luis Potosí	212
26	Kijahe Xontjoa	Son On Jan	Oaxaca	210
27	Nacimiento del Río Mante	Macho Pit	Tamaulipas	206
28	Hoya de las Guaguas	Entrance drop	San Luis Potosí	202
29	Sistema H3-H4		Puebla	200
30	Kijahe Xontjoa	Lajao Se	Oaxaca	200
31	Nita Gatziguin	Entrance drop	Oaxaca	200
31	Sima La Funda	Entrance drop	Chiapas	198
33	Sótano de Soyate	Entrance drop	San Luis Potosí	195
34	Sótano de Alpupuluca	Entrance drop	Veracruz	190
35	Cuaubtempa	Pozo con Carne	Puebla	190
36	Sótano de Tepetlaxtli no. 1	Entrance drop	Puebla	190
37	Sótano de Puerto de los Lob	Entrance drop	San Luis Potosí	189
38	Sótano de Hermanos Peligrosos	Second drop	Veracruz	186
39	Ahuihuitzcapa	Entrance drop	Veracruz	180
40	Sistema Soconusco	Darwin	Chiapas	180
41	Sima de Veinte Casas	Entrance drop	Chiapas	180
42	Hoya de la Luz	Entrance drop	San Luis Potosí	180
43	Croz 2	Entrance drop	Puebla	180
44	Sima del Cedro	Entrance drop	Chiapas	175
45	Sótano de la Cuesta	Entrance drop	San Luis Potosí	174
46	Sima Dos Puentes	Entrance drop	Chiapas	172
47	Sótano de los Monos	Entrance drop	San Luis Potosí	171
48	Sótano de Otates	Third drop	Tamaulipas	171
49	El Socavón	Entrance drop	Querétaro	171
50	Sótano de los Ladrones	Entrance drop	Oaxaca	170

DEEP CAVES OF MEXICO

Mark Minton
April 2005
Depth in meters

1	Sistema Cheve	Oaxaca	1484
2	Sistema Huautla	Oaxaca	1475
3	Cueva Charco	Oaxaca	1278
4	Akemati	Puebla	1226
5	Kijahe Xontjoa	Oaxaca	1223
6	Sistema Ocotempa	Puebla	1070
7	Akemabis	Puebla	1015
8	Sonconga	Oaxaca	1014
9	Guixani N'dia Kijao	Oaxaca	955
10	Sistema Purificación	Tamaulipas	953
11	Sistema Perrito	Oaxaca	906
12	Sistema Tepepa (Ehécatl+Niebla)	Puebla	900
13	Nita Chó	Oaxaca	894
14	Sótano de Agua de Carrizo	Oaxaca	843
15	Sótano de El Berro	Veracruz	838
16	Sótano de Trinidad	San Luis Potosí	834
17	Resumidero El Borbollón	San Luis Potosí	821
18	X'oy Tixa Nita	Oaxaca	813
19	Nita Ka	Oaxaca	760
20	J2	Oaxaca	753
21	Sistema H31-H32-H35	Puebla	753
22	Sonyance	Oaxaca	740
23	Nita Xongá	Oaxaca	739
24	Yuá Nita	Oaxaca	705
25	Aztotempa	Puebla	700
26	Sótano de los Planos	Puebla	694
27	Sótano de Alfredo	Querétaro	673
28	Sistema Cuetzalan	Puebla	658
29	Sótano de Tilaco	Querétaro	649
30	Nita Nashí	Oaxaca	641
31	Cuaubtempa Superior	Puebla	640
31	Sistema Atlalaquía	Veracruz	623
33	Cueva de Diamante	Tamaulipas	621
34	R'ja Man Kijao (Nita)	Oaxaca	611
35	Sistema de los Tres Amigos	Oaxaca	604
36	Nita He	Oaxaca	594
37	Meandro Que Cruce (H54)	Puebla	588
38	Yometa	Puebla	582
39	Sótano de las Coyotas	Guanajuato	581
40	Sótano Arriba Suyo	San Luis Potosí	563
41	Sistema Tepetlaxtli	Puebla	535
42	Sótano del Río Iglesia	Oaxaca	531
43	Sótano de Nogal	Querétaro	529
44	Resumidero de la Piedra Agujerada	San Luis Potosí	521
45	Grutas de Rancho Nuevo	Chiapas	520
46	Sistema Soconusco	Chiapas	513
47	Sótano de las Golondrinas	San Luis Potosí	512
48	Hoya de las Conchas	Querétaro	508
49	Sótano de Los Hernández	Querétaro	507
50	Sótano del Buque	Querétaro	506

Updates and corrections:

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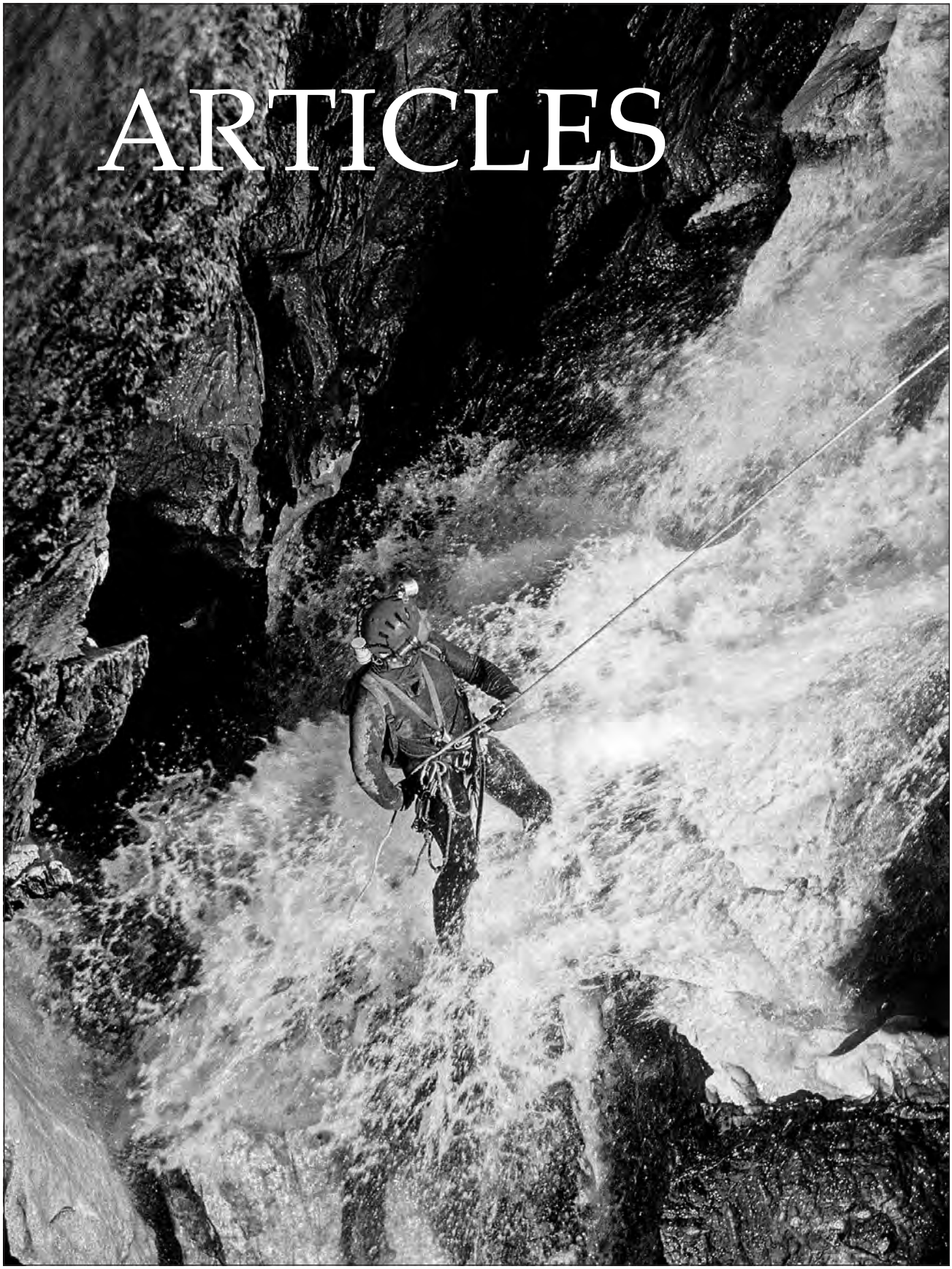
Mark Minton
April 2005
Length in meters

LONG CAVES OF MEXICO

1	Sistema Ox Bel Ha	Quintana Roo	134038
2	Sistema Purificación	Tamaulipas	93755
3	Sistema Sac Actun	Quintana Roo	62828
4	Sistema Nohoch Nah Chich	Quintana Roo	61581
5	Sistema Dos Ojos (Sistema Jacinto Pat)	Quintana Roo	56672
6	Sistema Huautla	Oaxaca	55953
7	Cueva del Tecolote	Tamaulipas	40475
8	Sistema Cuetzalan	Puebla	37676
9	Kihaje Xontjoa	Oaxaca	31373
10	Sistema Tepepa (Ehécatl+Niebla)	Puebla	26500
11	Sistema Cheve	Oaxaca	26194
12	Sistema Soconusco	Chiapas	21733
13	Sistema Naranjal (Najarón-Maya Blue)	Quintana Roo	21525
14	Coyalatl	Puebla	19000
15	Sistema Aerolito	Quintana Roo	18000
16	Cueva de Alpazat	Puebla	15200
17	Sistema PonDeRosa (Pondazul, Eden)	Quintana Roo	15019
18	Sistema Yaxchen East	Quintana Roo	13090
19	Cueva del Río La Venta	Chiapas	13000
20	Atlixicaya	Puebla	12200
21	Cueva Pitch	Quintana Roo	12000
22	Sistema San Andrés	Puebla	10988
23	Cueva del Mano	Oaxaca	10841
24	Sistema Taj Mahal - Minotauro	Quintana Roo	10600
25	Actun Káua	Yucatán	10360
26	Grutas de Rancho Nuevo (San Cristóbal)	Chiapas	10218
27	Cueva del Arroyo Grande	Chiapas	10207
28	El Chorro Grande	Chiapas	9650
29	Sistema Tepetlaxtli	Puebla	9600
30	Sistema Chac Mol - Mojarra	Quintana Roo	9193
31	Cueva Quebrada	Quintana Roo	9000
31	Sótano de Las Calenturas	Tamaulipas	8308
33	Gruta del Tigre	Quintana Roo	8200
34	Nohoch Actun	Quintana Roo	8200
35	Xel-Ha	Quintana Roo	8000
36	Sumidero Santa Elena	Puebla	7884
37	Cueva Yohualapa	Puebla	7820
38	Cueva de la Peña Colorada	Oaxaca	7793
39	Cueva de Comalapa	Veracruz	7750
40	Sistema Zapote (Toucha-Ha - Vaca Ha)	Quintana Roo	7697
41	Sistema Xunaan-Ha (María Isabella)	Quintana Roo	7600
42	Sistema Camilo	Quintana Roo	7397
43	Sótano del Arroyo	San Luis Potosí	7200
44	Sistema Perrito	Oaxaca	7148
45	Cueva de la Puente	San Luis Potosí	6978
46	Sistema Huayateno (Guayateno) -Tecaltitlán	Puebla	6911
47	Sistema Actun Koh/Heder	Quintana Roo	6800
48	Cueva Charco	Oaxaca	6710
49	Sistema Zoquiapan	Puebla	6597
50	Xongo Dwi Ñi	Oaxaca	6500

ARTICLES



Robbie Warke on Nightmare Falls at –1362 meters in Cueva Cheve during the 2003 Cheve Expedition. Photo by Bill Stone.

RETURN TO TABASCO

Jim Pisarowicz
with contributions by Philip Rykwalder,
Louise Hose, and Chris Amidon

The seeds of the 2004–2005 Caves of Tabasco Expedition were sown during the Tabasco expedition I organized with Warren Netherton and a group of Swiss cavers in 1989, the 1999 Tabasco expedition I took with Abby Wines (now Snow), and the BBC film documentary project I participated in during March 2004. The earlier trip began the survey of Agua Blanca in the Municipio de Macuspana, but going leads were left. The most significant of these leads was a large, beautiful cave, found by the Swiss, whose notes disappeared when they returned to their home country. During the 1999 trip, Abby and I found and surveyed many small to moderate-size caves, mostly shown to us by Carlos Alberto Cordero Martínez. Several notable caves were also entered but not surveyed on that trip, mostly in the vicinity of Tapijulapa. And finally, on the last day of the BCC film project into Cueva de Villa Luz, Jesús Gómez Martínez showed Peter Lord and me the entrance to a cave near Villa Luz. Standing near the entrance to this cave we could smell the telltale odor of rotten eggs. I thought to myself at the time, could this be another H_2S cave?

The 2004–2005 expedition almost did not happen. Continuing problems with my knees had basically restricted my caving to working on the *Journal of Cave and Karst Studies*. But several cavers had expressed an interest in caving in Tabasco, with its boundless potential of caves and karst, and I already had a list of caves that needed surveying, so a trip was planned. The core group on this trip was Chris Amidon, Philip Rykwalder, Vickie Siegel, and I. The four of us drove down in my truck and were later met by several groups of cavers who flew down to Villahermosa for varying lengths of time, mostly two to three weeks. These cavers were John and Sarah Curtis, Ajax Dalman, Meredith Dreyer, Neal Hines, Tom Jarvela, Laura Rosales Lagarde, and Nathan Parker.

Working through Roberto Porter, a Mexican caver from Villahermosa with connections in the government, I sent a letter to José Antonio Nieves Rodriguez, Subsecretario de Turismo, asking permission to go caving in Tabasco. Return correspondence from the state tourism office granted us permission to go caving in Tabasco as tourists. In further communication before we left for Mexico, Roberto informed me that he had just found a new caving area near Tenosique with great caving potential. Roberto asked, "Would you Americans want to join us in checking out this new area?" It looked as if the itinerary for the trip was getting mighty full.

Basically, the caving done during the expedition fell into four distinct areas, Agua Blanca Macuspana, Tenosique, the highlands of Chiapas, and caves near Villa Luz, Arroyo Chispa, Poana, Puxcatán, the Sierra Madrigal, and Agua Escondido.

Agua Blanca is a resurgence cave located in a park of the Municipio de Macuspana. When I first saw Agua Blanca in 1988, 10 to 20 cubic meters of water per second were gushing out of its entrance. We could not even get into the cave, but instead mapped several other caves in the area, including Iztac-Ha (2525 meters), Lado de la Vereda (390 meters), Cueva el Freute del Pricipe (282 meters), Cueva de Arco (230 meters) and Pozo de Agua Blanca, until this expedition the deepest cave in Tabasco at 38 meters deep.

In 1989, Warren Netherton and I returned to the Agua Blanca area and, along with a contingent of Swiss cavers, began mapping Agua Blanca. That year we mapped 5051 meters in the main river system there. Near the back (upstream) part of the cave, we found a karst window that allows easier access into the upstream leads of the cave. Leaving the cave through this exit, which we named La Ventana, we charted a series of trails through the tropical rain forest from it to our

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See the following articles in the *AMCS Activities Newsletter* for more on Pisarowicz's trips to Tabasco: "Caving in Tabasco," number 16, pages 30–37 (1987); "The Revenge of Chac: 1988 in Tabasco," number 17, pages 129–138 (1988); "The Acid Test: Cueva de Villa Luz," number 24, pages 48–54 (2001); and "Tabasco 2001," number 25, pages 34–39 (2002).

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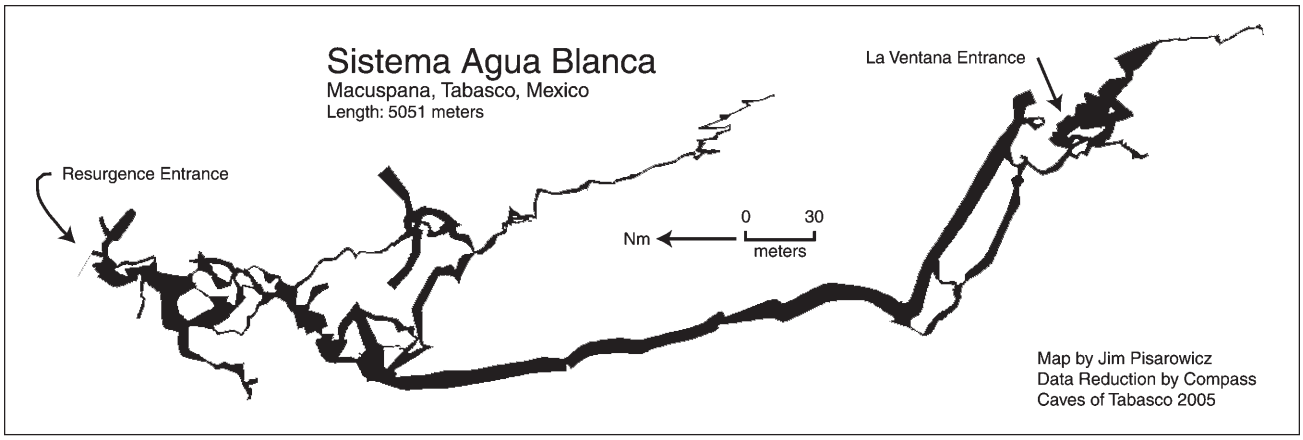


camp in the municipal park.

Also in 1989, a contingent of Swiss cavers discovered another cave in the Agua Blanca area that they named Cueva Magnífico. Although Magnífico has a relatively small and obscure crawlway entrance, the cave quickly opens up through a series of short drops into large, extremely well-decorated rooms. When that year's expedition ended, almost 2 kilometers of cave had been mapped in Magnífico, with two going leads where pits dropped down to lower levels. In fact, the lower levels of Magnífico appeared to be at the same elevation as the main part of Agua Blanca, and the trends of these passages were toward Agua Blanca. Perhaps these two large caves could be joined. Regrettably, when the expedition ended the Swiss took the survey notes to Magnífico to draft a map of this fine cave. No map was ever produced, and the notes were lost.

In the intervening years, Mexican cavers from Villahermosa wanted to take up the exploration of Magnífico and also push the upstream parts of Agua Blanca. Unfortunately, huge forest fires had burned all across Tabasco, including the Agua Blanca area. All the landmarks that had been used to locate the Ventana entrance to Agua Blanca and the route to Magnífico were gone, and the caves could not be relocated. A goal of this year's expedition was to relocate La Ventana and Cueva Magnífico. Using the survey data for Agua Blanca, the relative positions of the resurgence entrance and the Ventana entrance were calculated. A GPS point was then set near the main entrance to Agua Blanca, and UTM coordinates for La Ventana was derived. Similarly, using a surface survey done to the entrance to Cueva Magnífico from other caves in the Agua Blanca area, a UTM was calculated for that cave.

Programming in the calculated UTM coordinates, two teams headed into the regrown tropical forest at Agua Blanca. Chris, Phil and Tom headed toward La Ventana, while Vickie, Ajax, Laura, and I went in search of Magnífico. The only crimp in our plans was that we had only one machete, and the La Ventana group had it.

Following a GPS track to a cave through the rain forest without intermediate waypoints can be difficult. First, the direction given by the GPS is a straight-line track. This is very difficult to follow through the thick, vine-encrusted forest. Since this forest was the first regrowth after the fires in 1998, it had a particularly thick understory of vines and creepers. Without a machete, the going was difficult in the extreme. The second problem was that most of the time our current GPS position could not be determined because of the thick forest and high hills and karst pinnacles. After bashing around for several hours, we had a GPS location that indicated that we were only tens of meters away from the entrance to Magnífico. But moving a bit farther through the forest revealed that we were on top of a cliff that we could not climb down. After searching for a route for half an hour, we found ourselves at the bottom of the cliff, with no GPS coverage. After searching around for another half hour, we finally found ourselves at a small cave entrance. It definitely looked like the entrance to Magnífico that I remembered from sixteen years ago. Meredith headed into the cave with a small light and returned minutes later with a description. We had rediscovered the entrance to Cueva Magnífico.

As evening was coming on quickly, we made a hasty retreat to our camp. In the near dark, at the bottom of a massive doline we discovered a fine cave that required a rope. We got back to camp about forty-five minutes after dark. Back at camp I discovered that thousands of ticks had attached themselves to my flesh. There were so many that the only way to get them off was to shave them off with the blade of a knife.

The Ventana team was equally successful in finding their entrance. They marked a trail to it with flagging tape and machete blazes on trees. We were now set to begin remapping Magnífico and getting into the back of Agua Blanca to push leads.

Because of the difficulty in traveling through the rain forest to Magnífico, an overnight trip into the cave was planned. One team, consisting of Chris, Ajax, and Tom, started surveying at the entrance with the intention of leapfrogging the second team, of Phil, Vickie, and Laura, who went on into the cave rigging drops and then started surveying at the bottom of the second drop. After twenty-one hours of

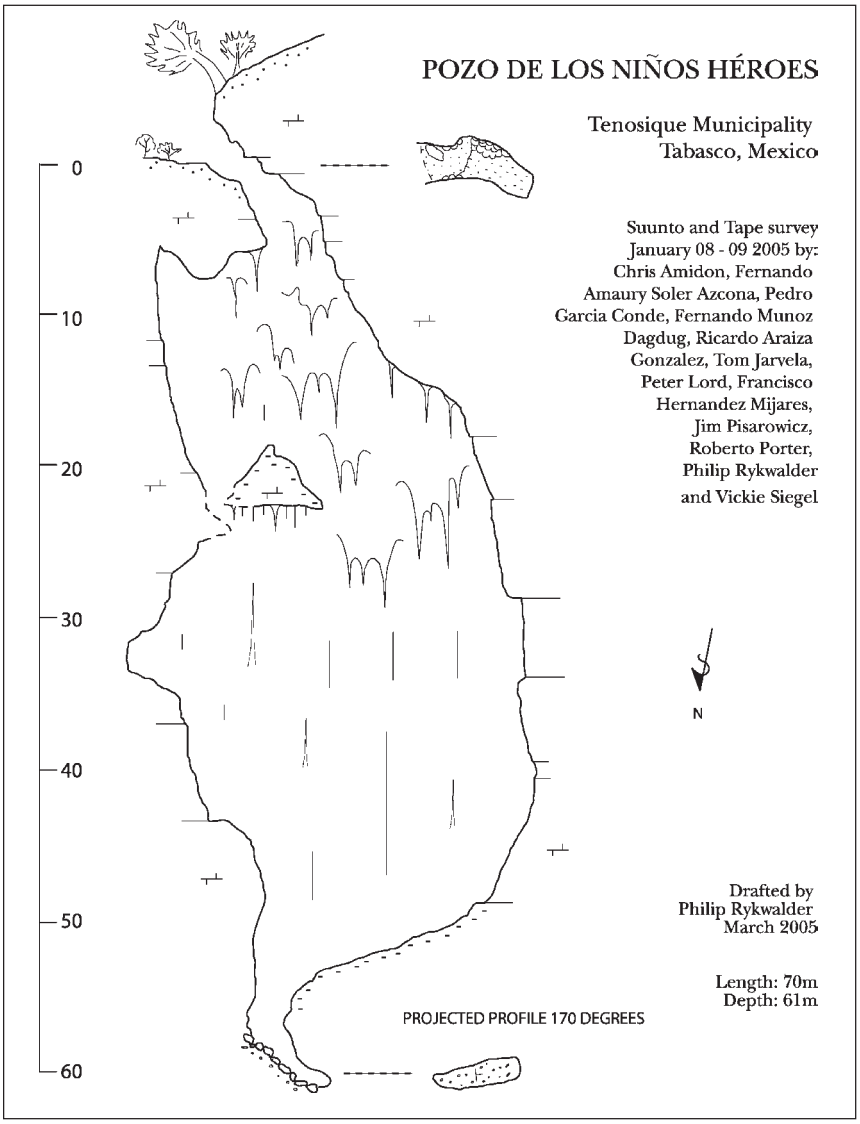
continuous surveying, both teams left the cave. The next morning Phil commented that he had never in his life surveyed in a cave with so many formations. One more survey trip was taken into Magnífico, starting out with Neal, Chris, Meredith, and Tom. This was scheduled to be a twenty-plus-hour trip. When Tom arrived at the entrance, he was not feeling well, so he returned to our camp. The others surveyed all day and night, returning to camp the next day after surveying hundreds of meters of cave. Tom was still ill the next day and continued to be sick until he had to return to the U.S. He had apparently contracted a case of dengue fever.

Peter Lord joined Chris and me for a trip to Ventana. Peter had been on the last trip to this part of the cave with Warren Netherton and me in 1990. Since Chris had been on the GPS trip that relocated Ventana, we had a fairly straightforward trip to the entrance. Climbing down the steep doline, we were soon at the large lake where this part of the cave apparently ends. In 1990, when the cave was in flood, the surface of this lake had waves a meter high. I had saved one of the Swiss cavers, who almost drowned when he had become loose from the safety line that we had rigged across the lake. Today the surface of the lake was calm.

Our plan for the day was to probe for ways on beyond the sump that the lake made. We did not have any diving gear, but since the water was down, perhaps we could free-dive into the passages that both Peter and I were sure were just beyond the lake.

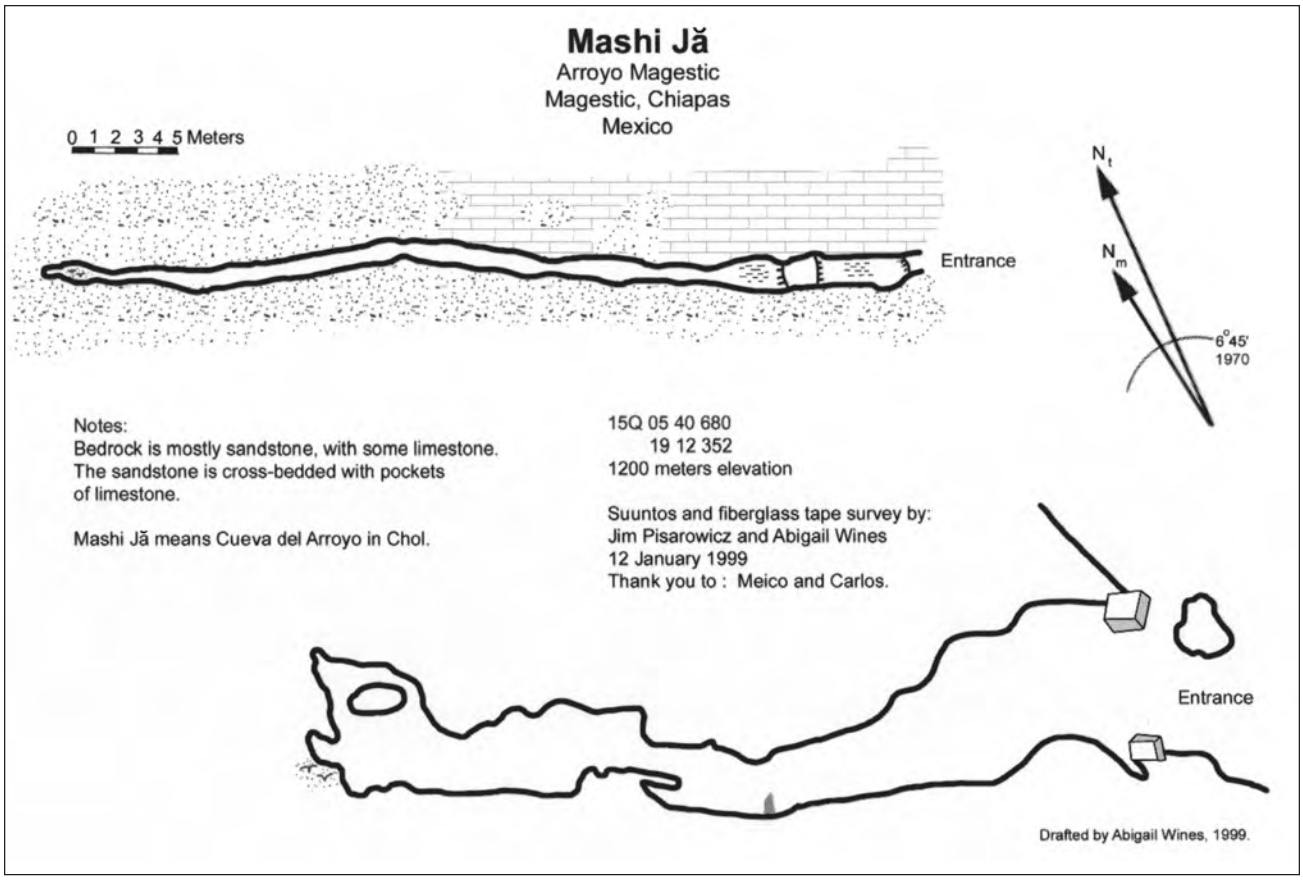
While Peter put on his wetsuit, I swam out into the lake. Soon I was at the wall at the end of the lake. I swam along that wall trying to kick my feet under it or to drop down wearing a diving mask and find a way on. After searching maybe 50 meters of wall, I found a spot where the wall did not seem to go down very deep. Although I had a very bright dive light with me, the water was so turbid that the light did not provide any illumination underwater. I took a deep breath, dropped down maybe 2 or 3 meters, and surfaced into an air-filled passage. It appeared to go parallel to the wall of the lake. I dove back to the lake and reunited with Peter, and the two of us, both wearing diving masks and snorkels, went back into the new passage. It was all swimming, and we checked out several parallel side leads. Unfortunately, none of these opened into the large trunk passage that just had to be beyond where we were.

On the way back to camp we found several interesting entrances and several large dolines. Subsequent trips into the area resulted in the survey of several moderate-size caves, including Pozo de Tigre and En Una Salla Blanca.



In November 2004, Roberto Porter received word of possible caves and cenotes in the Municipio de Tenosique. In Santo Tomás he saw a large cenote, and in the nearby area of Niños Héroes he and other Villahermosa cavers came across a pit that their 50-meter rope would not bottom. Graciously, he asked if we were interested in accompanying the Villahermosa cavers during their return trip to Niños Héroes.

The Municipio de Tenosique is right on the border of Chiapas and Guatemala. The roads into this new caving area are just now being constructed. There are plans to have a border crossing into Guatemala. This will definitely make access to the karst along this part of the Mexico-Guatemala border more accessible. The road will probably be finished within five years.



We had a full truck when we pulled into Santo Tomás. Peter Lord and Pedro Garcia Conde from Villahermosa joined Phil, Chris, Vickie, Tom, and me, and we had all our rope and other caving and camping gear. We arrived after dark and set up our camp just as the rain began. The rest of the Villahermosa cavers were to arrive the next morning.

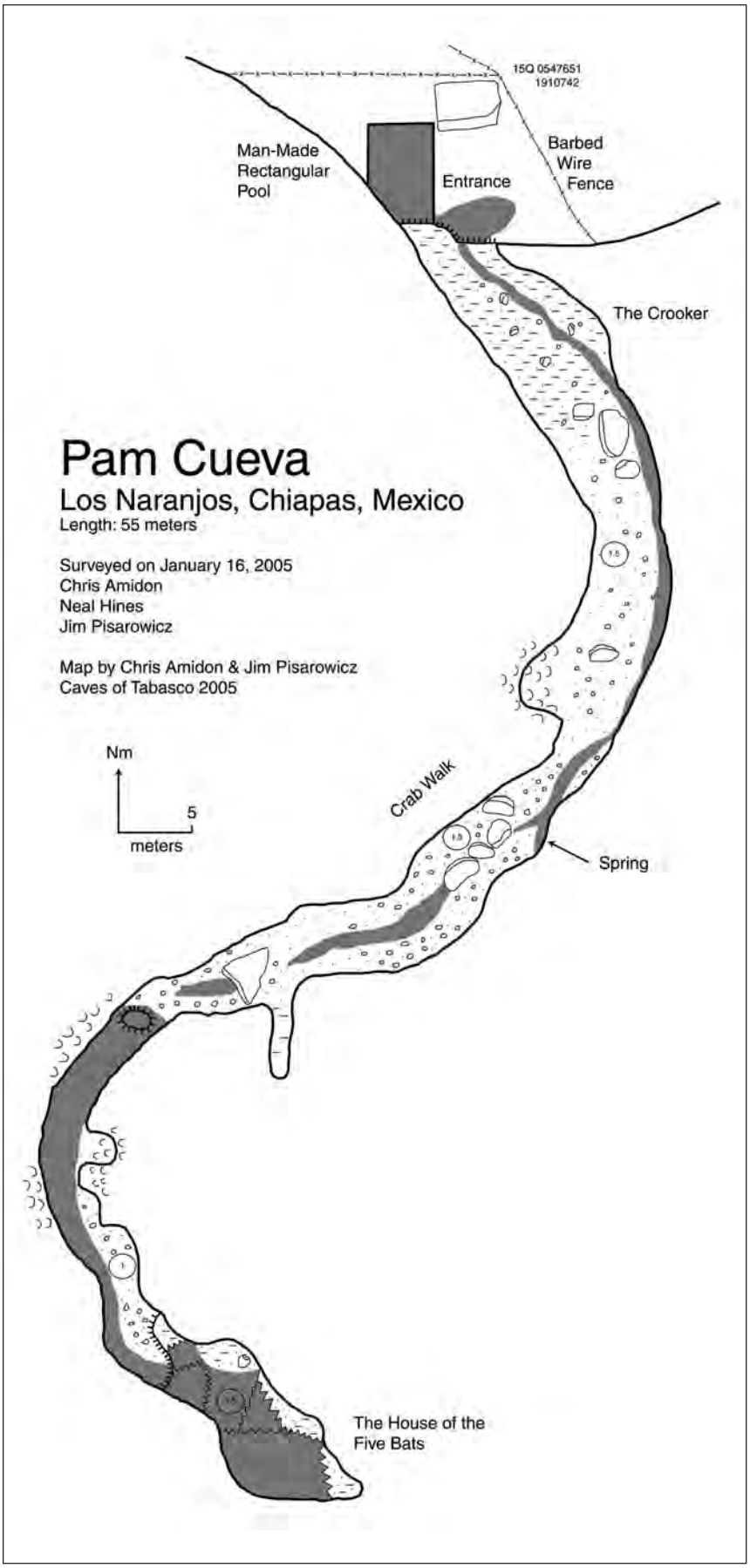
Everything was wet in the morning, but we headed out of town to look at the cenotes that we had been told about. After a short, easy hike we found ourselves looking into a large, round body of water. A local man said that the water level in the cenotes rises and falls with that of the nearby river. By the time we had returned to our camp, the rest of the cavers had arrived. These were Roberto Porter, Francisco Hernández Myares, Fernando Amacry Soler Azcona, Fernando Amaury Soler Pérez, Ricardo Maiza González, and Fernando Múroz Dagdug. With the entire crew present, we headed down the road toward Niños Héroes. About 2 kilometers before we got to Niños Héroes, the road broke into a large valley. The walls on both sides of this valley are cliffs of limestone, and as we made our way toward the Ejido Niños Héroes we could see cave entrances from the road. This valley continues to the southeast into Guatemala.

At Niños Héroes, we packed our gear on horses for what I was told would be a long horseback ride into the mountains. There we would find the pit that the Villahermosa cavers had been short-roped on. It was beautiful day as the horses headed out of town. Chris was not feeling well that day and stayed with the truck. Soon we were on a very steep trail going up and up and up. This eventually plateaued out into fields at a higher elevation. Then the ride became an undulating trip across these fields, until we stopped in a small valley. Here we dismounted and were told that the pit was just 50 meters from where we tethered the horses.

Using our 75-meter rope, Phil rigged the entrance to the pit, which we called Sótano de Niños Héroes. As this had been discovered by the Villahermosa cavers, they got the first descent. This was made by Peter Lord, followed by Roberto Porter.

As it looked like getting everyone into that cave and then out again would take some time, Phil, Vickie, Tom, and I went over to a small pit we had seen from the horse trail. This pit looked less deep and was quickly rigged by Phil. Tom got the honor of first decent (his first virgin pit), and soon Vickie had out the tape and instruments, and we surveyed down the pit. The pit turned out to be 24 meters deep and blind.

Back at Sótano de Niños Héroes, it had become obvious that everyone would not get down that pit. A couple of the Villahermosa cavers came over to drop our shorter pit, which we named Poza de la Novillona because of the dead calf at the bottom of the drop. Just about the time that the Mexican cavers got to the bottom of Novillona, it started to rain. Before long everyone on the surface was soaked through. By the



time everyone who went into Niños Héroes got out of the cave it was dark. It was an interesting horseback ride in the dark, down now-slippery mountain trails. We all got back safely.

Our camp was back in Santo Tomás. After a wonderful dinner of ribs, all the Mexican cavers headed back to Villahermosa. The American crew stayed the night and returned the next day to survey Sótano de Niños Héroes. The depth turned out to be 61 meters, which at the time was the deepest cave in Tabasco.

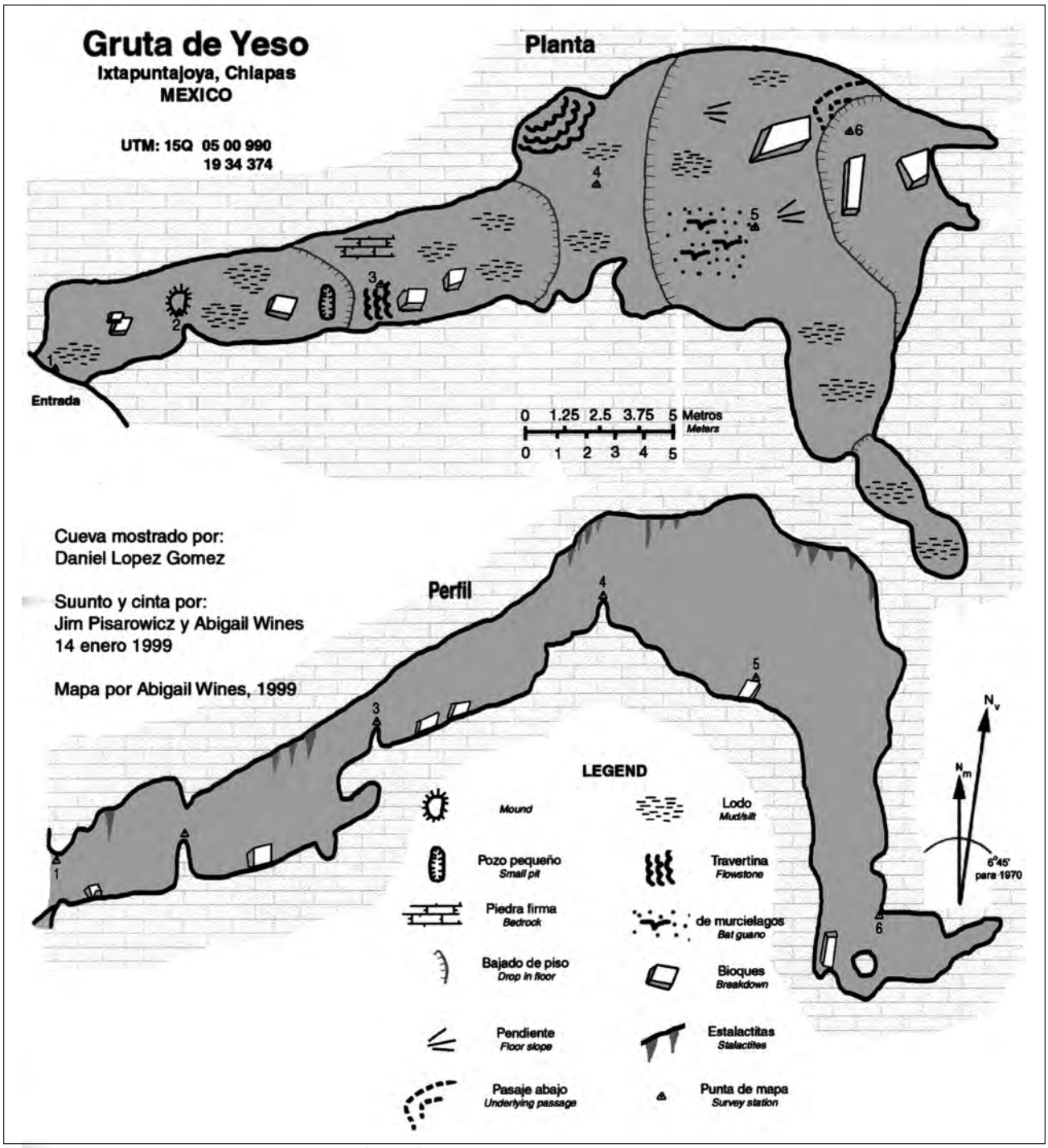
The area around Niños Héroes definitely has fine caving potential. The area is ringed with limestone and lots of sinking streams, dolines, pits, and cave entrances that can be seen right off the road. The people were friendly and seemed interested in having us return. A trip back to this area should be planned.

Chiapas is just a hop, skip, and jump from most of the caving areas in Tabasco. Sometimes it's good to get out of the coastal lowland karst of Tabasco and up into the Chiapas highlands, if for no other reason than to cool off. I have made several excursions into Chiapas over the years, mostly mapping fairly small caves. In 1999, Gruta de Yeso, near the town of Ixtapuntajoya, not far from Teapa, Tabasco, was shown to Louise Hose, Dave Lester, and me. Later Abby Wines and I returned to map this small cave. Also in 1999, Abby Wines, Carlos Cordero, and I drove up to Arroyo Magestic to investigate caves. Arroyo Magestic is at an elevation of 1200 meters. There we were led down into a large doline to a cave called Mashi Jǎ, a Chol name meaning Cueva de Arroyo. Although Mashi Jǎ turned out to be a short cave, it was an interesting one. The floor is cut into sandstone bedrock, while the ceiling is in limestone. The sandstone is mostly crumbly and cross-bedded, with pockets of limestone. In the back portions of the cave, the north walls are limestone, but the south walls are sandstone.

On our way back to Tapijulapa from Mashi Jǎ that year, we were

shown another cave called Pam Cueva. *Pam* means *high* in Chol. The elevation on the road near this cave is 1255 meters. Because we did not get a chance to survey this cave, it was added to my list of things to do in the future.

In 2005, I mentioned Pam Cueva to Neal and Chris, and a trip to the cave was planned for the next day. The drive to the cave from Tapijulapa is a long one. We basically had to climb 1200 meters in elevation over poorly maintained, mountainous, nearly four-by-four roads. Although only 20 or 30 kilometers, the drive takes three or four hours. As is typical on such a drive, many local people were encountered along the road. At one spot several people waved us down and asked for a ride up the mountain. We loaded everyone into the back of the truck. Neal wanted to talk with the people and tell them what we were up to. From the front seat of the truck I halfway listened in as Neal told our passengers that we were cavers and interested in studying and mapping caves. After about ten minutes of this, I laughed as one of the women in the back of the truck said to Neal in Spanish, "We can't understand a word you are saying." We were definitely in the land of non-Spanish speakers.



Hours later, we were high enough into the mountains to locate Pam Cueva. Although I had a GPS point for the cave, it did not have very high resolution, and we ended up wandering up and down the road for a while before we finally met a man on horseback. He said that there were no caves in the area, and he should know, as this land was his. We asked him politely if we could park our truck and look around for caves. He said that we could. Looking about, I thought I recognized the area where the cave would be found. About that time the landowner come along again on his horse and followed us over to the entrance of the cave. Once we were there, he said that there were several caves and pits in the area. He actually took us over to two small pits just down from the entrance to Pam Cueva.

Pam Cueva turned out to be a small stream-cave. The entrance area is hands-and-knees crawls, leading to a cool-water belly-crawl followed by a small room just high enough to stand up. The cave then ends. Another cave lead to cross off the list.

Although only small caves have been located in this area of Chiapas just off the Tabasco border, the area's potential for large and deep caves is quite high. We have hardly begun to look at this area for caves.

For several years I had thought about dropping some of the many skylights into Cueva de Villa Luz. When traveling though Villa Luz, one cannot help but be overcome by the beauty and magnificence of these skylights. Many are visually stunning. During the 2004 BBC trip, Peter Lord and I traversed the area above Villa Luz and located at least a half dozen of these skylights on the surface. A couple of these drops that appeared to go into the Snot Heaven or Bat Room sections of the cave appeared to be of considerable depth. Since none of these had ever been surveyed, the official depth of Villa Luz was only 23 meters.

The first pit we dropped was one of the skylights just upstream from the main walk-in entrance to Villa Luz. The pit is just off a fence line and is the culmination to a small drainage coming out of the jungle above the cave. Phil rigged the pit, tying off our rope to one of the large trees growing above the cave. The drop was fairly clean, as the water had washed the area free of debris. Sarah was the first person down the drop. Vickie had walked into the cave and provided a survey point at the bottom of the skylight. Chris then followed Sarah down the pit, doing the sketching. This pit was 19.3 meters deep.

Higher up the hillside, Phil, Chris, and Vickie rigged another pit. We figured that this drop entered the cave somewhere in the Sala Grande area. This pit was first dropped by Phil, followed by Chris reading instruments and sketching. Vickie then joined the crew in the cave to help try to tie into a previous survey. The tie-in did not come until the next trip, which also included Ajax. This survey upped the depth of the cave to over 40 meters.

Although several other pits were GPSed by Ajax and me, no more pits were dropped during the trip. Everyone discovered that equipment used in the cave was chewed up by the acid. Metal ascenders and racks were pitted, and although the nylon ropes used on the drops looked OK, these ropes were retired for fear of what the acid might have done to them.

The skylight survey of Villa Luz should be continued in the future, but only with specialized vertical equipment. Polyester ropes and harnesses, which would not be affected by the acid, should be used. And carabineers, racks, and ascenders used in doing these pits need to be used once and discarded or thoroughly tested after use.

Gruta de Kolemja is a cave in the Villa Luz area that Abby and I had started in 1999. It was one of those nasty, crawly, wet, muddy caves that no one who goes to Mexico wants to explore. But for some reason we had taken several trips into the cave, surveying downstream but not upstream. The upstream section of this cave was pushed and surveyed by Chris, Phil, and Vickie to bring the cave's total length to 279 meters.

Another small cave in the area was surveyed by Neal, Chris, and Meredith. This was another nasty, crawly, wet, muddy cave, but this one had a dead goat at the bottom of the climbdown into the cave. The survey crew dubbed the cave Viento Putrefacción because of the stench that permeated the cave. The cave continues, but only Meredith was small enough to fit through the tight spot where the survey ended. One hundred eleven meters were mapped in this cave.

On one of the last days of the BBC film shoot in March of 2004, Peter Lord and I were shown the entrance of a cave in the vicinity of Cueva de Villa Luz. This entrance was not in the same hill as Villa Luz, but nearby. At the entrance to this cave I thought I could detect the odor of rotten eggs, a sure sign that it might be a hydrogen-sulfide cave. Not having time to look at this cave further, I added it to my To Do list. Near the end of the 2004–2005 expedition we checked out the entrance of this new cave. A hot wind was blowing out of the climbdown crack that is the entrance to the cave. Being concerned about toxic levels of H_2S, depleted O_2, or high levels of CO and CO_2, I carefully climbed down into the cave. Using a lighter to check for oxygen levels, I could not keep it lit in the entrance room. I quickly scrambled out of the cave.

Returning to the cave better prepared, with H_2S filters and SpareAir cylinders, Nathan climbed down into the cave to place a thermometer to get a temperature reading. Next Meredith and Vickie headed into the cave to start surveying. Although we had many filters and masks, we had only three filled SpareAirs, because the fourth had an o-ring failure that had allowed all the air to leak out. Without any spare o-rings or the means to fill a tank in the field, we were limited to having three people in the cave at a time. Before long Vickie and Meredith surfaced with stories of two types of streams in the cave. One type had clear water, and the other had milky-white water. Mud

Chris Amidon sketching in one of the skylight entrances to Cueva de Villa Luz. *Jim Pisarowicz*.

in the cave caused burning sensations, gypsum crystals and springs were abundant in some parts of the cave, and snottites were observed, all evidence of another H_2S cave like Villa Luz. On subsequent trips we measured a temperature of approximately 27 degrees C in the cave. Using multispectum pH paper, we got pH's in the range of 2 to 3. Several kinds of fish were observed in the streams, and bats were everywhere. Perhaps the most annoying fauna in the cave were thousands of biting ants.

Because of the significance of the discovery of another hydrogen-sulfide cave, we set to work producing a complete map that geologists and biologists could use to coordinate their observations in the cave. Given the cave's location in a small block of limestone bounded by valleys, we figured we could easily complete a map of the cave in just a day or two. Boy, were we wrong!

Snottites in Cueva Luna Azurfe. *Jim Pisarowicz*.

We were now calling the cave Luna Azufre, Sulfur Moon, because the first survey trips occurred during a full moon. Despite the efforts of all of the remaining crew, surveying in Luna Azufre every day until the day we left Tabasco, we could not finish mapping all the passages in the cave. Over 576 meters of cave were mapped in the waning days of the expedition.

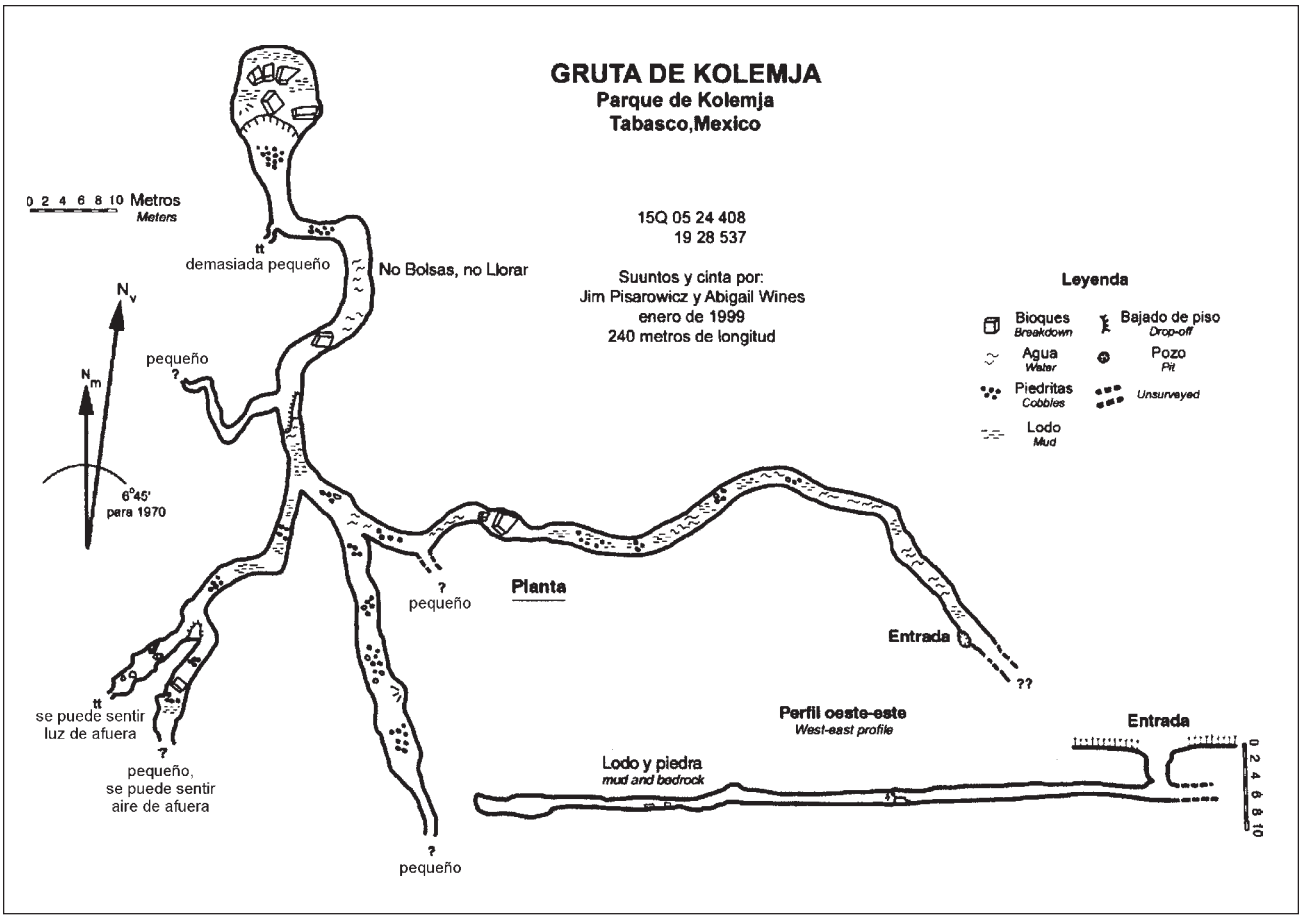
Recognizing the importance of the discovery of Luna Azufre, I contacted Louise Hose, the science coordinator of the Caves of Tabasco Project, via e-mail. Word that another H_2S cave has been found quickly spread among the biologists and geologists who have worked in Villa Luz. It will be interesting to learn what conclusions they make about Luna Azufre in comparison to Villa Luz.

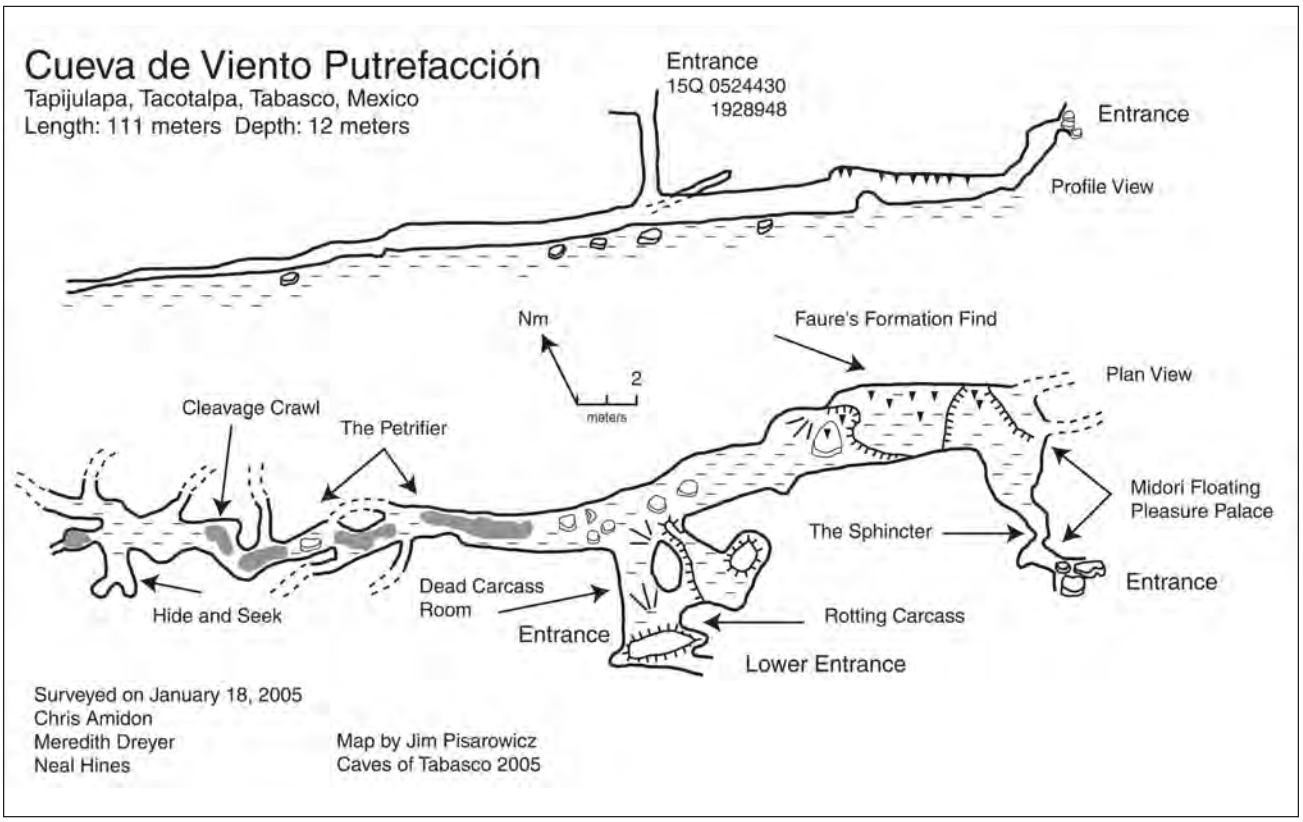
Ejido Arroyo Chispa is the nearest settlement to Grutas Cuesta Chica. Cuesta Chica was one of the first caves mapped in the Tapijulapa area in 1988. I was told then that there were other caves in the vicinity of Cuesta Chica, but our caving efforts at that time had been focused on Villa Luz, and we did not get back to check for other caves at that time.

In 1999, Virginia Gómez Martínez and her brothers Candido and Mateo showed Abby Wines and me several caves near Cuesta Chica. Abby and I proceeded to survey those caves that year. These surveys included a resurvey of Cuesta Chica and initial surveys of La Gruta de Ponce (160 meters long), Culvert Cave (38 meters), La Gruta Afuera (65 meters), and La Gruta de Cuatro Tecolotes (33 meters). The most intriguing of these caves was La Gruta Afuera because of the tremendous wind at the entrance of what appeared to be a relatively small cave. By our reckoning, the wind in this cave was going up into the ceiling of the large central chamber that makes up the cave, but there was no way on. People from Arroyo Chispa said that there were other caves at higher elevations than Cuesta Chica.

One of the new regulations that the Officina of Turismo for the Municipio de Tacotalpa has is that tourists in the Tapijulapa area are required to have a guide with them when visiting caves. This regulation is part of a new economic development program initiated by the Tabasco state government. Our expedition was assigned two guides, Jesús Gómez Martínez and his brother Lupe. Jesús was the same guide I had met when working with the BBC film crew in March 2004.

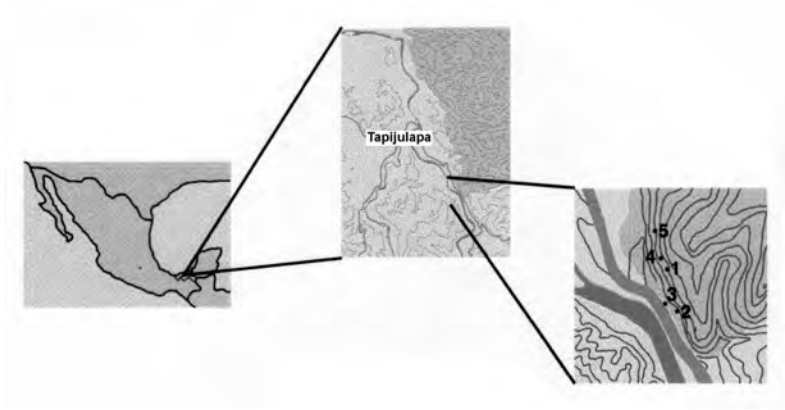
One of the first caves that Jesús showed us was Caverna de Muerte, the Cave of Death. When asked why the cave was called that, he said that when it rains the cave fills with


GRUTA DE KOLEMJA
Parque de Kolemja
Tabasco,Mexico
0 2 4 6 8 10 Metros
Meters
15Q 05 24 408
19 28 537
Suuntos y cinta por:
Jim Pisarowicz y Abigail Wines
enero de 1999
240 metros de longitud
Leyenda
Bioques
Breakdown
Bajado de piso
Drop-off
Agua
Water
Pozo
Pit
Piedritas
Cobbles
Unsurveyed
Lodo
Mud
demasiada pequeño
No Bolsas, no Llorar
pequeño
6°45'
para 1970
Planta
pequeño
Entrada
se puede sentir
luz de afuera
pequeño,
se puede sentir
aire de afuera
Perfil oeste-este
West-east profile
Entrada
Lodo y piedra
mud and bedrock
pequeño

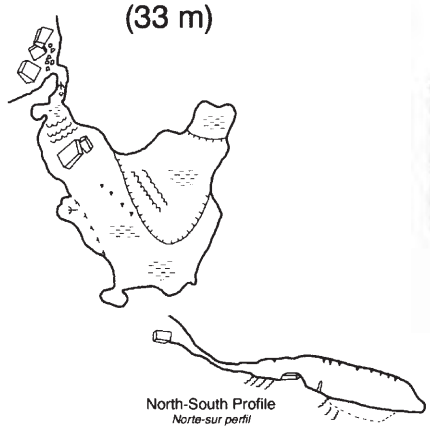

Cueva de Viento Putrefacción
Tapijulapa, Tacotalpa, Tabasco, Mexico
Length: 111 meters Depth: 12 meters
Entrance
15Q 0524430
1928948
Entrance
Profile View
Nm
2
meters
Faure's Formation Find
Plan View
Cleavage Crawl
The Petrifier
Midori Floating
Pleasure Palace
The Sphincter
Entrance
Dead Carcass
Room
Hide and Seek
Entrance
Rotting Carcass
Lower Entrance
Surveyed on January 18, 2005
Chris Amidon
Meredith Dreyer
Neal Hines
Map by Jim Pisarowicz
Caves of Tabasco 2005

LAS GRUTAS DE CUESTA CHICA

Tabaso, Mexico



Grutas de Cuesta Chica No. 5 La Gruta de Cuatro Tecolotes (33 m)



Suuntos and fiberglass tape survey by Jim Pisarowicz and Abigail Wines January 1999

Maps drafted by Abigail Wines

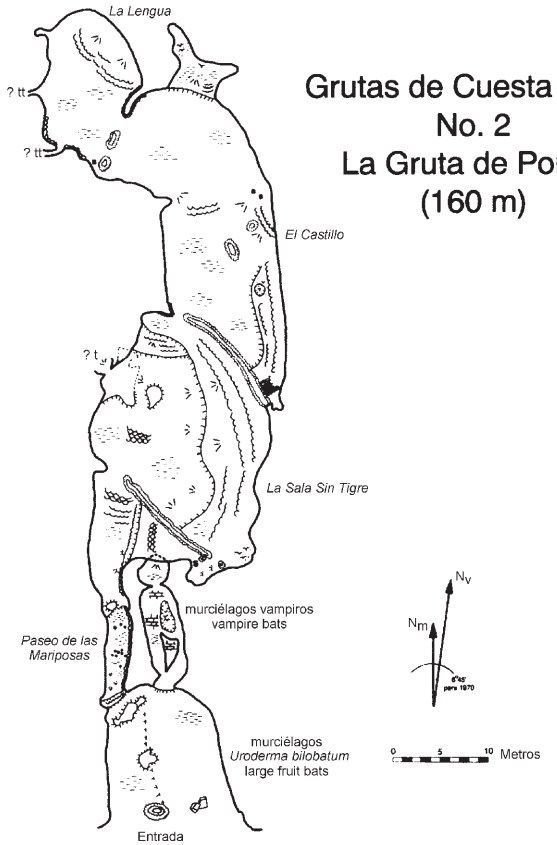
Notes:

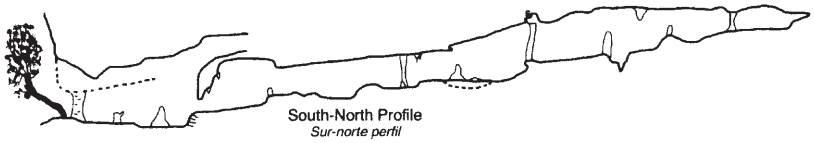
Gruta de Cuesta Chica has stairs leading up the hill slope to its entrance. This developement was done to facilitate marimba concerts in the cave.

The other four caves have no development.

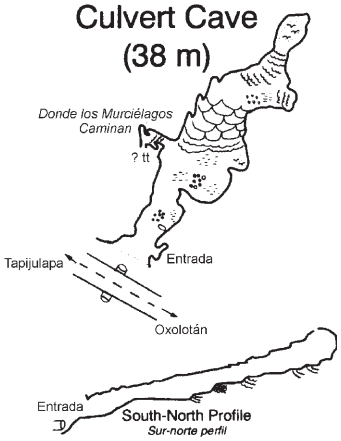
Culvert Cave is adjacent to the road, and is a popular nightime hang-out.

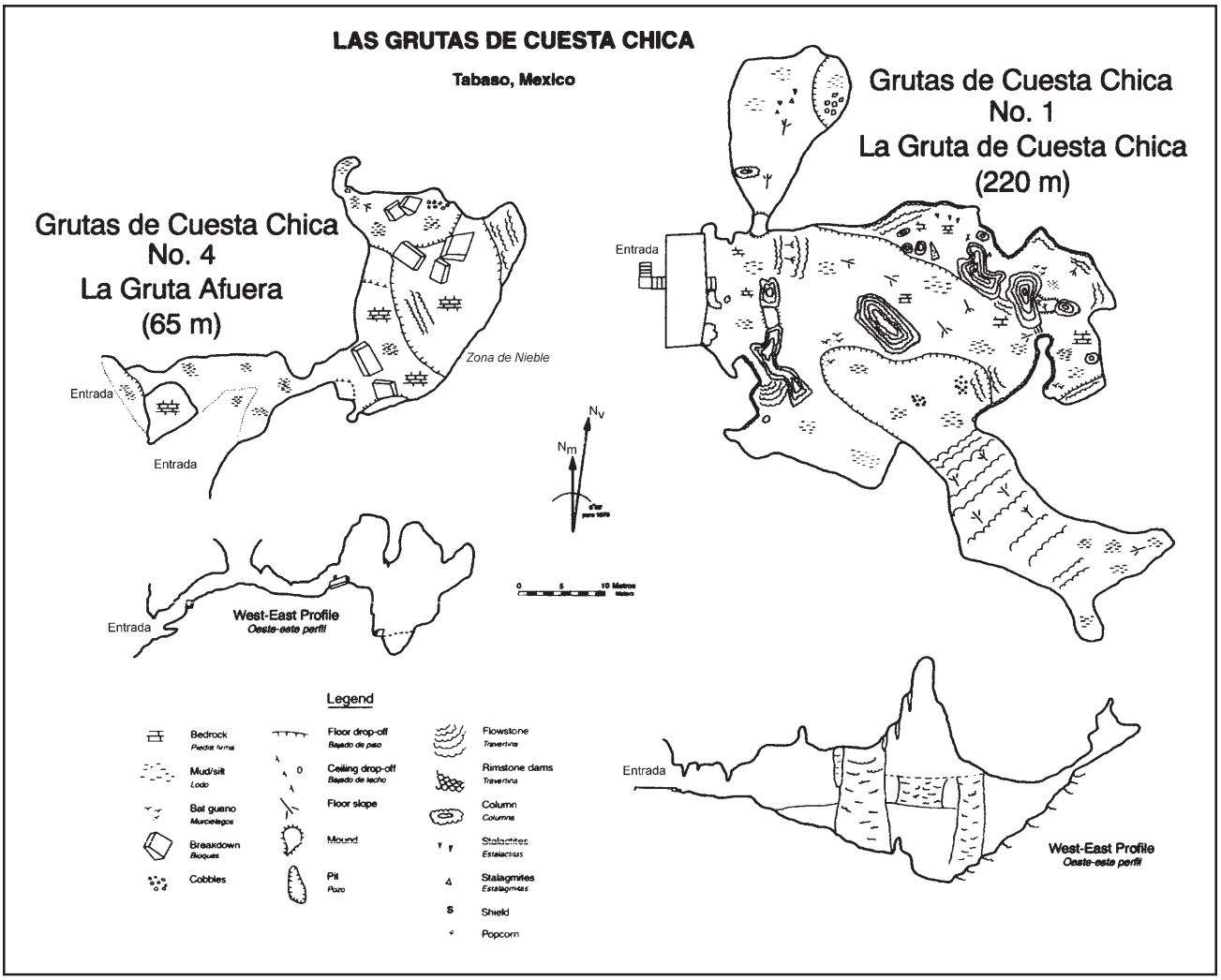
Grutas de Cuesta Chica No. 2 La Gruta de Ponce (160 m)





Grutas de Cuesta Chica No. 3 Culvert Cave (38 m)



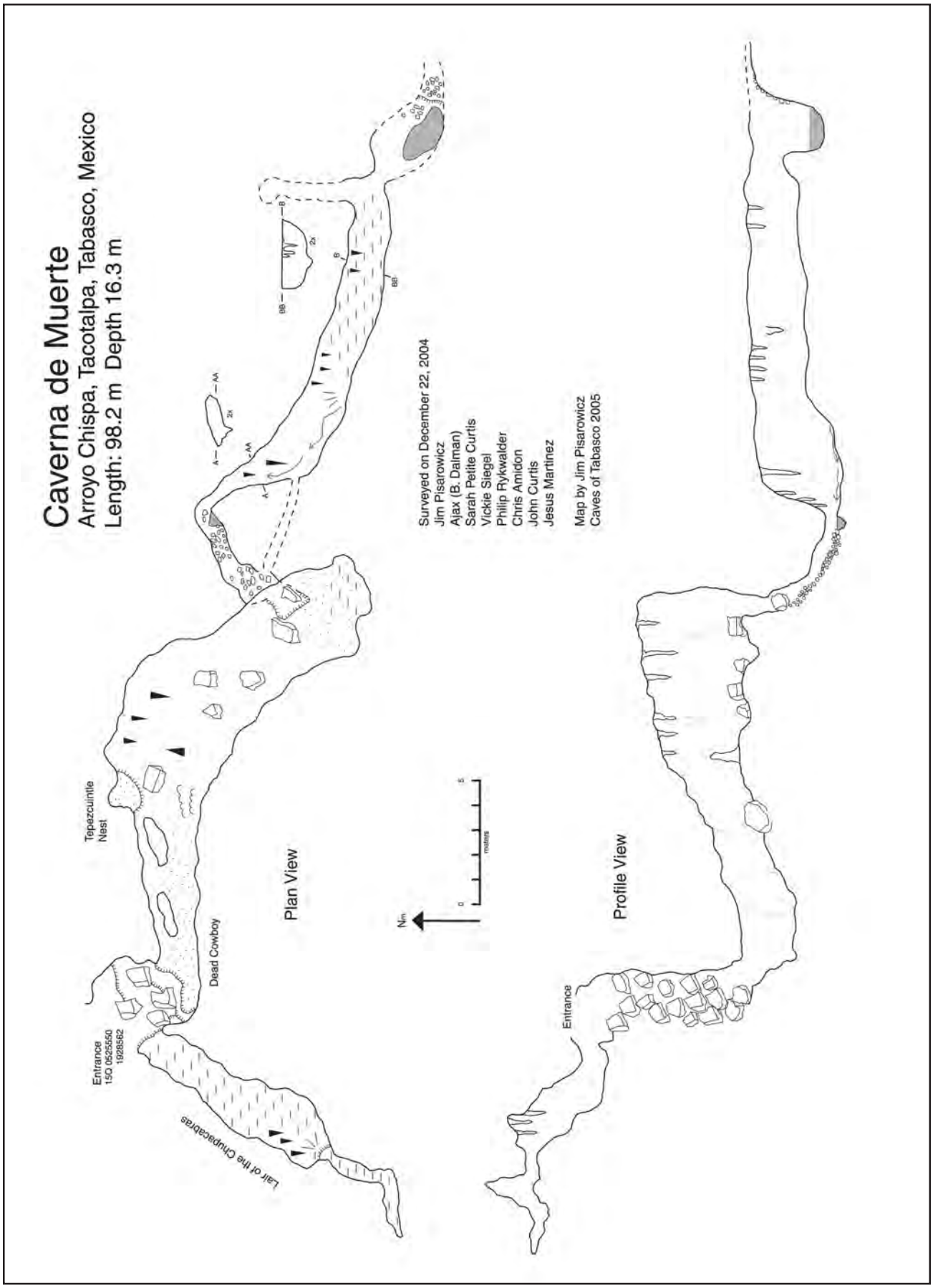


water, with large amounts flowing out of the entrance. Anyone entering the cave at that time would surely die. Jesús indicated that during dry times one could get back to a sump that could be passed, leading to a large passage that he had explored fully. We then asked if it has been dry lately. Jesús said, "*Si*, pretty dry."

We had two trips to the Cave of Death. The first was a recon trip to see if it had indeed been pretty dry. The entrance did not have any water flowing out, and Jesús, Phil, and Chris climbed down the entrance to check it out. Fortunately the entrance area was dry, and they scoped out the cave back to the sump, which they did not swim out into. Returning several days later, we broke our group into two survey teams. Phil, Chris, John, and Jesús would go back to the sump to see if they could push past the water. They would leave a marker there for the other team to tie to. Ajax, Sarah, Vickie, and I would survey from the entrance and tie to the other team's first station. If the sump was not passable, the first team would survey back toward the entrance. The entrance to Muerte is a boulder climbdown that eventually opens to a large walking passage. This is obviously scoured by the flow of lots of water. Sand, not the usual Tabasco mud, covers the floor. This eventually leads to a small, cobble downclimb into another walking passage and then the sump, which was not open. Since it had been so dry, Jesús thought that the sump would be open by May or so. Unfortunately we could not wait that long.

The next cave that Jesús took us to was called Croquis de la Gruta Arroyo La Chispa. Jesús said that the cave was perhaps 800 meters in length. I was surprised when he led us to the cave I knew as Gruta Afuera. Jesús and Lupe had discovered the way on in this cave. Coming into Afuera from the other side of the hill through a cave they called Arroyo La Chispa, they had rigged the cave with ladders made of polypropylene rope and branches from trees. One could now climb up into the ceiling of Gruta Afuera and travel through the hillside. This well-decorated cave was eventually mapped by Chris, Tom, Vicky, and Phil. Later Jesús said that he had mapped the cave and provided us with the map that he and his brother had produced.

Jesús and Lupe know of many caves in the hills behind Arroyo Chispa. Phil, Nathan, and our guides located many karst features in this area and mapped El Sótano del Niño Perdido (Lost Boy) and Sótano del Jamaica.


Caverna de Muerte
Arroyo Chispa, Tacotalpa, Tabasco, Mexico
Length: 98.2 m Depth 16.3 m
Surveyed on December 22, 2004
Jim Pisarowicz
Ajax (B. Dalman)
Sarah Petite Curtis
Vickie Siegel
Philip Rykwalder
Chris Amidon
John Curtis
Jesus Martinez
Map by Jim Pisarowicz
Caves of Tabasco 2005
Tepezcuintle Nest
Dead Cowboy
Entrance
15Q 0525550
1928562
Lair of the Chupacabras
Plan View
Nm
0
5
meters
Entrance
Profile View

The Sierra Poana is a mountain range of classic karst haystack hills. This area was one of the first karst areas Karen Rosga and I saw in 1986, and it convinced me that Tabasco would be a great area to go caving in. Previous trips to the Sierra Poana had mapped Cueva de Tepezcuintle (*Agouti paca*) after getting involved in a *tepezcuintle* hunt in the cave involving spears and a dog that had its face ripped off by the cornered animal, the beautiful Cueva de Arroyo Azul, and Solidad, an impressively large cave that we camped in when we surveyed it in 2002. Five caves were mapped in the Poana area during this year's expedition: Cueva Garzas, Cueva de Dos Bovedas, Cueva de Poana, Cueva del Polvorín, and Cueva del Perro Fantasmas.

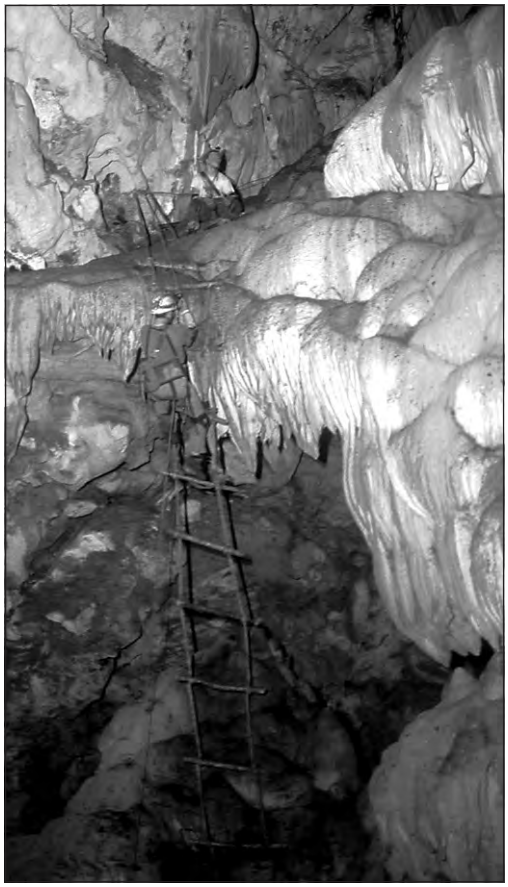
Dos Bovidas had been shown to me by Roberto Porter in 2002. I had been contacted by an Azteca television affiliate in Villahermosa that wanted to interview me and other cavers for a special about caves in Tabasco. I asked Roberto if he knew of a nice straightforward and easy-to-get-to cave to use for the interview. He suggested Dos Bovidas. I later discovered that the program made that day had won a Mexican award.

After a traverse of a field and a short chop up a hillside, we were at a cave entrance, but not the entrance to Dos Bovidas that I remembered. There Chris, Phil, and Vickie got out the survey gear to begin mapping, while I searched for the entrance to Dos Bovidas, which I found just slightly higher in elevation and around a rock outcrop. We called the first cave Garzas, because all morning Phil had been telling jokes about cattle egrets, which are called *garzas* in Spanish. Although short in length, Dos Bovidas is a series of very large rooms. The ceilings are always at least 10 meters above your head, and the rooms are well decorated with flowstone, stalactites, stalagmites, and columns. Beyond a climbable pit at the end of the main passage, the cave ends in a mud floor.

Cueva de Poana had been visited several times during previous Tabasco expeditions. It is basically a through-trip through a haystack hill. From a small entrance on the west side of the hill, large walking passage, a small duck-under in the muddy middle, and more large passage eventually lead to a moderate-size entrance farther north on the hill. Along the way are a couple of small leads and some very nice flowstone areas, with large stalactites and columns. Chris, Ajax, Vickie, Phil, and I mapped this cave.

Phil spent a day climbing one of the haystacks near Cueva de Poana so that he could attempt to enter a large entrance we could see about three quarters of the way up. Because the entrance looked overhung, he took a rope with him so that he could get above the entrance, rappel down, and swing into the cave. He and Jesús bashed, thrashed, and climbed their way through the jungle, working their way above the cave entrance. Echoing around them during the climb were the raucous calls of the *zaraguates*, howler monkeys (*Alouatta palliata*). After some fine exposed climbing, Phil and Jesús were above

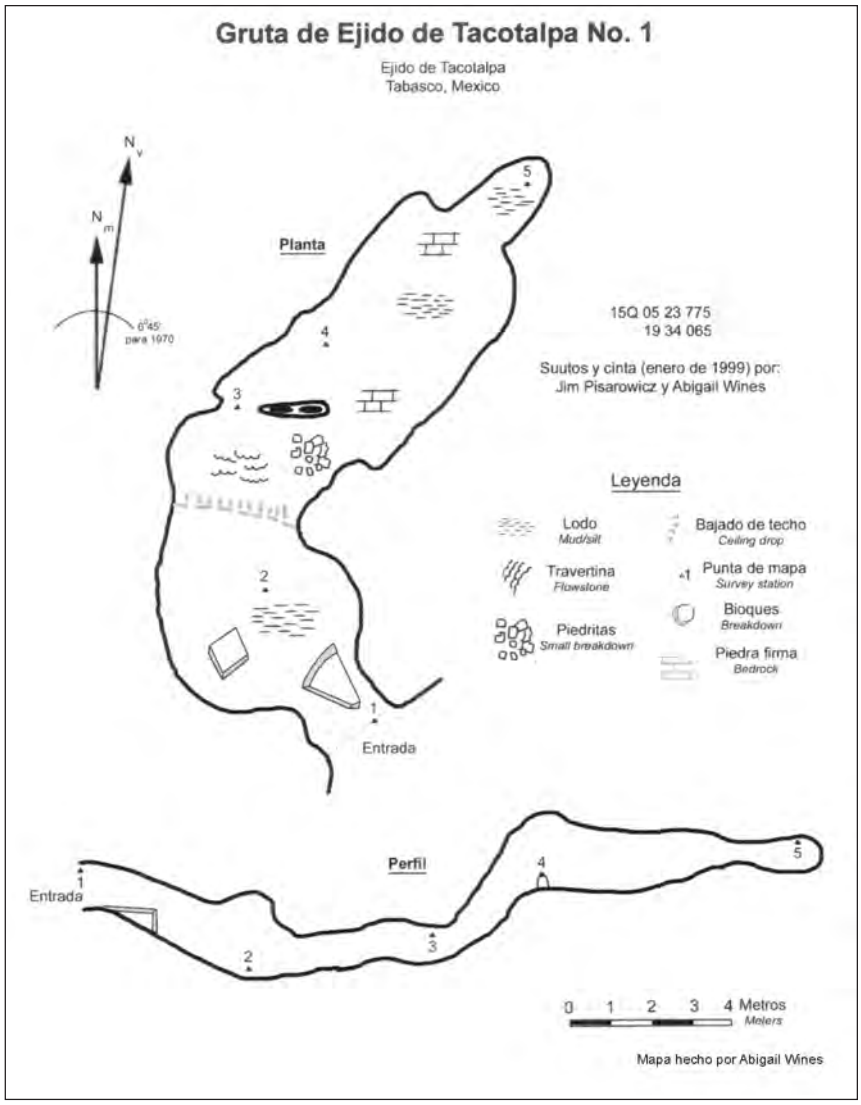
Chirs Amidon climbing rope in Arroyo Chispa. *Jim Pisarowicz*.



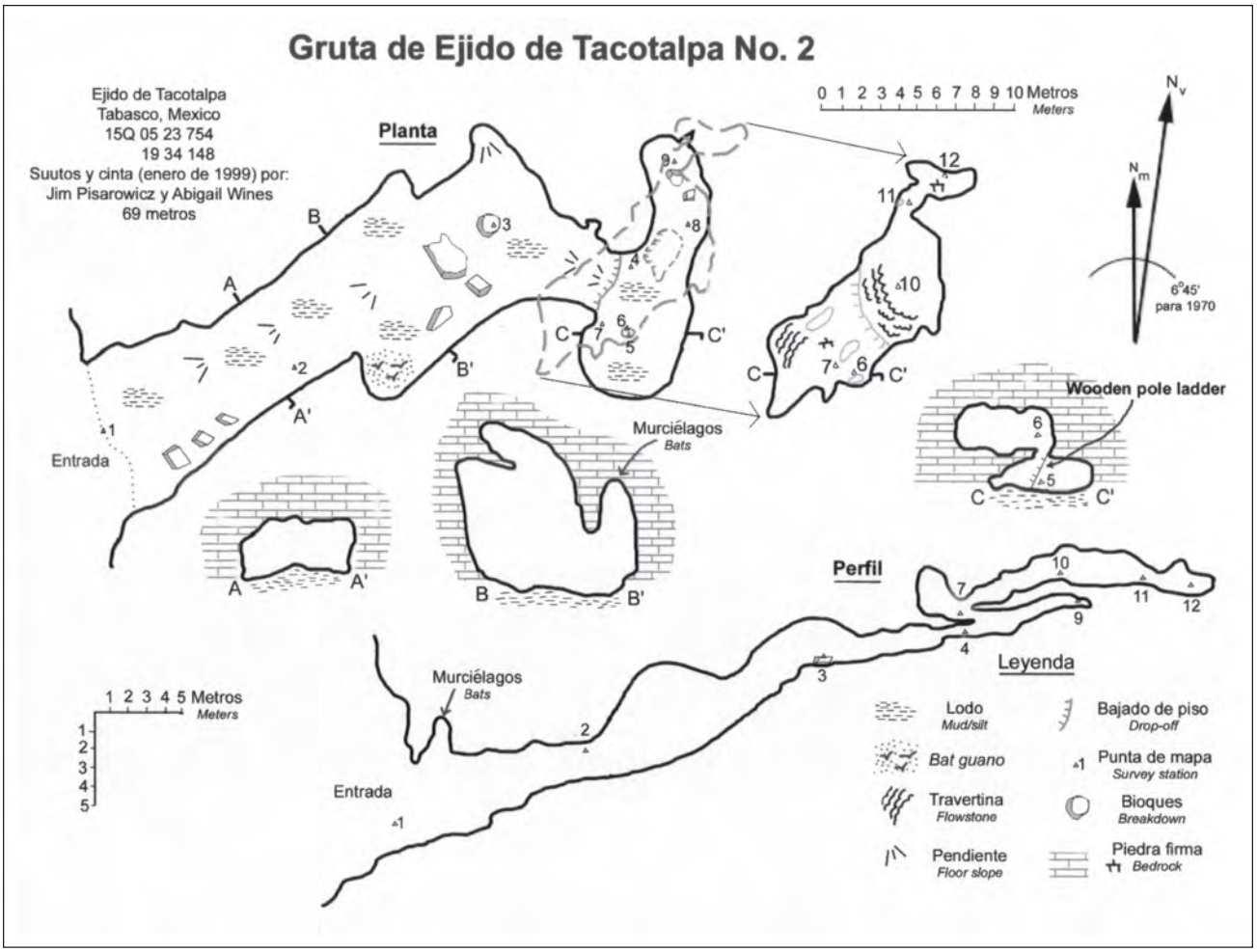
the entrance. Their 50-meter rope was just long enough for them to rappel into the entrance. Unfortunately, the cave was just a large shelter. The original plan was to check the cave and then rappel down from the cave entrance to the ground. But the 50-meter rope was too short for a simple rappel back down to the ground. After over an hour of dicey climbing and rappelling, Phil and Jesús were back down to the bottom of the haystack. An unsuccessful cave trip, but an adventure all the same.

One day, Jesús and Lupe led us over to Estación Poana, a railroad station on the north side of the Sierra Poana. There we hopped on *planos*, small platforms attached to axles that rode on car wheel-bearing races that fit on the rails. These vehicles were propelled down the tracks by using a pole, like a gondolier pushing a boat down a canal. Using these *planos*, Chris, Ajax, Tom, Vickie, Phil and I traveled down the iron road to a small settlement of about five houses. There we met the landowner, who agreed to take us to a cave in the hills behind his home.

Leaving the settlement of small houses, we made our way through a small field and past a stone building that had warehoused explosives used during the construction of the railroad. This powder magazine, or *polvorín*, provided the name of the cave, Cueva del Polrvorín. After chopping a trail through the jungle, we were soon standing near a small hole in the exposed limestone, where we were being eaten by mosquitoes. Everyone wanted to get into the cave quickly to get out of the swarm, but the entrance is relatively small, and after a short squeeze there is a tricky maneuver to get out of the small passage and safely down a short drop called El Brinco. From there the cave opens into a sizable room with a high ceiling. A small passage, the Bat Flush, had a constant stream of bats flying out of it. Larger passages lead to another room with several skylights

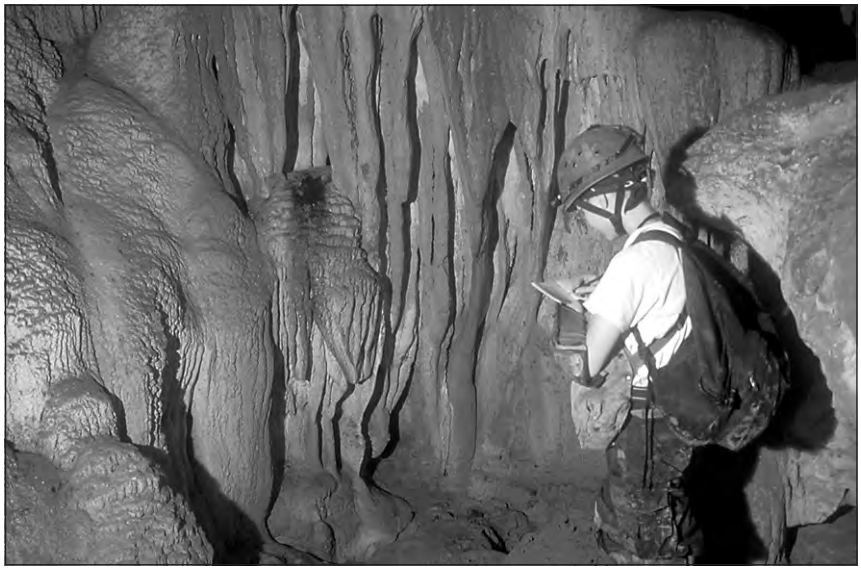


Vickie Siegel looking into the main room of Cueva de Dos Bovidas. *Jim Pisarowicz*.



high above. Another passage turns into a nice hands-and-knees crawl infested with many very large cockroaches. This eventually opens into several large rooms with balconies high up on the side of a haystack overlooking the valleys and flatlands to the east. Vultures and owls had nests on several of the shelves of these balconies. Pottery sherds and human skeletons were found just into the cave from the balcony overlooks.

Cueva del Perro Fantasmas is located right in the town of Poana. Chris and I found the entrance to the cave one day while the others were out looking for other entrances. Meredith joined Chris and me in surveying this small cave. After mapping Perro Fantasmas, we joined the other members of the expedition on a stack-walking day that located many small caves, none of which we mapped. We GPSed all these cave entrances.



Ajax Dalman drawing an invertebrate in Cueva de Poana.

I had heard stories about caves near Puxcatán, but had never been over to that area looking for caves before this trip. Puxcatán is on the eastern side of the Sierra Tapijulapa and a long, roundabout drive from Tapijulapa. I had previously driven through this area to get to Tacotalpa, where Abby Wines and I had found a nice river cave in

Above: Ajax Dalman in a passage in Cueva de Poana. *Jim Pisarowicz*.

Below: Ajax Dalman at the entrance of Cueva de Poana. *Jim Pisarowicz*.

1999. The valley in which this road is located is truly spectacular, with the impressive Cerro Campana just northeast of the Río Puxcatán valley.

Early in this trip, Phil, Vickie, Chris, and I had driven over to Puxcatán and asked whom we needed to talk to for permission to go caving in the area. We were directed over to the town clinic, where we were told we could find the *delegado*. At the clinic we were confronted by a long line of local women queuing up for their appointments. Into this throng of women we walked. All of the women were very short, not even coming up to my armpits. Towering over everyone, we made our way to the reception desk, where the nurse there told us that the *delegado* was out in the *zocalo*. There we met with him, and he informed us that we could visit caves in the area, but would need to come back in a couple of days, when a guide could be found to take us to a cave. We said that we would be back. A couple of days later the same group returned, bringing along Ajax, Sarah and John. Now we were told that we could not visit any of the caves in the area. Using John's fluent Spanish, we discovered that the problem was a cave in the area called Cueva de San Felipe. This cave is an ancient burial site, and many of the people in Puxcatán were reluctant to have us visit that cave.

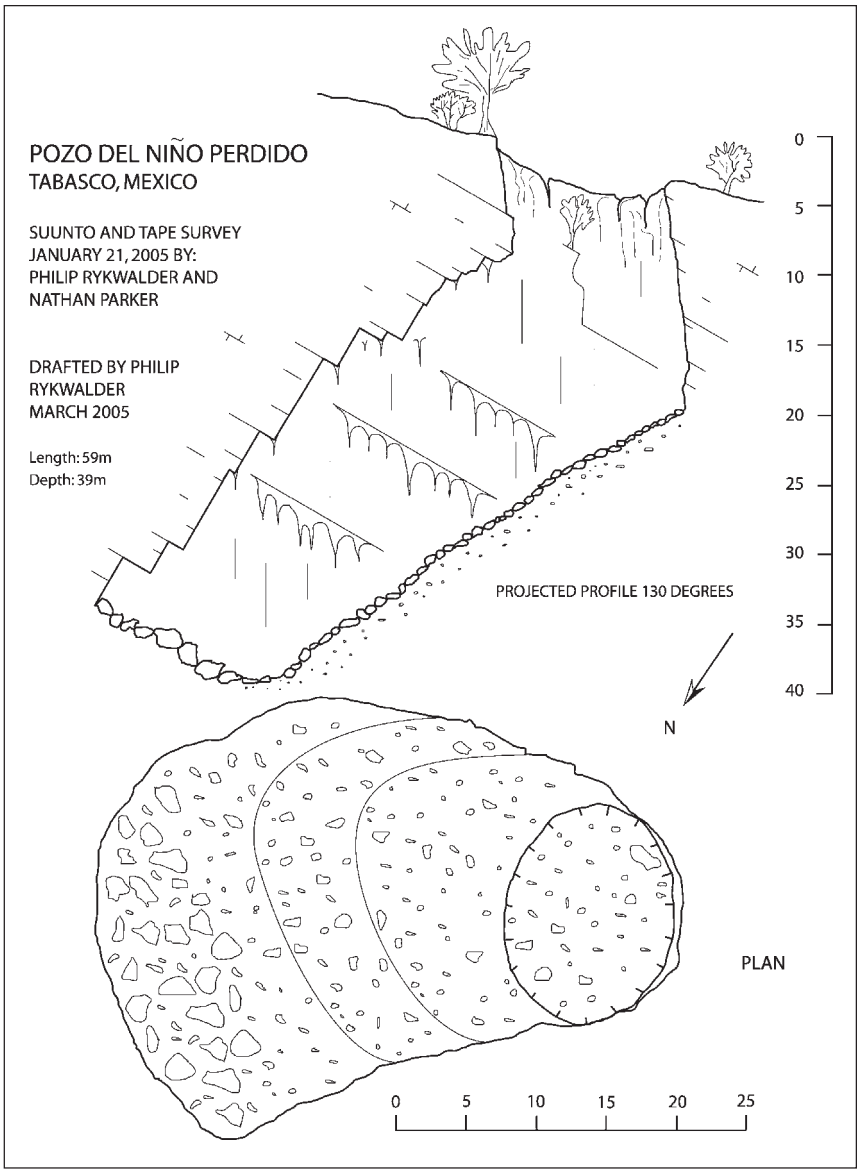
Several weeks later, Jesús said that he knew of a couple of caves near Puxcatán that he could show us. We told him of our problems getting permission, but he said that the caves he knew of were different and we would have no problems. Off to Puxcatán again.

Jesús's caves were some distance outside of Puxcatán. The hike to the caves was interesting in that it required fording the Río Puxcatán several times and then hiking across several fields. We probably crossed more barbed wire that day to go caving than on any other day on the trip. But after less than an hour, we were looking into a double cave entrance out of which a small stream flowed. Cattle were lounging

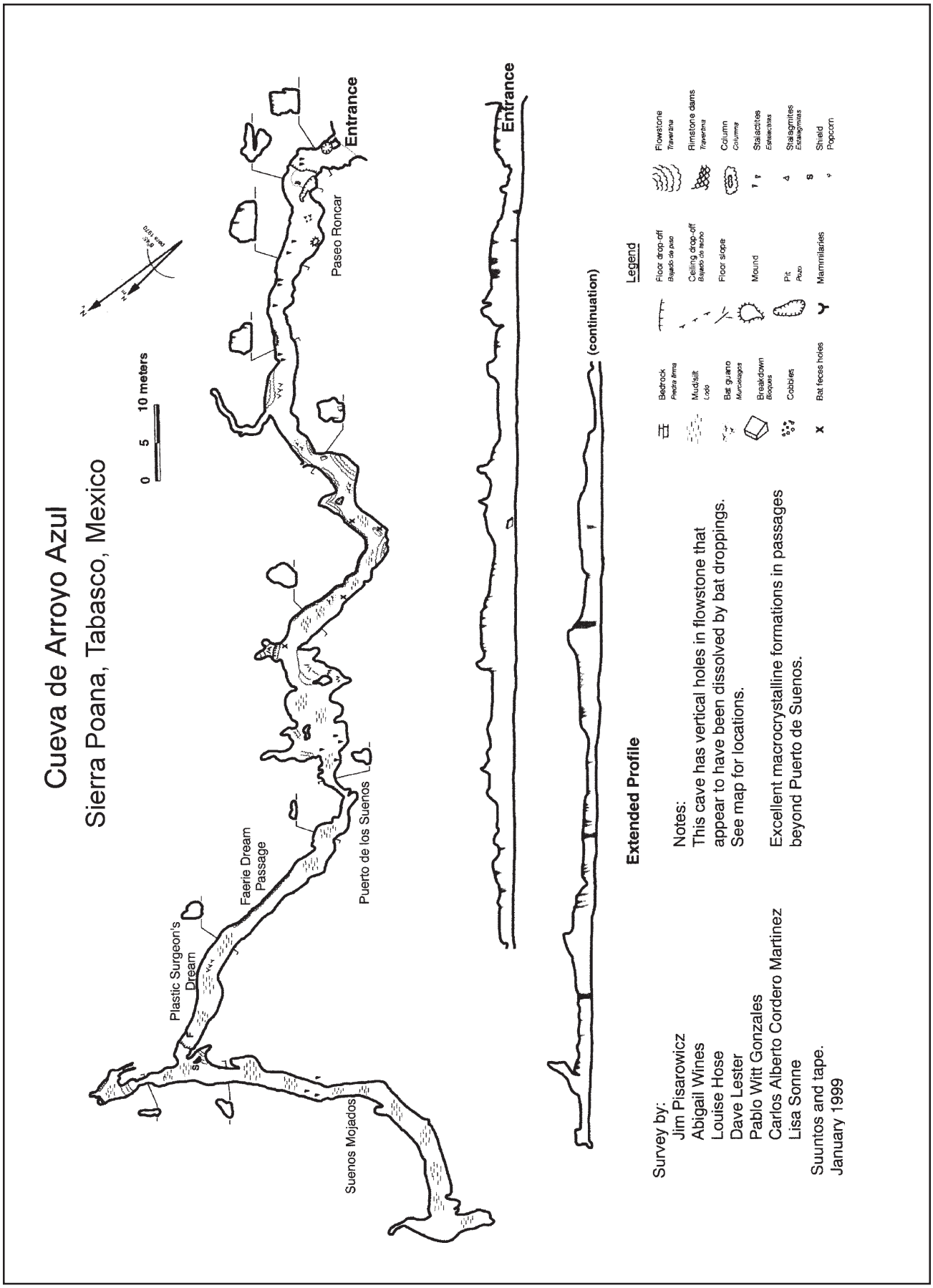
in the shade of the entrances. As we stood there, we watched a cow do a through trip between the entrances. Jesús said that the cave forked a short distance in, with one passage going to a sump and the other to a higher entrance and more cave. We split our group into two teams. Chris, Meredith, and I would survey down to the sump and then survey into the other passage until we tied into the first survey point of the second team, Phil, Nathan, and Jesús.

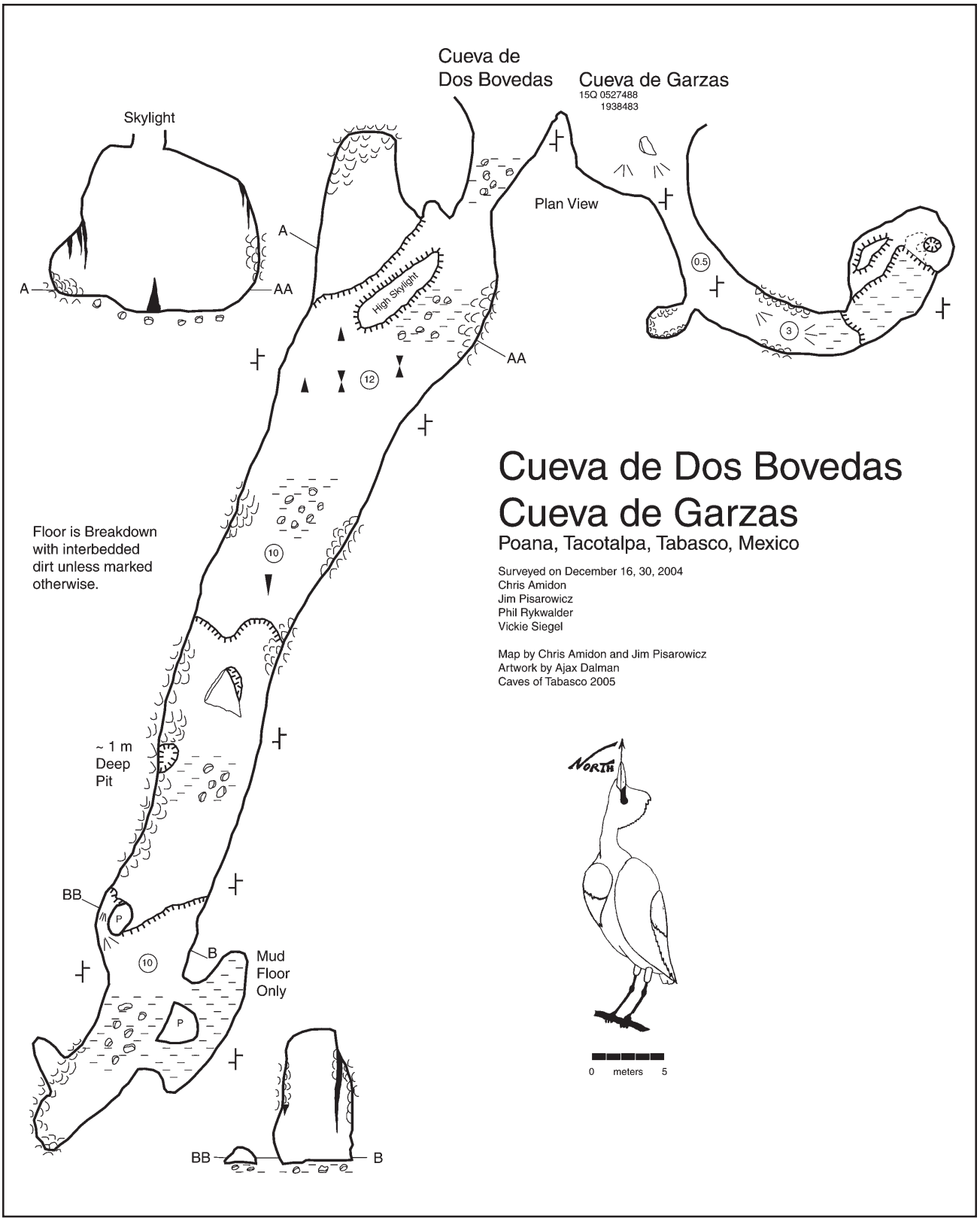
Just inside the entrance it was obvious that this cave is different. The walls and floors of the cave consist entirely of conglomerate. Everything in the cave except the speleothems is cemented stream cobbles. Farther in, the cave intersects a large surface doline. Here the cave passage divides. To the right is ankle-deep water to a large room with a floor of cemented cobbles. This eventually goes back down to stream level and drops down to a large lake. We waded into the lake until it became necessary to swim. Meredith made her way across the lake, but the passage ends there. Halfway across the lake is a small crawl that bats were flying out of. We surveyed into this passage until it was time to turn around to meet up with the other survey team. Phil's group returned after climbing into an upper-level passage. This leads to a belly crawl that eventually opens into a walking passage, where they had turned around in going cave.

A return trip was planned to Cueva en Conglomerado to finish its survey. Jesús said that just over the hill there was another cave and that it was also in conglomerate. On this trip Nathan, Meredith, Neal, and I continued the survey in the original cave, while Phil, Vickie, and Jesús went over to the new cave. After traversing the stooping passages and belly crawls in Cueva en Conglomerado, my team was standing in nice walking passage. White cave popcorn and stalactites and flowstone inspired the name Snowball Hall for this area. Traveling

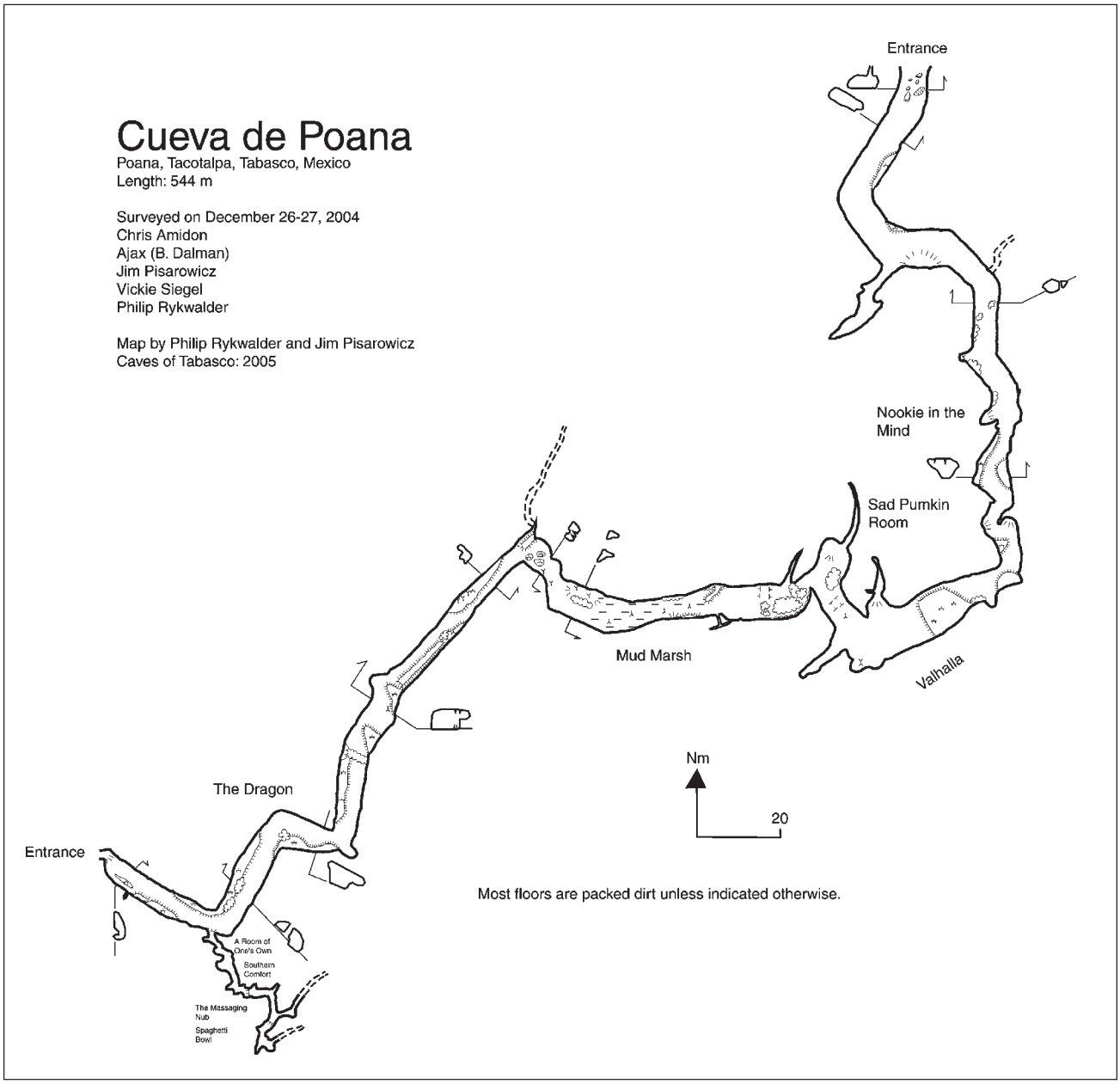


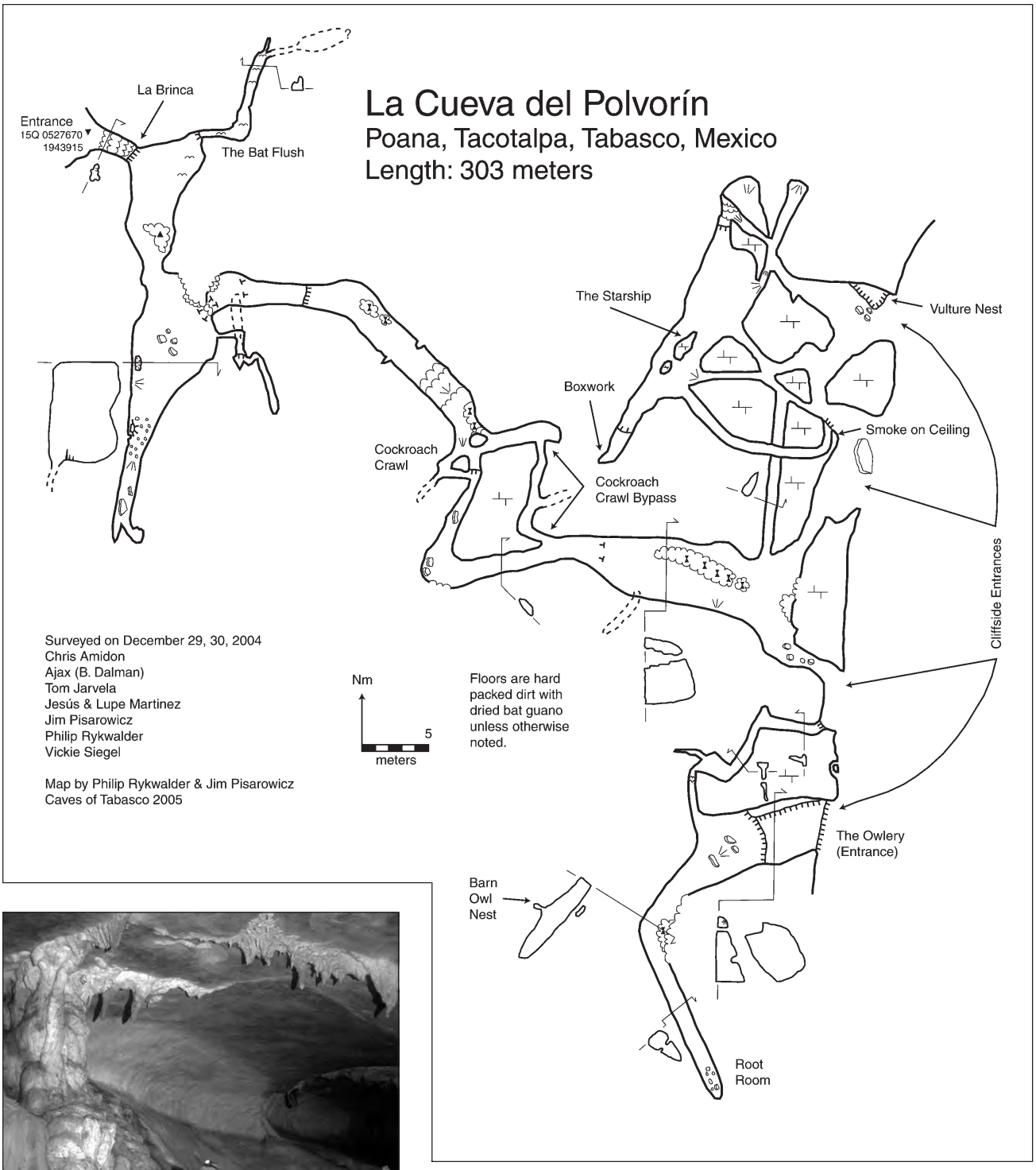
Chris Amidon in Polvorin.
Jim Pisarowicz.


Cueva de Arroyo Azul
Sierra Poana, Tabasco, Mexico
0 5 10 meters
Entrance
Paseo Roncar
Plastic Surgeon's Dream
Faerie Dream Passage
Puerto de los Suenos
Suenos Mojados
Entrance
(continuation)
Extended Profile
Legend
Bedrock
Piedra firma
Mud/silt
Lodo
Bat guano
Murciélagos
Breakdown
Bloques
Cobbles
Bat feces holes
Floor drop-off
Bajado de piso
Ceiling drop-off
Bajado de techo
Floor slope
Mound
Pit
Pozo
Mammilaries
Flowstone
Travertina
Rimstone dams
Travertina
Column
Columna
Stalactites
Estalactitas
Stalagmites
Estalagmitas
Shield
Popcorn
Notes:
This cave has vertical holes in flowstone that appear to have been dissolved by bat droppings. See map for locations.
Excellent macrocrystalline formations in passages beyond Puerto de Suenos.
Survey by:
Jim Pisarowicz
Abigail Wines
Louise Hose
Dave Lester
Pablo Witt Gonzales
Carlos Alberto Cordero Martinez
Lisa Sonne
Suuntos and tape.
January 1999


Cueva de
Dos Bovedas
Cueva de Garzas
15Q 0527488
1938483
Skylight
Plan View
A
AA
High Skylight
AA
12
0.5
3
Cueva de Dos Bovedas
Cueva de Garzas
Poana, Tacotalpa, Tabasco, Mexico
Surveyed on December 16, 30, 2004
Chris Amidon
Jim Pisarowicz
Phil Rykwalder
Vickie Siegel
Map by Chris Amidon and Jim Pisarowicz
Artwork by Ajax Dalman
Caves of Tabasco 2005
Floor is Breakdown
with interbedded
dirt unless marked
otherwise.
10
~ 1 m
Deep
Pit
NORTH
BB
P
B
Mud
Floor
Only
10
P
0 meters 5
BB
B

Jesús Gómez Martínez, Neal Hines, and Chris Amidon at the entrance to Agua Escondida. *Jim Pisarowicz*.





Jesús Gómez Martínez in Cueva de Poana. *Jim Pisarowicz*.

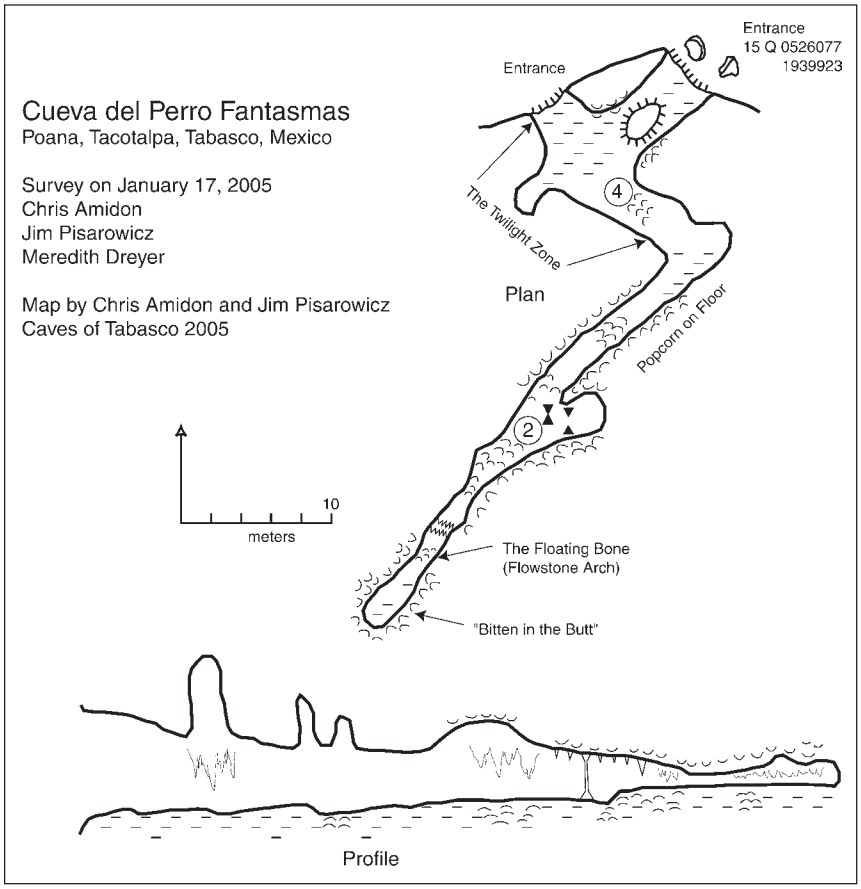
southwest out of Snowball Hall, we walked down curved, muddy-floored, decorated passage. This was a hot, sweaty cave, and Meredith was wearing just a sports-bra top, so we named the passage the Mid-riff Curves. Unfortunately, the passage in this direction soon ended. We headed back to Snowball Hall to go east and north. The passage in that direction is not as tall as the Mid-riff section, but it is equally wide.

Phil's group's cave is not as extensive as Cueva en Conglomerado, but it too is in conglomerate, as promised. Pools of gunky water were found there, and they surveyed several hundred meters of cave.

Traveling into Tapijulapa from the north, one drives along a winding road with the Sierra Madrigal soaring high above him to the west. This mountain is entirely limestone, but incredibly steep and jungle-covered. Locally, the name Sierra Madrigal means the mountain of caves.

In January of 1999, Abby Wines and I, accompanied by Carlos Cordero, had met with Don Venito and his son Chepe. Don Venito knew of a pit up on the Sierra Madrigal, and he offered to take us there. The problem was that it had been thirty years since he had last been there. The trek to the cave was an arduous one. Don Venito and Chepe, swinging their machetes, chopped a track up the thickly jungled mountainside. Sharp limestone, spiny and toxic plants, slippery mud, and all kinds of other nasties greeted us as we sweated our way up the mountain. After four hours of wandering up and down the mountainside, we finally stood at the entrance to a pit. While I took a GPS point, Abby rigged the pit, and before too long she was rappelling down. Don Venito was amazed that a woman would be doing this. Carlos went down next, and I followed. A short distance in, we encountered another pit. After we had descended this, we immediately ran into another pit and discovered we were out of rope. Rocks dropped seemed to fall at least a couple of seconds. The 2004–2005 expedition would bottom this pit.

Meredith Dreyer in Cueva en Conglomerado. *Jim Pisarowicz*.

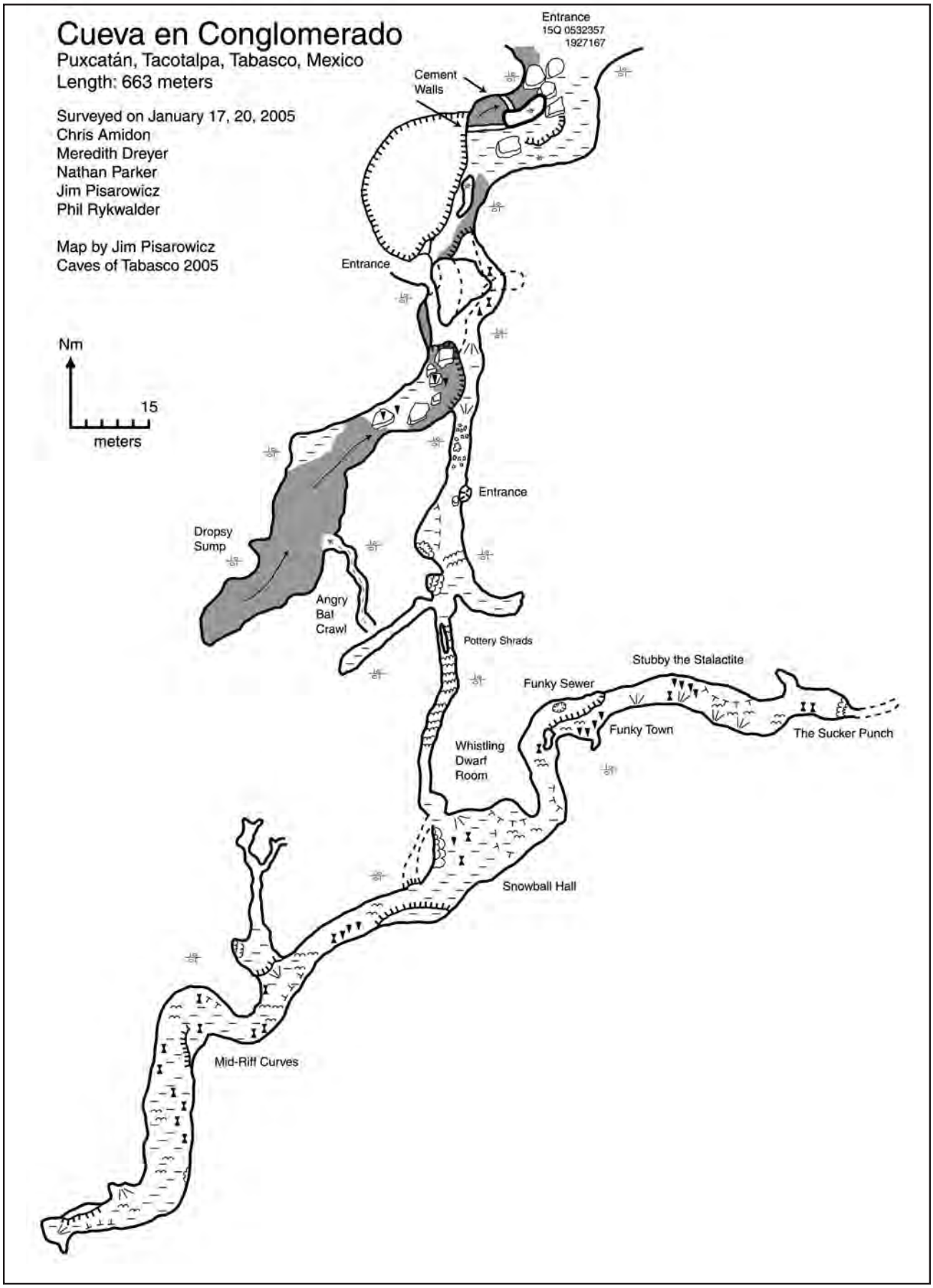


Programming the coordinates of the pit into a GPS, Jesús, Nathan, Meredith, and Phil headed up the Madrigal. Owing to the vertical nature of the hike and the thick canopy of jungle overhead, GPS coverage was sporadic at best. Using occasional GPS locks and his compass, Phil guided the crew up the mountain toward the pit. At one place, while Jesús was taking the point, bashing his way through the steep jungle, they encountered another man on the mountain. "What are you doing," he asked Jesús. "Cutting a trail up the mountain to a cave," answered Jesús. The man pointed at the trail he was on as said, "Why don't you use this trail. It goes right to that cave." And it did.

Several days later, Phil, Nathan, Meredith, Neal, and Lupe, carrying lots of rope, made their way back up to the cave, which had been named Sótano de la Madrigal 5. With Phil rigging the pits and the rest of the crew surveying, they got to the bottom of the cave. The third drop was the final one, with the cave ending up a bit short of 74 meters deep—the deepest cave in Tabasco.

One day Jesús informed us that he knew of a cave near Agua Escondido that was filled with fish. He asked us if we were interested in looking at this cave. I had looked at maps of the Tapijulapa area and could not remember seeing Agua Escondido before, so I was curious about it, and a trip was planned to survey the cave. Neal and Chris accompanied me. As we drove over to Agua Escondido, Jesús took out a fish spear that he had with him. He said he was going to catch some fish for dinner. As we neared Agua Escondido, I remembered the area. In December 2001, Neal Hines, Dawn Cardace, and I had mapped Cueva de Amalia y Candido in this area. Although the cave is not long, the time spent with Amalia and Candido, the people on whose land the cave was located, had been memorable. After mapping Cueva de Amalia y Candido, we had been invited into Amalia and Candido's home for dinner. Neal and Dawn both speak Spanish fluently, and during dinner Amalia had gone into a long and emotional discussion on the tragedy of the World Trade Center disaster. She talked about how she would never be able to meet and know any of the thousands of people killed that September day. Even with my limited Spanish, I had been taken to tears by her emotional and heart-felt discourse on that tragic event. As we parked the truck and headed out across the fields toward the limestone hills where Jesús was leading us, I pointed across the way toward Cueva de Amalia y Candido and reminded Neal of that trip.

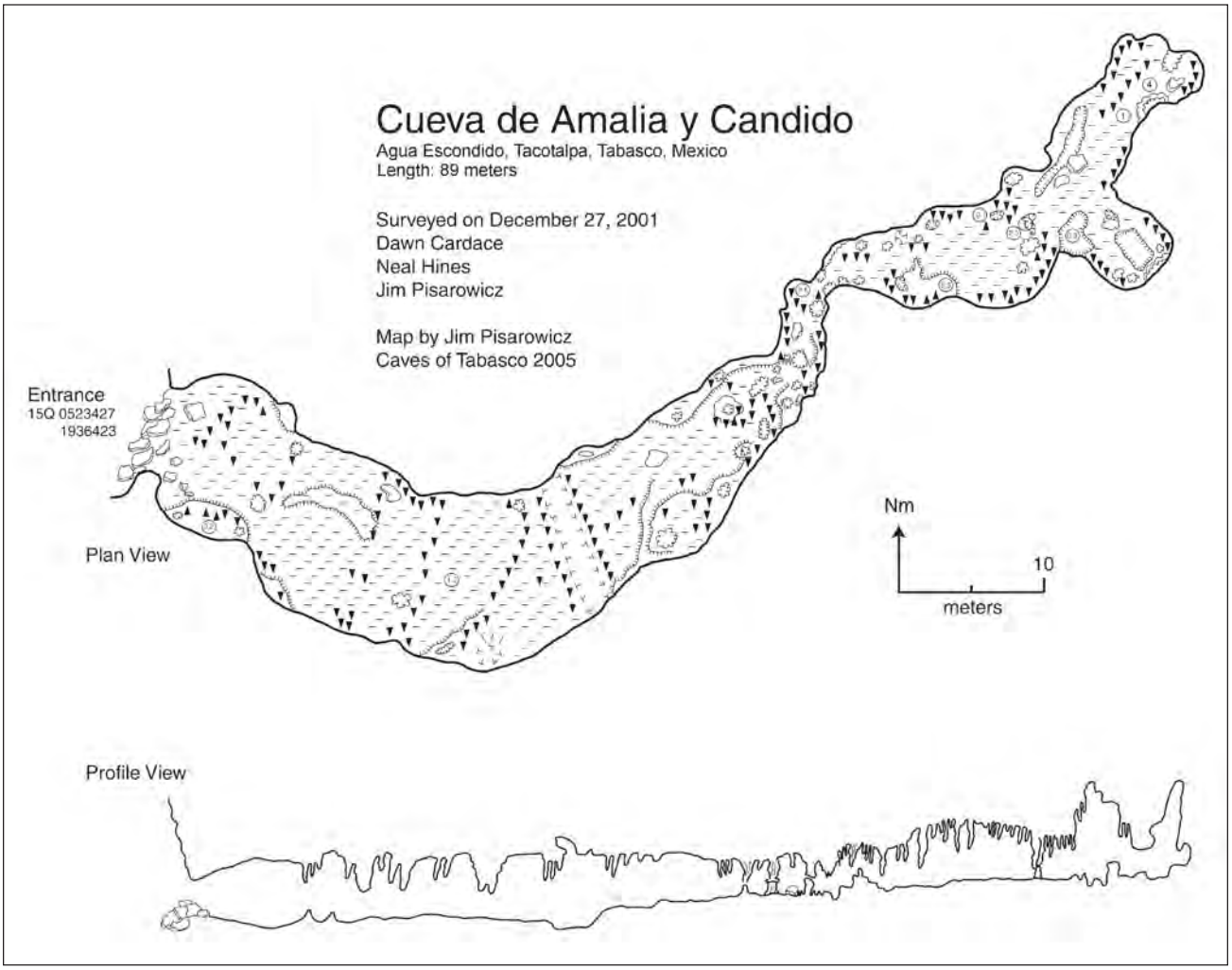
Cueva de Agua Escondido is probably the easiest to get to cave we saw during this expedition. The hike to the entrance, right at the base of the hills, is short and across flat fields. Just inside the entrance the ceilings are incredibly scalloped. Like most Tabascan caves, its

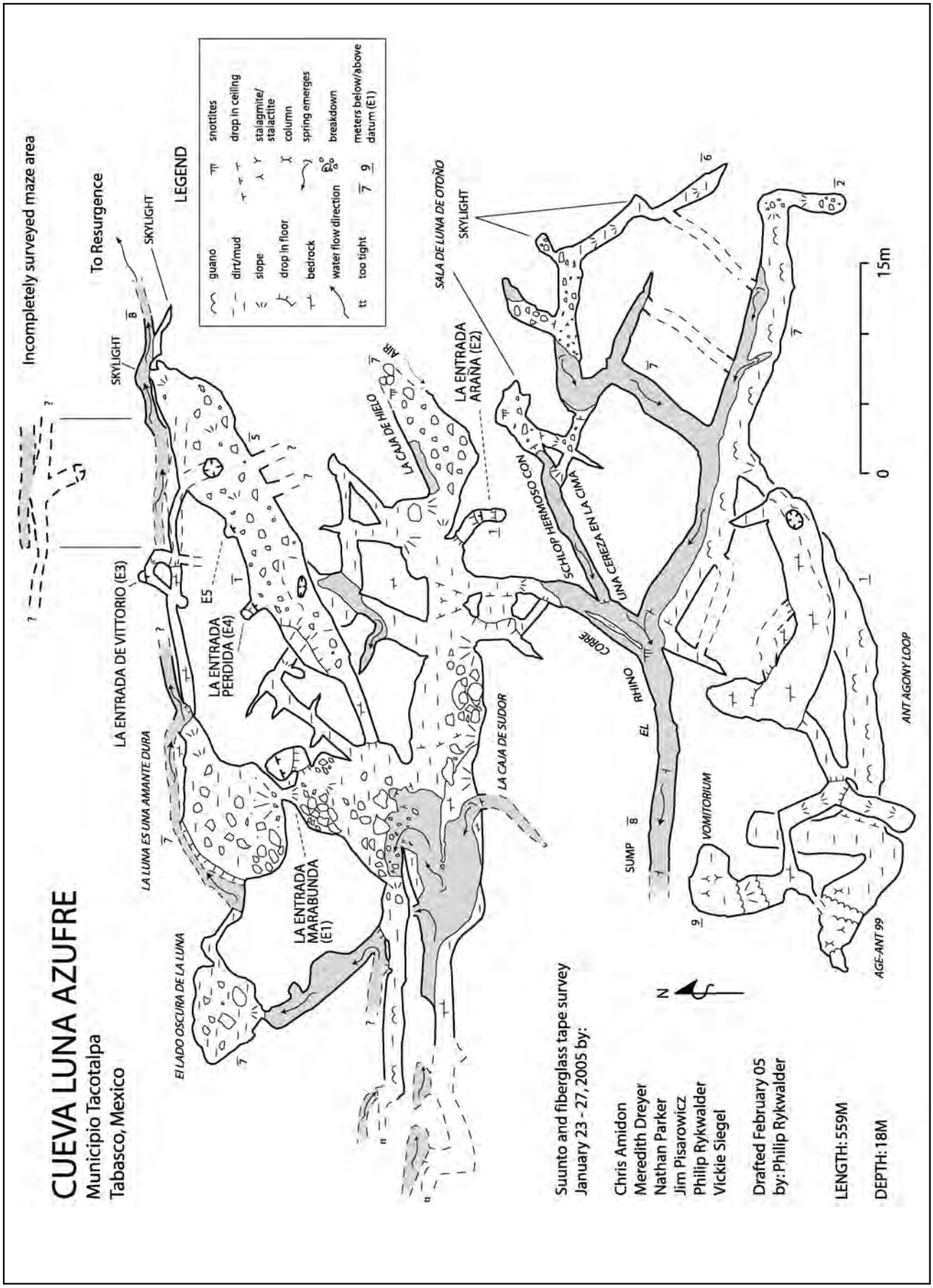

Cueva en Conglomerado
Puxcatán, Tacotalpa, Tabasco, Mexico
Length: 663 meters
Surveyed on January 17, 20, 2005
Chris Amidon
Meredith Dreyer
Nathan Parker
Jim Pisarowicz
Phil Rykwalder
Map by Jim Pisarowicz
Caves of Tabasco 2005
Nm
15
meters
Entrance
15Q 0532357
1927167
Cement Walls
Entrance
Entrance
Dropsy Sump
Angry Bat Crawl
Pottery Shrads
Stubby the Stalactite
Funky Sewer
Funky Town
The Sucker Punch
Whistling Dwarf Room
Snowball Hall
Mid-Riff Curves

floor is muddy, but in this case not too goopy. Smalls pools of water were encountered along the main passage. Farther into the cave, we saw catfish about 15 centimeters long. The main passage eventually seemed to end, but Chris found a way past a tight keyhole we named the Lock and Dam, before the cave eventually pinched down. A side lead before the Lock and Dam opens up and leads to another entrance. This is a pit, and Chris climbed out and could see the field we had crossed to get to the cave. But he could not tell where he was on the hill from what he saw. When he had climbed back down, we continued the survey. As we made our way into the next section of cave, there was a sudden loud crack. Chris looked over to me and said, "What was that?" I was sitting there in tears, because the little cartilage I have left in my knee had popped out of place, the ends of the bones in my leg had jammed together, and then the whole mess had slid back into place. I could hardly walk. Fortunately, Jesús knew that just ahead was another entrance we could get to with essentially no crawling. With the help of Chris and Neal, I limped my way out of the cave and eventually back to the truck. The best cave rescues are self-rescues. Afterward, Jesús said that by going in this second entrance one could come out of the mountain near Poana if the water level was low. Since we had been in the area for over a month and had had no rain, we were excited by the prospect of finally finding a long cave, so a return trip was planned the next day.

Two survey teams were set up, one to survey from where I had popped my knee to the entrance we had used to get me out of the cave and the second to push the cave back into the mountain. Chris, Neal, Phil, Vickie, Nathan, Meredith, and Jesús made up the survey crews. I stayed back at the field house nursing my knee. I was surprised when everyone came back early that afternoon. The rumored through-trip to Poana was just that, a rumor. The cave ended in an incredible mud hole that was named the Bog of Eternal Stench because of all the dead things trapped in the mud there.

As has been the case of expeditions to Tabasco in the past, many caves were explored and mapped, but many other new caves were discovered. Despite seven weeks of almost continuous caving (one day near the end of January, Phil made the comment that he needed a day of rest from caving—something I never thought that I would hear from him), I still have a long list of caves located, but not yet mapped. This year's expedition added more new caves to that list




CUEVA LUNA AZUFRE
Municipio Tacotalpa
Tabasco, Mexico
Incompletely surveyed maze area
To Resurgence
SKYLIGHT
SKYLIGHT
LEGEND
guano
dirt/mud
slope
drop in floor
bedrock
water flow direction
too tight
snottites
drop in ceiling
stalagmite/ stalactite
column
spring emerges
breakdown
meters below/above datum (E1)
LA ENTRADA DE VITTORIO (E3)
LA LUNA ES UNA AMANTE DURA
EI LADO OSCURA DE LA LUNA
LA ENTRADA PERDIDA (E4)
E5
LA ENTRADA MARABUNDA (E1)
LA CAJA DE HIELO
AIR
LA ENTRADA ARAÑA (E2)
SALA DE LUNA DE OTOÑO
SKYLIGHT
SCHLOP HERMOSO CON
UNA CEREZA EN LA CIMA
CORRE
EL RHINO
LA CAJA DE SUDOR
SUMP
VOMITORIUM
ANT AGONY LOOP
AGE-ANT 99
0
15m
N
Suunto and fiberglass tape survey
January 23 - 27, 2005 by:
Chris Amidon
Meredith Dreyer
Nathan Parker
Jim Pisarowicz
Philip Rykwalder
Vickie Siegel
Drafted February 05
by: Philip Rykwalder
LENGTH: 559M
DEPTH: 18M

than we crossed off. We are still just beginning the search for caves in Tabasco. At this point we have only located the easy-to-find caves. How many hard-to-find caves are out there?

MAPPING LUNA AZUFRE

Philip Rykwalder

In my caving, I reserve a special category for those caves that are purely and utterly sickening for some reason, be it kilometer-long belly-crawls, drops with horrifyingly loose rock, squeezes that defy the anatomy, or soft rock that seems to want to push bolts right out, leaving you climbing rope softly and delicately. This special category of caves is reserved for those truly gruesome holes that even the most dedicated cavers are reluctant to visit. I call them horror holes. Recently I had the utter pleasure of mapping a half-kilometer-long horror hole, Cueva Luna Azufre.

I spent the winter of 2004–2005 in Tabasco, Mexico, on a trip led by Jim Pisarowicz. Along with others, we explored and mapped a number of caves around our home base, the town of Tapijulapa. With a backlog of caves to map, we were busy each day mapping, and we chose to map the longest, deepest, and most pleasant, a sensible equation for a good time. The area is known for its famous Cueva de Villa Luz, a true horror hole that gains the designation from its strong sulfur smell, dangerous pH values, and potentially deadly air. We had visited the cave on a number of occasions and found it to be caustic to every human sense, and so when Jim announced that he knew of a smaller sulfur cave near Villa Luz that needed mapping and, he guessed, was perhaps 30 meters long, we tucked it in the back of our minds for when we ran out of pleasant caves to map. But the day finally came when we chose to visit the cave.

Jim, I, and a few others visited the cave, finding that it blew ungodly hot, wet air out of the entrance. For starters, I don't like hot caves. No, I hate hot caves. As a hot-blooded person who excels in cold alpine caves, I simply cook in hot caves. And so on that first day at what we were simply calling the hot cave, I was relieved when Jim volunteered to go into the cave first and test the air quality with an air monitor. Portions of Cueva de Villa Luz have dangerously elevated levels of CO, H_2S, and other gasses. Jim returned soon enough and reported that the air was indeed dangerous and that we shouldn't enter the cave that day—and that the short bit that he did see was full of vicious, biting ants.

As the winter wore on, we finally felt the need to map the hot cave, and we returned armed with respirators and bottled air. On Sunday, January 23, Meredith Dreyer, Nathan Parker, Jim Pisarowicz, Vickie Siegel, and I headed up to map the hot cave. After Jim tested the air and verified that it was breathable that day, we hatched a plan to minimize exposure in the cave. Meredith and Vickie geared up in respirators and wore bail-out bottles of compressed air in case the air changed for the worse suddenly or the respirators failed. After donning all the gear, they started surveying in, setting the stations as they went and recording the tape and instruments readings, without sketching, so as to minimize exposure to what we thought would be a short cave. After they came out, Nathan and I, similarly equipped, went in. I identified their marked stations and sketched what they had surveyed, while Nathan observed the cave's biology and took notes on the cave's fish population.

The entrance we used that day, the Marabunda Entrance, is a 2-meter climbdown that leads to a downward-sloping squeeze, beyond which one slides down some low passage into a room with about 10 centimeters of milky-white water. Immediately I noticed what would come to be one of the cave's most distinguishing features, the abundance of aggressive, biting ants. I generally don't mind ants. All that we had seen in Tabasco thus far were innocent leaf-cutter ants that seemed too busy carrying around their green peace flags to bother biting. But the ants in the hot cave were not too busy and seemed very eager to bite. When I had to crawl, slide down a slope, or brace against the floor, I learned very soon to do so quickly, as ants were on every surface. Later, surveying in the upper-level crawls, Nathan, Chris, and Vickie got bit hundreds of times, resulting in numerous welts.

That first day I sweated heavily as I sketched in the hot and humid air. Cave humidity is exacerbated when the cave is hot, and this cave is very hot. This cave is as hot as any cave I've been in, and in the end I spent almost four days in it. That first day we mapped about 150 meters of some pretty horrible passage, including the first room, La Caja de Sudor, the Sweatbox. Some horrible passages are squeezy, some are overly awkward, and some are sharp and thrutchy. The first day we mapped walking or stooping passage, and it was still among the worst I've seen. Sweat dripped in my eyes, I smelled the horrible sulfur air, I got bitten up and down by ants, and I was constantly pestered by flying insects that sought out the light of my lamp. My note paper was always littered with dead insects that I had swatted off on my arms and face, and I had to continually scrape the pages clean of their bodies. And I was afraid to touch any of my clothing, because, if the cave had dangerously acidic soil, I might accidentally rub some in my eyes.

By the day's end, I saw that the cave was becoming something of a project. I had made a list of leads, and it was lengthy. I was sure there were more to come. For the following day we had planned a little trip up to Villahermosa to visit the Olmec museum, and so we had a respite from the hot sulfur horror hole that still lacked a name.

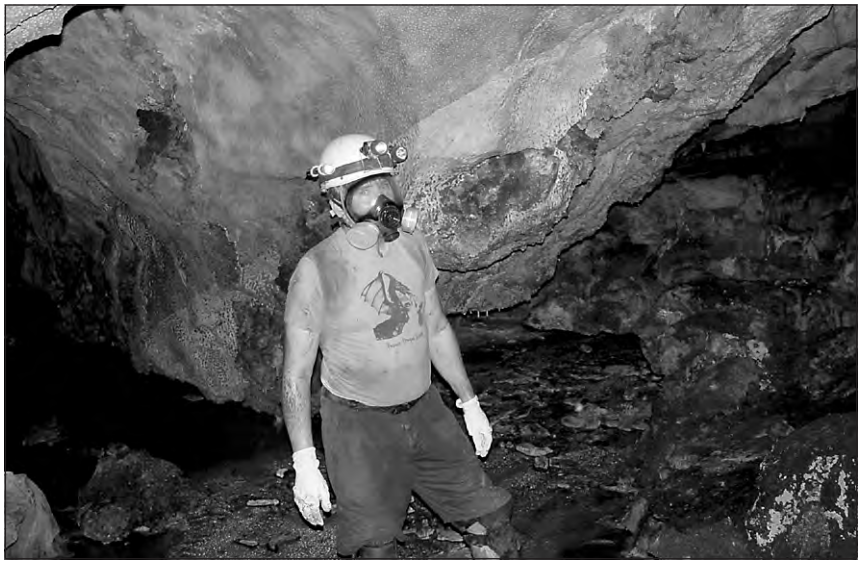
Tuesday, January 25, we spent the morning driving back to Tapijulapa from Villahermosa, and by 1 P.M. we were in Tapijulapa. The end of the six-week trip was looming, and I really wanted to finish mapping the cave, but I couldn't force myself to go back into it. In the end, Nathan's moxie saved the day. He convinced Vickie and me to return, and after

the hour walk to the cave we started mapping the Ant Agony Loop off the Insect Heaven and HF surveys. By the day's end we had around a quarter kilometer surveyed in the hot cave, with more leads.

On Wednesday, we worked at mopping up the cave, going down my lead checklist. We decided to bypass the nasty La Entrada Marabunda by using La Entrada Araña, and soon we scooted through the Ant Agony Loop, did a climb up, and found Age-Ant 99 and the highest point in the cave, the Vomitorium. The rest of the day was spent in small, very unpleasant crawling passage in the cave's northeastern sections, which involved lots of lying in biting ants shooting 2- and 3-meter shots. At the end of the day, we popped up into a room, La Luna es Una Amante Dura (The Moon is a Harsh Mistress), with three leads heading off . One led directly back to the main entrance, bypassing some crawls. Another blew cool air, and I waited while Chris Amidon pushed it. He returned to report that it led to another entrance, Entrada Vittorio. The third lead held water and remains unpushed.

We were scheduled to leave Tapijulapa and return to the States on Friday, January 28, so on Thursday I hoped to finish mapping the cave, though my list of leads was still lengthy. That day we finally came up with a name for the cave, Cueva Luna Azufre, Sulfur Moon Cave, in honor of the full moon and the sulfurous nature of the cave. That day we started by mapping some loops around Entrada Araña, and then we found another lead that took us into an upper level that contained La Entrada Perdida, the Lost Entrance, and led eventually to the downstream end of the cave. It appeared that we would never complete the survey. Everywhere we turned, we found more crawling, more entrances, more maze passage and loops, more water-crawl horror. Chris was the champion that day, as he pushed the grimmest passages to their bitter ends and reported back their dimensions to me. He got down and dirty with the tape in the wet maze passages and urged Vickie and me to survey every crawl.

In the end, we had no choice but to call it a day, leaving some leads remaining, and, true to the surveyor's style, they are the grimmest in the cave. Still to be surveyed are some downstream crawls, some water crawls east of La Caja de Sudor, one of which Chris reported held a very heavy sulfur smell, and some miscellaneous dead-end passages. I hope to mop up these leads and polish off some other details on later trips back to the truly horrific horror hole that is Cueva Luna Azufre.



Doug Soroka in Cueva Luna Azufre. Snottites are visible near his left elbow. *Louise Hose*.

A SCIENTIST LOOKS AT CUEVA LUNA AZUFRE

Louise Hose

Jim Pisarowicz began sending e-mail messages about this newly discovered sulfur cave while his team was carrying on their mapping effort. The news energized the Cueva de Villa Luz science team, and we immediately began plotting a quick visit to the cave. Pisarowicz and Philip Rykwalder rushed maps and information to us. Extending the upcoming Presidents' Day weekend seemed the best opportunity, but the already too-short trip had more than the usual share of delays and distractions. In the end, biologist Doug Soroka and I, a geologist, spent only about five hours in the cave. But this provided enough information to confirm that Cueva de Luna Azufre is an important scientific find. If not for its nearby big sister, Cueva de Villa Luz, it would probably stand out as a spectacular scientific find.

Atmosphere. As noted by the original explorers, the Luna Azufre air temperature is about 2°C higher than Villa Luz, and there seem to be pulses of warm, moist air flowing out the entrances. However, the pulsing was not noted within the cave. The higher temperature is attributed to the warmer spring-water temperature. Villa Luz was having notably "good" air days during our stay, so our readings in Luna Azufre may also have given a rosier than normal picture of the air chemistry. Atmospheric H_2S never exceeded 3 parts per million and was generally 0 ppm in Luna Azufre. However, CO_2 was commonly about 0.02 percent, nearly one order of magnitude above the normal 0.003 percent. In addition, the O_2 level was generally about 20.4–20.6 percent. (Normal is 20.8.) Since the CO_2 can not explain this large of drop in oxygen, there must be another, yet unidentified gas displacing the oxygen and adding a

troublesome worry to exploration in this type of caves. The abundance of guano in the cave raises the strong possibility that histoplasmosis looms.

We recommend in the strongest terms that all parties entering this cave and other sulfur-rich, little-studied caves in the future carry a portable gas monitor that continuously checks on O_2 and CO_2 levels, that each person carry an emergency air tank, and that explorers continuously wear gas masks with acid and organic-vapor filters no matter what the readings. It is prudent to remember that a high enough level of oxygen to sustain life and burn a flame is not sufficient evidence of a safe environment. In Villa Luz, we have seen the CO_2 level high enough to be fatal despite sufficient oxygen. Other gases known from such caves, such as carbon monoxide and formaldehyde, as well as gases so far unidentified, are also concerns.

Hydrology. The water temperature varies in the Luna Azufre springs, but all are thermal and warmer than the Villa Luz springs. They also contain much more dissolved oxygen and total dissolved solids than most Villa Luz springs. Despite Luna Azufre's proximity to Villa Luz, its waters are notably different. Perhaps they have been less diluted by mixing with meteoric waters.

Biology. There is a much lower density of life in Luna Azufre than Villa Luz, but its community is still intriguing. Surprisingly, the fish appear to be a different species than in Villa Luz, and they may be a new species of cave fish. We observed the tail of a small eel, but not enough to identify it. The abundant snails in the cave are also different from those found in Villa Luz. There were many bats flying everywhere in the cave. Unfortunately, vicious, biting ants and guano were ubiquitous on non-stream floors throughout the cave. No biting ants were noted in nearby Cueva de Villa Luz, so I hope for future investigators' sake that the phenomenon is short-lived in Luna Azufre.

The largest spring regularly produces small biomat clumps, similar to the "phlegm balls" in some Villa Luz springs, and there are minor "slime" accumulations downstream. But the microbial community in Luna Azufre is only subtly displayed. Only a couple of very small snottite deposits, in the southern part of the cave, were seen. Probably the most obvious microbial community in the cave is abundant biovermiculation displays.

Geology. The cave appears to have formed in the same massive, micritic Cretaceous limestone as Cueva de Villa Luz. The strike of all observed bedding trends nearly west-east and dipped about 35–45° to the north. A fault of undetermined offset controlled development of the southern stream passage. One distinctive difference between Luna Azufre and Villa Luz is the relative abundance of exposed limestone bedrock in Luna Azufre. Most bedrock in Villa Luz, particularly in the stream passages, is coated with gypsum paste and selenite crystals, biomats and biovermiculations, or sediments such as Ragu deposits. The only exposed limestone in Villa Luz crops out in dry areas, such as the upper parts of Fresh Air, or where surface water frequently flows down the walls during and following rains. The abundance of limestone outcrops along with relatively limited gypsum paste and other wall coatings in Luna Azufre suggests that either much more surface drainage enters the cave during rains or the conditions are not as ripe as in Villa Luz for prolific microbial activity because there is less chemical energy available.

As Pisarowicz had promised in his e-mails, Cueva de Luna Azufre is a smaller, subtler version of Cueva de Villa Luz and a very important discovery. Our team, and other scientists who will follow, owe the discovery, exploration, and mapping team a debt of gratitude for their efforts and willingness to share what they learned. The cave, with its pervasive and vicious biting ants and acidic guano piles with pH as low as 1.9, isn't much fun to explore, and it must have been horrific to map. We certainly appreciate their efforts and generosity in transferring their knowledge to us.

CAVES OF MACUSPANA

Chris Amidon

In the Macuspana municipality of the Mexican state of Tabasco, there is a provincial park called Agua Blanca. Here a river emerges from a cave system, and during high-rainfall periods water shoots from the Agua Blanca resurgence like from a water cannon. According to a topographic map, no less than eight streams sink into this area of limestone, and all this water re-emerges at Agua Blanca. An extensive system of caves that some cavers estimate could reach 30 to 50 kilometers in total length exists in this limestone.

There are three different cave levels in the area: a high-and-dry zone, an intermediate level, and the river level. Cave exists in all three levels, and the goal in the area is to interconnect the many caves, a goal made difficult by the climate in the region, as high rainfall causes rapid dissolution, which leads to collapsed passages and passages entirely choked off by huge dripstone formations.

In 1989, Jim Pisarowicz, Warren Netherton, and a team of Swiss cavers first surveyed much of the area. They surveyed four kilometers of Agua Blanca, about two kilometers of a cave called Cueva Magnífico, with the data and its location subsequently lost, and a handful of other cave systems.

Enter the Tabasco 2005 cave expedition. Our goals for the Agua Blanca area were to relocate and resurvey Cueva Magnífico, relocate an entrance deep in the Agua Blanca cave system that Jim Pisarowicz and Peter Lord had discovered in 1989 but whose location was then lost to a jungle fire, and survey other caves in the area.

To rediscover the location of Cueva Magnífico, we had the aid of a surface survey done in 1989 and a GPS. To its credit, the surface survey accurately guided the search team to the cave entrance, but not before thousands of tiny ticks invaded the group's privacy. Even worse, later that evening, after we

deticked, boots and several pieces of clothing were stolen from our camp. After a trail was blazed to the cave, avoiding the tick-infested area, six people prepared to spend an overnight session exploring and mapping the cave, then reemerge the next morning. Group A, consisting of Ajax (B. Dalman), Tom Jarvela, and me began the survey at the cave's entrance. Group B, consisting of Phillip Rykwalder, Vickie Siegel, and Laura Rosales, proceeded to the first rope drop and began surveying from the bottom.

Cueva Magnífico starts off in small crawls, but soon opens up into a well-decorated room, the China Shoppe, filled with typical stalactites, stalagmites, draperies, and the ever-present tarantulas. Side leads exist off this room, though most were scooped at a later time. A small crawl of 20 meters leads to the first drop, of 8 meters. After this drop, the cave opens into the large King's Room, 15 to 20 meters high, 10 to 15 meters wide, and 100 meters long. Dripstone is everywhere. Just beyond the King's Room is an area covered in white "snow," probably gypsum, named the Snow Cascades. Pure white crystals cover the ground, the draperies, and the walls, and we carefully danced our way through the snow. Yes, there is snow in the jungle; one just has to know where to look for it.

Group B, after resting for a few hours, rigged another rope up a slope, then down a chimney, and found themselves in a huge chamber rivaling the King's Room. In its center, a stalactite the size of a car had fallen from the ceiling. A side chamber, the Egg Sack Shack, held a female tarantula with an egg sack the size of a chicken egg.

Low on sleep, high in giddy laughter, Group A pushed on past the Snow Cascades into mixed crawling-walking areas. Names like the Jester's Chamber and the Jester's Secret came to us in this ever-changing area. In the floor, thick with mud, we found the boot prints of our predecessors, the Swiss cavers of 1989. Much stranger, we found barefoot prints that we assumed came from the Swiss group, but we couldn't tell for certain. . . .

Around four in the morning, Group A took a rest break. Thirty minutes later, when we awoke, someone muttered, "What's that?"

"Whoa, is that light?"

"I see it too."

We all saw it. Or *thought* we saw it—wavering lines of light, sometimes white, sometimes shades of red and orange. Our thirty minutes of rest had induced a group hallucination, and so our resting spot received the name Foxfire Chamber.

We pushed on through the Iron Maiden, a small, nasty, body-twisting squeeze around stalactites and stalagmites, and into walking passage. When we finally had to turn around to make our rendezvous time, we left walking passage and numerous side leads.

Total survey on the first trip was around 500 meters.

A few weeks later, another group returned to Cueva Magnífico. This group included Meredith Dreyer, Neal Hines, and me. Down the first rope drop, through the King's Room, the Snow Cascades, and the Iron Maiden, we made our way, eager to pick up the walking passage we had begun surveying when our time expired on the previous trip.

Fifty meters from where our previous survey had stopped and 2 meters from where our lead pusher had turned around, the passage ended in a dig, a dig with air, but a dig nonetheless. Foiled! The Jester's Joke had the last laugh.

We backtracked to other side leads. One side lead went, and it went in joint-controlled passages until we encountered pools of water with one set of boot prints squished into the submerged mud. After the pools came an unclimbable drop, maybe a total of 10 meters, but we had no rope. From our perch, we could not see the bottom, but a thrown rock revealed more water. Is this a water-filled pit? Or does it open into stream passage? We heard no sounds of flowing water, and the bottom of this drop awaits another trip.

During another short respite, this time in the China Shoppe, another member awoke to visions of wavy lines, sometimes white, sometimes orange—same cave, different trip, different room, different person, but same hallucinations.

Total survey from the second trip was 350 meters.

On a day when I had the most energy of my entire life—I ran everywhere, knocking over jungle brush, jumping from rocks with ease—I spent the afternoon retrieving ropes left in Cueva Magnífico. During this solo trip, after retrieving the ropes I pushed some of the leads. During the first trip, Tom Jarvela had seen two windows from a room adjacent to the China Shoppe. In this room, I squeezed down a crack, belly-crawled a few body lengths, and popped into walking borehole passage. No footprints. I was in virgin cave. I pushed the borehole to its end, maybe 300 meters, where it emerged on a cliff side. This second, previously unknown entrance overlooked the Agua Blanca valley, and while I stood there in the afternoon sun, admiring the view, I basked in a solo virgin through-trip experience.

By the end of our trips into Cueva Magnífico, we had surveyed close to a kilometer of cave, and we estimated another 500 meters had been seen, but not surveyed. Then there is the undescended rope drop, which we don't think the Swiss cavers did. Possibilities remain in Cueva Magnífico.

We made several trips into Agua Blanca. As the water was the lowest Jim had ever seen it and we could easily walk in through the resurgence, which was not the water cannon of 1989, a survey crew of Phil Rykwalder, Laura Rosales, and I went in to mop up the entrance area. As the day came to a close 300 hundred meters later, we left passage unsurveyed.

A few weeks later, Neal Hines, Meredith Dreyer, and Nathan Parker continued the Agua Blanca resurgence survey through a few hundred meters of small crawls. This resurgence survey has yet to be connected with the Agua Blanca survey done in 1989, except by a surface survey.

Jim Pisarowicz, Peter Lord, and I returned to the jungle entrance of Agua Blanca to push some leads off a lake that Jim and Peter remembered from 1989. Then the lake had huge waves, unlike anything they had seen before, and they were certain more cave was beyond. I had emerged only a few hours before from an overnight into Cueva Magnífico, so while Jim and Peter went swimming, I took a nap. This time there were no waves. After poking around for a while and ducking under a sump, Jim and Peter returned waterlogged and without news of the going cave they had hoped for. One promising lead remains, up a muddy slope needing ropes.

Other, smaller caves were pushed in the area. In the morning of the same day as my rope-retrieval Magnífico fun, Phil Rykwalder, Vickie Siegel, and I returned to an area Jim, Peter, and I had stumbled into while trying to shortcut through the jungle. The shortcut had been a bust, but we had stumbled onto three karst features and one cave. The karst features ranged from 10 to 30 meters long, sometimes 10 meters high. All of them were choked off with huge amounts of dripstone. The Sorcerer's Apprentice became the name of the one cave, because it gave us hopes of breaking into the Agua Blanca system as it went deeper and deeper. The entire cave was one huge dripstone collection. One could climb the flowstone-drapery walls 20 meters to the ceiling. After nearly 100 meters, the cave dead-ended in mud and dripstone chokes, making this beautiful but short cave just an apprentice to the river system of Agua Blanca.

Philip Rykwalder, Vickie Siegel, and Nathan Parker spent a day dropping pits atop the Agua Blanca ridge. One of these pits opened into walking borehole passage, dry and beautifully decorated like the show cave in the area, Iztac-Ha. It ended after 300 meters.

All of the caves in the area, Agua Blanca, Iztac-Ha, Magnífico, and the smaller ones, are clearly part of the same ancient system, but high rainfall has caused the upper cave levels to collapse or has choked them off with dripstone formations. The mystery is how to connect these many kilometers of cave into a larger system. Significant cave remains for those who will seek its passages.

Retorno a Tabasco

Una expedición a Tabasco visitó varias cuevas, en ocasiones junto con espeleólogos de Villahermosa, y topografió algunas de ellas, generalmente pequeñas. Su descubrimiento más interesante fue una cueva sulfurosa similar a la de Villa Luz. La nueva cueva, Luna Azufre, aparentemente tiene una menor actividad de sulfuros y sulfatos, pero es caliente y está llena de hormigas agresivas.

HISTORY

EXPLORING A WILD CAVE

Alfred M. Lansing

Text and photograph from Collier's, *October 1, 1954. ©1954 Crowell-Collier Publishing Company. The map is from F. Bonet's* Espeleológia de la Region de Cacahuamilpa, Gro. *(1971), following page 52. Reports on 1966 trips to Gruta de la Estrella appear, with photos, in* Association for Mexican Cave Studies Newsletter, *volume 2, numbers 5 (pp. 119–121) and 6 (pp. 157–158). Apparently the mapping described there was never completed. The visit to Estrella reported in this magazine article contributed to some description and geological discussion in J Harlen Bretz's paper "Cavern Making in a Part of the Mexican Plateau,"* Journal of Geology, *volume 63, pp. 364–375 (1955).*

For generations, America has been a nation of explorers. Nowadays, of course, there isn't much left to explore; the physical frontiers of the world have been pushed back until there's almost no unknown territory remaining. Perhaps that's why people climb mountains, or swim around under the sea—or crawl through caves.

Judging by the swift growth of the spelunker (or amateur cave-investigator) movement, more and more people are finding in underground exploration the excitement they're looking for. I can see why. A few weeks ago, I accompanied a world-famous speleologist (or *scientific* cave-investigator) into a rugged section of Mexico which is pockmarked with caves, and had an opportunity that few would-be adventurers get: a chance to explore a so-called wild cave—one which never before had been fully investigated. I got my fill of excitement.

There were six of us in the party: Dr. J Harlen Bretz, professor emeritus of geology at the University of Chicago, and one of the world's foremost experts on caves; Dr. Alberto R. V. Arellano, professor of geology at the National University of Mexico; Dr. F. Bonet, one of Mexico's leading zoologists; Raymond de Saussure, a hell-for-leather research associate with San Francisco's Western Speleological Institute Inc.; photographer Leo Choplin, and myself.

Dr. Bretz had led us into the mountain country of southwest Mexico—a region of limestone hills, scrub forests, tiny villages and poor herdsmen and weavers—where, he had been told, there was one of the largest caverns on earth. Dr. Bretz is the leading proponent of a theory now widely accepted among top geologists that caves are not created by subterranean rivers deepening their beds (as has been believed in the past), but are caused by water pressures deeper underground which, circulating within limestone or other soluble rocks, produce chambers which may not come to light for thousands or millions of years. The caves of Mexico's southwest mountain region promised to give fresh substantiation to the Bretz theory, and he was tooking forward to seeing them.

All of us were clothed in rough shirts and trousers, cleated or rubber-soled shoes and miners' helmets equipped with carbide lights. At the hamlet of Tonatico, we hired Señor Morelos Guzmán, a dark-skinned, silent man, as our guide; others in the village told us he knew the area better than anyone else around. Morelos turned out to be a prize. He said little, but he was tireless, fearless and willing. No burden was too much for him, no chore too hard.

It was Morelos who led us to the cave we were looking for, called (I don't know why) Cacahuamilpa, or Field of Peanuts.

But the exploration of Cacahuamilpa was a disconcerting experience. The cave was one enormous room—easily the largest and longest single underground chamber known. It was also one of the dullest. It was about 300 feet wide, nearly as high as a 20-story building in some places and running for almost a mile into one of the local mountains—far surpassing in volume the immense main room in the Carlsbad cavern that has always been called the world's largest. The Mexican cave was so big that it defied Leo Choplin's efforts to capture it on film—he couldn't photograph more than part of one surface at a time.

Although Cacahuamilpa was interesting to the scientists, from a photographer's point of view it was a flop—and from an adventure seeker's viewpoint, it was even worse: it didn't twist or climb much, it had no side passages, and it obviously had been visited often by the local folk, so it wasn't wild. It was just an enormous, unexciting shaft in the side of the mountain.

Not far away were other caverns.

Without much hope, we turned to them—and in one of them, called the Cave of the Star after a star-shaped rock nearby, I had enough adventure to last me a whole lifetime.

The Cave of the Star was a cave-crawler's dream: unexplored, mysterious, dark and ancient. Morelos told us about it, then guided us to the entrance: down the winding mountainside into the valley of the River Zapote, which is bounded on two sides by sheer limestone cliffs and on the third by a great hill, and then along the banks of the rain-swollen river. As we approached the hill, the rushing noise of the water gave way to a roaring sound. Suddenly we passed through a curtain of shrubbery, and stopped.

THE ROCK THAT SWALLOWED THE RIVER

We were standing on a tiny ledge. In the bare rock before us yawned a huge, dark mouth, drinking in the waters of the Rio Zapote as they roared from a waterfall off to our left. About 20 feet below us, and on the other side of the water, was a shelf—the only visible footpath into the cave.

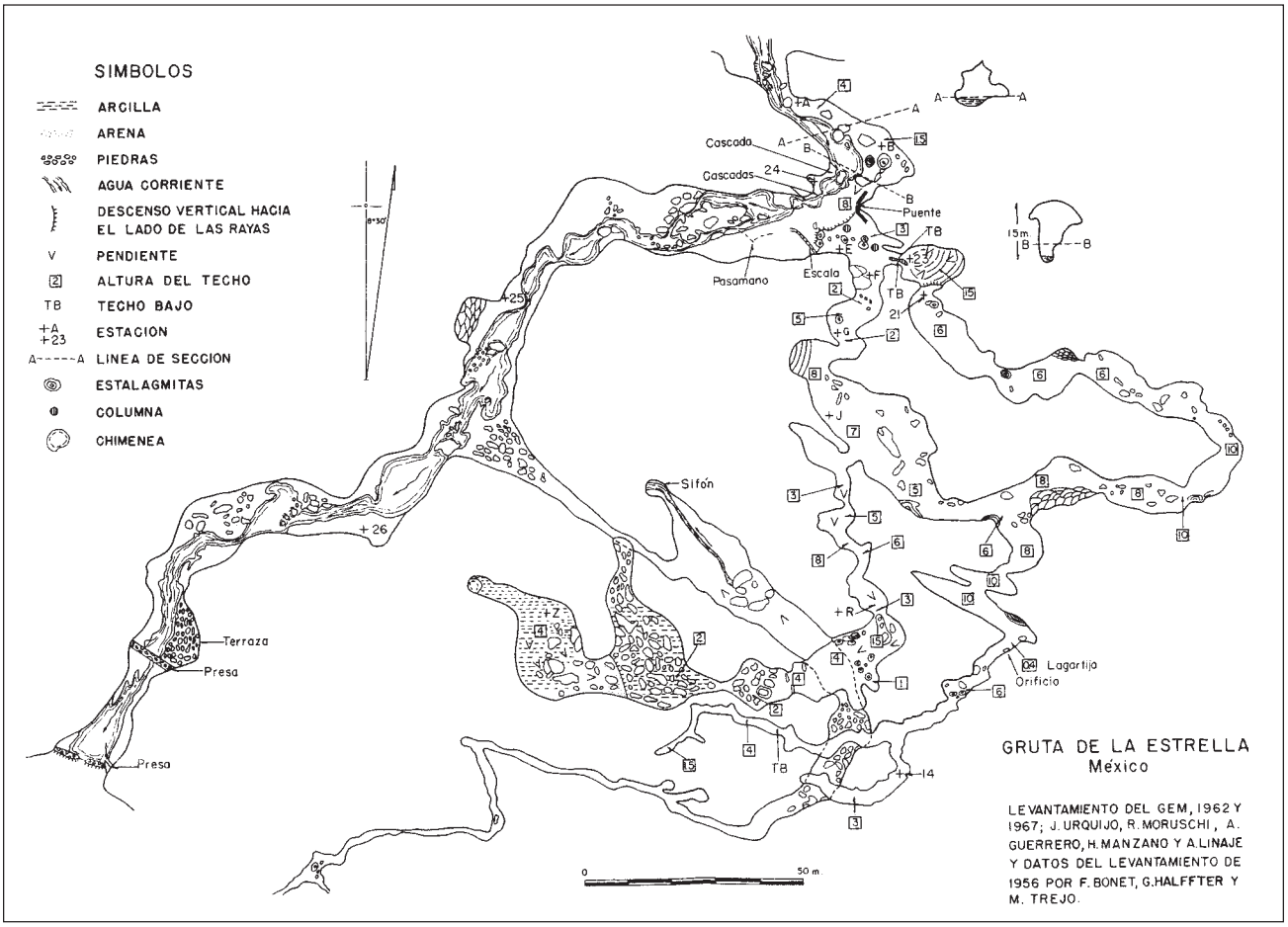
Ray de Saussure was the first to speak, and he had to shout into Bretz's ear to make himself heard.

"It'll take ropes. I've got a sixty-five-foot rope ladder that at least ought to get us down to the river. But we still have to get across."

Bretz nodded. It wasn't going to be easy. The water rushing along below us was neither deep nor wide, but it was very swift and turbulent. From inside the cave came enough additional noise to make it evident that the stream remained rough for quite a distance. A man who lost his footing in that water, especially a man burdened with packs as we were, might be in serious trouble.

De Saussure rigged his nylon ladder, dangling it toward the stream, then tested it. It groaned, but held. Morelos grabbed the rope, swung himself down. Then he jumped to a great boulder in the center of the stream—and was across. He steadied the ladder and looked up encouragingly. Bonet started down, quickly and sure-footedly—and suddenly slipped. For a moment he dangled from the ladder by one hand, then dropped into the boiling water below. For an instant longer he teetered upright, trying to keep his feet, and in that instant Morelos leaned over, grabbed Bonet's arm in his strong brown hand and hauled him out in one sweeping motion, soaked but safe.

The rest of us descended more carefully after that. We made it without incident and for a few seconds we stood there sizing up our surroundings. To the right, out through the mouth of the cave, we could see the sunshine glinting off the waterfall. In the other direction lay the dark passageway of the cave—and from somewhere in that blackness there came a booming roar, a noise so loud that it now



drowned out the waterfall only a few feet away.

"Light up your lamps and let's get moving," Bretz shouted. Ray lighted the gasoline pressure lantern, the rest of us turned on our carbide helmet lamps, and then we started into the cave, walking in Indian file, with Morelos in the lead. The rim of rock on which we walked skirted the edge of the subterranean river, curving around as the stream twisted. With every step, the roaring became louder and the pathway trickier. At first it was possible to walk upright, but then the roof got lower and lower, and soon we were forced to shuffle forward in a crouch. The real hazard, however, was underfoot. The slick-surfaced limestone, which was covered with a thin paste of slippery mud, began to slope alarmingly toward the rushing water and it quickly became impossible to get a good foothold, even with the cleated shoes we wore. I made plans: if I slipped, I would drop flat on my back and cling to every surface within reach, to keep from sliding into the gorge.

Suddenly, the roaring reached a new pitch and we swung our lights toward the river. There, at our feet, was a waterfall—first a long drop into a deep pool about 15 feet across, then an even more impressive drop into a slotlike chasm, way, way down. There may have been a third waterfall even farther down, but it was too dark to be sure. Instinctively, I pulled back against the wall. I wanted adventure, but not at the bottom of a gorge. Bretz beckoned to Choplin, and the photographer sidled up and peered over.

"As a photographer, you should be able to judge distance," yelled the speleologist. "How far would you say it was to the bottom?"

"I can only guess," Leo shouted, "but I'd say it's at least seventy feet. Let's get out of here!"

We scraped forward along the ledge—and 100 feet farther on came to a juncture. The gorge and the roaring river that flowed through it swung abruptly to the right, the grotto becoming steadily deeper and the walls completely sheer. It was impossible to follow the river. But to the left was a second passageway, and Bretz turned into it.

We found ourselves in a tunnel-like corridor that wound and twisted between stalactite and stalagmite columns, becoming so narrow in some places that it was hard to squeeze through. Very quickly, the thunderous roar of the waterfall was gone—lost in the natural baffles of the twisting tunnel. After about 50 yards we emerged into a small room where a number of large stalactites had fallen from the ceiling and now lay on the floor like great petrified logs. We all paused, and I looked at my companions. Like me, they were perspiring heavily. The temperature was high, and the humidity, incomprehensibly, must have been close to 90. Bretz mopped his forehead with a bandanna and sat down. "Let's take a breather," he said.

We collapsed limply on the nearest stalactites, some of us examining the walls curiously, some just resting. Professor Arellano scratched absently at the floor with his archaeologist's hammer.

PROFESSOR COULDN'T EXPLAIN WARMTH

"What makes it so hot in here?" I asked Bretz. "I thought caves were usually cool."

"They usually are," he said. "I don't know how to account for this . . ."

Suddenly Arellano spoke. "*La linterna!*" Somebody passed him the lantern. Instead of resting, he was digging hard, obviously excited. As we crowded around him, he pulled a small, jagged piece of pottery out of the cave floor, and studied it carefully under the lantern. Then he looked up and smiled.

"It's preconquest, I'm certain; made before the Spaniards came to the New World. It's at least four hundred years old."

"How can you tell?"

"Mostly because it doesn't have any glaze. The process of glazing was unknown among the Indians before the Spaniards came."

He went back to his digging. Within 15 minutes he and the others had dug up 11 pieces of pottery, including one to which a handle was affixed—apparently part of a jug.

Somehow, those nondescript-looking fragments were exciting. It's one thing to see archaeological specimens laid out in a museum case with a neat little placard explaining what they are; it's altogether different to watch them being freed from the ground where they have lain for 400 or 500 years—ever since they were dropped there by the user. We had suddenly closed a gap in time: far to the north, at the time that jug had shattered on the cave floor, there had been nothing but plains and forests—no cities, no roads, no white men. . . .

"Let's go," said Bretz.

We climbed back into our packs and helmets, a little tired now, and resumed our Indian-file passage through the tunnel, ducking to avoid low-hanging stalactites, and stepping high to avoid deep pools of water that had seeped in through the roof.

We had gone perhaps a hundred yards when we became aware of a change. We stopped and flashed our lights around. We were in a huge room. Our lights just disappeared when we groped with them for the walls, and it was terribly still: you could hear yourself breathe, and you could hear your neighbor breathe, but the sounds seemed to travel out into the blackness and never come back. Once again, we gathered around Bretz.

"I'm going to call it a day," he said. "I want to look around outside. I'd like to find out where the Rio Zapote emerges from the cave and there are other geological questions I want to look into, too. Suppose we split into two teams, one to finish exploring in here, the other to go back."

Bonet and Arellano also were eager to get back outside, so the cave exploration was left to Ray de Saussure, Morelos Guzmán, Choplin and myself.

First we tried to figure out the size of the big room by moving around the walls. It was roughly the size of a baseball diamond, and—judging by the way our lights shone on the ceiling—about 60 feet high.

At the other end of the room we found a large corridor leading

Scientists dig in cave floor for 400-year-old pottery after Dr. A. R. V. Arellano (right) found piece of broken jug. Others are (left to right) Dr. J Harlen Bretz, Dr. Bonet, and Ray de Saussure. *Leo Choplin*.

deeper into the mountain, and we started along it with a real sense of exploration, now that the more scientific-minded members of our group were no longer with us.

EACH PASSAGE HAD ITS OWN MYSTERY

In all, there were three major passages leading off that winding, twisting corridor. We investigated each of them in turn, and each supplied us with a minor mystery. In one, we were brought to a stop by a great boulder-filled hole, apparently marking a spot where the floor had collapsed (and quite possibly the ceiling, too, since there was no passage beyond that point). Using ropes, we let ourselves down onto the topmost boulders—and we could then hear distinctly, far below us, the sound of rushing water. Where was it coming from? The Zapote was a long distance away, and no other rivers were supposed to be in the area. We never learned the answer.

Investigating another passage, we came to a small room and were startled to hear a soft moan.

"Did you do that?" Leo asked Ray.

"Gosh, no!"

"Well, who did?"

The sound came again: "*Oo-oo-oo-ooh . . .*"

My flesh crawled.

"*Señor*." Morelos beckoned from the far side of the room. Holding his lantern high, he pointed out an 18-inch hole in the wall, about 10 feet off the floor. The hole groaned. "*Whoo-oo-ooh*."

We boosted Ray de Saussure up and he peered into the hole.

"There's nothing in it," he said, shrugging, after we'd let him down. "It's just a hole about three feet deep. It's making a noise, but I don't know why."

Morelos grinned. "*Fantasma?*" he suggested.

Ray grinned back. "No, no ghosts."

"Maybe it's the wind," someone suggested, and we all agreed that it must be the wind. Then we dropped the subject, before anyone got around to mentioning that there wasn't a breath of air in that cave, and hadn't been since we entered it.

We continued along the passage a short distance farther, but the walls began closing in. Soon the passage became too narrow to admit us and we turned back.

The third major passage also petered out. It climbed sharply for a long way, then the floor began to rise toward the roof. Finally we reached a small chamber where floor and roof came together and we could go no farther. As we started out of the little room, something fluttered past. It was a bat. We were as far from the mouth of the cave as we could get: How did bats get all the way in there? The only possible conclusion (unless the bats knew of an opening that had eluded us) was that those bats were in the habit of entering where we had, and flying all that tortuous distance to this little room, deep under the mountain—which seemed pretty silly.

While we were walking back toward the big room again, I turned my head for a moment and my helmet light picked out a small side passage. We studied it for a while, and then I said, "Why don't I try it, while the rest of you wait below? It's too small for more than one of us—and I'll have to crawl, at that."

I was much less confident than I must have sounded, but I felt obliged to volunteer; after all, *I* was the adventure seeker on this expedition.

So the others went on, toward the big chamber. I watched them go, then hitched up my belt and squirmed into the narrow opening. The stillness and the darkness had impressed me before, but now for the first time I was alone. I could hear only myself breathing, and I could hear only my own boots scraping along the ground. The passage became narrower and narrower. At last I was down on my belly, with my helmet scraping along the roof. The passage couldn't have been more than nine inches high. But I had always heard that, in caves, the smallest passageway sometimes leads to the largest room, so I kept going.

Then my light went out.

I don't think I've ever been more scared. I was all by myself, a long way from my friends, pinioned in a tiny tunnel deep underground—

in pitch blackness. I didn't *think* I'd passed any side passages while crawling along, but suppose I had? Suppose I blundered into one, trying to back out in the darkness? What if the others couldn't find me? Why had I ever taken up cave-crawling?

FIXING A CARBIDE LAMP—THE HARD WAY

I took a deep breath. There was really nothing to worry about, I told myself; all I had to do was fix that lamp. My arms were stuck straight out ahead of me, and by a little gymnastic exercise I was able to get my hands back to my helmet and get the helmet off my head. First I had to clean out the little nozzle on the lamp. I burned my fingers trying to find the cleaning wire, then spent long minutes fishing with the wire for the tiny nozzle hole. At last I had the nozzle clean. All I needed now was fresh carbide.

At that instant, I remembered. I had no carbide. Ray had taken the whole can with him.

I don't know how long I lay there fighting panic, my face pressed against the rock, my arms stretched over my bead, my heart beating. At last I started to scrape backward along the narrow tunnel, trying to return to the main passage. My progress was slow and painful, and I imagined all sorts of things were in the tunnel behind me. I crawled that way for a long time, wondering if I had missed the right route.

Then something touched my leg. Instantly, I stopped and pulled my leg up. Then I felt a squeeze. Wildly, I kicked out; I couldn't go forward, and so I scrambled backward. Something grabbed my arm, and I flailed about. . . . I was in the main passage, and Ray was shining his light in my face and peering at me.

"What're you doing running around with no light?" he asked.

"Let's get out of here," I said.

He looked at me again, read the expression on my face, and didn't press the point. We turned and left.

Outside, we met the three scientists. They took us to see a couple more caves, both good-sized (their mouths must have been eight stories high), but so full of water that they couldn't be entered. I didn't mind. I'd had enough of caves for a while. I was willing to consider the expedition a success: Dr. Bretz had found abundant evidence that the caves in the area had been created in accordance with his theory, so he was pleased; I, who had come looking for adventure, had found more excitement than I'd bargained for. I can't say I was pleased, exactly, but I was mighty glad to be outside.

And I realized, a little to my surprise, that I was also exhilarated. I had helped explore a cave that had been visited rarely, if ever, since Columbus' time. I'd had a good scare, but I'd had a lot of fun, too.

Explorando una Cueva Silvestre

Esta es una reimpresión de un artículo que apareció en una revista popular en 1954. El autor visitó la Gruta de la Estrella, cerca de Cacahuamilpa, en Guerrero. Los afamados espeleólogos Federico Bonet y J. Harlen Bretz estaban en el viaje.

JADE PEARL EXPLORATION PROJECT, SISTEMA OX BEL HA, QUINTANA ROO

Sam Meacham

This article is a revised version of the final report by project director Sam Meacham to The Nature Conservancy. The project was conducted by Centro Investigador del Sistema Aquífero de Quintana Roo, A.C. (CINDAQ), an official non-profit organization in Mexico that supports, along with the Steve Corey Memorial Fund, the efforts of the Grupo de Exploración Ox Bel Ha in the area of Ox Bel Ha.

During the last Ice Age, water levels in the world's oceans were approximately 100 meters lower than their present levels. The caves of the Yucatan Peninsula were dry during that period. When the Ice Age came to a close 18,000 years ago and the glaciers receded, the caves flooded as sea levels rose. These flooded cave systems play an important role as conduits for freshwater from the jungle interior to the Caribbean Sea, making them a critical link among all the major ecosystems in the area, including those of the Mesoamerican Barrier Reef and the Sian Ka'an Biosphere Reserve. Along the way they are used as the primary source of potable water for the population and, unfortunately, as a convenient place to dispose of waste. These underwater labyrinths are part of an intriguing puzzle that explorers and scientists are only just beginning to piece together.

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Rapid development of the coast of Quintana Roo has set the stage for the underground rivers to be adversely affected. In the last seven years, the 120-kilometer strip of beach known as the Riviera Maya has seen an explosion of growth. Behind this boom is the tourist industry, which, while creating jobs, has placed great stresses on the environment. It has taken only seven years for the number of hotel rooms in the Riviera Maya to equal the number that it took twenty-five years to build in nearby Cancún. Filling these 22,000 rooms are an estimated 1.7 million tourists each year. Many of the major attractions in Quintana Roo are located along the Riviera Maya, so the millions of Cancún visitors and Cozumel cruise-ship passengers are leaving their footprints as well. Much of the area's development has been based on the premise that it is easier to ask for forgiveness than permission. This lack of planning and spotty enforcement of laws has set the stage for catastrophe.

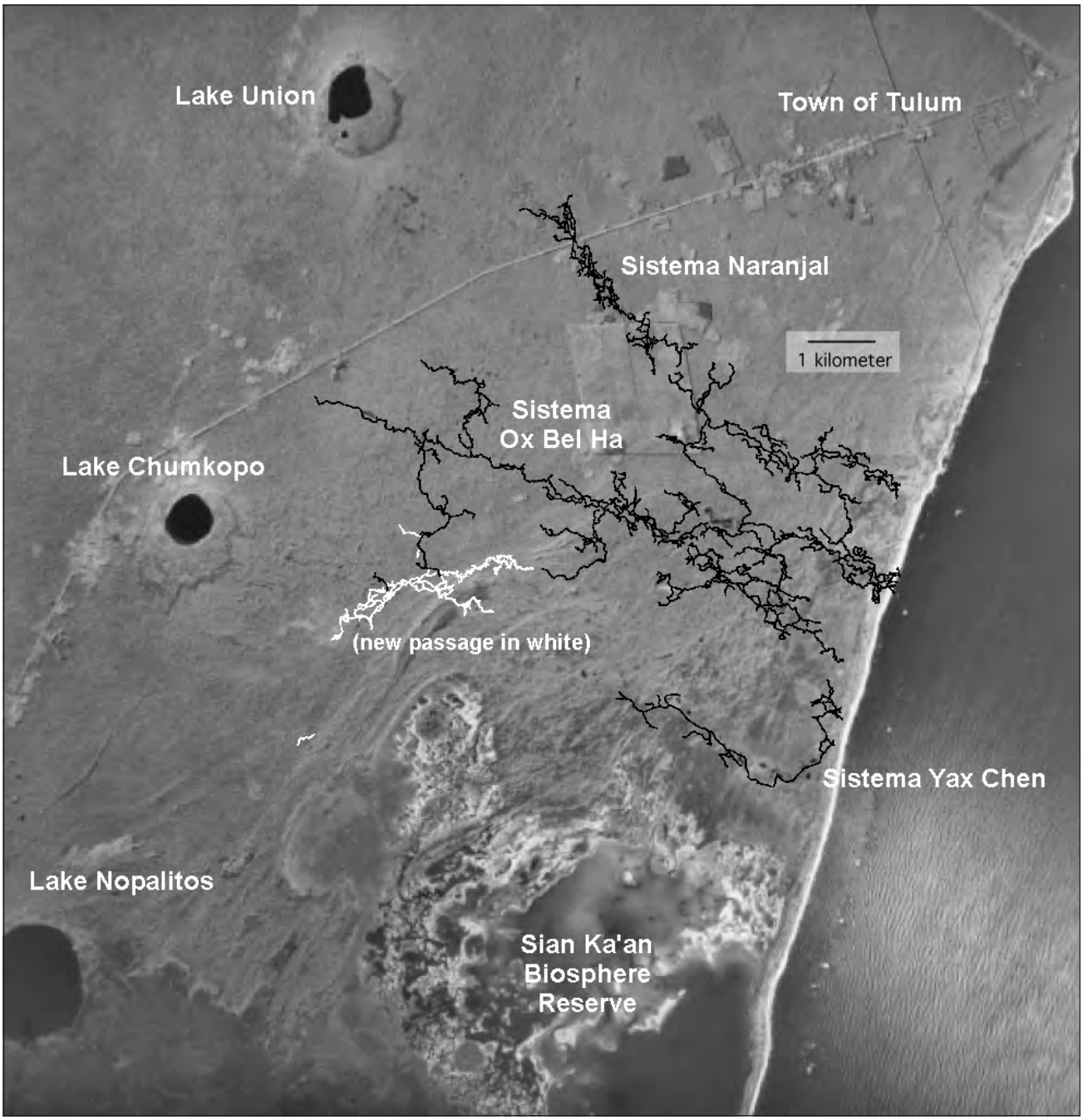
Urban sprawl has followed. Playa del Carmen, which had a population of 10,000 in the early 1990s, is now estimated to have a population approaching 120,000. Planned future development of the town of Tulum will cover much of the area underlain by Ox Bel Ha, and many roadways have been cleared in the jungle south of town. Basic sanitary infrastructure has not been able to keep up with this rapid growth. The two main threats to the freshwater aquifer are sewage and solid waste. The majority of the local population lives without the benefit of proper sewage treatment or storm sewers. Inadequately built septic tanks leach raw sewage directly into the freshwater aquifer. In some cases it is dumped directly into the cenotes that are the entrances to these flooded cave systems. It is estimated that the municipality of Solidaridad generates approximately two hundred tons of garbage a day. This garbage is deposited in unlined landfills, where it is burned. What is left leaches a potent cocktail of contaminants through the porous limestone bedrock directly into the freshwater aquifer. By law, all major hotels are required to have waste-treatment facilities. Treated wastewater is injected into the bedrock at a depth that averages between 50 and 100 meters. Unfortunately, the hydrology of the area is such that this does not prevent pollution of the freshwater aquifer. See the article "Where Does the Sewage Go?" in *AMCS Activities Newsletter* 25.

Over the last twenty years, dedicated cave divers have discovered, explored, and mapped more than 108 submerged cave systems and 450 cenotes and coastal lagoons in the area of the Riviera Maya. In total, over 480 kilometers of submerged passageway has been surveyed and mapped. The three longest underwater cave systems in the world, Sistema Ox Bel Ha, Sistema

Nohoch Nah Chich, and Sistema Dos Ojos, are all within 25 kilometers of each other. Two of them, Ox Bel Ha and Nohoch Nah Chich, have been connected by divers directly into the Caribbean Sea. So far, thirty-eight stygobitic life forms have been identified within the cave systems. Anthropologists and archeologists, working with cave explorers, have identified important remains that are shedding light on prehistoric human settlement in the western hemisphere, not to mention the ritual and everyday use of cenotes by the ancient Maya. Plant life found within the moisture-rich microclimates of cenotes is allowing botanists to study ancient Maya plant use and cultivation techniques. Ornithologists are interested in studying what role cenotes play as stop-over and wintering sites for the estimated two billion birds that migrate through the area every spring and fall.

By combining survey data and observations made both inside and out of the caves, cave explorers are providing a broad picture of the area's aquifer and ecosystems. In addition to showing where the flow of freshwater comes from and goes to, the data and maps that cave explorers produce form the foundation for scientific study and allow the identification of potential threats to the freshwater resource of the area.

No cave serves as a better example than the Ox Bel Ha System. Located to the south of the Tulum



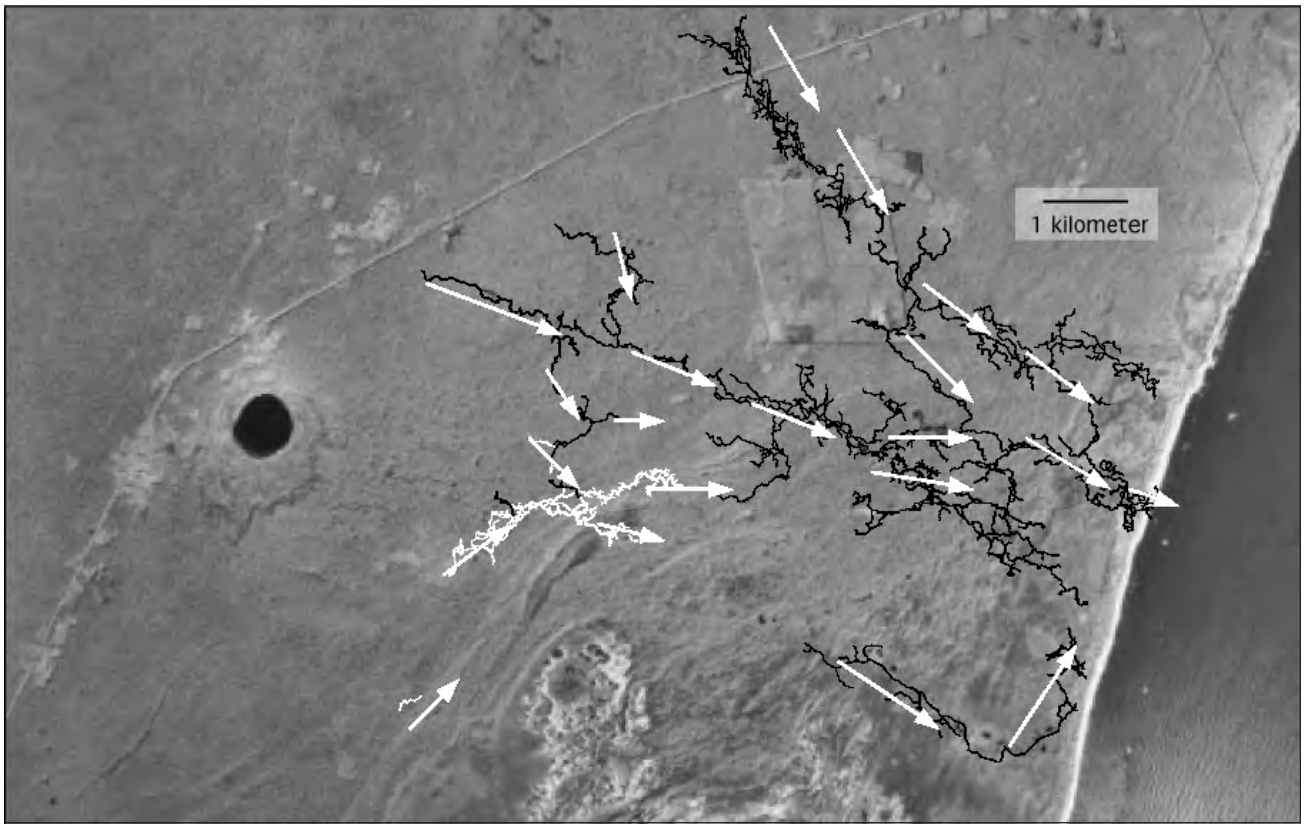
Development at Puerto Aventuras. *Steve Bogaerts.*

archeological site, Ox Bel Ha is an immense cave system, still in the process of being explored. At the end of 2003, it has over 125 kilometers of surveyed passageway, 72 interconnected cenotes, and 3 freshwater exits into the Caribbean Sea. In addition, archeological sites within the cave date back to when the caves were dry. As it winds its way beneath the surface, Ox Bel Ha passes through every major ecological zone in the area, emptying out onto the Mesoamerican Barrier Reef in front of Tulum. Each cenote within the system is an oasis of life, containing a variety of freshwater fish, reptiles, amphibians, insects, mammals and birds, as well as a profusion of plant life. Until 1998, Ox Bel Ha lay unknown below the surface, and it would have remained so if it were not for a dedicated group of cave divers seeking to find out what lay below. Today it is possible for a diver to enter a cenote at the inland end of Ox Bel Ha and traverse the cave system, following the flow of freshwater, to exit at the barrier reef in front of Tulum. Although this traverse of 8.5 kilometers has yet to be done, it is important to realize that if a human being can make this journey, so too can any contaminant.

Without the maps that cave divers make, there would be no knowledge of what lies below the surface. Ox Bel Ha is just one example of many cave systems in the area that are threatened. What has been explored so far along the Riviera Maya is only a fraction of what exists. All previous exploration efforts have been conducted on a shoestring budget and in the spare time of the explorers.

With the goal of developing a conservation model that will contribute to the protection of the Mesoamerican Reef System, CINDAQ, with support from the Summit Foundation, The Nature Conservancy, Amigos de Sian Ka'an,

Observed direction of underground water flow.



Cenote Sinaan. *Sam Meacham.*

and private contributions, planned a major exploration and mapping project in Sistema Ox Bel Ha for the fall of 2003. The expedition was dedicated to the late Lorenzo Bela Rissolo. After a meeting with TNC representatives Marlou Church and Juan José Dada and ASK representative Jorge Luis Basave on July 28, 2003, permission was obtained from both Ejido Tulum and Ejido José María Pino Suárez to conduct the project on their lands. Between August 2 and October 8, seven trips were made into the proposed area of exploration to assess existing foot trails, locate cenotes, and begin thinking about where to place our base of operations. Access to the majority of the Ox Bel Ha area is along foot trails and property lines. In this particular area there is a *nohbe* (*big trail* in Mayan) that runs between the village of Chumpon and the town of Tulum. This trail may have its roots in ancient Maya history. The trail was used by the rebellious Chan Santa Cruz Maya during the famous Caste War of the Yucatan. It is still used by the community of Chumpon every year for a religious procession.

Our activity in this area goes back some time. In late September 2001, Bil Phillips and Steve Bogaerts located Cenote Sinaan just off of the Chumpon Nohbe. *Sinaan* means *scorpion* in Mayan. On October 6, they returned, and Steve performed a reconnaissance dive in Sinaan. A total of about 350 meters of line was surveyed, and Steve confirmed freshwater flow and large cave passageway. Further hikes in this area by Sabine Schnittger and Bil revealed one more cenote, Box Ha (Black Water) and a large depression filled with palm trees and dense vegetation. They also located stone structures attributed to the ancient Maya.

On January 17, 2003, Bil and Steve discovered Cenote Soso'ok while on a 6000-meter roundtrip dive from Cenote Ak'alche in Ox Bel Ha. On this dive, Bil and Steve surfaced in Soso'ok and were able to get a GPS coordinate, establishing the farthest south point of Ox Bel Ha in this area. Several weeks later they returned and relocated Soso'ok by land, preparing a provisional trail.

On August 2, Bil and I did a first assessment as part of this project of existing trails and cenotes. There is no one way to find a cenote. On this particular day, we used the "dumb luck" method. We walked along the trail Bil and Steve had cut and easily relocated Soso'ok. After taking a break, we decided to hike over to Sinaan, hook up with the Chumpon trail, and then head back up to the parking area. Not more than 500 meters from Soso'ok, we stumbled upon the most glorious cenote we had ever seen. With crystal-clear water and perfectly round, it was named Jade Pearl. We free-dove to a depth of 6 meters in the surface pool and found that there was significant freshwater flow and large cave passage going off into the distance. Once Jade Pearl was plotted on the topographic map, we realized that it lay in a very strategic position that fit right into the goals of the project.

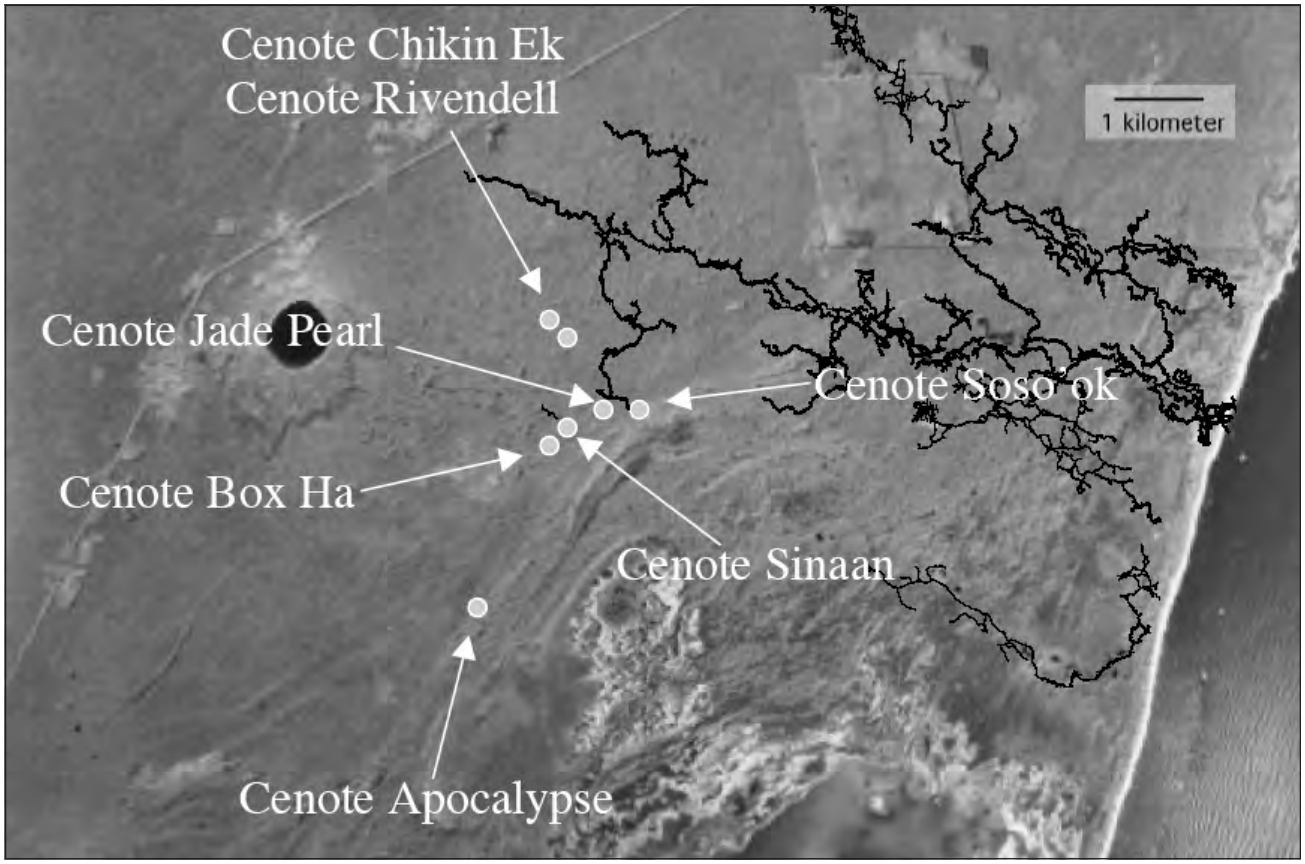
On August 12, Bil and I returned once again, our objective to find two cenotes and reconnoiter a large depression seen on the aerial photograph. This time we used a different method. With a 1:20,000 scale aerial photograph with the UTM grid system superimposed on it, we were able to extract coordinates, put them into the GPS, and find one of the two cenotes and the depression. Our first target was 420 meters off the Chumpon trail, and we hit it straight on, a stunning crystal-clear pool of water we named Cenote Chikin Ek, Western Star in Mayan. We did an in-water assessment and observed cave passage, but not very much flow. Bil also found a separate pool of tannic water on the southeast side of the cenote. We then proceeded to look for Cenote "X," a large cenote visible in the aerial photograph and also captured on video during a previous over-flight. After two hours of looking without success, we decided to continue on to the big depression, passing by Cenotes Sinaan and Box Ha. The large depression was easily located. It holds a combination of mangrove and sawgrass and is very dense and inhospitable, with thorn forest at its perimeter. We continued north, back up to Jade Pearl, took a well-deserved swim, and then hiked back out to the parking area by way of Cenote Soso'ok.

Our next foray into the jungle was on August 14. This time local knowledge helped us find a cenote. Our original plan was to take equipment for one diver in order to briefly check Cenote Chikin Ek and to continue searching for Cenote "X." Unable to locate any of our sherpas, we decided to change plans and instead check Laguna Chumkopo on foot. Laguna Chumkopo is a large freshwater lake

approximately 700 meters in diameter 10 kilometers south of Tulum and directly west of the Ox Bel Ha System. It is one in a chain of five lakes that define the southern limits of the Holbox Fracture, a geologic feature that extends from the north coast of the peninsula south to the Sian Ka'an Biosphere Reserve. We have always wondered what role this enormous lake plays in the complex hydrology of the area. One of Laguna Chumkopo's main features is a deep sinkhole on its northern end. In 1998, veteran cave explorers Kay and Gary Walten of Akumal dove two times in this sink, which they named Taam Ich (Deep Eye). They found a 2-to-3-meter-thick hydrogen sulfide layer beginning at about 30 meters and a maximum depth of 80 meters, but no horizontal cave passage. Bil and I hiked out to the lake with Don Gilberto, the caretaker for the owner of property along the lake, and were able to get a good GPS fix and take some photographs. While at the side of the lake, Don Gilberto told us about a cenote in the area of our proposed project. He gave us directions, and we set off immediately to find it. After a good hour's hike and without too much trouble, we located a large depression with signs of both recent and ancient occupation. A small *palapa* in a state of disrepair stands next to a stone structure that may date to the ancient Maya. On the southern end of the collapse, we encountered an overhang with a crystal-clear pool of water. We named the cenote Apocalypse, after the hurricane of bats that emerged from its recesses and the voracious tetra fish that bit away at our flesh. We were able to get a good GPS fix and take photographs. Without mask or submersible lights, we were unable to assess the cenote for diving. Due to its proximity to the apparent outflow into Sian Ka'an, we decided to return and dive it.

Steve and I had the pleasure of being accompanied by Jo Brice, who was researching a piece we will be filming for the BBC program *Natural World* in mid-2004, and the indefatigable Nick Morton as we searched for yet one more cenote on September 8. Our target, Cenote "Y," was 200 meters to the southeast of Cenote Chikin Ek. We passed by Chikin Ek, then continued on to find it and name it Cenote Rivendell, a crystal-clear pool where a large sapote hangs out over the water and palm trees dip down to sip. It is truly a stunning cenote. I was able to free dive to assess it, but found no obvious cave passage upstream or downstream and little flow. We found this interesting, since crystal-clear cenotes usually have at least some flow to keep them clean. During the main diving phase of the project, Steve Bogaerts did find passage out of this cenote.

Sabine Schnittger joined Bil and me for a hike on September 18. Our objectives were to find another cenote, Cenote "Z," seen on the aerial photographs and to assess the state of the Chumpon Nohbe south of Sinaan toward Cenote Apocalypse. We parked at the southern *mensura* (property boundary), hiked in to the intersection with the Chumpon Nohbe, and headed north. We passed what may be a cenote. Sabine free-dove into the tea-colored



water and couldn't see any passage, yet the presence of fish at the surface made us suspect that there may be a connection to cave passage. We continued north and then east toward our target coordinates for Cenote "Z." We were unable to locate the cenote, though we came to within 400 meters of Sinaan. Steve would find Cenote "Z," which he named Cenote Aluxe, later in the project.

On September 22, we returned to Cenote Apocalypse with gear for one diver to enter the water. Santos and José Mejia of Tulum helped carry the gear out. Bil was able to find a downstream lead that produced 400 meters of surveyed passageway through a large collapsed area. The most remarkable observation was a flow of fresh water different from the normal pattern of flow for this area. In the Ox Bel Ha area, the water generally flows from northwest to southeast. On this dive, Bil observed water flow from the southwest to the northeast. The cave walls have many embedded fossils, and a healthy population of cave life was observed. Bil reached a maximum depth of 26 meters and observed the halocline at a depth of 20 meters. Unfortunately, Apocalypse was too far from base to be included in our program in November.

On October 8, Bil and I made one more trip out to assess everything and make final decisions on where trails should go and where our base camp should be. We decided to use Cenote Jade Pearl as our base of operation. It put us in a completely unexplored area, it had easy access to the water, and we would be situated 500 meters west of Soso'ok and the farthest downstream lines of Ox Bel Ha and 700 meters to the east of Sinaan and Box Ha, where Steve had found big cave and flow. With flagging tape we marked areas around the cenote for our camp. Our decision on trails was to cut 500 meters from Ayim Cenote south to the *mensura*, clean the *mensura*, and improve the rough trail Steve and Bil had cut to Soso'ok, extending it to Jade Pearl and Sinaan. We decided not to use the Chumpon Nohbe out of respect for its history and the fact that it has many low points that could flood in heavy rain. In all, 6.5 kilometers of trail needed to be made before the November diving camp.

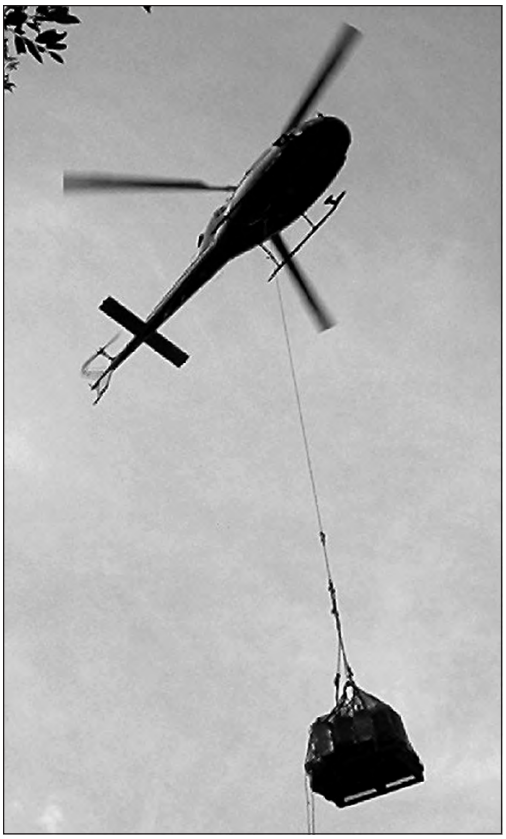
Bil Phillips and Steve Bogaerts coordinated trail and camp preparation. Our trail team of Santos Mejia, Sr., Santos Mejia, Jr., José Mejia, Juan Mejia, Eugenio Herrera, Oligario Hau, and Pedro Chimal began to work on the trails on October 10. On October 30, one week prior to the start of the expedition, our base-camp support team of Eugenio, Pedro, and Oligario moved out to Cenote Jade Pearl and prepared the area, making clearings for the main tent and the helicopter supply drops. The *muchachos* took with them our newly purchased 1000-watt generator and the base cell phone.

Meanwhile, we began to stock up for the project. Major purchases for the project included, besides the generator and cell phone for the main tent, a 3000-watt generator for the charging area, a filter tower for the 8.3-cubic-feet-per-minute Bauer compressor, an iBook laptop for mapping and photo organization, and a chainsaw for trail work. In addition, maintenance was performed on all life-support equipment. Over 50,000 feet of nylon dive line was purchased, and through the great effort of Lucely Xicum Ku it was knotted every ten feet to measure distances in the passages explored. On November 3, the main tent was carried out with the help of the Mejia family and erected under the supervision of Bil and Steve. Final work on trails was finished on the fifth of November, ready for us to begin moving in.

Next, equipment was delivered to the base camp. Our team typically has 1.5 to 2 tons of gear for our expeditions. How this is transported depends on access and terrain. For this project, we were able to hire a helicopter to assist in moving in our equipment. A helicopter increases productivity by saving time, since a helicopter can move in one hour what horses can move in four days, and it also gives an opportunity for aerial reconnaissance. We arranged for a helicopter and pilot Enrique Chávez Barragán from Magic Sea and Sky Adventures of Cancún for November 6. Since this area is a major drug-trafficking zone, anything unusual, especially helicopters flying around with cargo nets, is viewed with suspicion. As a precaution, I contacted CINDAQ's friend retired Vice Admiral Alberto Vazquez de la Cerda. He agreed that it would be prudent to inform the Sub-Secretary of the Navy in Mexico City, and he kindly handled this for us.

Andrés Labarthe, Bil Phillips, Steve Bogaerts, and I filled our trucks with gear and headed down to the landing area south of Tulum to await the helicopter's arrival. We were joined by Eugenio and Oligario, who hiked out from the Cenote Jade Pearl camp to join us, and the Mejia family. The helicopter landed without incident just after 10 A.M. The plan was to lift loads on a 10-meter cable, so that they could be

Santos Mejia carries over 50,000 feet of knotted dive-line. *Steve Bogaerts.*



The helicopter lowers a pallet to the Jade Pearl camp. *Andrés Labarthe.*

lowered gently into the prepared area near base camp.

As we were preparing to do a test hookup and detach, two vehicles raced into the area. They contained local and state police officers, weapons drawn and pointed at us. I presented myself to the officer in charge, showing him our legal documents, identifications, and permissions. I explained that we had authority from the office of the Sub-Secretary of the Navy to be conducting helicopter operations. After a few tense moments they relaxed, and when the commander of the Tulum naval garrison, Sergeant Ángel Mex Herrera, arrived and confirmed our claim, we were allowed to continue.

Since we had only two cargo nets, we could do only two loads before the helicopter had to land while we packed the next loads. As a safety precaution, Captain Chávez had us limit the loads to a maximum of 450 kilos. This was well under the helicopter's rated load of approximately 700 kilos. In all, five loads were taken in to the lowering zone. The heaviest load was our twenty-two aluminum 80-cubic-foot tanks, at about 400 kilograms. Chávez made it look easy, and Andrés did a fine job at the cenote, where he had gone to supervise the unloading. In one hour we were able to transport our equipment to the side of the cenote 4 kilometers away. Due to the time taken up by the police officials, we were unable to do the aerial reconnaissance we had hoped for.

Soon after the helicopter departed, our horses arrived. On all of our previous expeditions, we have depended on pack animals to carry our equipment out to our camps. Although the helicopter took care of the trip out, we felt it necessary to have the horses as a backup should the helicopter fail and to assist us for the duration of the project, taking additional loads in and out. The horses arrived without incident and were taken that afternoon out to Jade Pearl.

On November 7, Steve and I hiked in early to Jade Pearl, after helping Juan and José Mejia establish a camp at the parking area. Throughout the project, they were able to keep an eye on our vehicles and provide an important link in our supply chain. Steve and I found everything as it had been left by Andrés and his crew the day before. We began to distribute gear to the various areas of our camp. On Saturday the eighth, we were joined by Bil and Andrés, and within three days we had the camp set up. The main tent, which had been set up earlier in the week, served as our office and eating and gathering area. Off to the side of the main tent we placed four tarps with hammocks, a kitchen area, and a small area for the 1000-watt generator. The horses were kept far enough back up the main trail to keep their smell and ticks at bay. By the side of the cenote, we built a small platform in order to prevent bank erosion and allow us easier access to the water. The compressor was placed close to the cenote, so that there would be minimum movement of tanks. Using the pallets from the helicopter loads, Bil was able to create a deluxe charging area for the many batteries that we take with us underwater. In previous projects the charging area has been inside the main tent. While convenient, this also meant that the generator, which runs all night, kept us up. For this project, with the small generator for the main tent and the large one for the charging area, we were able to separate the areas and reduce noise and fatigue. Our new base cellular phone made our logistics a breeze. Communication was clear the majority of the time. We were able to send and receive phone calls whenever the generator was turned on. Although we had no emergencies on this project, it is certainly reassuring to know that help is only a phone call, not a two-hour hike, away. Despite the fact that we had torrential rain

The heaviest load, over 400 kilograms of scuba tanks, goes up from the staging area. *Sam Meacham.*

almost every single day of the project, our camp held up remarkably, and this too bolstered our moral and enthusiasm.

Grupo de Exploración Ox Bel Ha begins exploration of a new area in the cave system from a centrally located camp such as Jade Pearl. When other cenotes are found during exploration dives, trails are cut to them overland through the jungle. Each new cenote is then treated as a potential starting point for further exploration. Dives are conducted from each cenote in all available directions in order to cover as much new ground as possible. Typically, GEO's dive team consists of three to five divers, each of whom takes a day off after two days of diving. All team members not diving act as safety backups and support for divers in the water.

Exploration dives are conducted during daylight hours. This makes finding new cenotes from underwater easier, because the sunlight is visible from a long way back in the cave. This also makes a known cenote easier to locate if it is needed as an emergency bailout point. If there is an emergency or an accident, response and possible evacuation is far easier during the day that it would be at night. A team debrief is held at the end of each day, and the objectives and plans for the next day are discussed and finalized.

A thin nylon guideline knotted every 10 feet is laid as the diver explores a new passage. A line is always necessary for safe cave diving; the knots facilitate the survey. At each change in direction, a single small locking wrap is placed on a convenient feature within the cave, and this then becomes a survey station. The diver will continue exploring in this manner until either he runs out of line, the cave ends, or a predetermined limit, such as tank pressure or time, is reached. When the diver makes his final tie-off and turns to leave, the survey process begins. At each survey station, a minimum of three pieces of information are gathered and logged on a slate: a depth at the current station, an azimuth, and the distance to the next survey station. The depth is taken using one of the diver's decompression computers, two of which are typically worn on the forearm. Distance is measured by counting knots in the guideline and estimating the distances between the end knots in each shot and the stations. The compass is sighted along the guideline to determine the azimuth. (See the article "Surveying Underwater Caves" in *AMCS Activities Newsletter* 24.)

Various types of cave-diving equipment have been used during exploration of Ox Bel Ha. Open-circuit scuba apparatus is simple and reliable. It is wasteful of gas, since only a fraction of the oxygen in the air that is exhaled into the water has been consumed. But at the shallow depths found in much of Ox Bel Ha, it still allows for relatively long dive times with a manageable number of diving cylinders. Typically the team uses aluminum 80-cubic-foot cylinders filled to 3000 PSI (210 bars). At an average depth of 18 meters, each tank allows approximately one hour of dive time, considering the fundamental cave-divers' safety "rule of thirds," where one plans to consume only two-thirds of his air, the remaining third being reserved for emergencies.

GEO has found that the most effective and safest technique to explore with open-circuit scuba in small areas of the cave is with a side-mount configuration. This means two diving cylinders are worn on the sides of the body rather than connected together on the back, reducing the vertical profile of the diver. In this way the cylinders can be removed, either one at a time or both together, in order to pass through very small areas. Because the tanks are independent, the diver cannot suffer a complete, catastrophic gas loss and is thus properly equipped to dive solo safely. (In small, silty passage, the visibility can drop to zero in a matter of seconds, forcing the diver to maintain contact with the guideline during the exit. On the way in, the diver may get only one look ahead before becoming engulfed in a cloud of silt. A second diver in this situation is effectively blind all the time, and this makes a second diver dangerous to himself and his partner.) It is also much easier to transport single cylinders through the jungle.

In addition to the two primary side-mount cylinders, extra tanks may be carried by the diver in order to extend the penetration into the cave system. These extra cylinders are called stage tanks. When one third of the gas from one of them has been used, it is left on the guideline for the diver's return.

Divers' survey slates.
Andrés Labarthe.

Bil Phillips filling tanks with nitrox at Jade Pearl. *Stephen Alvarez.* ©Alvarez Photography.

Typically, GEO divers will use two stages in addition to the two primary side-mount cylinders, but as many as four may be carried on a dive, allowing dive times between four and six hours.

Cylinders are filled with nitrox breathing gas, a blend of compressed air and extra oxygen. The smaller percentage of inert gas, mainly nitrogen, in the mixture helps to minimize decompression at the end of long dives. Tanks are filled in the field using a few relatively simple tools: a gasoline-driven air compressor, a continuous-flow blending system, and cylinders containing high-pressure pure oxygen. The continuous-flow system allows large volumes of nitrox to be quickly and accurately blended, even in the middle of the jungle. The oxygen content of the blend is always verified with an oxygen analyzer. Tanks containing 100 percent oxygen are placed at 6 meters depth in the cenote for use during decompression.

When exploring deeper or more remote sections of the cave, the team uses closed-circuit-rebreather technology, which is far more gas-efficient. Most of GEO's CCR dives are six to eight hours duration and only use a fraction of the gas that would ordinarily be required to complete the same dive on open circuit. There are other advantages to the rebreather technology, but since the rebreather is worn on the back, it cannot be used in small passages. None of the dives during this project used rebreathers.

During both open-circuit and CCR dives, a GEO diver will often use an underwater diver propulsion vehicle, commonly known as a scooter. The DPV is used to tow the diver quickly to the end of existing exploration line, minimizing bottom time and gas consumption. The DPV also makes it easier to transport heavy equipment loads, such as multiple stage cylinders for extended penetrations. On very long exploration dives, multiple DPVs may be used, the diver riding one while towing another behind. The thirds rule is also applied to scooter battery power. On long-range, double-stage, double-scooter dives, which have reached up to 3600 meters from the nearest exit, the GEO team dives in buddy pairs for extra redundancy and safety.

From November 8 through November 23, 2003, our dive team conducted thirty-eight dives. Of these, twenty-nine dives were exploration dives. In total, over 15 kilometers of new passageway was explored and surveyed. In addition, ten cenote entrances were added to the Ox Bel Ha system. Other than minor cuts, scrapes and bruises, mostly gotten during work on jungle trails, the GEO team had no accidents.

The following narrative of exploration was compiled by the editor based on dive logs and detailed maps accompanying the expedition report. There were thirty-eight dives in all, but a number of them were short dives devoted to photography near Cenote Jade Pearl, and one dive resurveyed some passage near Cenote Jade Pearl to correct a closure problem. They are not covered below. The photo dives were done on compressed air. All the exploration dives were done on EAN, compressed air enriched to, in these cases, between 29 and 34 percent oxygen. Almost all the exploration dives ended with at least a few minutes of decompression; unless this exceeded 5 minutes, it is not explicitly mentioned, but it is included in the stated dive times. Many of the dive reports note life in the water, including fish and invertebrates, but the observations were not systematic and are not discussed here.

November 8. Sam Meacham made the first dive out of Cenote Jade Pearl, laying the 135-meter Jade Pearl Perimeter Line. The cenote is open to the cave on all sides except a small part of the north side. The top of the debris mound is at –6 meters, and it slopes down to from 12 to 17 meters at the sides. Visibility is clear due to good water flow. Then he headed north, then west in passage up to 8 meters high and from 6 to 15 meters wide with huge flow, laying 317 meters of Spudster Line. He used side-mounts for a total dive time of 113 minutes.

November 9. Steve Bogaerts made a side-mount, double-stage dive from Cenote Jade Pearl. He explored and laid the 129-meter Sinaan Shortcut Line and then extended the Spudster Line as the Sinaan Connector Line for 314 meters to where the short Sinaan Surface Line goes to the surface at the northeast end of Cenote Sinaan, which has tannic water. Both the Sinaan Shortcut Line and the Sinaan Connector Line go through large passage, up to 10 meters high and

30 meters wide, with good visibility and high flow. He then established a short connection to the Freeflow Line out of Cenote Sinaan that had been surveyed in October 2001. Back toward Cenote Jade Pearl, the first good lead to the south was lined for 407 meters. This Openside South Line, which passes close to the southeast corner of Cenote Sinaan, has good flow from the south in passage 15 meters wide and 8 meters high. The dive lasted 265 minutes, including 40 minutes of decompression.

Sam Meacham did a side-mount dive out of Cenote Jade Pearl and laid 605 meters of new Soso'ok Connection Line to connect with Sistema Ox Bel Ha at that cenote. He also discovered Cenote Box Hi via the 34-meter Mangrove Cenote Line. Total dive time was 132 minutes, including 12 minutes of decompression.

That afternoon, Andrés Labarthe and Bil Phillips did a side-mount dive out of Jade Pearl to try to push south and east toward the Sian Ka'an preserve. They laid 631 meters of new Wash Line, starting at a passage to the south from the Soso'ok Connection Line near Jade Pearl. The passage turned out to be a large east-west passage that more or less parallels the Soso'ok Connection Line passage and has steady flow toward the east. It ended in breakdown with a ceiling of roots at 2 meters depth. There was a lot of open space seen toward the north of the passage, and there were also leads to the south, but the two-man team did not check them because of limited visibility due to silt knocked of the ceiling by their bubbles and an ill-defined halocline starting at –12 meters that blurred vision. The main Wash Line passage is 4 to 8 meters high and 6 to 15 meters wide. Dive time was 163 minutes.

November 10. Andrés Labarthe dove from Cenote Jade Pearl using side-mounts to check leads north off of the Soso'ok Connection Line. But he instead took a south lead and connected to the Wash Line Passage with 116 meters of new Guardian Line through passage 4 to 8 meters high and with width ranging from 4 meters up to unknown. It has dark speleothems and a good flow of dark water above the halocline. Dive time was 98 minutes.

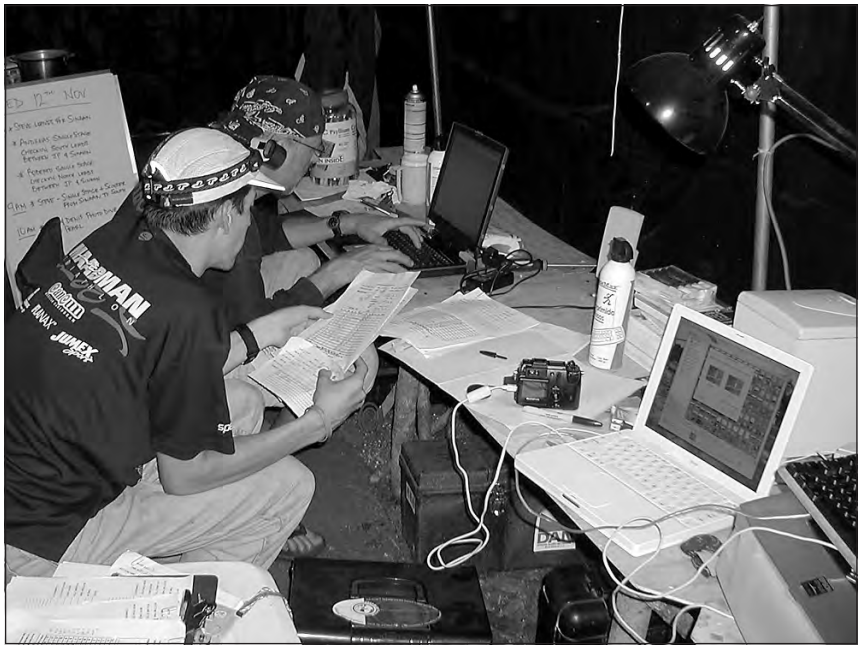
November 11. Steve Bogaerts used side-mounts and two stage tanks to dive from Cenote Jade Pearl and extend the Openside South Line toward the Sian Ka'an preserve. He scootered to the end of the line and extended the passage south for 467 meters with the new Rapids Line though initially large passage that started to close down in a decorated area. He passed through multiple restrictions before the cave got too small to continue, but there was still "screaming flow" from the south. A passage one station back from the end of the Openside South Line went relatively deep to –18 meters, mostly in saltwater. He laid 155 meters of new Basement Line there. This passage continues, but with little flow. Steve expects that it will join the Rapids Line passage. Including 30 minutes of decompression, the dive lasted 250 minutes.

Using side-mounts and a single stage tank, Roberto Chávez dove from Cenote Jade Pearl to check for leads north off of the Spudster–Sinaan Connector Line passage. He laid 90 meters of Coral Line in a new silty passage with little or no flow during a dive of 161 minutes.

Bil Phillips, using side-mounts and a single stage bottle, dove from Cenote Jade Pearl to further investigate the end of the Wash Line. Near there he laid the 106-meter

Bil Phillips begins an exploration dive with a full reel. *Sam Meacham*.

Sam Meacham begins the first dive out of Cenote Jade Pearl. *Steve Bogaerts.*



Andrés Labarthe and Bil Phillips enter data. *Sam Meacham.*

Bite Line, the 58-meter Two Tarpon Line, and the 101-meter Still Line in new passages, in the process discovering from below Cenote Two Tarpon, named for two fish seen in its tannic water. All those passages begin large, 4 meters high and 6 wide, but get lower as their ends are approached, with flow dissipating to zero. On his return trip, he stayed on the south wall of the Wash Line passage and turned into a new passage in which he laid 275 meters of the South Bank Line in a passage with unlimited visibility in still saltwater. It has heavy white silt and broken dissolution "Swiss cheese" debris on the floor. It ultimately connected into the Sinaan Shortcut line. He surfaced 207 minutes after the start of his dive.

November 12. With side-mounts and a single stage bottle, Andrés Labarthe left Cenote Jade Pearl to check further for south-trending leads from the Wash Line passage. Near its end, he found a passage that went south and then west, where he laid the 156-meter Moon Line in saltwater passage 3 to 4 meters high 4 to 6 meters wide, with some flow to the south. Dive time was 174 minutes.

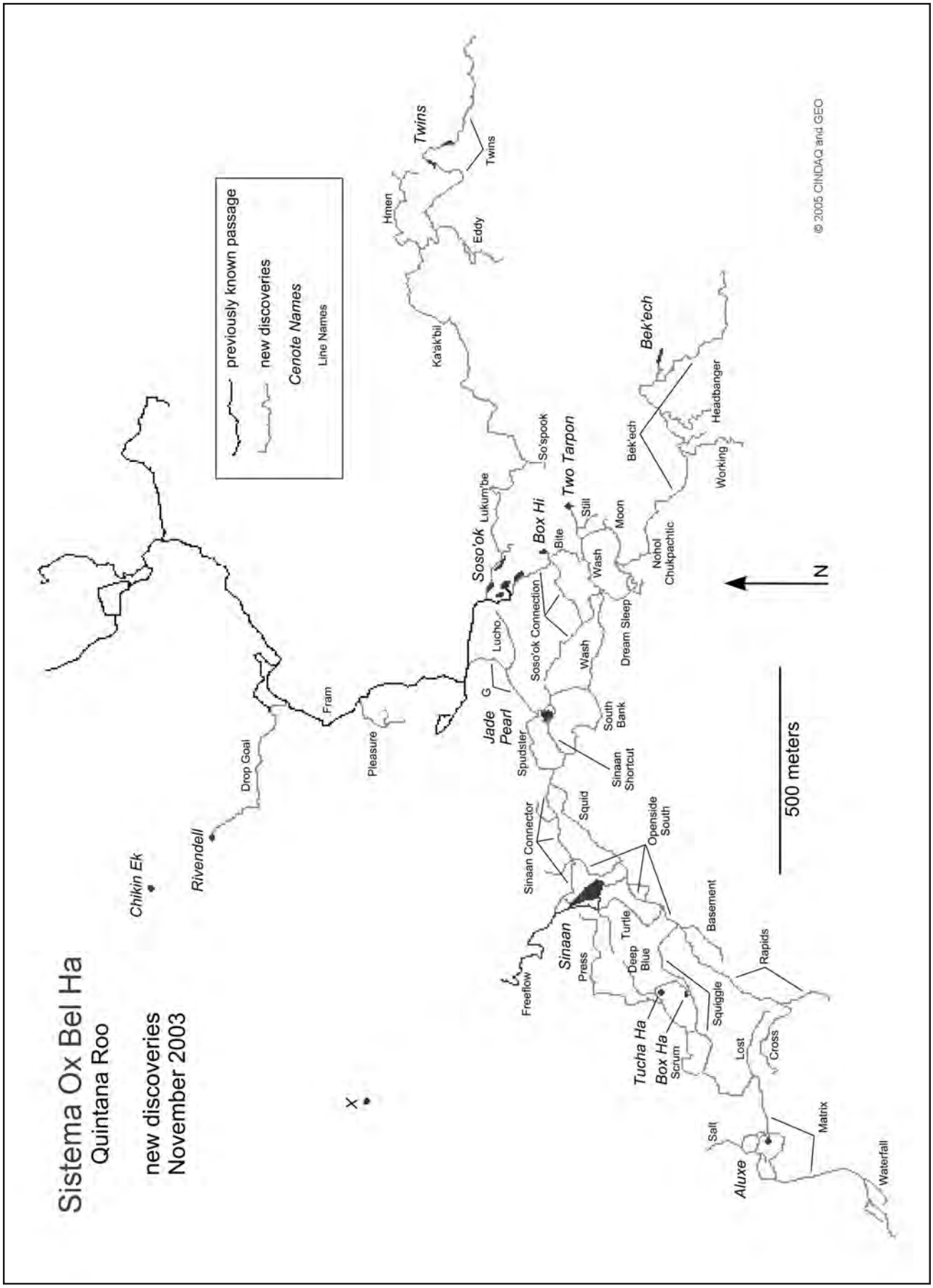
Roberto Chávez, similarly equipped, searched for leads north off the Spudster–Sinaan Connector route. He surveyed 90 meters of new Amarillo Line in a passage north from near where the Openside South Line departs to the south. Several other leads to the north dead-end quickly. He surfaced after 162 minutes.

With side-mounts, two stage bottles, and a scooter, Steve Bogaerts entered the water at Cenote Sinaan to try to push south. Near that end of the Openside South Line, just before its intersection with the Basement Line, Steve found a passage heading west in which he laid the new 562-meter Squiggle Line, along the way finding, via a short side passage, Cenote Box Ha, on the south side of a large depression with tall palms and other large trees with massive root systems into the water, which is tannic and very smelly. Some other passages in the Cenote Sinaan area, including the Roundabout Line passage that forms a loop to the east of the Openside South Line, were lined and surveyed, for an additional 400 meters of new cave. His dive lasted 282 minutes, including 20 of decompression.

Bil Phillips entered the water at Cenote Jade Pearl with side-mounts, two stages, and a scooter to check for passages going east from Cenote Soso'ok. He worked his way around the north side of the depression and eventually found going passage in which he laid an impressive 824 meters of new Lukum'be Line. There are some major restrictions along the way, but at the last two stations the passage appeared to be opening up into bigger cave, with blurred visibility from the halocline. Passage width varies from 0.6 to 4 meters, with height from 1.5 to 6 meters, and there is good flow. Lines So'spook (46 meters) and Pressure Ridge (60 meters) were laid in side passages to the south of the main route. The duration of the dive was 265 minutes.

November 13. With a scooter and side-mounts and two stage bottles, Bil Phillips sought passages to the south from the Wash Line. A lead with good flow was found going south about 90 meters before the end of the Wash Line. It led to the end of Andrés's Moon Line of the day before and ended in a silty area with no flow. Doubling back and following the flow southwest led to another low, silty bedding plane. The 192-meter Dream Sleep Line and the 66-meter Cones Line were laid and surveyed in this area. Then he found going cave with strong flow to the south from the Moon Line; in it he surveyed 278 meters of new Nohol Chukpachtik Line. That passage has heavy silt and is from 3 to 6 meters wide and 3 to 5 meters high. His dive lasted 210 minutes.

November 15. Steve Bogaerts originally planned a dive out of Cenote Box Ha, but a severe downpour prevented work on the surface trail to it, so he dove out of Jade Pearl looking for more leads to the south between there and Cenote Sinaan, using side-mounts, two stage bottles, and a scooter. He found a south lead one station past the junction of the Spudster and Sinaan Shortcut lines and laid 335 meters of the Squid Line in it, until it connected to his Openside South Line south of Cenote Sinaan. Down that line a bit, he entered a westward lead, laying the 237-meter Turtle line west and then north to intersect the old Freeflow Line of 2001 at Sinaan. From there he laid


Sistema Ox Bel Ha
Quintana Roo
new discoveries
November 2003
previously known passage
new discoveries
Cenote Names
Line Names
Twins
Twins
Hmen
Eddy
Ka'ak'bil
Bek'ech
Bek'ech
Headbanger
Working
So'spook
Two Tarpon
Lukum'be
Soso'ok
Box Hi
Still
Bite
Moon
Wash
Nohol
Chukpachtic
Soso'ok Connection
Lucho
Wash
Dream Sleep
G
Jade
Pearl
South
Bank
Spudster
Sinaan
Shortcut
Fram
Pleasure
Drop Goal
Rivendell
Chikin Ek
Squid
Sinaan Connector
Openside
South
Basement
Turtle
Deep
Blue
Press
Sinaan
Freeflow
Rapids
Squiggle
Tucha Ha
Box Ha
Scrum
Lost
Cross
Salt
Aluxe
Matrix
Waterfall
X
500 meters
N
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106 meters of Revolutions Line into a relatively deep, saltwater area. Maximum depth of the line there was 19 meters, with cave visible 6 meters deeper, nice cave with white silt and formations. After 15 minutes of decompression, he surfaced from a dive of 189 minutes.

With side-mounts, double stages, and a scooter, Bil Phillips returned to the end of his Nohol Chukpachtik line of November 13 and continued in similar passage, laying 890 meters of Bek'ech Line trending northeast and then southeast, through a large, decorated room and passage and several restrictions. Cenote Bek'ech, a long, thin opening, was encountered and tied in with the 85-meter Cenote Bek'ech Line. Beyond the cenote, the main Bek'ech Line passage continued as winding cave with restrictions and strong flow of freshwater above a well-defined halocline. With 15 minutes of decompression, his dive lasted 255 minutes.

On a side-mount dive, Andrés Labarthe sought leads northward off of the Jade Pearl Perimeter Line and found a passage heading northeast from the beginning of the Spudster Line. In it he laid the 264-meter G Line, making a shorter connection to the previously known passages in Ox Bel Ha. He surfaced after 100 minutes.

November 16. Steve Bogaerts entered the water at Cenote Sinaan, wearing side-mounts and carrying two stages. He scootered west along the Squiggle Line and surfaced at Cenote Box Ha, where he took a GPS location reading and waited for a surface team to arrive. The surface team had flagged a trail from Sinaan, passing by Cenote Tucha Ha, which they said was nearby. Bogaerts then continued to the end of his Squiggle Line and beyond into a large lead heading southeast. His Lost Line in this passage is 179 meters long, to a point near the Rapids Line. The Lost Line Passage has strong flow from the south and is 30 meters or more wide and 6 high. After surveying back, he turned west and laid 697 meters of Matrix Line, passing through a huge room and then past Cenote Aluxe, which has tannic water and was tied in by a short surface line, and continuing in huge, deep passage with strong flow from the south above the halocline near the ceiling. Line depths reached 20 meters, with the floor often estimated to be at –30 meters; passage widths ranged from 15 to 30 meters and heights from 8 to 12 meters. This deep dive required 30 minutes of decompression, for a total underwater time of 264 minutes.

Andrés Labarthe returned to his area north of Cenote Jade Pearl and found a lead east off his G Line. This decorated Lucho Line passage in saltwater goes 193 meters toward Cenote Soso'ok, and it continues beyond the end of his line. His dive time was 99 minutes.

November 17. Steve Bogaerts entered the water at Cenote Box Ha, reaching it by the surface trail made the day before. He was equipped with side-mounts, two stage tanks, and a scooter and intended to further explore the area of Cenote Aluxe, where he surfaced to get a GPS fix. While there, he met Bil Phillips, who had made a surface trail. Since there was now a trail to Aluxe, he recalculated his gas and scooter run-time margins for an exit there and went to the end of his Matrix Line, where he placed the Promise Line, the Promise Loop Line, and the Waterfall Line, totaling 294 meters of beautiful large, deep saltwater passages that dead end abruptly with strong freshwater flow coming out of cracks in the ceiling and making waves in the halocline at corners. At the end of the Waterfall Line passage he found a 3-meter chimney with freshwater pouring down it so rapidly that as he swam up his bubbles were being swept downward by the current. Back at Cenote Aluxe, he laid the Aluxe Circumference Line and the Loop Line for an additional total of 201 meters, before surfacing after 26 minutes of decompression and a total dive time of 236 minutes.

Andrés Labarthe, with side-mounts, two stages, and a DPV, departed Cenote Jade Pearl to check for going passage at a collapse zone off of the previously known Fram Line that tied Ox Bel Ha into Cenote Soso'ok. The new 167-meter Pleasure Line and the new 52-meter Slit Line were laid in nice passages that quickly went into saltwater with little or no flow. No going leads were found. His dive time was 156 minutes.

Roberto Chávez prepares to dive from the platform at Cenote Jade Pearl. *Steve Bogaerts.*

Bil Phillips winds the last of the 50,000 feet of line onto his exploration reel. *Roberto Chávez.*

The charging area at Jade Pearl. *Steve Bogaerts.*

November 18. Andrés Labarthe, equipped as the day before, again scootered up the old Fram Line passage, this time to seek leads toward Cenote Chikin Ek from another collapse area along the passage, but no leads were found and no new line laid. The dive lasted 117 minutes.

Bil Phillips scootered out of Cenote Jade Pearl with side-mounts and two stage tanks to look for passages south off his Bek'ech Line. He first surfaced at Cenote Bek'ech, where he took a GPS location. Turning back up the line, he worked in the area of a large decorated room. The Headbanger Line was laid southward for 223 meters in passage with some flow, but it ended in crumbly breakdown. The Slow Go Line passage, 71 meters long, also had some flow but shut down in an unstable area. Passages were 1 to 3 meters high and 1 to 4 meters wide, but were winding and had deep silt and heavy fall of dirt from the ceiling disturbed by diver's bubbles, difficult places to proceed safely. Bil thinks something could be found in this area, but not on these lines. After 10 minutes of decompression, he surfaced from a 240-minute dive.

November 19. Steve Bogaerts used side-mounts, two stage bottles, and a scooter to investigate the vicinity of Cenote Aluxe, where he entered the water, Cenote Box Ha, where he emerged 240 minutes later after 20 minutes of decompression, and down the Rapids Line. North of Aluxe he laid a loop of 129 meters of Norte Line and 97 meters of Salt Line extending north from that loop. He connected to Cenote Tucha Ha from the Squiggle Line via his new 209-meter Tucha Ha Circumference Line. And he found and surveyed the 272-meter Cross Line, a passage heading west off of the Rapids Line, parallel to and a bit south of the Lost Line Passage that had been surveyed from the end of the Squiggle line on November 16.

Bil Phillips, similarly equipped, entered the water at Cenote Soso'ok to extend his Lukum'be line of November 12, which had ended where the passage was opening up. His extension, the 603-meter Ka'ak'bil Line, wound on eastward toward Cenotes Can U and Sac Ek, although neither was encountered. The passage soon got huge and decorated with dark formations. Dark water made it difficult to see the walls, but there is a lot to be checked out in this area, where the passage is from 4 to more than 6 meters tall and of undetermined width most places. The passage did not seem to want to stop, and the line ends at a huge open room to the south. The Hmen Line branches from the Ka'ak'bil Line and also heads east, somewhat north of the other passage, for 325 meters. This passage is better defined and has a section of shallow, tannic water, before going deeper again, with eastward flow. Quite a bit of life was seen in the tannic water. The Skip Line is in a passage to the south off of the Hmen Line near its end. It is 59 meters long, to where it closes down with some flow continuing to the south. The Hmen and Skip Line passages are smaller, 3 to 5 meters high and 3 to 6 meters wide, with some restrictions. He decompressed for 10 minutes and surfaced after 270 minutes in the water.

November 20. Steve Bogaerts dove from Cenote Box Ha with side-mounts, two stage bottles, and a scooter to check for southward

leads between Cenotes Box Ha and Aluxe. But he ended up laying several lines in the vicinity of Cenote Tucha Ha. The Press Line passage goes north and then east from the Tucha Ha Circumference Line for 462 meters, mostly in relatively small, silty bedding plane from 1 to 3 meters high and 9 to 30 meters wide. Flow was from the northeast. The 133-meter Deep Blue Line passage is in the same area, but is a deep, saltwater passage 9 meters high and 15 to 30 meters wide. His new Skid Line, Bitter End Line, and Scrum Line in the area near Tucha Ha add up to an additional 265 meters of new cave. Including 16 minutes of decompression, his dive lasted 231 minutes.

November 21. Bil Phillips dove from Cenote Soso'ok with sidemounts, two stage tanks, and a scooter to again push to the east. It was a long way to the end of his Ka'ak'bil Line. Turning first to the south, he laid the 220-meter Eddy Line and the 90-meter Goof Line, the latter circling back around the side of a giant room, beyond which the Eddy Line went down into saltwater with southbound freshwater flow above the halocline. The passage ended in breakdown. Returning to the end of the Ka'ak'bil Line, he headed northeast into the beginning of the Twins Line passage, where 735 meters of new line was laid and surveyed. The passage, which has strong flow throughout, turns north to just beyond the end of the Hmen Line, where it intersects the new Cenote Twins. The passage has heavy silt but looked stable, and beyond the cenotes the passage trends consistently eastward, with several restrictions in a bedding-plane section. Except at the restrictions, the passage is generally 2 to 4 meters high and the width, where it could be determined, is from 3 to 12 meters. His dive lasted 250 minutes, with 10 of decompression.

November 22. In the last dive of the project, Steve Bogaerts entered Cenote Rivendell, about 800 meters north of Jade Pearl Cenote, with side-mounts and two stage bottles. The basin of Rivendell is shallow and the entry to the cave tight, with small passages leading to slightly larger rooms with lots of decorations. He finally broke through and laid 516 meters of Drop Goal Line in passage with flow from the west, to connect to previously known passage in Ox Bel Ha and add yet another cenote entrance to the system. Upstream from Rivendell, he pushed 106 meters of Whinging Wallabies Line toward Cenote Chikin Ek that had been discovered from the surface. Since there is no connection under rock between the two lines out of Rivendell, this is not considered part of Ox Bel Ha. (Steve explains the line names: On this day, the English became Rugby World Champion by defeating defending champion Australia by a drop goal.) Bogaerts was underwater for 180 minutes, the last 30 of which were decompression.

Proyecto de Exploración Perla de Jade
Sistema Ox Bel Ha, Quintana Roo

En noviembre del 2003 el Grupo de Exploración Ox Bel Ha condujo un proyecto de exploración ambicioso partiendo del Cenote Perla de Jade, entre secciones conocidas de Ox Bel Ha y la reserva de la biósfera de Sian Ka'an. Más de 15 kilómetros de pasaje nuevo fueron descubiertos y topografiados durante los veintinueve buceos de exploración y los nuevos descubrimientos fueron conectados al Sistema Ox Bel Ha. Al final de la expedición Ox Bel Ha contaba con 125 kilómetros de longitud, con setenta y dos cenotes de acceso.

TANCAH CAVE REVISITED

Dominque Rissolo

When we consider the spectacular caverns, cenotes, and submerged cave systems of Quintana Roo, the small and seemingly insignificant cave at Tancah hardly merits a second glance. However, to archaeologists no other cave in Quintana Roo is as famous, both for its place in the history of archaeological exploration and for its truly unique petroglyphic stairway. Previous investigations of the ancient Maya coastal site of Tancah and its oft-cited cave provided detailed information on the site's architecture, murals, and occupational history, while published studies of the cave offer a superb recording of the stairway as well as an interpretation of the its carved, glyph-like elements. Reddell and others mapped the cave in July 1975, but the map has not been published (Reddell 1975: 252). Missing from these previous investigations are a map of the cave itself and a consideration of the other caves or cenotes within the immediate vicinity of the Tancah site. Also, the exact location of the cave does not appear on published maps of the Tancah ruins. Although we recorded its position relative to the site's ancient platforms and pyramids, preservation of the cave's artifacts and rock art would be better served by not publishing such information at this time.

Along with Bil Phillips, Sam Meacham, and Sabine Schnittger, I visited Tancah in December of 2004 for the purposes of mapping the cave and recording and photographing those features that were omitted or not reproduced in the archaeological literature. Additionally, I hoped to integrate various geographic and speleological data collected during numerous exploratory trips in the forest near Tancah. What I provide here is an overview of the cave and its colorful history, followed by a preliminary reevaluation of the cave's archaeological significance. I am also pleased to have the opportunity to pull this cave's fascinating rock art from the archaeological literature and make it available to interested cavers and cave scholars.

The cave at Tancah was first reported by Samuel K. Lothrop in 1924. Lothrop and the famed Mayanist Sylvanus G. Morley were lured to the cave by reports of "hieroglyphic inscriptions." At the time, the two archaeologists were engaged in one of a series of three expeditions to the east coast of the Yucatan Peninsula sponsored by the Carnegie Institution of Washington. Much to their dismay, Lothrop and Morley encountered not a rich Classic Period text, by rather what they describe as "incised patterns which vaguely resemble glyph-blocks, but which are apparently meaningless" (Lothrop 1924:132). Moreover, they surmised that the petroglyphs were an attempt by local Maya during the Colonial Period to replicate or rekindle an ancient and lost body of knowledge. Be that as it may, there is no reason to assume that the carved images are therefore without meaning.

Despite his apparent disappointment, Lothrop endeavored to record key details of the cave and provide a brief description in his landmark 1924 publication, which primarily featured his extensive work at Tulum. Though Lothrop provides two photographs of the carved stairway (1924:fig. 131, A and B), the images are of relatively poor quality. He also mentions a large, inscribed stone slab, which he refers to as an idol (ibid:132). Again, the accompanying photograph of what might otherwise be described as a stela (ibid:fig. 132), is of little value. His figure 132 also contains a photograph of a small, plastered, pyramidal "altar." He states that an idol once rested atop this miniature platform, but was spirited away by Mexican troops some fifteen years before his arrival (ibid:133). No other record exists of this altar or of its venerated patron or guardian, as the altar itself was destroyed sometime prior to subsequent investigations of the cave.

The first sketches of both the petroglyphic stairway and the stela were published by Ricardo de Robina in 1956. Although his drawing of the stairway lacks significant detail, Robina offers an intriguing interpretation of the glyph-like elements. He sees among the carved images certain glyphs that resemble or may represent specific day names from the 260-day divinatory calendar (often referred to as the *tzolk'in*) and month names from the 365-day solar calendar (also called the *haab*). The simple carved faces on the upper stair riser are interpreted

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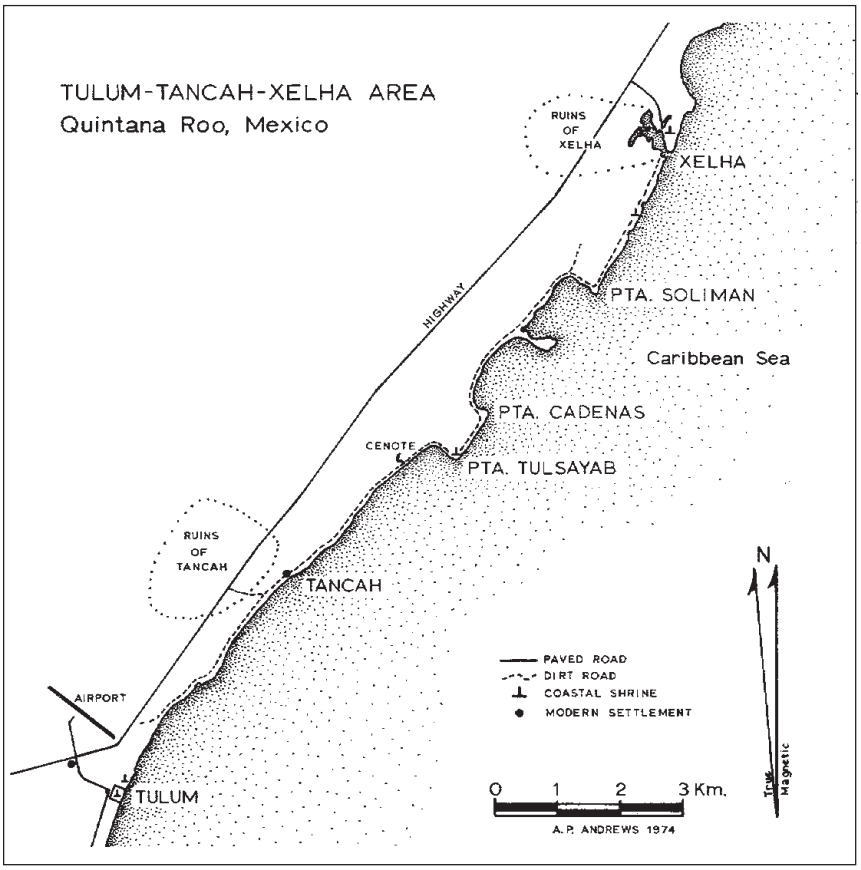
by Robina as "abbreviated" Ahau day-glyphs, while the ladder-like elements are described as numerical notations. Like Lothrop, Robina suggests the petroglyphs might to date to the Colonial Period.

By far the most detailed recording and interpretation of the petroglyphic stairway appears in Arthur G. Miller's book on the Tancah-Tulum mural tradition (1982:87–89). Miller (ibid:fig.119) provides a highly accurate and beautifully rendered drawing, by artist Kees Grooenboer, that can hardly be improved upon. Like Robina, Miller sees calendrical notations among the carved elements, including what he interprets to be the pairing of the celestial and calendrical Lamat glyph and 1 Ahau (ibid:87). He goes on to propose that this particular cave was selected for its east-west orientation, so that glyphs along the east side of the cave pool can be envisioned as emerging from the watery Underworld (ibid) and represent the heliacal rising of Venus, the morning star, as it faces the dark water of the cenote (ibid:97). The well-documented significance of the planet Venus in Maya ideology and worldview notwithstanding, the many carved elements in Tancah cave are in my opinion more idiosyncratic than overtly indicative of such astronomical associations.

I do, however, find Miller's suggestion that the Maya had perhaps been acutely aware of the west-to-east flow of the region's underground rivers to be a most fascinating topic. I imagine that every underwater-cave explorer in Quintana Roo has at one time wondered whether or not the ancient Maya had any concept of the vastness, complexity, and beauty of the submerged cavern systems beneath their feet. Local inhabitants have long been aware of the *ojos de agua*, or the near-shore openings along the coast where fresh water emerges from the sea floor. Miller mentions Punta Tulsayab, near Tancah, which carries an ancient name meaning "where the [fresh] waters go out" (ibid:88). I agree that this phenomenon of underground rivers from the west flowing out to sea must have been charged with symbolic meaning. With respect to the cave at Tancah, neither Miller nor the ancient Maya could have known the cave's physical connection to an extensive and truly impressive underwater system.

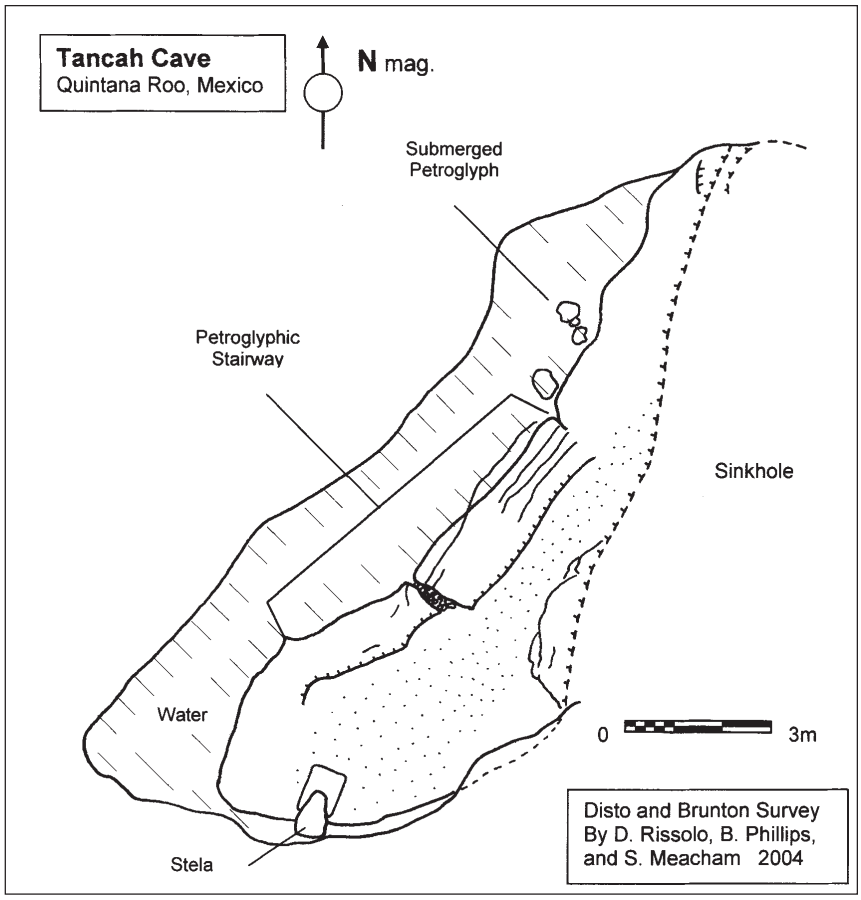


In February 2005, Jim Coke posted on the Quintana Roo Speleological Survey website the connection of Sistema Nohoch Kiin and Sistema Cuts, to which Tancah Cave serves as an entrance, to Sistema Sac Actun. This connection, which was accomplished by Robbie Schmittner and Steve Bogaerts, has resulted in what is currently the second-longest surveyed underwater cave in the world. Although the pool in Tancah Cave has been dived at least a few times over the years, most recently for the purpose of entering or leaving Sistema Cuts, the extent to which the Maya used the cenote as receptacle for offerings is not entirely clear. Miller reports the recovery of a ceramic water jar from a depth of 20 meters during underwater excavations (1982:78; fig.114), but there is no further mention of what the divers encountered during their investigation. A more systematic survey of the cave pool might yield further evidence of offertory activities, but our brief visit in January 2005 was largely concerned with mapping the small dry portion of the cave and plotting its famous stairway and stela.

Upon entering the cave at Tancah, one is immediately surprised by how small it really is. The cave can be described as a twilight alcove at the bottom of a sinkhole or depression that slopes down to the west. Approximately one half of the area beyond the dripline is bedrock and collapse, while the remainder is cenote pool. Relative to the modest size of the chamber, the broad petroglyphic stairway has a commanding presence. The stairway is 7 meters at its widest and 1.25 meters in height. Towards the northern end of the stairway, at least five steps are clearly discernable, with the lowest riser and tread lying just beneath the water's surface. The upper steps appear to grade into the steeply sloping midsection of the stairway, while the petroglyphs to the south of a debris-filled

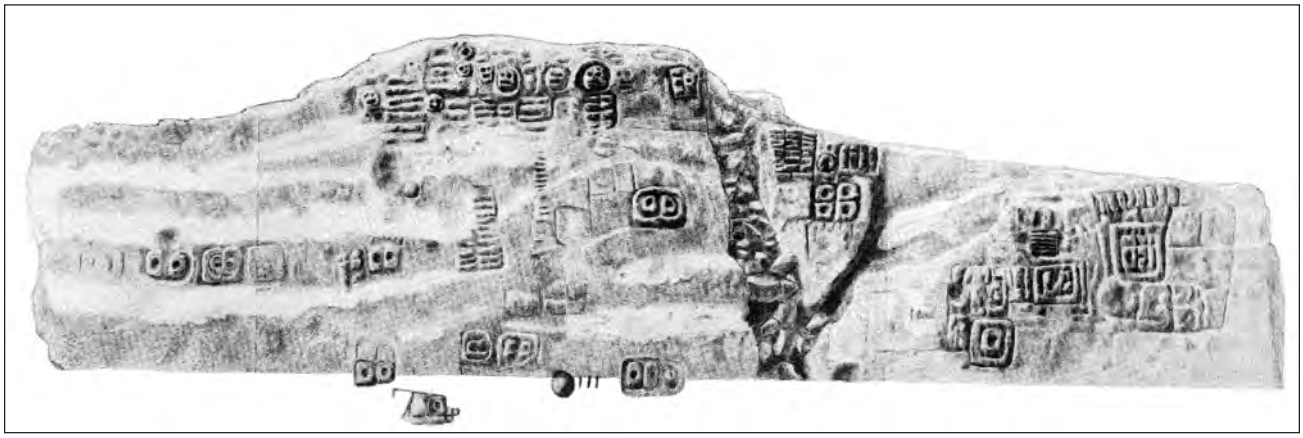
cleft are located on bedrock slope rather than on the risers of carved steps.

Although I find many of the glyph-like elements carved into the stairway highly idiosyncratic and difficult to interpret, I do not agree with Lothrop's assessment that they are without meaning. Certainly these images had symbolic significance to the individuals who carved them. If nothing else, their very presence along the water's edge speaks to the importance or sacredness of the cave itself. With respect to the tiny "faces" along the topmost riser of the stairway, their resemblance to the Ahau glyph is likely coincidental. They are essentially what they appear to be, faces. Simple frontal faces, like those found in Tancah cave, are ubiquitous in caves across the Yucatan Peninsula (see Rissolo 2001) and appear to be associated with stairways or pathways that lead to water, and Tancah Cave is further evidence of this association. The ladder- or step-like elements beneath the faces are intriguing, but not without precedent. Most notably, similar carvings on boulders in Loltun Cave were reported by Edward H. Thompson (1897:plates IV and V). Another example can be found in Aktun Ch'en Chin (Bonor Villarejo and Sánchez y Pinto1991:fig.6). A single example of a small face atop ladder- or step-like elements strikingly similar to what we see in Tancah Cave was recorded in the Gruta de Calcehtok (Uc González and Canche Manzanero 1989:fig.4d).



The petroglyphic stairway in Tancah Cave. Drawing by Kees Groonboer, after Miller 1982: fig. 119.

The locations of these stepped motifs in certain caves of the Oxkutzcab area have led Bonor Villarejo and Sánchez y Pinto (1991:48-49) to suggest that they might function as a sort of directional signage for visitors to the cave. This does not appear to be the case in Tancah; nor do the stepped motifs in Tancah Cave seem likely to represent a form of numerical notation, as suggested by Robina (1956:184). Rather, they appear to represent or function as metaphorical stairways, as alluded to, but not directly suggested by Miller (1982:87). In the case of Tancah Cave, Miller believes that the Ahau glyphs (i.e. faces) atop the step-like motifs might represent the rising sun (1982:fig.119 [caption]). He cites an example of an architectural "model" (or *maqueta*) of a stairway carved on a rock near Texcoco in the Valley of Mexico, as reported by Cook de Leonard (1955:fig.8). The purpose of carving these miniature steps is elusive, though



Houston (1998:337,360) suggests that such *maquetas* may have been used in symbolic activities where the flow or channeling of water was performed or observed.

The three distinct petroglyphs found on the stela in Tancah Cave are also difficult to interpret. They are admittedly glyph-like, but like much of the cave's rock art their very presence may hold more meaning than the content of the petroglyphs themselves. We can think of no other example of a stela in a cave in Quintana Roo. Rather than erecting an actual stela in Tancah Cave, it appears as if they appropriated a somewhat tabular block of collapse debris and transformed it, in situ, into what can essentially be described as a stela. This, in and of itself, is quite interesting. The stela, which measures a maximum of 0.82 meters wide, 0 .78 meters thick, and 1.96 meters high and rests against the south wall of the cave, is shaped like a wedge and only appears to be rectilinear when viewed face-on. The plastered stone base atop which the stela appears to rest was actually built around the stela, thus completing the illusion.

One final petroglyph, which has not been previously reported, was noted in the cave. Among the collapse debris in the northern portion of the cave is a partially submerged boulder that bears a simple carved face within a larger circle or cartouche. Though the top of the image is just below the surface of the water, it appears that the boulder slid down-slope into its current position sometime after it was carved.

When considering recent activities in the Tancah area, it should be noted that the cave has carried a few different names. Lothrop (1924) simply refers to the cave as the Cave of Tancah, while Miller (1982) calls it Tancah Cenote Cave. Among local divers and cavers, it is also known as Altar Maya, Cave Under the Sea, or Doorway Under the Sea. Interestingly, a certain fear of the cave that has been conveyed to us by local Maya was also noted by Miller during his work at the site of Tancah in the mid 1970s (1982: 87). The belief that this cave is somehow special, perhaps even dangerous, has survived to the present day and perhaps explains why other nearby caves or cenotes where not transformed to extent that we see in Tancah Cave.

Ongoing exploration of the rather extensive archaeological zone of Tancah by Jim Coke has so far revealed four new caves, two of which share the same large depression. In addition to the well-known Casa Cenote (also called Cenote Tankah or Cenote Manatee), two new cenotes near the Tancah ruins have been explored by divers in recent years. Though cultural material was noted in a few of these caves, a more thorough archaeological investigation would be warranted. Most relevant to the discussion here is the cave/cenote located less than 100 meters north of Tancah Cave. Though not mentioned by Lothrop or Miller, the lack of cultural transformation in this rather similar cave is somewhat conspicuous. A scattering of sherds and a few conch shells attest to this cave's ancient use, but perhaps it functioned as a more utilitarian complement to its much feared or revered neighbor to the south.

The central coast of Quintana Roo continues to offer new glimpses into its subsurface world, even in relatively well known, but in some ways forgotten, places like Tancah. With all of its temples mapped and drawn, archaeologists, to some degree, have all but closed the book on the Tancah-Tulum region. However, future combined efforts by archaeologists and cave explorers will no doubt reveal a landscape of dry caves and cave/cenotes that were integral to the daily and spiritual lives of area's ancient inhabitants.

I would like to thank the Quintana Roo Speleological Survey for their financial and logistical support. Jim Coke and Bil Phillips have been integral in facilitating archaeological cave research along the central coast of Quintana Roo, and I personally would have spent several days wandering aimlessly in the jungle without their assistance. I am grateful to Jorge Portillo for graciously providing access to Rancho Tancah, and I appreciate the continued enthusiasm and local knowledge shared by Hilario Hiler. Special thanks also to Sam Meacham, Sabine Schnittger, Robbie Schmittner, María José Con, and Adriana Velázquez Morlet.

The petroglyphic stairway with stela in the background. *Sam Meacham*.

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The stela. *Sam Meacham*.

Cueva de Tancah, Revisitada.

Esta cueva en la zona arqueológica de Tancah, en Quintana Roo, ha sido finalmente topografiada. La cueva contiene una escalera labrada y varios petroglifos. El lago en la cueva es una de las varias entradas al Sistema Sac Actun, la segunda cueva subacuática más larga en Quintana Roo.

CAVES, RIVERS, AND SCORPIONS: A BIOLOGICAL EXCURSION THROUGH THE MEXICAN KARST

Peter Sprouse

In September 2004, Andy Gluesenkamp, Charley Savvas, and I joined biologists Oscar Franke and Edmundo González from the Universidad Nacional Autónoma de México on a cave-scorpion-collecting trip for the American Museum of Natural History. This trip was part of a much larger effort to collect new specimens to be used in a worldwide scorpion DNA-analysis and reclassification project. Over several weeks we covered a lot of territory in rapid style, entering several caves per day. This trip was reminiscent of the wide-ranging cave-biology trips conducted by James Reddell and others in the 1960s and 70s, and I will proceed in the same narrative style of those early AMCS reports.

September 11—Andy, Charley, and I left Buda, Texas, and crossed the border into Mexico. Our destination that night was Cañon de la Huasteca, where we were to meet up with Fofo González and the crew from Monterrey Tec, who were having their club training trip at El Salto. We made our way down the steep road from La Ciénega and could hear the partiers' revelry echoing off the canyon walls long before reaching them at 2 A.M. There must have been a hundred people there, some of whom had already passed out, but we were greeted warmly and given some tacos before sleeping for a few hours.

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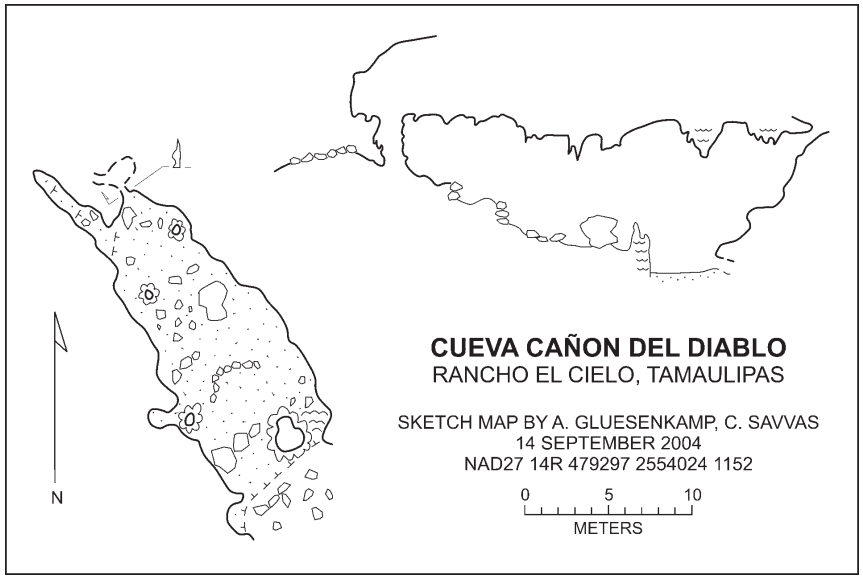
September 12—We watched a few hung-over rock-climbers practice some routes before we bid farewell and continued south to Cd. Mante, where we met up with Edmundo and Oscar at a hotel near the square. We were also joined by local caver and environmentalist Jean Louis Lacaille Múzquiz, who was to be our guide at El Cielo the next day. Jean Louis works for a conservation group that provides assistance to villages in the mountains.

September 13—The six of us drove up to the Texas Southmost College research station at Rancho el Cielo. On the way up the mountain, Jean Louis showed us the ruins of the Cameron residence near Alta Cima, where a family from the United States had settled in the early twentieth century. That settlement led to Frank Harrison's establishing Rancho el Cielo in the 1930s, and his legacy eventually led to the formation of the biosphere reserve of today. Along the road, Jean Louis pointed out a small pyramid built by even earlier residents. He also showed us a cave on the west side of the road that we named Cueva Govenia, after a common plant, but it didn't appear to be suitable scorpion habitat, so we didn't enter it. We parked our truck at Rancho el Cielo and hiked 400 meters up the western hill to Cueva de la Mina, where the first blind scorpion in Mexico had been collected. A steep dirt slope leads down into a large formation chamber. We searched that room, then located the root-penetrated chamber off to the right



of the entrance where previous scorpion collections were made. Pitfall-trap jars were still present in the floor. No scorpions were found, but a lot of other fauna were collected. On the hike back to the trucks, Jean Louis showed us a pit that we entered later that evening. Sótano de la Palanca is a short vertical drop with a side room off the bottom. Bats were present, as was a rock wall that could be of pre-Columbian origin. We surveyed the cave, which I later discovered had previously been explored by Gerald Moni and others. They had named it Sótano del Lomito de Guano, but they had not mapped it, so it was just as well that we did.

September 14—Edmundo and I hiked back up to Cueva de la Mina in the morning and searched the Roots Room again, finding a pseudoscorpion. The others were shown a 60-meter pit that they did not enter. They did collect in another cave, Cueva Cañon del Diablo, and were shown a couple of others that they made sketches of. We left Jean Louis and went on to Sótano de Yerbaniz near Cd. Valles, San Luis Potosí, where we were able to drive right to the cave. Andy, Charley, and I went in as it got dark and found lots of good habitat, collecting many spiders, schizomids, and more. We searched several hundred meters past the second drop, making extensive use of our UV lights, but found no scorpions. (Scorpions fluoresce nicely in UV light.) On the climb out we noticed a beehive in a crack, but, as the landowner had advised us, they didn't seem Africanized. Edmundo and Oscar, using UV lights on the surface, collected the surface scorpion *Centruroides gracilis*. We stayed in Cd. Valles that night.

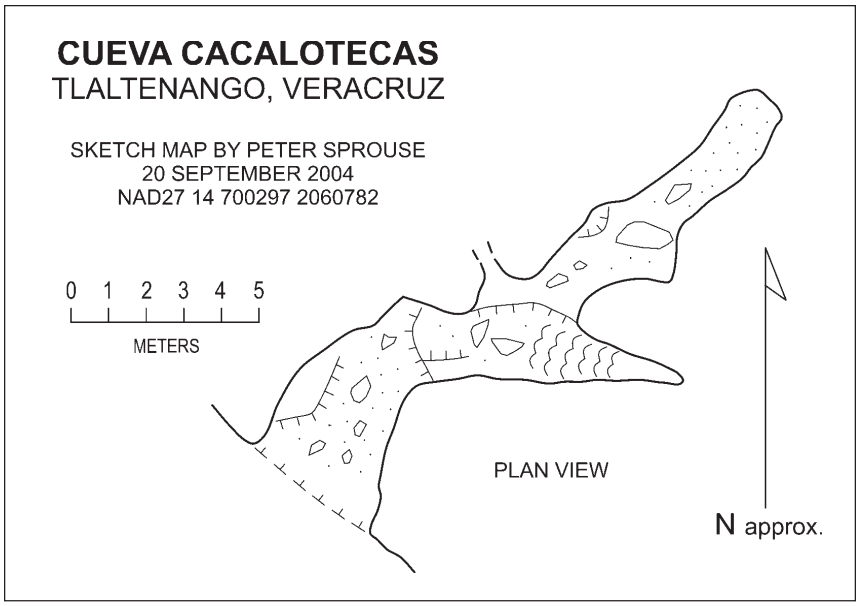
September 15—We drove west from Cd. Valles to San Nicolás de los Montes, locating a guide who took us to an intermittent-resurgence cave southwest of town. We followed black pipe from a defunct water system up an arroyo to the entrance. Cueva de Tacho goes in 35 meters to a sump containing cirolanid isopods.

September 16—We went on a long hike to the east of San Nicolás de los Montes, where our guide knew of caves. On grazing land at Mesa de Castro we were shown several caves. Resumidero Mesa de Castro has a flowing stream entering it, but it soon pinches. Cueva de Arturo had better collecting conditions and several hundred bats, but no scorpions were found there either. We also checked a pit, Sótano de las Cicadas, surrounded by large flowering cycads. Back at San Nicolás de los Montes, we located a bad-air cave, Cueva Mal Aire, by the road, but it was a poor collecting site. We drove east into Veracruz state that night.

September 17—We drove south all day and reached Tuxtepec, Oaxaca.

September 18—Driving up the mountain past Jalapa de Díaz, we reached San Miguel, near Huautla. San Miguel is located on a narrow ridge, with the Río Santo Domingo gorge dropping off to the south and the San Miguel Dolina on the north side. It was market day, so Andy and I perused the vendors, one of whom was selling packets of DDT. Oscar and Edmundo went into the *presidencia* to acquire permission.

Andy Gluesenkamp in Sótano de Yerbaniz. *Peter Sprouse.*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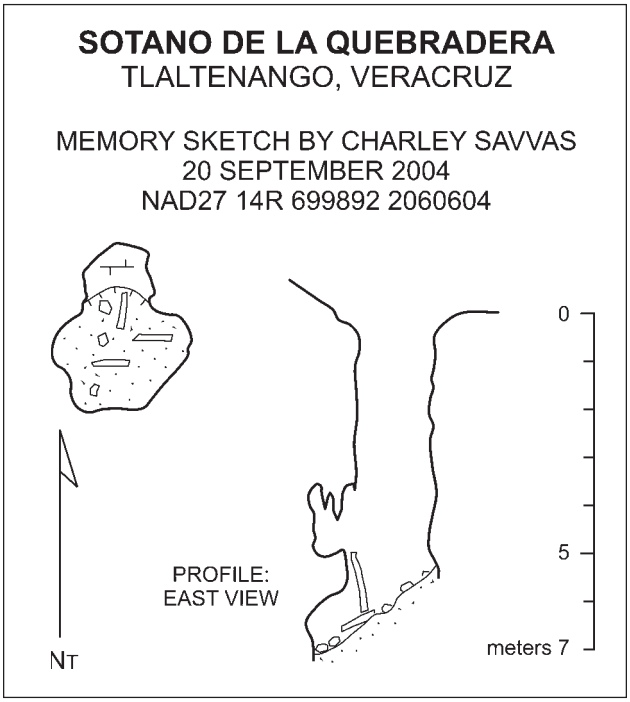
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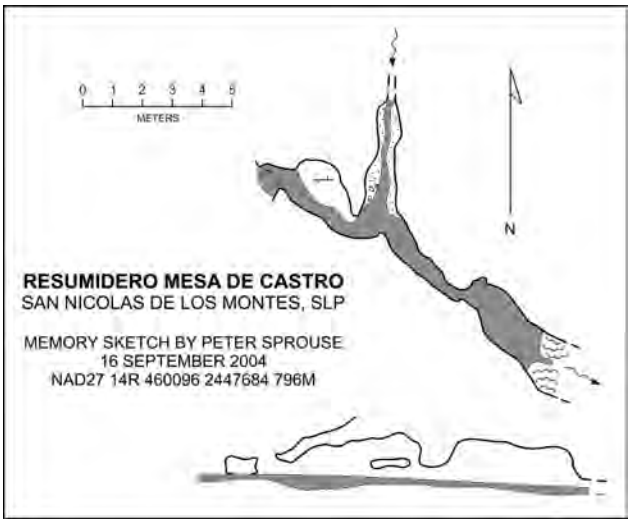
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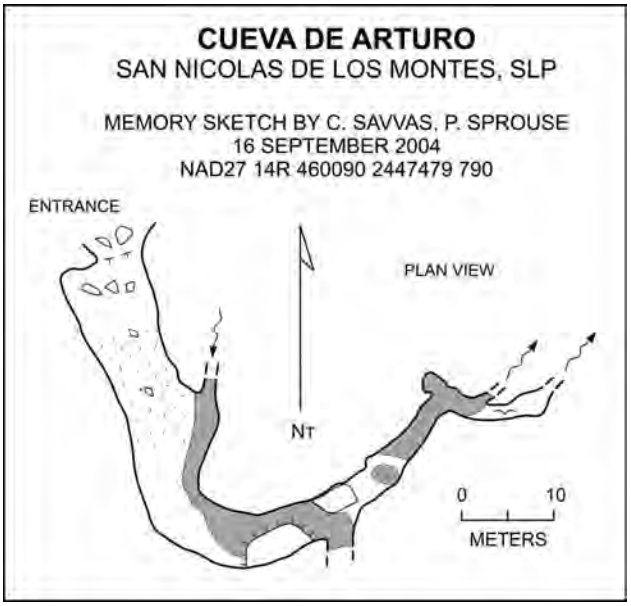
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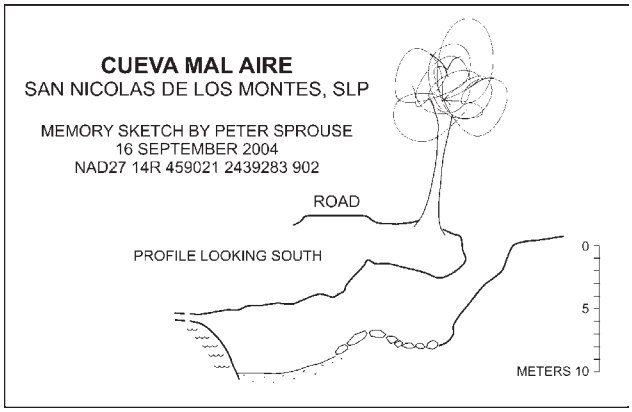
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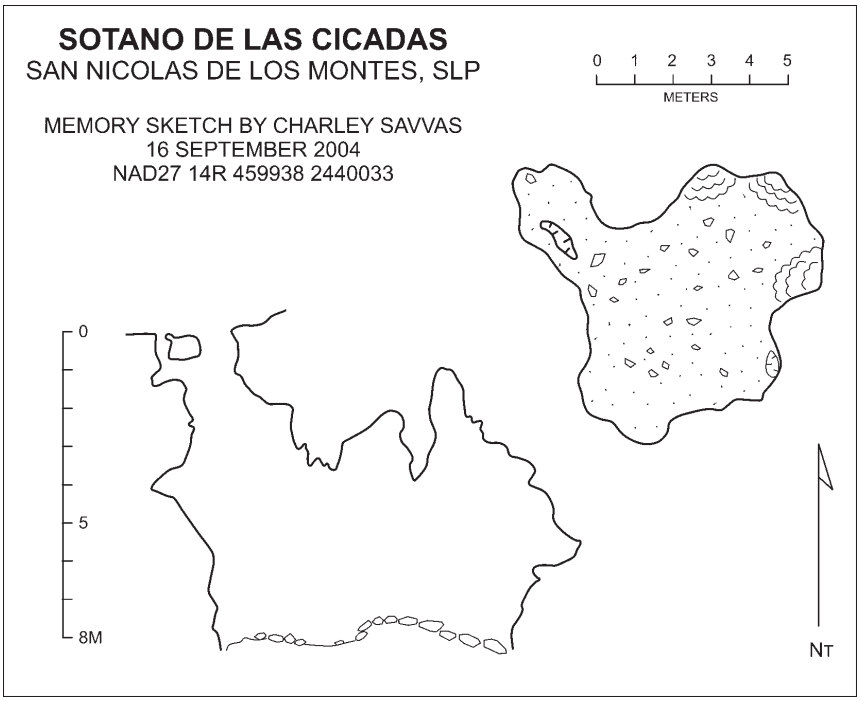

After it was decided that they weren't "foreigners trying to fool them," permission was granted. Using an old area sketch from an AMCS publication, we located Sótano del Escorpión. Andy, Charley, and I entered, using two ropes to reach the bottom of the cave 100 meters down. After climbing down into a large room, we followed a flowing stream. We searched the edge of the sump where a scorpion had been found in 1978. Blind schizomids, amblypygids, and finally one scorpion were found. The scorpion was in an upward-trending side passage 20 meters before the sump. Charley and I knew immediately what Andy's whooping and hollering meant. This passage is on the right side as you head into the cave. The scorpion was on the left wall about a meter above the floor, in the open. It was slow-moving and easy to catch. I took a number of photographs of it prior to collection. Since we'd had no luck finding cave scorpions up to this point, the biologists were a bit frustrated, so Andy decided to prank them, not mentioning the scorpion when we got out of the cave. Only when coaxed to take a look at another supposed amblypygid collection did Oscar realize we'd gotten a specimen of Mexico's most troglobitic scorpion. We spent the night in Huautla, marveling at how such a large city was located on so steep a mountainside. Charley guided us to a little restaurant popular with cavers. Tourism in Huautla seems to center around mushrooms, as far as I could tell.

September 19—Descending the west side of the Sierra Mazateca, we proceeded to Orizaba, Veracruz, and entered Cueva del Ojo de Agua de Tlilapan. Located in a town, it is very disturbed by human traffic and the bustle of an active bat colony. We then searched for more caves near a large spring to the east, where Belgian cavers had recorded a small stream-entrance with municipal water pipes coming out of it. There was too much flow to enter this, and we had no luck locating any more caves nearby. We returned to Cueva del Ojo de Agua de Tlilapan after dark to search the cave again with UV lights, but the habitat was so impacted that we lost hope.

September 20—With some trepidation we drove up to Tlaquilpa, where they had cut our rope nine years before. There was no problem getting permission from the *presidencia municipal*, though they warned us to also get permission from landowners. Oscar and Edmundo spent several hours working on land access with property owners at Tlaltenango, one of whom initially wanted 30,000 pesos ($2643 US) to enter his caves. Eventually they settled on 100 pesos per cave, so we went up to see his three caves northeast of Tlaltenango. One pit, Sótano de la Quebradera, is blind and didn't lead into good habitat. We didn't enter the next pit, 50 meters deep, but did enter Cueva Cacalotecas, which is 20 meters long and contained blind harvestmen. Then we hiked over the hill to the vicinity of Sótano de Poncho and Sótano del Hombre Miedoso, where I had collected a new species of cave scorpion in 1995, but the

Andy Gluesenkamp crossing the river on the way to Mesa de Castro. *Peter Sprouse.*

Above: Andy in Sótano del Escorpión.

Top right: The Huautla cave scorpion *Alacan tartarus.*

Bottom right: Edmundo González at Cueva de Ojo del Agua de Tlilapan. *Peter Sprouse*.

landowner refused access, saying that our previous exploration had caused him great political headaches. Echoing the famed "golden giraffe" incident, he wasn't buying our scorpion story, certain we were looking for gold in his caves. (See *AMCS Activities Newsletter* 22, pp. 61–81.) We then tried to get permission to enter Resumidero de Tlaltenango, a cave we'd only partially explored before the giraffe incident, but spent an hour getting the runaround about whom to ask, so we left Tlaquilpa to its misery and drove down to Tequila for dinner.

September 21—We tried to reach a cave we had heard about near Tlilapan, but the land was posted against trespassing. Then we drove the old highway toward Córdoba and looked for caves in the next valley to the east. Three girls at a Pemex station pointed us toward a cave where "a lot of people have gone in, but not come out." We located an intermittent-resurgence cave at the base of Cerro Chicahuaxtla that is reputed to contain blind fish. We saw no fish in Cueva Chicahuaxtla, but collected many invertebrates. East toward Atoyac, we next visited Cueva del Cabrito, where I had found scorpions in 2001. We collected 800 meters into this cave, but found no scorpions, despite extensive blacklighting. This is farther than I'd been before in this cave, and the flowing stream continues on. We mapped only eleven stations into this cave in 2001, and the Veracruz cavers say they haven't reached the end yet, so this cave remains a great project. We spent the night in the pleasant town of Paso del Macho, Veracruz.

September 22—At Atoyac, Oscar guided us through two tunnels down the old railroad bed, where we caught a spectacular view of the Río Atoyac cascading through a gorge. We visited Grutas de Atoyac, but it is very trashed. It would be a good place to collect twine, however. Andy dined on a very large *langostino* in Atoyac, then we proceeded west to Paraje Nuevo. We were following up on a scorpion collection in the 1950s in a nearby resurgence cave. The source of the Río Atoyac is an enormous spring. An obscure hole in the breakdown above it leads into walking passage

where a river can be heard ahead. There was quite a bit of dry passage to collect in before we regained the river at a large waterfall. Spiders, amblypygids, and a blind crayfish were collected. We then drove on to Acatlán, Oaxaca.

September 23—We visited the quarry south of town where Cueva Desapareciendo is said to be located. The two cave remnants we looked at were too short to have good scorpion habitat. We waded across a river near Maravillas to look for another cave, but couldn't locate it. Oscar made pseudoscorpion collections under dead-tree bark in that area, finding many. Then we all entered Cueva de la Laguna Verde, searching about 400 meters of passage. Collections included blind crayfish, blind tarantulas, and one scorpion. Edmundo found this scorpion in the open in the collapse area near the entrance. The shed skins of two scorpions were also found under rocks in this area.

September 24—We drove north to Cd. Valles, San Luis Potosí.

September 25—We met local cavers Jean Louis Lacaille Múzquiz and Arturo González to have another try at Sótano de Yerbaniz. Again, no scorpions were found. Andy, Charley, and I bid farewell to the others in Cd. Mante and went to camp at La Florida, near Gómez Farías on the Río Frío.

September 26—I drove back up to El Cielo, where Andy and I returned to Cueva de la Mina. The Roots Room was searched, but again no scorpions were found. Then we drove north to Texas.

Although only some of the targeted scorpion species were found, many other biological specimens were collected on this trip, including three likely new species of surface scorpions. I would like to express my gratitude to Lorenzo Prendini and the American Museum of Natural History for funding this trip, and to Oscar Franke and Edmundo González of UNAM for their great expertise and companionship in the field.

Charley Savvas checks out Sótano de la Quebrada. *Peter Sprouse*.

Cuevas, Ríos y Alacranes
Una Excursión Biológica a Través del Karst Mexicano

Tres espeleólogos de Estados Unidos y dos biólogos de la UNAM visitaron muchas cuevas a través de México para recolectar especies nuevas de alacranes de cueva. No hallaron todas las especies conocidas, pero lograron otras colectas biológicas, incluyendo tres nuevas especies de alacranes de superficie.

COAHUILA CAVING

Bev Shade and Peter Sprouse

This was supposed to be an Oztotl Flying Club trip to recon the karst of Coahuila from the air, but mother nature decided it was going to be cloudy. So the reconnaissance was at ground level instead. Jesse Becker, Charley Savvas, Bev Shade, and Peter Sprouse left Austin on 26 January 2005 and crossed into Coahuila at Piedras Negras. The next morning they set off to find Cueva de La Azufrosa, which bat-investigators Jim Kennedy and Arnulfo Moreno had visited in the summer of 2003. In 2003 Arnulfo had stopped there first, but he declined to go in after he was told that two people had died in the cave from "gases." The cave is located above a sulfur spring. Jim visited the site shortly thereafter with Merlin Tuttle, but didn't go too far in due to bad air.

Armed with this information, they drove south from Allende on the road to Villa Unión. After 11 kilometers they turned right on the road to Ejido la Azufrosa, where they obtained a ranch key from the *comisariado*. From there it was only a kilometer drive west to the cave. With the directions from the *ejidatarios* and Jim Kennedy's coordinates, they reached the sulfur spring with little trouble. It emerges at the base of a hill. They could smell the sulfur as soon as they stepped out of the truck. The main spring itself was fascinating. Water bubbles up from an orifice at the deepest point of the pool. A large leopard frog sat on the bottom, its head bobbing in the flow. After watching him for awhile and even making a video of him, they realized he was actually dead. Was it the sulfur that killed him? The stream is filled with blue and white bio-mats and stalagmite-shaped growths. Downstream is another small sulfur spring, flanked by a small freshwater spring. Minnows swam up the freshwater flow, but wouldn't enter the sulfurous water.

There is actually a whole line of springs along the northwestern edge of the low hill. The marshy area that the springs feed is pocked with new and old collapses in unconsolidated soil mixed with a variety of mineral precipitates. The springs appear to have started forming to the north and slowly moved south along the rise. The most active spring is described above. It is about 2 meters wide, with a 1-meter-wide spring run that flows about 20 meters northwest. The remains of at least four older springs can be seen north of the main spring; some of them are still active.

They set off to locate the two cave entrances reported to be just up the hill. One is a sink just uphill from the main spring that supposedly had been an entrance to the cave, but the local residents had filled it with trash. The open entrance is 100 meters to the south. It is a steep sink developed in blockish, flaggy rock akin to Boquillas flagstone. Warnings and a death's head adorned the rock, and soon a goat herder came up to warn them that some twenty years before seven kids had gone in, three of whom became gravely ill and the rest of whom died. He explained that they had gone into the cave until they came across something, an object of stalagmitic shape perhaps, that caused them to feel ill and flee. Two died in Monterrey and two in Piedras, and one, his nephew, was in the San Antonio hospital for two months.

So the cavers surveyed into the cave with some caution. A restriction at the bottom of the slope opens into a stoopway of ample width. Suspecting histoplasmosis as the problem, they spidered carefully over the thick guano piles. The passage zigzagged through right-angle turns and cross-passages. Dead bats on the wall raised some concern, but they detected no sulfur fumes or bad air. Soon they passed some cross-joint passages with live bats, *Mormoops megalophylla.* The main route narrows to a gun barrel, where they got a 20-meter survey shot, but it gets too tight soon after that. One of the bat passages is pushable, but there were too many bats, perhaps five hundred in all. The last left-hand lead on the way out, which Jesse noticed, is the one that went. It is walking passage where they quit the survey, and Jesse explored 50 meters ahead. It continues smaller, sloping down. But further mapping will have to wait for the next trip, as they had to continue on to Monclova to pick up Mónica Grissel Ponce González, president of the Asociación Coahuilense de Espeleología.

The next day they drove back and

bev@purificacion.org
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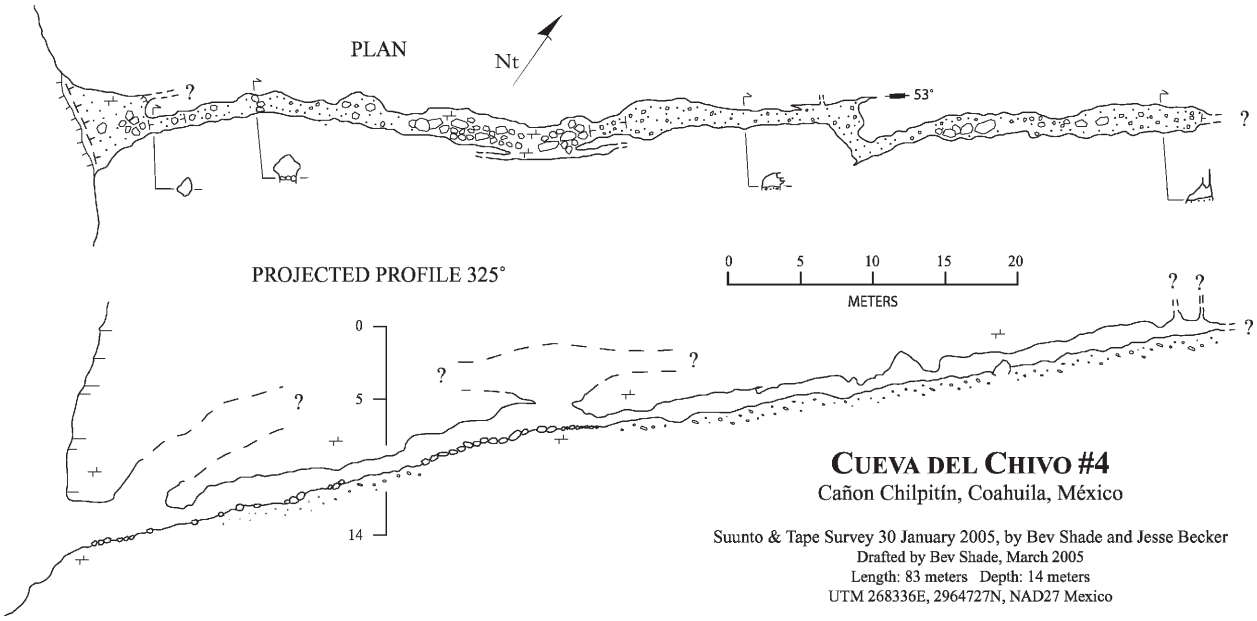
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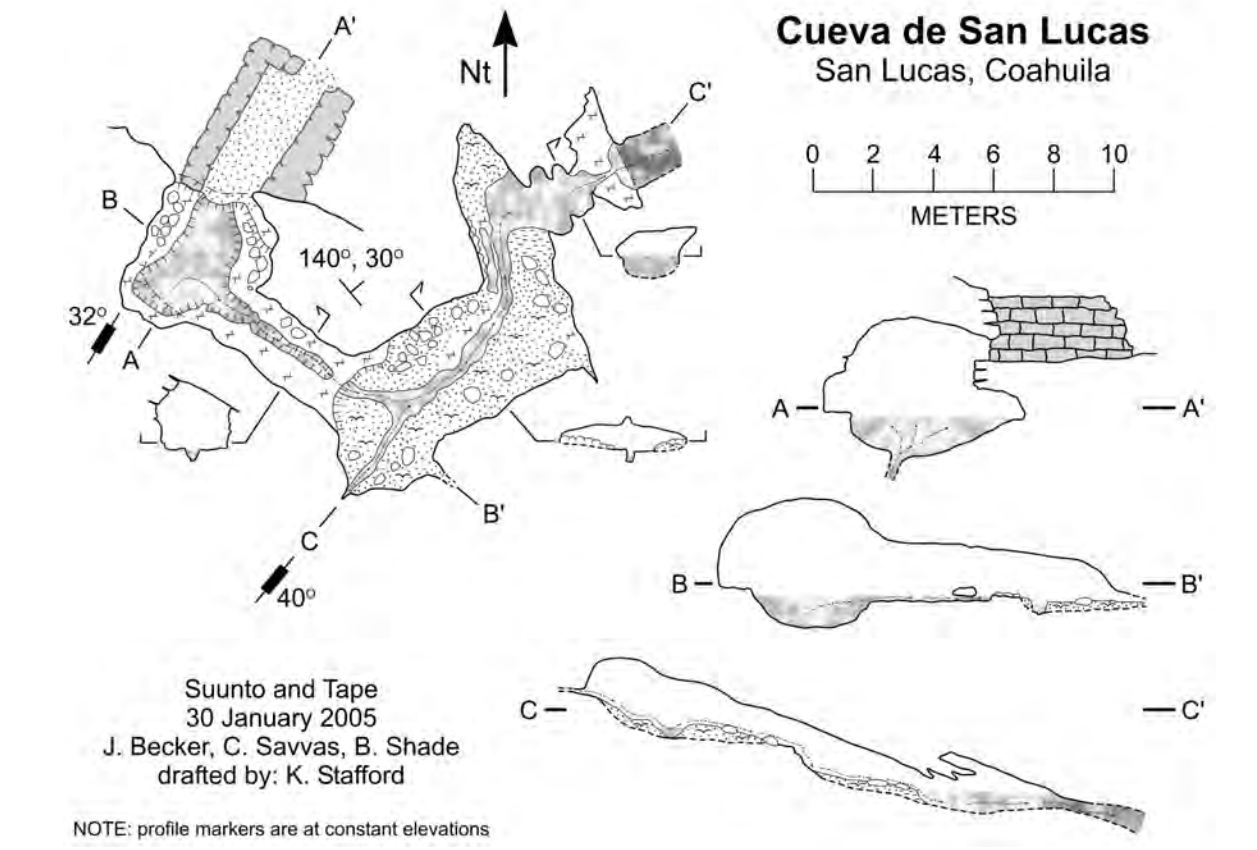
CUEVA DEL CHIVO #4
Cañon Chilpitín, Coahuila, México
Suunto & Tape Survey 30 January 2005, by Bev Shade and Jesse Becker
Drafted by Bev Shade, March 2005
Length: 83 meters Depth: 14 meters
UTM 268336E, 2964727N, NAD27 Mexico


Cueva de San Lucas
San Lucas, Coahuila
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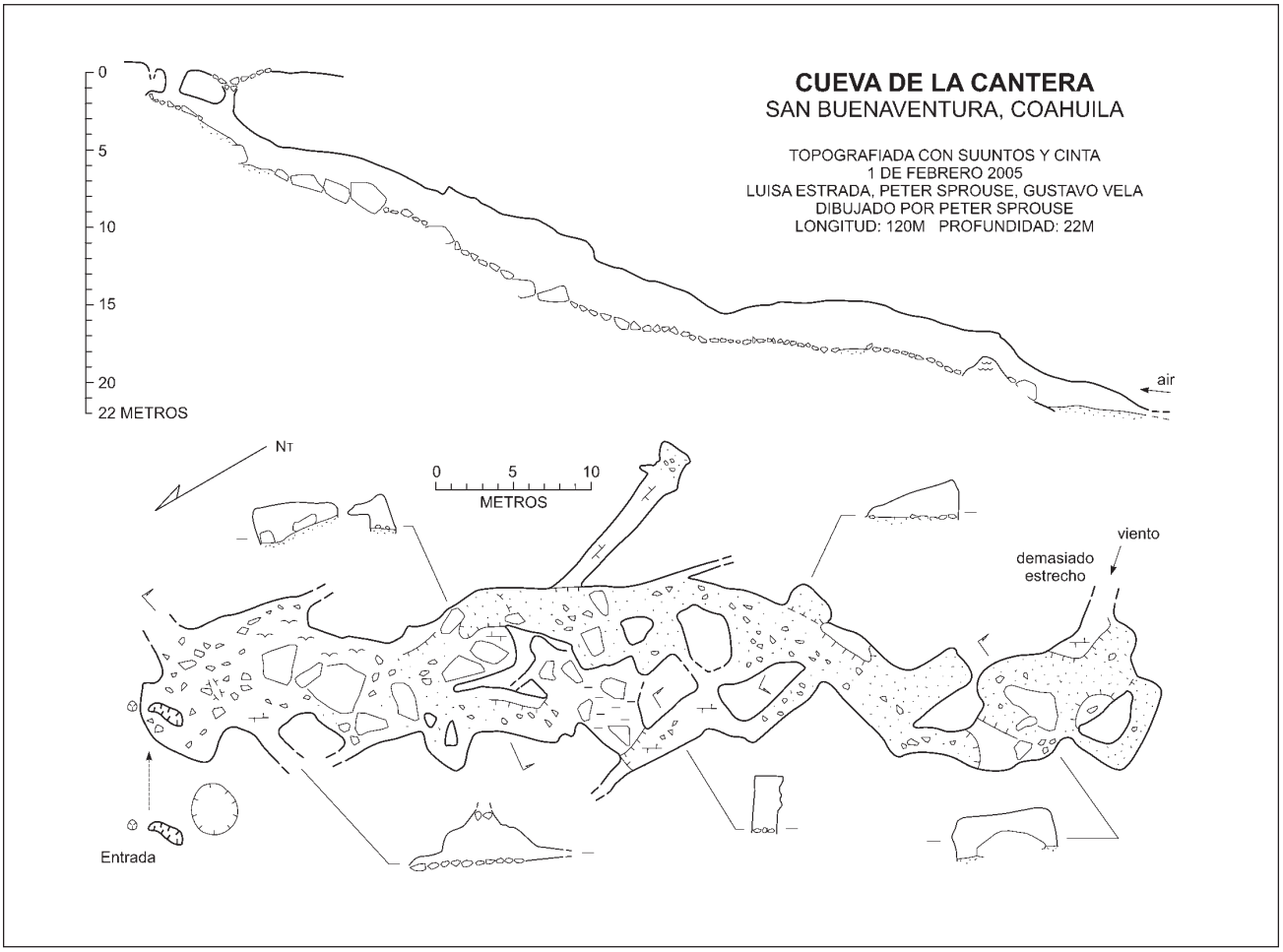
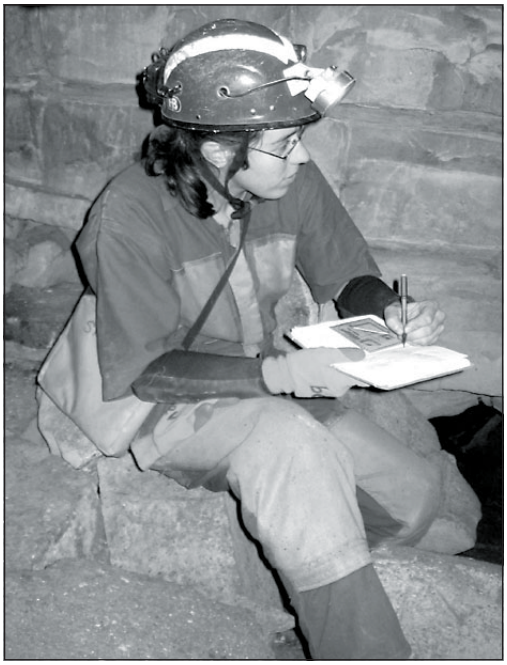
Suunto and Tape
30 January 2005
J. Becker, C. Savvas, B. Shade
drafted by: K. Stafford
NOTE: profile markers are at constant elevations

Charley Savvas and Jesse Becker in Cañón Chilpitín. *Peter Sprouse*.



Above: Jesse Becker at the entrance to Cueva del Geko. *Charley Savvas*.

Below: Bev Shade sketching in Cueva de la Azufrosa. *Peter Sprouse.*



forth through Monclova looking for a spring shop to add a leaf to Bev's truck, to no avail. So they drove southeast of town to Chilpitín Canyon, which penetrates the core of the Sierra la Gloria, a place Peter had wanted to visit for many years. They picked a way across the desert to the canyon entrance. Entering the canyon, they could see a number of entrances high on the walls. The group stopped at a ranch house and learned that some on the south side, which looked like they could be reached by an interesting climb, were called the Cuevas de Belén. The reputedly largest cave in the canyon is called Cueva del Salitre, and a rancher named Pancho Torres said he could take them to it in a few days. Farther up the canyon there is supposed to be a pictograph cave.

On 29 January they were joined by New Mexico Tech geology students Kevin Stafford, Laura Rosales, Megan Curry, and Brendan Headd. Everyone set off to track down a lead on a pit near Cuatro Ciénegas, but they couldn't connect with the guide. Asking about sulfur springs, they heard about some in the Ocampo valley. They picked up one of the Rancho Agua Verde owners in Cuatro Ciénegas and drove an hour north. The ranch is due east of Ocampo, in the middle of the alluvial valley. There they saw three springs, one of which Laura sampled for sulfurous water.

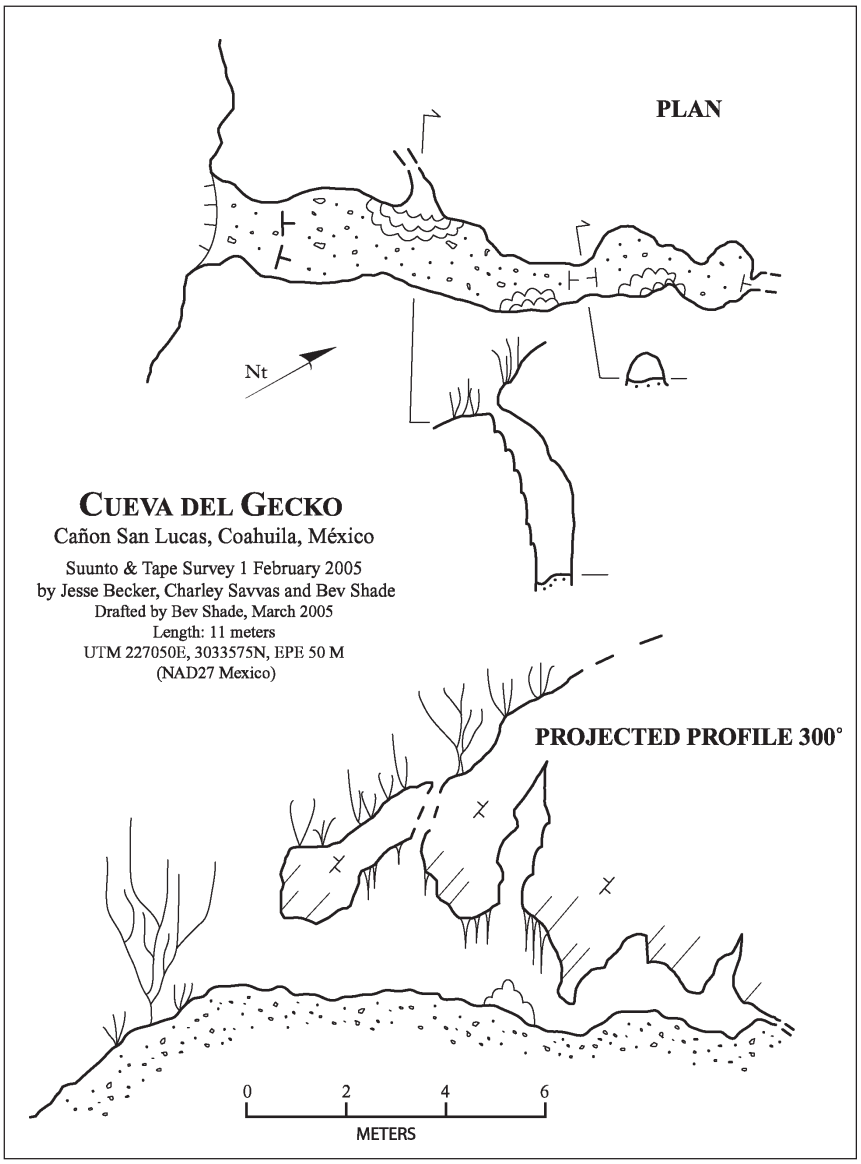
On the following day, Kevin's crew set off 10 kilometers north of San Buenaventura to Santa Gertrudis to look at a La Azufrosa spring, where they collected water samples, and then they headed to Nuevo León for a few days. Bev, Jesse, and Mónica went back to Cañón Chilpitín to check leads there. The guide who knew the location of Cueva del Salitre was busy herding goats, so they explored farther east into the canyon, accompanied by his 10-year-old son, Manolo Torres. They drove far enough up Cañón Chilpitín to get into oaks and mountain laurel, where Manolo led them to several short, shelter-like caves with fairly well-preserved pictographs. Don Emiliano Aquirre, another local rancher, referred to this group of caves as Cuevas de los Indios. The Cuevas de los Indios appear to be small paleosprings that issued on top of a thick bed of limestone along a northeast-southwest cliff face. The paleosprings are smallest to the southwest and enlarge to the northeast. Don Aguirre also told them that way up in the mountains there are more pictograph caves that he had visited as a young man, and he described the approximate location of a road that climbs the south side of the mountain.

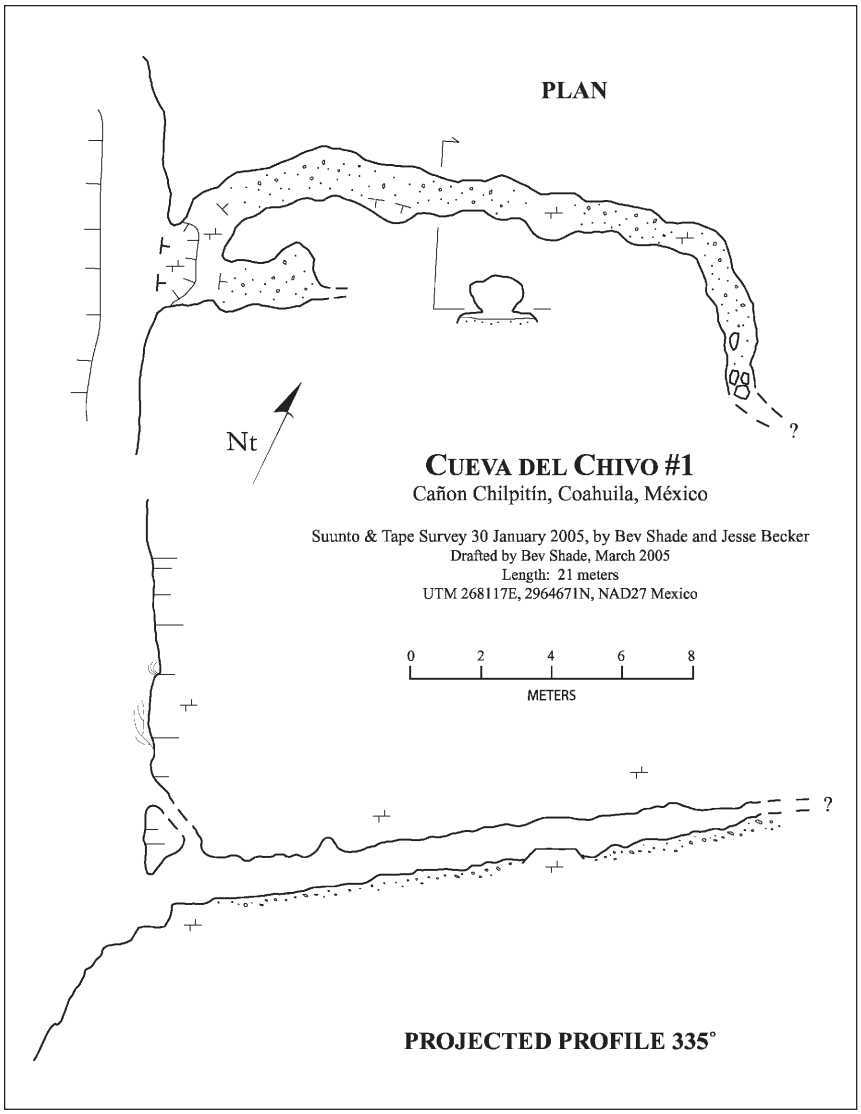
Charley and Peter went into Cuatro Ciénegas to try to visit a guano cave they'd heard about, but couldn't convince the guide to actually leave town. They gave up and headed back to the Ocampo valley, stopping to look for biologist Dean Hendrickson along the way. At Rancho el Retiro they heard of large caves and a "*hundido*" at Palos Verdes, with access via Ejido la Victoria, but they found by consulting the new book from the Italian cavers that those caves had already been checked. So they asked about caves at Ejido el Oso, and heard about one in Cañón el Guano to which they could be taken another day. This is likely one visited by Charles Fromen and others in the early 1980s. They drove up to the *ejido*'s water source at Los Ojitos, where considerable water comes out of some fifteen springs developed in alluvium and bedrock. Two of these come out of very short caves, where they did some collecting, finding cave crickets, spiders, and *tachys*. They sketched the longest cave, Cueva los Ojitos no. 1, some 5 meters to a sump dig.

The group was enlarged that evening by the arrival of Gustavo Vela, Luisa Estrada, Leonard Pruitt, Geoff Hoese, and Brian McMillin. Thus fortified, they organized three teams on 31 January. Geoff, Mónica, Leonard, and Charley headed south to go to a guano cave marked on the topo map south of Monclova in Nuevo León. After many hours checking roads they reached the site in late afternoon. There are two pits 50 meters apart with old steel ladders in them. They seemed about 60 meters deep, and one had a strong guano smell. They did not explore them due to lack of time and gear.

Gustavo, Luisa, and Peter tried to visit Cueva el Hundido in the Sierra la Rata, but could not find the guy with the key. So they drove west to San Antonio de la Cascada, where they checked out some of the springs west of town. They are slightly thermal. Then they went to La Cascada, where diverted water drops off a 30-meter-high travertine mesa. There is a scenic grotto behind the falls, and they were able to climb up onto the mesa. They followed the stream for nearly a kilometer to find two springs, one in alluvium and one in travertine, neither enterable. Once back in San Antonio de la Cascada, they heard about a cave above Ojito la Tacita and got guides to take them there. They drove through an interesting travertine quarry and parked just above it. The cave was 100 meters up a slope from there. Luisa dropped 2 meters into a broad, sloping stoopway. After crawling over sacks of blasting mixtures, she found that the cave goes at least 50 meters and continues. They then took the guides home and drove north two towns to San Antonio de las Higueras, where they heard about a cave at San Lucas with a sulfur stream in it.

The crew of Bev, Jesse, and Brian returned to Cañón Chilpitín and were led by Pancho to several of the cliff caves that had been spotted on the first visit. During a steep hike along the south side of the canyon, they mapped Cueva del Chivo #1 and Cueva del Chivo #4 and attempted to climb into another cave about 5 meters above the trail. They quickly determined that the climb needs a rope, as it is above a narrow ledge, perhaps 1.5 meters wide, above a drop of some distance. All of these caves, including several other short, flowstone-choked holes, appear to be small phreatically formed conduits that have been intersected by the cliff face. The conduits have minor vadose modifications, like downcutting into the floor. They probably led to small paleosprings like the Cuevas de los Indios. They are fairly horizontal, sloping gently toward the cliffs. There is airflow in some of these caves that seems to be circulating from higher up the cliffs, where more recent vadosely enlarged fractures have intersected the older conduits. Cueva del Chivo #4 is over 80 meters long, and Cueva del Chivo #2 was mapped for over 20 meters to a restriction that could be easily dug open. They also surveyed Cueva del Salitre, on the north side of the canyon within sight of the Chivo caves. Cueva del Salitre is a much bigger paleospring, probably a major resurgence in the canyon in the past. Later, Salitre became a well-decorated active, air-filled cavern for a period of time, as indicated by the large old flowstone and draperies along the first 20 meters of passage. The scenic entrance is about 8 meters tall by 8 meters wide, but the floor quickly rises to intersect the ceiling of the passage, so that the cave is less than 70 meters long. The fill is



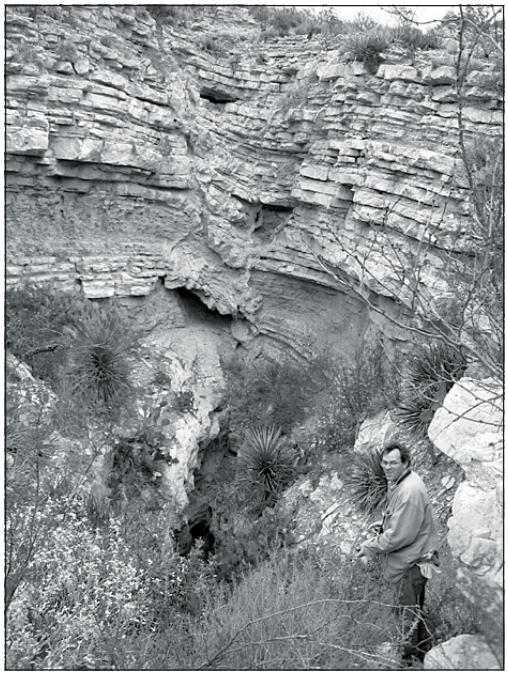


Charley Savvas, Jesse Becker, and Bev Shade at the entrance to Cueva de la Azufrosa. *Peter Sprouse.*

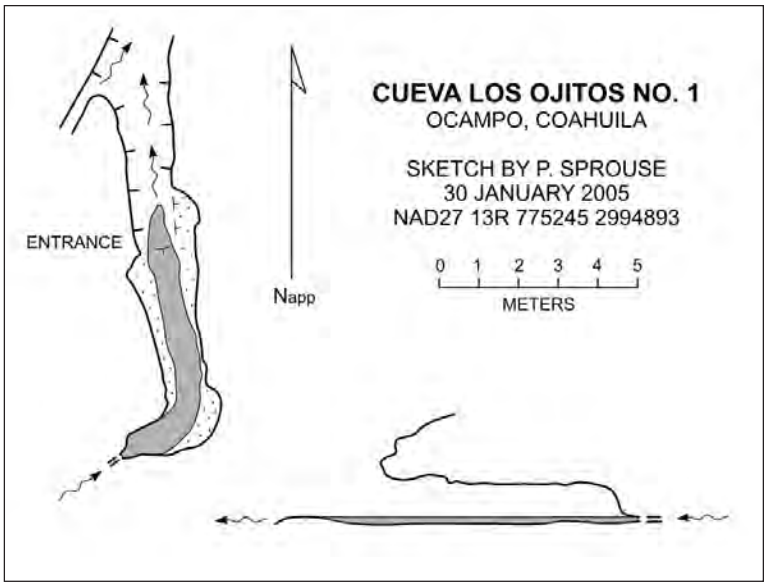
dry and sandy, with several holes along the east wall that have been excavated in modern times. In the last 20 meters of the cave, small gypsum needles are forming in the dry sediment. The very end of the cave is blocked by dry, compact clay, an older fill than the loose sand filling the rest of the cave. All of the Chilpitín caves serve as shelter to the many goats raised in the area, and they are dusty, with lots of goat scat and hair, as well as rodent refuse. A dust mask is recommended for exploring caves in this area.

Bev, Charley, Geoff, Mónica, and Jesse went to check the San Lucas area the next day. They found several freshwater springs as they approached the *cañada* and then reached the sulfur cave. There are ruins of an old spa from 1906, where people soaked in the thermal waters. Cueva de San Lucas has a travertine blockhouse built at the entrance, with a spring pool just inside. The cave water has a strong sulfur smell and flows 20 meters to a sump, with all kinds of interesting minerals precipitating on top of guano, as well as what appeared to be snottites. The cave stream is fast-flowing, even where it enters the sump.

The cavers hiked farther up the canyon and found several more small caves. There, Charley, Bev, and Jesse mapped a small cave that was inhabited by two large geckos; they called it Cueva del Geko. This cave is a vadosely enlarged fracture that runs roughly perpendicular to the canyon at that point. It is mostly filled with loose sandy material that has clearly been excavated by hand in two places. The first is a restriction that leads to the back chamber where the geckos were living, and the second dig is at the very end of the cave. The cave is well decorated with inactive formations, but most of these have been broken, probably by the same people who had been



Geoff Hoese at one of the guano caves in Nuevo León. *Charley Savvas*.

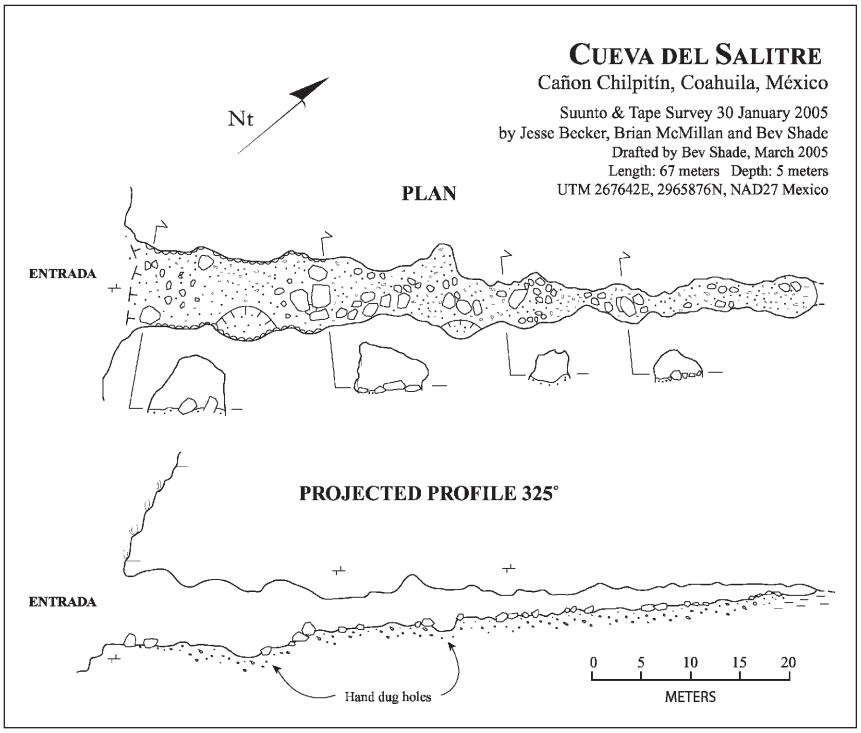


digging in the cave.

Leonard, Gustavo, Luisa, Brian, and Peter went back to Cueva de la Cantera, by the travertine quarries. It follows the plunge of the anticline down for about 60 meters to where it gets too small. They also mapped a loop through several right-angle turns. Then they tried to follow the road around the mountain to the northwest, but it was fenced off, so they returned to the highway. At San Lorenzo, they asked about going to Cueva el Tulillo, but the *comisariado* wasn't home, so they couldn't get the ranch key. Then they drove southwest of the quarries toward Trincheras, asking about caves at a travertine-block loading-station. They heard about several caves at El Terrero, but it would have been necessary to get a key from the owner in Monclova.

The next day the expedition vacated its base in San Buenaventura and headed into Monclova to meet a guy whom Mónica had met in the cyber cafe. He agreed to guide the group up onto the western foothills of the Sierra la Gloria to a 4- or 5-second pit that he had found while running above the dolomite quarries. They worked their way through the quarries, acquiring permission along the way, and passed them not long before a blast. They spread out to search for the meter-diameter pit, to no avail. Driving south out of Monclova, Peter had the misfortune of getting pulled over twice, lightening his wallet each time. Several of the crew were ill in the stomach, so they stayed at a hotel in Monterrey, while Charley, Mónica, and Peter joined Kevin's crew camped at Potrero Chico, Nuevo León. They had visited Carrizal since leaving the others. The new arrivals roused them from bed and all enjoyed a campfire until it began to rain all night.

The next few days were spent at the UMAE congress in Monterrey, where several of the group gave papers and many new acquaintances were made. The evening of 4 February, eight of the remaining group went to meet Becky Jones at Minas Viejas, but couldn't get



through the ranch gate. So they went a bit farther north and camped at Rancho Cerro Colorado instead. In the morning they drove into a canyon of the Sierra de Lampazos to find a lead in a cliff north of Cueva de el Tule that had been seen years before. Laura, Charley, Bev, and Peter hiked up the lechuguilla-covered talus to it, but at the base of the cliff they faced an 8-meter climb for which they lacked technical gear. Kevin, Mónica, Brendan, and Megan looked for caves in other parts of the canyon, but didn't find anything. All drove into Bustamante for the closing remarks and dinner of the congress.

Coahuila

Justo antes del congreso de la UMAE en Monterrey, espeleólogos de los Estados Unidos y miembros de la Asociación Coahuilense de Espeleología buscaron cuevas en Coahuila. Varias cuevas pequeñas fueron visitadas y topografiadas.

Marike Suzan Jasper
June 14, 1963 – April 4, 2004

Marike Suzan Jasper came to Mexico from the Netherlands to pursue her passion for diving in 1998. She started a dive business in Cancún, and it was at this time that she first discovered the amazing caverns and caves of Quintana Roo with which she fell in love. Marike became cave certified in March 1999, and cave diving quickly became an all consuming passion for her.

Shortly after her full-cave certification in June 1999, Marike began exploration of a new cave that she named Sistema Crustacea. Crustacea was too prove to be a very important cave from a scientific point of view, with a unique biology, and Marike was very protective of this fragile environment that she cherished.

Marike took part in several other exploration projects during which she made valuable contributions. She was an accomplished and talented cave diver, artist, and cartographer and used her skills to produce many detailed and beautiful maps and illustrations of the caves and caverns of the area. She donated many of these maps and illustrations to authors, scientists, landowners, and local cave- and cavern-diving safety organizations in an effort to help promote safety, conservation, education. and the study of the caves and caverns of the area.

As well as being a PADI Open Water Instructor, Marike was an active cavern and cave guide and had logged her five-hundredth cave dive just before her death.

Marike passed her love of the caves and caverns on to many people from all over the world, and her enthusiasm and passion were infectious. Many people were very shocked and deeply saddened at her passing, and she left a big void in the local cave diving community. We will miss her energy, enthusiasm and genuine love of cave diving.

RIP Marike.—Steve Bogaerts

Marike S. Jasper was a colorful and vibrant caver who made her home in Quintana Roo, Mexico. She chose to live in an area where her artistic and cartographic talents could be expressed though underwater cave and cavern maps. Cartography was a passion that Marike held close to her heart; she was never without a new project that could be shared with landowners and cave divers alike.

With instruction and encouragement from her mentors, Marike started her career by portraying the underwater caves in the X-calak region. As her drawing matured, she penned both large and small caves, with a half dozen maps to her credit. Maya glyphs and sky band borders adorned her work, expressing recognition of past culture and her ever-present devotion to the people of Quintana Roo.

Marike was also involved in innovative exploration. Her discovery of Cenote Crustacea and her astute evaluation of the cave life within this cave are perhaps her greatest legacies. Although she never completed a map of this cave, she opened a new and exciting door for many scientific investigators.

Marike left a void in the local caving community when she took her life near a cenote she loved and cherished. We will miss her presence, her cartography, and the contributions she had to offer as a caver and friend.—Jim Coke

DURAZNO AREA, DOS AGUAS, MICHOACÁN

Christmas 2003–New Year's 2004

Chris Lloyd

This expedition began, like most others in Mexico, with car problems. We all figured that since the Catalans had just finished having their old truck tuned up and fixed, they would be fine, but it didn't work out that way.

The advance team of Sergio Gómez, Susana Salazar, and Jordi Fernández from Catalonia and Taco van Ieperen and Lara Arnott from Canada left Guadalajara a couple of days before Christmas with the idea that I would catch up with them once family duties were out of the way. Vicente Loreto of Mexico City was able to leave Guadalajara with me on Xmas morning to meet the others down on the beach in western Michoacán. No time was spent dallying in the surf, and the two vehicles headed into the hills. Unfortunately one of them didn't make it very far. Shortly before getting to Coalcomán, the old Nissan the Catalans had bought for their Mexican caving tour stalled out. Attempts to revive it by pulling out a large worm-like thing that was blocking the fuel filter provided only temporary relief. Fortunately those in the second vehicle were able to locate a country mechanic who agreed to have a look at it on Christmas day. One beer later, the second vehicle became the only vehicle, as the first one was grounded until various parts could be acquired.

Leaving the Catalans behind to camp in the mechanic's back yard, the Canadians, Vicente, and I headed up the hill to relocate our old campsite in the dark. Everything went well until 50 meters from camp, where the old road turned out to be overgrown, and a temporary camp was set within spitting distance of where we should have been. A few minutes with the saw in the morning cleared the way to our old haven by the creek, and a new camp was made before noon. The crack of noon even had us out the door to go caving.

Our first target was a cave that Vicente and I had briefly explored in shorts on the last day of our previous trip four years before. The entrance was even more impressive this time, as the locals had trimmed the branches on all the spruce trees in front of the it, allowing a lot of natural light into the opening 30 meters wide by 8 meters high. All the spectacular roof pendants glowed warmly in the diffuse light, casting weird shadows here and there over the large, open chamber. This is just the kind of place one would expect ancient cultures to have visited, but no sign of them was noted. We headed right back in to the middle part of the cave to start checking the holes in the floor that we had noted previously. The plan was to drop down one of these straight into the end of Cueva del Río Durazno (see *AMCS Activities Newsletter* 24, pages 67–70) and give ourselves a nice short-cut. Taco checked out a couple of likely looking targets in the 9-meter-wide main passage just before it makes a jog to the right, with no success. Then Vicente disappeared down a side passage that we had not noticed before. Shortly his shout of a pit brought us running over that way.

The side passage is comfortable walking size, with a flat floor and walls covered with popcorn up to a distinct line at waist height. It opens up to 5 meters wide, and a drop in the floor requires a traverse along the left to pass. After a few more meters, a real pit appears that drops out of sight. This was just what the plan had ordered. After setting up two slings, Taco headed down to place a bolt at the point where it went vertical. Nine meters later he landed on a floor of boulders that appeared to be plugging the rift, and exploration in both directions confirmed that. This was not part of the plan. But there is a continuation of the upper passage on the other side of the pit, so Taco climbed up 6 meters into it and managed to continue another 10 meters before running into the back wall. This must be part of a different plan.

Not wanting to come back later to survey this, we started the survey there by throwing the tape across to Taco, and while he finished derigging, Vicente and I surveyed back to the main passage. Once there, we continued the survey into the cave, capturing the most impressive part, with its subway-tunnel-like nature, dead straight, flat-floored, and more than enough room to swing a cat. Tunnels like that never last, of course, and this one ended by getting even bigger, over 10 meters wide, with an irregular floor and more tempting but

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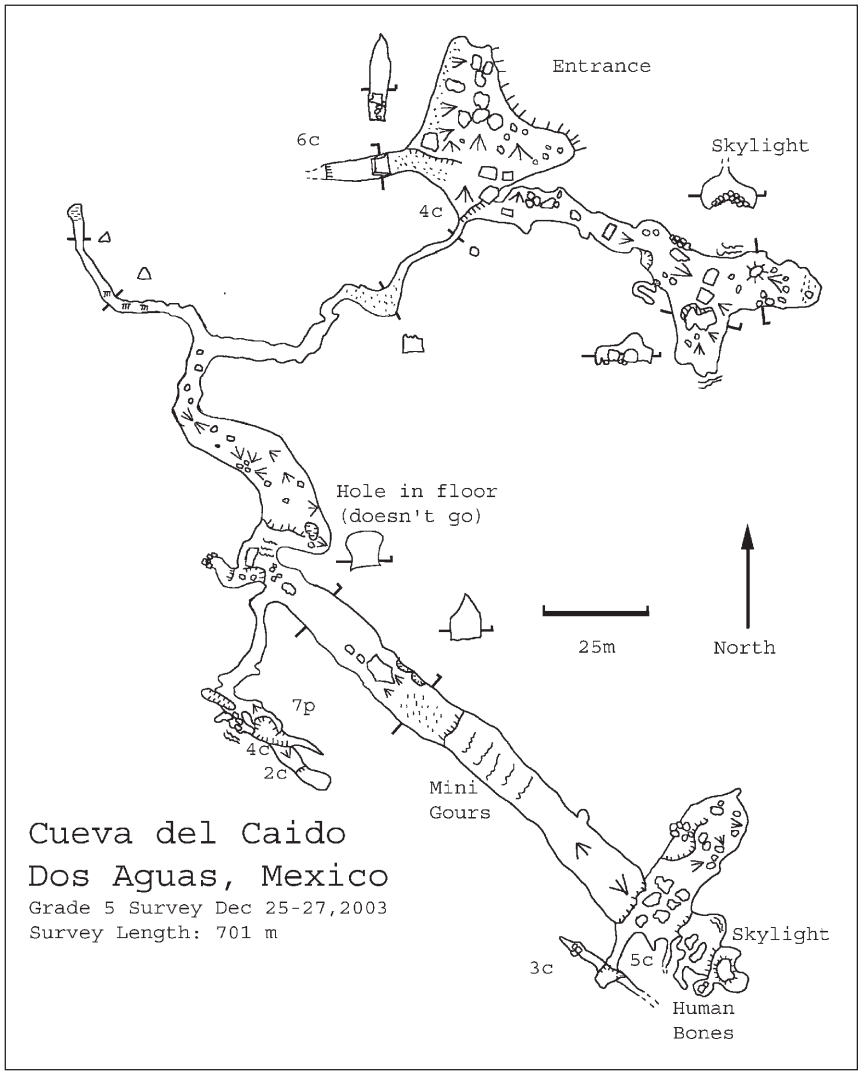
choked holes in the floor. A climb up out of this passage ends in a large but low-ceilinged chamber with some large blocks and stalagmites. Ways on could be seen to the left, right, and ahead. To the left, going down and up over blocks, we reached another room, with no way on and yet another hole in the floor that wouldn't go. Straight ahead, one has to climb up through blocks before popping out into a chamber with a skylight about 8 meters above. This second entrance would account for the strong draft felt in the smaller bits of passage back near the large horizontal entrance. The plan was looking like it needed revising at this point, so we called it a day with 350 meters of survey. It was at this point that Vicente happened to notice at his feet the skeleton of someone who had not survived his fall from above. Half the skull was missing, but the spinal column led down to a couple of femurs and other leg bones. Hard to say how old he might be, but probably not too ancient, or he would have been buried by more debris over the years. Could have used a better dentist, too.

Boxing Day had Taco, Lara, and Vicente heading back into Cueva del Caida (Cave of the Fallen) while I guarded camp. They started by pushing the skylight-entrance area and the holes through the blocks off to the right from the final chamber, all to no avail. Continuing the survey back down the main passage towards the horizontal entrance, they picked up the side passage on the left before the low bits pop up into the big entrance. But before going out the big entrance, they went through the blocks on the right side and came out into another large chamber with another skylight entrance and yet another hole in the floor, choked of course, that was likely the one Vicente remembered from the previous year. This time his light was strong enough to see it wasn't a pit and that there were pottery fragments in various parts of the chamber, finally some evidence that the ancients had been in this area. But no more human remains. Their survey topped out over 400 meters, bringing the length of the cave up to 754 meters, which was a nice start to the trip. Late that afternoon the Catalans showed up in camp, after getting repairs done to the truck and a little extra, unintended sightseeing on the last part of the way—something about their two GPSs not getting a signal or some such thing.

Back up to full strength people-wise, and having killed the short-cut plan, we decided it was time to head back into the main cave, Cueva del Río Durazno and rerig the route into the fourth sump. I led Susana and Jordi back into the depths and was quite curious to see what changes had occurred during our four-year absence. The first was that the entrance climb needed to be dug out from under a layer of logs washed in by the river, and then the next one was that the first contact with the stream had gone from a calf-deep dip to a waist-deep splash. Ahh! The rest of the initial stream passage was much the same as before, with the first splash being the deepest, fortunately. The first bypass appeared to have flooded to the roof, and we had to scrape mud out of the back-up spit, as a bolt had not been left in place. The Catalans marveled at the size of the Boring Stompway, as apparently the active streams in their part of Spain aren't typically very large. Fortunately the rope tied off at the second sump bypass was still in place, and Susana headed up first, as she was the lightest of the three. Aside from being very muddy, the rope seemed fine, and we continued up the big ramp beyond. Again there was no trace of our previous passage aside from the rope, so the whole ramp must have flooded to the roof as



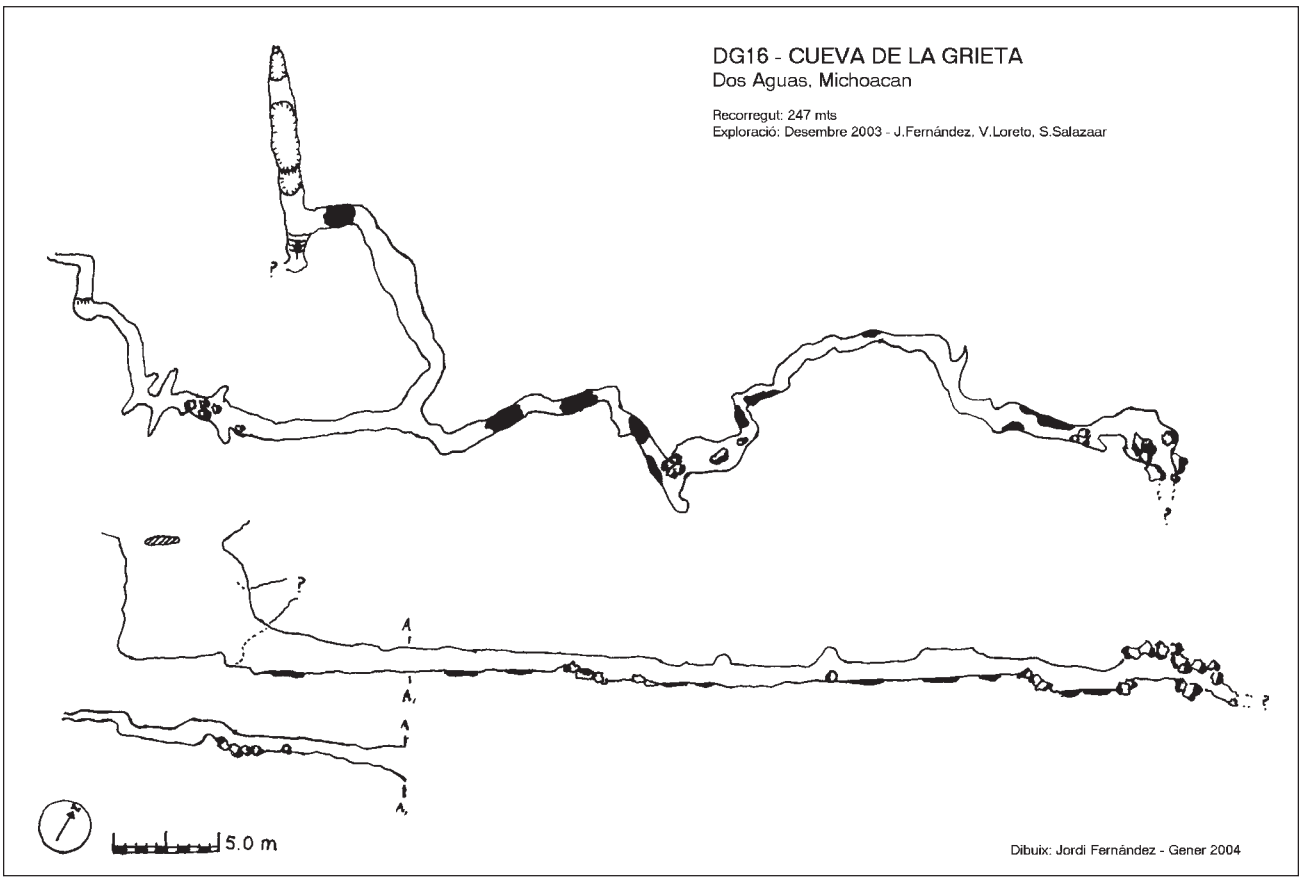
The entrance to Cueva del Caido. *Chris Lloyd*.

well. That means the water rose some 50 meters above the normal river level. Glad we weren't there.

Rigging down through the blocks to Chupabotas and Chupalámpara was the joy that was expected. Everything was covered with mud, and tying slings around huge blocks required two people just to reach around. It took two hours to rig 70 meters of rope through the obstacle course to the top of the drop into Lago Osioso (Good for Nothing Lake). But at least the way on was now prepared for the next team to push on to the end of exploration and see what lay beyond.

Meanwhile Taco, Lara, and Sergio were out prospecting for entrances and had turned up two right up above the road, above the entrance to Durazno. One was quite small and marked by a symbol (an X inside a circle) indicating that it had been mapped and by another symbol that we figured must have been placed by the Draco group. The other was 9 meters wide by 6 meters high and continued on with similarly large passage to a larger room with a rift in the floor and a strongly drafting tube in the wall. As the tube looked very small and nasty, Taco figured a sketch was all Cueva del Tubo warranted, and they continued on their way down the valley to look for more. Late in the day, Lara found a steep-walled doline with a 17-meter pit in it that Taco dropped to scout out. It continued in large passage, and he left it for another day. Sergio dropped a small pit up a side valley, but it was blocked at the bottom.

The next day saw Taco, Lara and me headed out to map Lara's find of the previous day, while Sergio and Vicente headed in to push the way on in Durazno. The 17-meter



pit was rigged off a tree up the slope and is a beautiful free drop, 5 meters wide by up to 10 meters long at the bottom. A further drop of 5 meters gained access to the tall rift going into the cave. The floor in the first part is mainly mud with some rocks, but it has some mini-gours coming in from a nice drapery on the right side farther in. We started climbing over rocks and boulders as the 8-meter-wide passage dropped down and got wider. A side passage goes down to the left, while the main branch continues on. Going down, we found a couple of spots where it looked like water flows down, but they are choked with mud. Past the lowest point, the passage heads back up and then drops down a pit that looked about 8 meters deep, but with no way on visible at the bottom. We had no rope to check for sure. Checking some small side passages in the down-trending stretch, we ended up back in the main branch, which closed off quickly. With the survey out of the way, we proceeded to take photos.

Once back in camp, we had a long wait to see how things went with the team pushing Durazno. It was almost midnight and everyone was wanting to retire to the warmth of their sleeping bags (night time temperatures dipped below freezing most nights) when they finally appeared. Over a few fresh logs on the fire, the story turned out to be quite short. They had reached the previous end of exploration and done the expected traverse over to the window only to progress 5 meters horizontally before the passage went up a dome. Ugh! This wasn't part of the plan either. Having done all they could, they derigged back to the ramp. Upon further queries, it turned out there is also another dome just inside the room we had stopped in before, and it is probably that one that is taking the majority of the breeze, as the dome beyond the window had little, if any, air flow. Which is a good thing, as it was estimated to be about 15 meters high, while the closer one taking the air looked only about 8 meters or so high. Scaling the dome with a drill seems to be the next plan, but will have to wait until we can find someone with such an item.

December 30 was as long as Taco and Lara could stay on the expedition, so I gave them a ride down into Coalcomán and used the opportunity to pick up Victor Hugo, who had been along on the last trip four years before. Susana and Jordi explored one of their

Lara Arnott under the skylight in Cueva del Caido. *Taco Van Ieperen.*

finds north of camp. Cueva de la Grieta (Crack Cave) starts out as a 10-meter rappel in a meter-wide rift or surface crack. It continues as a tall rift passage for about 200 meters before hitting a breakdown pile that only Susana could pass through. She continued on another 20 meters in the rift before hitting another breakdown pile that, not having backup support, she did not push. Later in the afternoon, they went out with Vicente to the northeast of camp to locate entrances and found two above one of the logging roads. Once back in camp, I decided to have a look at the sink closest to camp, which Vicente had noticed was blowing strongly. Here was a lead, all of 10 meters off the trail, that we all had been walking right past for two whole expeditions. But it was blocked by cow bones, so I began pulling them out, along with the rocks and mud that were holding them in place. After an hour's digging, something of a way on could be seen, but it still looked pretty bleak. But with that kind of draft and that close to camp, it warranted a bit more effort.

The last day of the year saw Susana, Jordi, and Vicente going in to survey Cueva de la Grieta. The boulder choke proved to be as tight as before, so they surveyed only 200 meters, leaving further progress to a thin team of the future. Meanwhile I was able to convince Victor to help dig cow bones at Cueva de la Vaca, and after an hour's work removing the rest of them, we managed to break into open passage. Victor squeezed into the opening, which is a hands-and-knees crawl, and squirmed his way down 7 meters of even smaller stuff before popping out into walking passage. He checked out about 30 meters of that before returning with the good news. Later in the afternoon, Sergio and Victor headed out scouting to the east and northeast of camp, but came back with nothing except a sighting of one of the springs that feeds the nearby stream.

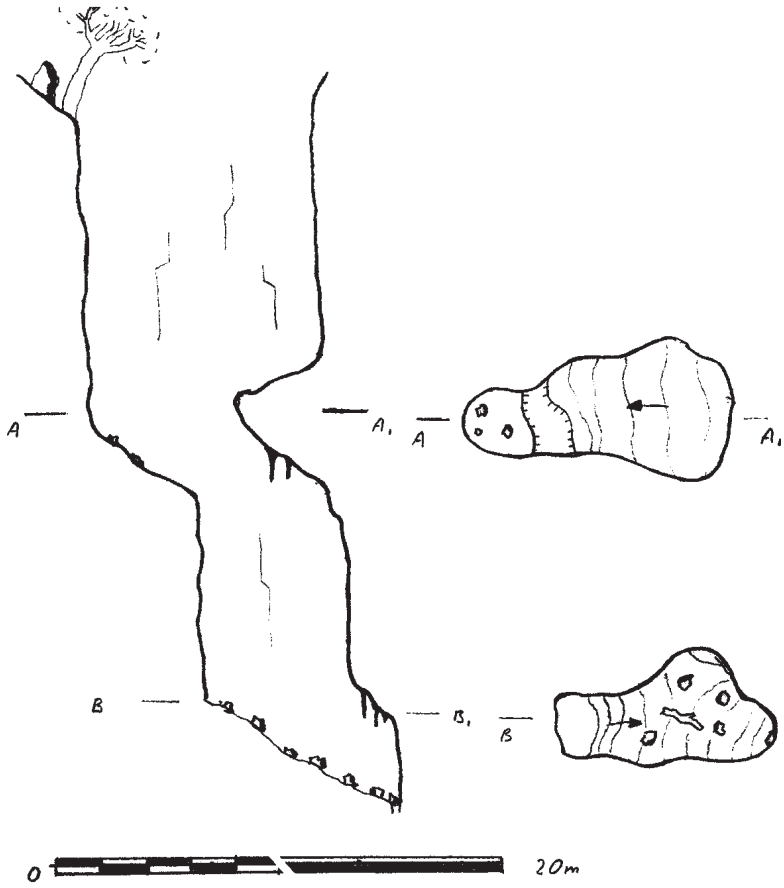
New Year's Day got off to its normal slow start, with Sergio, Susana, Victor, and Vicente heading off down-valley to look for a big entrance that I remembered seeing on my first trip into this area. They checked all of the likely areas with no success, prompting me to figure that it must be located off a different road, probably due south of camp off the main road to Dos Aguas. Meanwhile, though, Chris was off scouting for entrances to the north of camp, making it all the way out to where Magdalena is marked on the map. A number of very promising dolines were scratched off the list, and one short cave was finished, as it goes in only 35 meters. Its entrance, 3 meters high and wide, sure got the hopes up, though. A number of other entrances were noted but not entered, as they needed climbing or crawling that wasn't going to happen wearing shorts.

With only two days left to explore and dwindling going leads, we felt that it was time to check out some of the leads found by Ruth Diamant on our previous trip. Some of them sounded very enticing, so two teams set off to the west, leaving Victor guarding camp. (That's what happens when you don't get up early enough.) Before

DG22 - CUEVA DE LOS ESTRIBOS

Dos Aguas, Michoacan

Desnivess: -7 mts
Recorregut: 14 mts
Exploració: Desembre 2003 - J.Fernandez



Dibuix: J. Fernández. Març 2004

Taco van Ieperen in the entrance to Cueva del Tubo. *Lara Arnott.*

getting over to the area Ruth had checked, we came across a pit right by the trail. After the normal kafuffle one expects when there are four people trying to rig one drop, Jordi dropped the 7 meters to the floor to confirm that it was a blind pit. He brought back up two old but fancy stirrups, giving the cave its name Pozo de los Estribos. We all then continued on to locate the first entrance on Ruth's list, which turned out to be taking a stream. The actual stream entrance did not look too inviting, being less than a meter wide, but a large dry entrance was located off to the right. This 10-meter-wide entrance obviously used to take the stream, but repeated flooding seems to have blocked it and allowed the stream to be pirated to its present entrance. Not to be deterred, though, Jordi managed to locate a drafting spot on the far right of this entrance and began pulling logs out. Sergio leapt into the fray, and together they quickly progressed about 4 meters at a steep downward angle, but then gave it up, as it looked like it might go on like that for some time. Vicente and I left at this point to look for the second entrance on Ruth's list, leaving the Catalans to contemplate the wet entrance.

About 300 meters to the south, just out of the same large doline, a large pit appeared beside the trail. This pit 4 meters wide by 8 meters long appeared to drop about 12 meters into a tall rift that disappeared around a corner. A goer if there ever was one. I rigged the rope while Vicente geared up, and a rebelay at the lip had Vicente down the drop. A quick check of the bottom, though, revealed that just around the corner the tall rift was blocked by mud and logs. Another dud. More great expectations dashed. So much for the great promise of Ruth's leads.

The backup plan was to move on to the fifth one on Ruth's list, as it was close by. After taking a roundabout route up the active streamway, Vicente and I crashed downhill into a large doline. The Catalans, having declined to drop the 5-meter-deep pit taking all the water in the first cave, were coming in from the other side to see who would find number 5 first. Despite checking everything in the large doline twice, no one found any sign of the supposedly large entrance described by Ruth. Hmm? So much for GPS coordinates. The two teams then headed off to the northeast to check out that area and ended up circling around back to the truck, with only the Catalans finding an entrance, which was blowing, but needed digging.

The last day was derig day, but we figured we needed to squeeze a few more meters of survey out of this trip, so the five of us headed into the large cave Taco had wanted to only sketch, Cueva del Tubo. Sergio, Jordi, and I surveyed in, while Susana and Victor went on ahead to work on the drafting tube. The very tall rift passage branches just in from the large entrance chamber, with the left-hand side going in a loop to join back in almost under the entrance. The roof of the right branch comes down to where a flowstone blockage almost cuts off the big chamber beyond. A steep slope leads down into that chamber, which heads off to the right, with a parallel rift in the floor below. No way on could be found out of the lower rift. Another room is located off the left end of the chamber, but a small opening in flowstone would have to be hammered open to enter it. This left the small tube that Susana was working on, hammering to make it a bit bigger. By the time the survey was done, Susana was ready to try and drop the tube where it goes vertical, and she used me as a backup anchor point while setting a spit at the top of the actual drop. The sounds of her struggling to pass the next tight spot were not very encouraging for those of us up top, who are all considerably bigger than she is. But she got through, only to run out of rope, with large passage appearing below. So it was with this large passage beckoning that we had to leave it, as Susana and Victor still had to go derig Cueva del Río Durazno, which went uneventfully. Back at camp, Vicente and I went into Cueva de la Vaca to survey what we could, which turned out to be very little, because I could not pass the 7-meter squeeze at the entrance. Even Vicente had to blow the air out of his lungs to get through, leaving both of us impressed with Victor's efforts on December 31. Vicente went on ahead to check how far the cave went and found Victor's turnaround point in the walking passage, where one needs to climb over a boulder to continue. Passing said boulder, Vicente then ran into a boulder choke, where the air-flow

was lost and no way on could be found. Blocked again—the revenge of the cow no doubt.

The total for the nine days of work turned out to be 1400 meters of new survey in various caves, not counting the 5 meters of progress in Cueva del Río Durazno. Hopefully we can find someone with a drill to come along next year, when it is likely we will also be able to connect Cueva del Tubo into Río Durazno, as it lies right over the first bypass area. Hopes for a short cut into the current end of the cave are also not completely dashed, as no prospecting has been done due south of where the cave is heading at its end. Most was focused much farther west, for some reason. Considering that we have over eighteen known but unentered entrances elsewhere, it is reasonable to expect some to the south as well. The main resurgence for the plateau is located about 5 kilometers due south and 600 meters vertically below. The Río Durazno has to get there somehow.

Área de Durazno, Dos Aguas, Michoacán

El autor y otros regresaron a la Cueva del Río Durazno. No pudieron encontrar otra ruta hacia Durazno y sólo hallaron un poco más de pasaje. Exploraron algunas otras cuevas en la zona, incluyendo la Cueva del Caído, que tiene una entrada vertical al final.

The "Old Reading Grotto": Bob Thren (left), Joe Pendleton, and Charles "Squire" Lewis. Photo by Sam Young. (See page 22.)

Grupo Espeleológico Jaguar A.C.

CAVES OF SAN FERNANDO, CHIAPAS

Gabriel Merino and Mauricio Náfate

Cueva de las Ollas, Col. Miguel Hidalgo, Mpio. de San Fernando, Chiapas, is a shallow cave with a vertical entrance drop of 15 meters that was created by a doline collapse and a landslide. From this point on, the cave is made up of a number of horizontal rooms filled with calcite formations. In order to safety explore the cave you need a 20-meter rope, a bolt and hanger for the spit, and locking carabiners and various lengths of webbing to rig the drop.

The cave contains a seasonal stream, and you will occasionally find small currents of water that disappear into small openings 50 centimeters in diameter in the lowest parts of the cave. Except in the rainy season, the only water is moisture left over from the rainy season and water droplets that constantly form on the ceiling. The cave has only one entrance, although we have located places where there are air currents that make us think there are other entrances that are obstructed by accumulations of mud and rock. The principal gallery has many formations of indescribable beauty, as large thick columns with calcite crystals make extraordinary reflections when the light bounces off of them. We also found a number of interesting speleothems, including helictites, on the ceiling and walls of the cave. Several species of cave crickets, spiders, bats, swifts, and worms have been found in the cave.

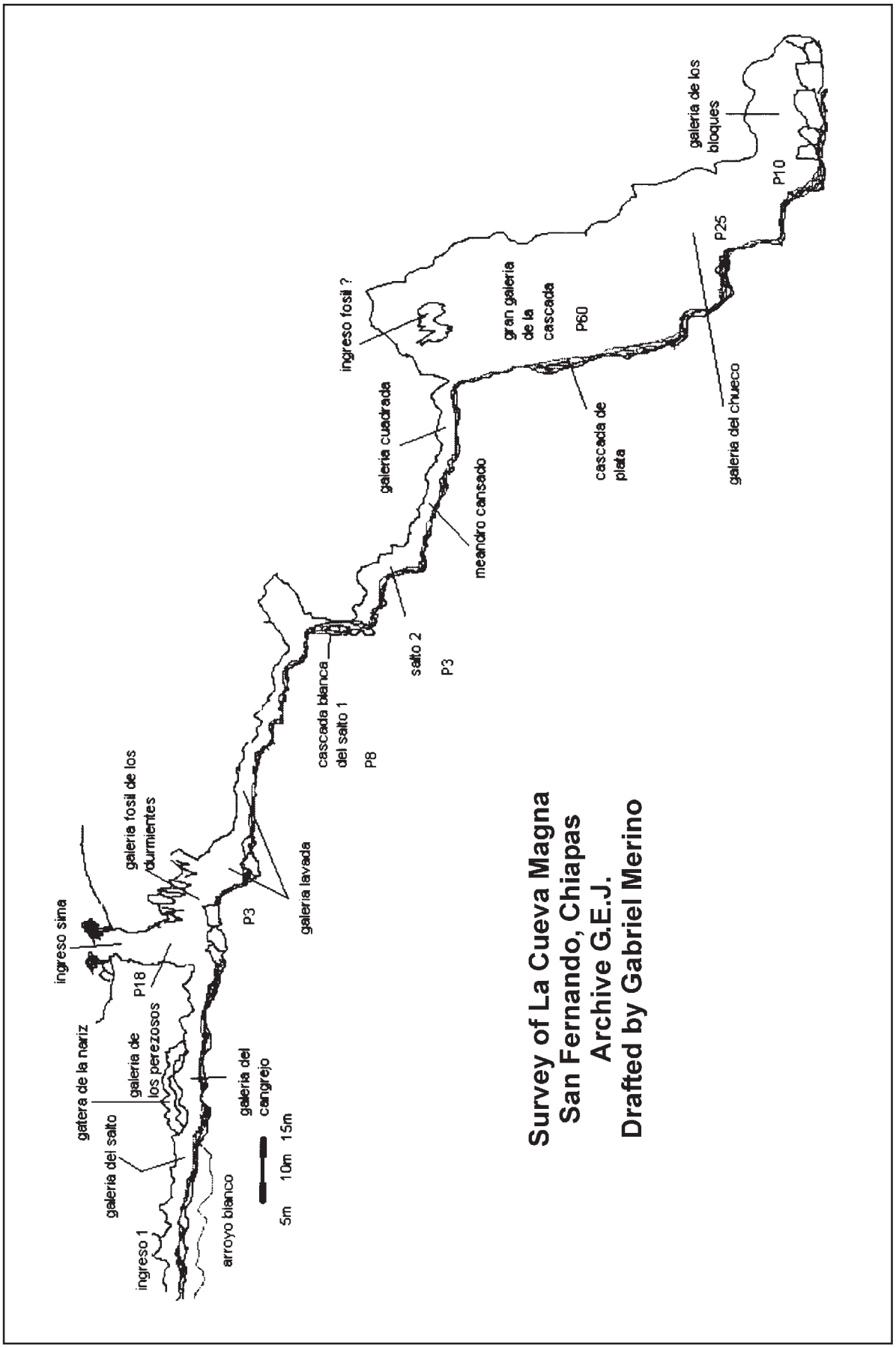
Cueva de las Ollas constitutes the most important and best-preserved archaeological discovery found so far during our explorations in the region of San Fernando. Ceramic vessels, probably between nine hundred and fifteen hundred, are found within the cave, and for this reason it is considered among the most important examples of sites of mass offerings in the area. Its cultural importance is also due to the incredible state of preservation of the majority of the ceramics, although some have been damaged, and the fact that a number of these contain carbon residues from burning copal or other incense. Also, jade pieces were found on the surface, and an artificial water channel has been carved in the rock. Some of the ceramic vessels, as well as a small man-made terrace, are completely covered with a thick layer of calcite. The terrace suggests to archaeologists that the cave may have been used for religious ceremonies. Comparing recent views with photos taken in 2001 indicates that pots in one part of the cave have been moved and then replaced since then, and we have reason to believe that they were used to collect water that drips from the ceiling. During an early trip into the cave, we saw a jar with its bottom broken out, and during a recent trip we found that it had been replaced by a new, unbroken vessel. Water from caves in this region is still used for sacred and occult ceremonies.

Except for a few isolated individual jars, the vessels in the cave are in three well-defined areas. In one area there are groups of vessels that are mostly flat, plate-like forms. Farther along are several finely detailed, flat-bottomed ceramic jars with a few carvings. Some of the vessels behind an area of formations have become cemented to the rock by calcite deposits. One area is completely covered with ceramics, many of which have unfortunately been destroyed by earlier visitors to the cave. However, there is only one heavily traveled path through the area, and it appears that only a small number of people made it to the end of the cave. A number of broken stalactites were found placed on a rock. It is here that we found incense burners of various forms and shapes, some with the pointy forms resembling the sacred *ceiba* tree and some with remains of incense. Because of the deliberate placement of ceramic vessels in this part of the cave, archaeologists have declared this a mass-offering site, not unlike similar sites in the areas of the Río La Venta and Tonala. It is probable that the cave is dedicated to a Zoque deity, as this area belongs to the Zoque culture. A more complete archaeological study and a formal inventory of the contents of the cave would help us better understand the secrets of this marvelous cavern.

The cave was explored and mapped by G.E.J. members Mauricio

Adapted from cave descriptions in the files of Grupo Espeleológico Jaguar of Tuxtla Gutiérrez, translated from Spanish for the AMCS by Calvin Smith.

Mauricio Náfate:
mauricionafate@gmail.com


ingreso fosil ?
galeria cuadrada
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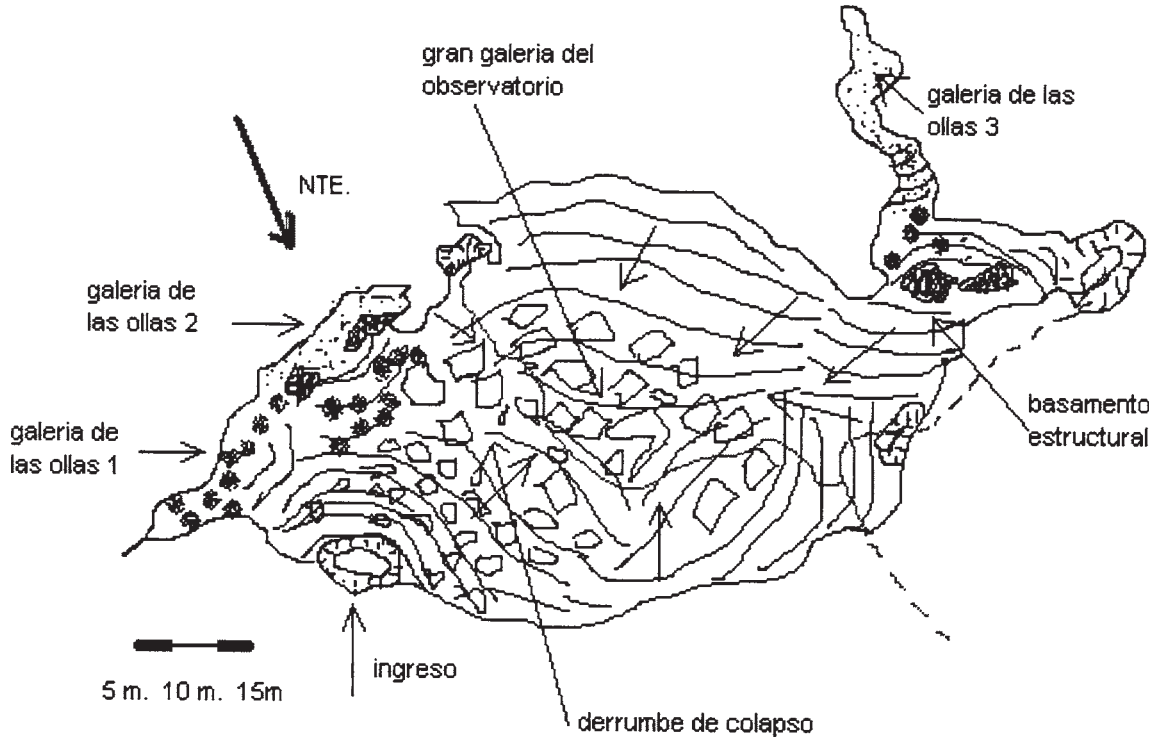
del salto 1
P8
gran galeria
de la
cascada
P60
cascada de
plata
galeria del chueco
P25
galeria de los
bloques
P10
galeria fosil de los
durmientes
ingreso sima
P18
P3
galeria lavada
gatera de la nariz
galeria de
los perezosos
galeria del
cangrejo
galeria del salto
ingreso 1
arroyo blanco
5m 10m 15m
Survey of La Cueva Magna
San Fernando, Chiapas
Archive G.E.J.
Drafted by Gabriel Merino

Plan of Cueva de Las Ollas, San Fernando, Chiapas
Archive G. E. J., Drafted by Gabriel Merino



Náfate, Gabriel Merino, Tomás Torres, Rafael Hernández, and Juan Rendon in December 2001. The exact location is being withheld on the orders of INAH, the Instituto Nacional de Antropológia y Historia, until a complete archaeological study has been completed.

Cueva del Puercoespín, Col. Benito Juárez, Mpio. de San Fernando, Chiapas, is located at 16°54'32.7"N, 93°11'40.9"W, elevation 1001 meters. (A map of the cave appears in the article on its exploration by Calvin Smith elsewhere in this issue.) With seventy man-hours of work during three expeditions, our group was able to survey 700 meters of passage to a depth of 380 meters. The entrance is divided into two parts, each approximately 15 meters high, and carries a small stream that later merges with additional flows. About twenty large boulders 3 to 5 meters in diameter are piled outside the entrance. Inside, our friend the porcupine has made his den to the left, just at the first rappel, happy in the complete darkness in his bed of leaves and twigs. The cave here has a worn, rugged look due to flowstone over the rock, and the walls show a somewhat whitewashed effect.

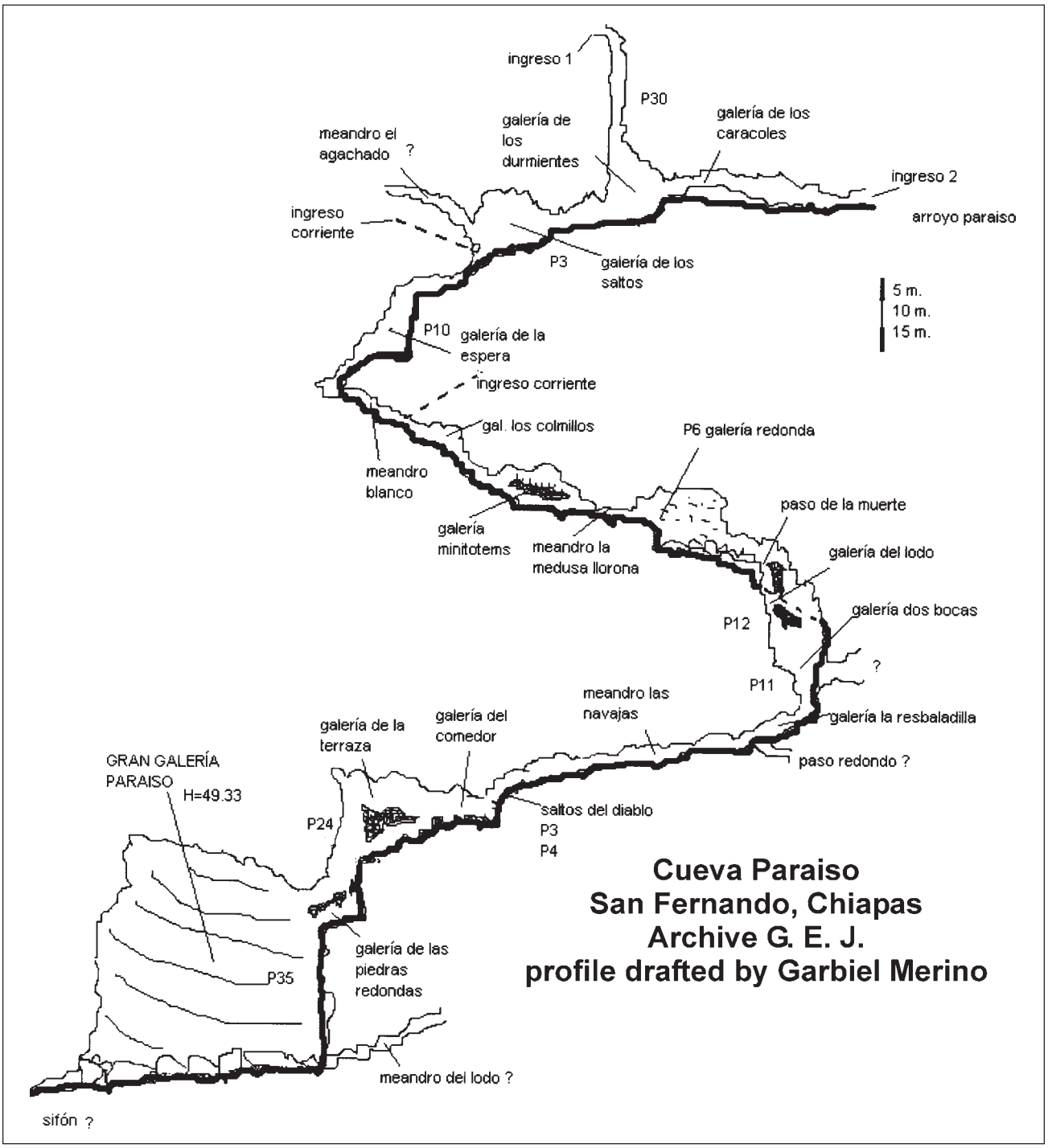
After the first three rappels, of about 20 meters each, comes the narrowest vertical section of the cave, which is roughly 1 meter wide. Shortly after this, a 10-meter rappel takes you to the edge of the Galería del Silencio, an impressive room approximately 60 meters in height. The 40-meter rappel into it is the longest in the cave. Here the main branch of the stream, probably that from the Meandro de Congrejo, is met. A long slope leads down to the Galería de las Piedras Negras, which has a number of significant stalagmites. Beyond, a 10-meter rappel down the round Pozo Blanco and then a 30-degree slope lead to the Meandro Pozo Blanco, named for a pothole carved over the years by swirling water. A bit later, another 10-meter rappel ends in a pile of rocks, eroded dangerously sharp over the years. This room is a spectacular sight, and a window opens into Pozo la Ventana, where the cave divides into two passages that join after a few meters in an area named Meandro de los Tres Pozos, full of small, still pools that team with life. The cave becomes narrower here, and there is a pool of considerable size located towards the middle of the long passageway.

The narrow part continues for about 80 meters and ends at consecutive rappels of 20 and 25 meters. These drop into an impressive room and a chamber with two deep, turquoise-colored pools with small white amphipods. A short free-dive was made in one of the pools, but the route became much narrower and appeared to stay that way for some distance. Without diving equipment it is impossible to push these pools.

The cave was explored in March 2002 by Mauricio Náfate, Tomás Torres, Calvin Smith, Alejandro Gómez, Gabriel Merino, René Cifuentes, Erwin Samayoa, and

Rafael Hernández. The air temperature in the cave was 18.5°C, and the water temperature was 17°.

During the course of the expedition of April 2003, we finished exploring Cueva Magna, which is located near the village of Miguel Hidalgo, Mpio. de San Fernando, Chiapas. The cave was explored by Gabriel Merino, Mauricio Náfate, René Cifuentes, Camilo Thompson, Gibrán Morales, Cintia Hartmann, Aldo Espinosa, Ana Paula de la O, Juan Carlos Franco, Juan Rendón, and Jorge Villanueva, and it is one of the most technical challenges our group has faced. The exploration took over sixty man-hours in the cave, mainly because of its active nature, with the stream temperature between 15 and 18 degrees Celsius. The cave consists of a series of vertical drops from 3 to 60 meters between horizontal segments, until, upon arriving at the Gran Galeria de los Bloques, the stream disappears into a conical hole that is impossible to explore because of unstable rocks. Within this gallery we found a large variety of fossils in the rock. On the way back out, we explored the Galería de los Durmientes, which is a fossil gallery with very large stalagmites and stalactites and various more



delicate formations on the ceiling and walls. We have found only two entrances, but everything indicates that there could be another entrance that leads directly into the Gran Galería de la Cascada. During our exploration, one group collected cave organisms that were later identified and registered. The walls are covered with oxidized minerals and organic materials deposited on them by the water, which gives them a rusty color. The survey of the cave amounts to 650 meters of length and 210 meters of depth, and the direction of the water flow suggests to us that the resurgence is in Cueva del Burro, near the town of Berriozabal, which would make a system of roughly 12 kilometers underground development. Only future studies will indicate whether this is correct.

Samples of water from within the cave were studied by Ing. Juan Carlos Franco Guillen of the Faculty of Engineering and Ecology and Environmental Protection in the Universidad Popular Autónoma del Estado de Puebla, the beginning of a series of studies of the present and future water quality in the karst of the San Fernando area.

Cueva Paraíso, Col. Miguel Hidalgo, Mpio. de San Fernando, Chiapas, is located at 16°52'95"N, 93°15'54.8"W, elevation 936 meters. It is equal in hydrological importance to Cueva Magna, for it also has a constant flow of water that has formed a number of beautiful waterfalls and impressive drops. A partly dry, horizontal passage leads to a second entrance that avoids the initial 30-meter entrance drop into Galería de los Durmientes, which contains a number of interesting formations sculptured by thousands of years of typical karst activity. The cave is almost entirely vertical, with a few nearly horizontal areas that slope downward only 5 to 15 degrees. The walls are often rounded and very smooth. Even in the dry season, approximately 340 liters per second of water flows through the cave.

In some high-level fossil passages there is an abundance of stalactites and stalagmites, and there are also some in the active passage. In the Galería Redonda, a waterfall forms a small lagoon encircled by rocks from centimeters to more than 3 meters in width. Beyond this point is the most difficult area of the cave, the Paso de la Muerte, which leads to a rappel onto a muddy floor and then into the Galería Dos Bocas. A considerable descent through the Galería la Resbaladilla is made up of small, slick climbs rounded by the flowing water. This leads into the Meandro las Navajas, an area of beautiful sharp sculpturing due to flow during the rainy season. This is one of the narrowest areas, between 0.8 and 1.3 meters wide, and the sharp rocks stick out like knives from the walls and steeply sloping floor.

Beyond, at the Saltos del Diablo, the floor becomes even steeper, until one arrives at the Galería del Comedor, where the cave becomes much wider and there are a variety of large, flat blocks that gave us a relatively comfortable place to eat and sleep at 190 meters depth. Almost immediately after this is the Galería de la Terraza, where a 24-meter rappel takes one past a beautiful 7-meter waterfall. The passage then opens up into the enormous darkness of the Galería Paraíso, 49 meters high, the largest room in the cave. A 35-meter rappel follows a powerful waterfall that spills out onto a mixture of smooth and sharp rocks, fallen from the walls and ceiling, that, along with hills of mud, form the floor of the 40-meter-long room. The water disappears into a small, partly flooded passage in breakdown that was impossible to explore. Another passage out of the Galería Paraíso goes more than 60 meters and might connect back to either Galería Dos Bocas or Galería del a Resbaladilla.

During one visit to the cave, the air temperature was 17.9°C in the Galería de los Durmientes, 18.9° in the Galería de los Saltos, and 19.2° in the Galería de la Espera. The water temperatures in the same places were 17.8°, 17.8°, and 18.1°.

The exploration of this cave, one of the most difficult explored by Grupo Espeleológico Jaguar, is a great advance in the knowledge of the hydrologic systems in the area of San Fernando. It is 910 meters long and 230 meters deep. It was explored in December 2003 by Mauricio Náfate, Gabriel Merino, Camilo Thompson, Omar Ortega, René Cifuentes, Gibrán Morales, Gabriel Camacho, Juan Rendon, Raquel Aguilar, Erwin Samayoa, Kaleb Zarate, and Tomás Torres.

Cuevas de San Fernando, Chiapas

Miembros del Grupo Espeleológico Jaguar, en Tuxtla Gutiérrez, han explorado varias cuevas como parte de su Proyecto Espeleológico San Fernando. Entre ellas está la Cueva de las Ollas, un sitio arqueológico importante con cientos de restos de cerámica, la Cueva del Puercoespín, de 700 metros de longitud y 380 metros de profundidad, la Cueva Magna, de 650 metros de longitud y 210 de profundidad y la Cueva Paraíso, de 910 metros de longitud y 230 metros de profundidad. (El mapa de Puercoespín está en otro artículo de este mismo número).

CHEVE 2003

Bill Stone, Yvonne Droms, and Nancy Pistole

A team led by Bill Stone descended into Cueva Cheve, Oaxaca, Mexico, for ten weeks in the spring of 2003 in an effort to extend exploration at the bottom of the system beyond the underwater tunnel that had stopped progress since 1990. A water-trace using colored dye had previously demonstrated a link to a resurgence spring located 2547 meters lower than the highest entrance of the cave and 17 kilometers to the north. If an exploration team can make the same trip, Cheve will become the deepest cave in the world by a substantial margin—possibly forever. There was significant motivation to return to the underwater tunnel, since explorations in the intervening decade had failed to discover a route forward in other parts of the cave. The exploration plan had two components. A team of divers would use closed-circuit rebreathers to explore the sump 1228 meters below and 8 kilometers distant from the Cheve entrance and to search for passage beyond, while simultaneously a team of climbers would attempt to bypass the sump by climbing their way up into high tunnels in the final canyon leading to the sump. The first contingent of a forty-five-member team assembled at Llano Cheve base camp on March 9, 2003, ready to start an assault on the cave after a six-year hiatus. Nearly simultaneously, a different team, led by Nancy Pistole and Matt Oliphant and consisting of twelve individuals, continued exploration of Cueva Charco. Cueva Charco is located approximately 8 kilometers north of Cueva Cheve and 1000 meters lower in elevation. It has been correctly viewed as a potential back door to Sistema Cheve. But because of its incredibly constricted nature, its exploration has been a struggle legendary in the cave-exploration community. The two teams comprised cavers from Mexico, Poland, England, the Netherlands, Germany, Switzerland, France, and the United States.

The text is a version of a report prepared in December 2003 for Mexican government agencies. All photographs are from the Cueva Cheve part of the expedition. See also a nice description by R. D. Milhollin of a trip into Cueva Cheve and an article by Rick Stanton on the sump dives; both appear in *AMCS Activities Newsletter* 27.

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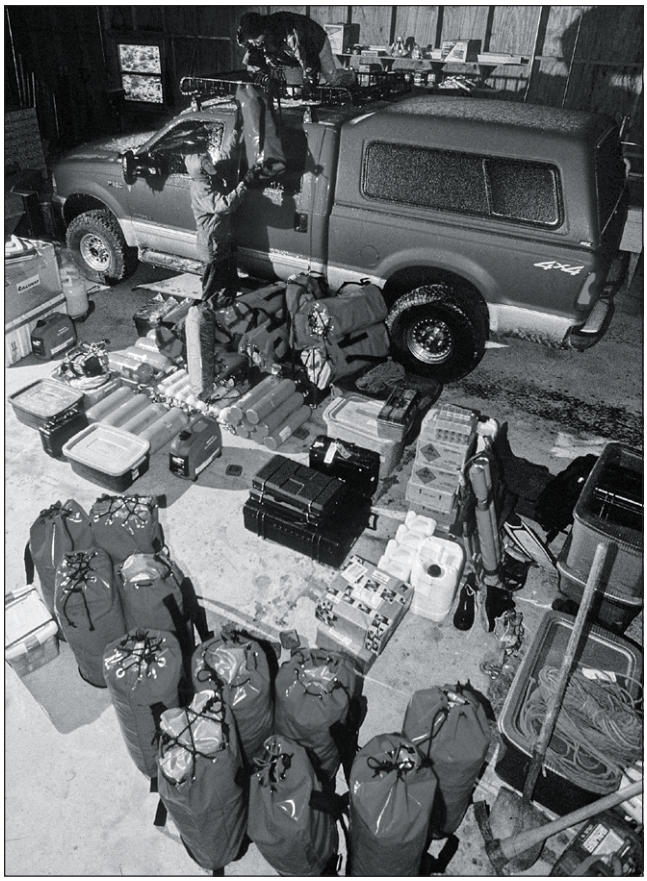
ydroms@RosettaStone.com
Nancy Pistole: bf821@lafn.org

At Cueva Cheve, the first sixteen days were spent rigging nearly three kilometers of rope and transporting many loads of equipment downward. This equipment included sleeping bags, pads, stoves, calcium carbide for lights, rope, rock bolts, drills, batteries, and diving apparatus. Three underground camps were established: Camp 1, an emergency bivouac site at –385 meters, Camp 2, a spacious and comfortable but windy camp at –787 meters, and Camp 3, a series of terraces constructed on a talus slope on one side of the massive AS Borehole, at –1010 meters. Diving apparatus was then transported from Camp 3 to the sump, and the stage was prepared for the first dive.

On March 26, Rick Stanton and Jason Mallinson, two of the world's foremost cave divers, made the first effort. The Cheve sump was first dived in 1991 by John Schweyen to a distance of 100 meters penetration and a depth of 24 meters. Schweyen reported that all of the tunnels he investigated were too small to continue. In preparation for the 2003 effort, we studied the data from 1991 and concluded that a fracture in the limestone had diverted the water into a different course. The main trend of Cueva Cheve is 330 degrees, that is, to the northwest. However, in certain sections of the cave, shear fractures cause the cave to divert to the east for short distances. We concluded that this is what must be occurring at the Cheve sump and hence decided to immediately look to the east for a new passage, rather than follow the old guideline. This hypothesis proved to be correct. Stanton and Mallinson successfully navigated a path through the sump and emerged, following a fifteen-minute dive, into an air-filled passage. The underwater tunnel that had stopped exploration for thirteen years was only 140 meters long and 12 meters deep. What lay beyond was a narrow, steeply descending canyon that carried the white-water river. (See the Sistema Cheve 2003 map.)

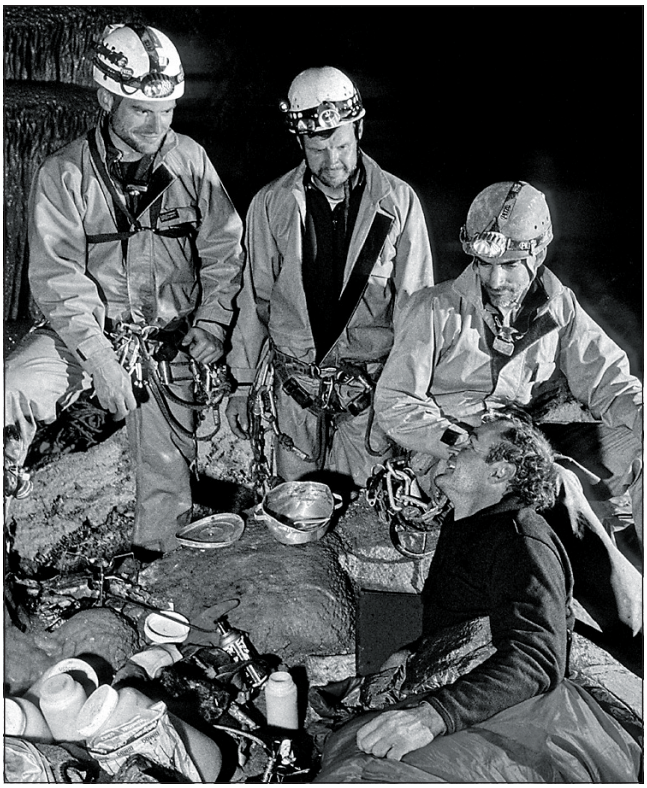
On this initial reconnaissance, the two divers did not have any rope for rigging vertical drops. Thus, the

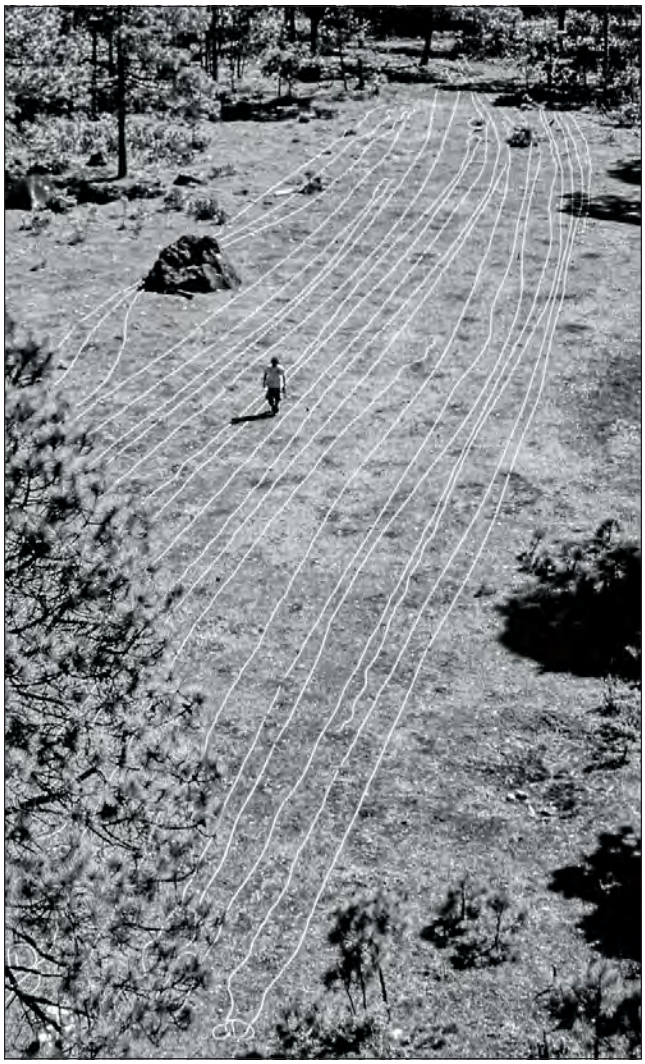


Upper left:Bill Mixon and Kasia Okuszko load gear in Mixon's barn in Austin, Texas. Freezing rain covered the truck with ice outside the night before. *Bill Stone.*

Lower left: Mark Stover, Robert Moncza, and Peter Penczer (left to right) deliver supplies to the bivouac in the Hall of the Restless Giants, awakening Mike Frazier. *Bill Stone.*

Below:More than 2 kilometers of new rope laid out to dry at Llano Cheve base camp. It was soaked to tighten the sheath. *Pete Penczer*.



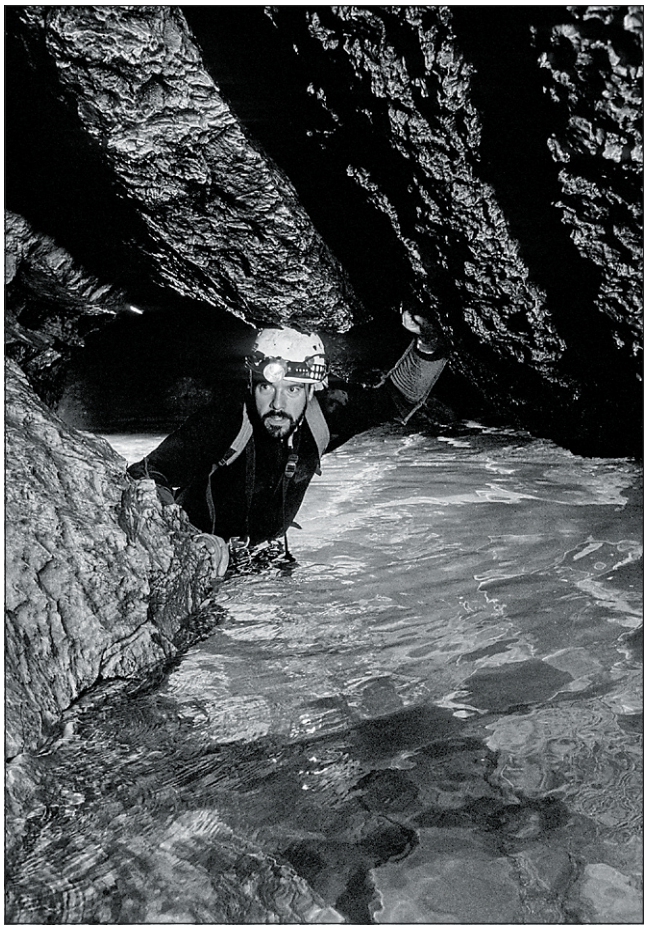


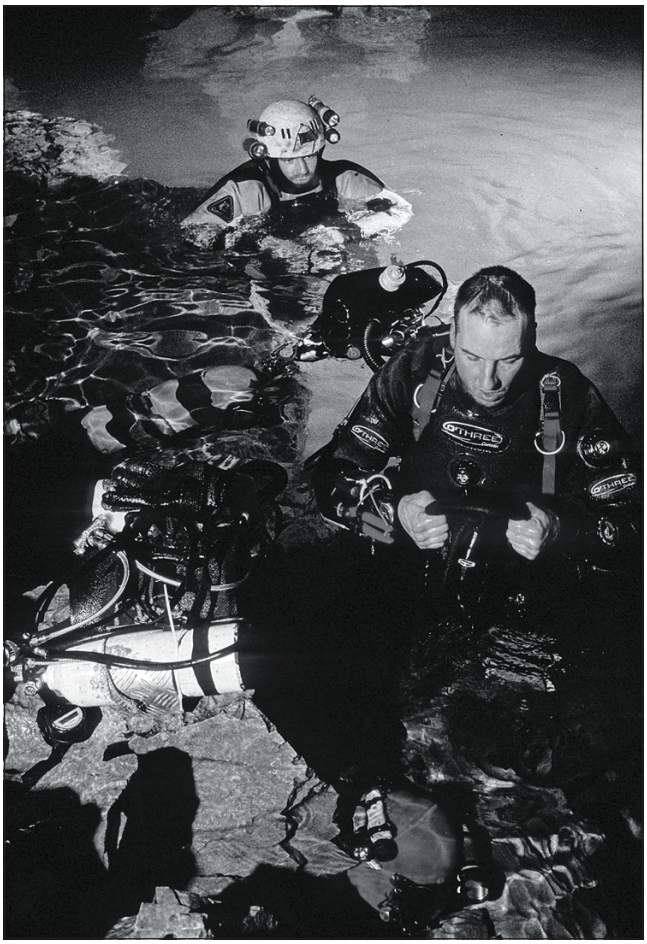
Upper Right: The beginning of the dive-gear transport job. From left, Kasia Biernacka, Marcin Gala, Kasia Okuszko, and Tomek Fiedorowicz load up for a supply run to Camp 3. *Bill Stone*.

Middle right:The Poles in Camp 2 at –805 meters. From left, Tomek Fiedorowicz, Kasia Okuszko, Marcin Gala, and Kasia Biernacka. *Bill Stone*.

Bottom right: From left, Paul Medhurst, Pauline Berendese, Jan Matthesius, and Andi Hunter celebrate a return to the surface.

Below: Richie Hudson gives a final check to one of the compact rebreathers going to the Cheve sump. *Pavo Skoworodko*.





Campfire dinner at Cheve base camp. *Bill Stone*.

descent through the canyon involved innumerable tricky, dangerous climbs through waterfalls. Furthermore, exploration beyond the underwater tunnel was complicated by the fact that this was done in diving dry suits. This had been one of the difficult decisions of the expedition. We did not know how long the underwater tunnel would be. Therefore the four divers, Stanton, Mallinson, Richie Hudson, and Bill Stone, decided to use dry suits rather than the more flexible wet suits used by most divers. These dry suits worked well in the underwater tunnel. But they led to significant overheating in the air-filled passages beyond. Fortunately, there were many deep lakes there, and these served to help reduce the heat accumulation.

On this first reconnaissance beyond the sump, Stanton and Mallinson discovered 800 meters of additional tunnel before they encountered another sump. At that point they had added 940 meters in length and 103 meters in depth to the cave. But the equipment used for diving through the first sump was insufficient to continue any farther. The diving team returned to the surface after nine days underground. We began to organize an assault on the second underwater tunnel, with more equipment and additional divers to help transport gear beyond the first sump.

Meanwhile, a team of climbers searched for high passages in the roof of the final kilometer leading into Sump 1. On March 26, Tomek Fiedorowicz led a climb 10 meters up into a new tunnel that ended after only a few meters. Another climb, led by Marcin Gala, went up into a narrow chimney with loose rock and mud and was equally unsuccessful. Gala, Fiedorowicz, and Pawel Skoworodko later found a horizontal tunnel, but after 200 meters it split into four directions, all either leading back to known passage or becoming too narrow to follow. On March 29, the climbing team returned to the surface for a few days of rest.

On April 4, the diving team, now expanded to include Richie Hudson and Bill Stone, arrived at Camp 3, ready to explore the second sump. Diving equipment was carried beyond Sump 1, and ropes were tied at the waterfalls to make them safer to negotiate while carrying the diving gear. On April 6 and 7, the team spent twenty hours beyond the first sump, exploring and mapping the new territory. After helping transport equipment to Sump 2, Hudson and Stone surveyed from there back to Sump 1. Mallinson and Stanton dived the second sump. They followed a sloping fissure passage for 280 meters, reaching a maximum depth of 12 meters underwater, and they reached an air-filled chamber with a wall of boulders just ahead. Although they could hear water through the pile of rocks, they found no way onward despite nearly shredding their dry suits in their efforts to squeeze through tiny openings in the breakdown. This point is now the most remote point reached in Cueva Cheve.

Also on April 4, the climbing team descended to Camp 3 for another attempt to find a high passage to bypass the sump. This time, after a difficult ascent up a waterfall, they found a high lead that had been reported by Mike Frazier, who had partially explored it in 1997. About 40 meters above the level of the active stream, the 2003 climbing team intersected new passage. A few climbs up and down to the north brought them back, after 200 meters, to known passage at a point near Sump 1. However, there were high-level continuations to the north. The northernmost tunnel, named Mazunte Beach, extended well out over the mid-point of Sump 1, some 60 meters above it, before terminating in a collapse. On April 9, the climbing team returned to the surface, helping bring out diving gear.

On April 14, a small team composed of Robbie Warke, John Kerr, Marcus Preissner, Bart Hogan, and Bill Stone began a final, ten-day push, checking high leads, completing surveys, and derigging the cave. In a final effort to bypass Sump 1, Stone, Kerr, and Preissner bolted 35

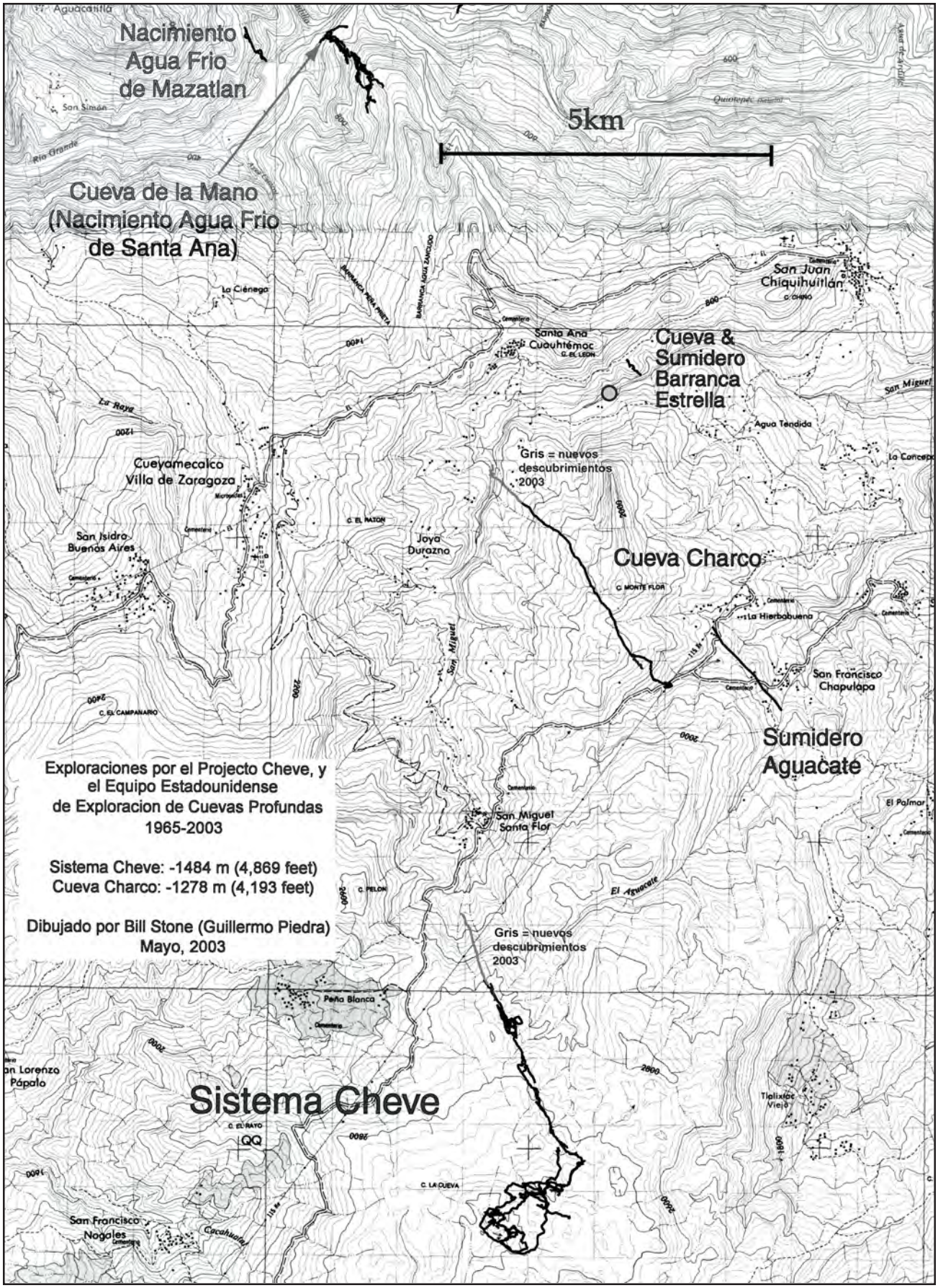
Facing page, clockwise from upper left:

Mariano Fuentes Silva on the lake traverse at the bottom of the Salmon Ladder, –600 meters. *Gustavo Vela*.

Bart Hogan traversing the lake at the beginning of Wet Dreams, –1200 meters. *Bill Stone*.

Tomek Fiedorowicz begins his descent of the last cascade in the Salmon Ladder, while behind him Marcin Gala negotiates a traverse over a pool. *Bill Stone*.

Jason Mallinson (left) and Rick Stanton prepare for their first dive into the Cheve sump. *Bill Stone*.


Nacimiento
Agua Frio
de Mazatlan
5km
Cueva de la Mano
(Nacimiento Agua Frio
de Santa Ana)
San Juan
Chiquihuitlán
Santa Ana
Cuauhtémoc
Cueva &
Sumidero
Barranca
Estrella
Gris = nuevos
descubrimientos
2003
Cueyamecalco
Villa de Zaragoza
San Isidro
Buenos Aires
Joya
Durazno
Cueva Charco
La Hierbabuena
San Francisco
Chapulapa
Sumidero
Aguacate
Exploraciones por el Projecto Cheve, y
el Equipo Estadounidense
de Exploracion de Cuevas Profundas
1965-2003
Sistema Cheve: -1484 m (4,869 feet)
Cueva Charco: -1278 m (4,193 feet)
Dibujado por Bill Stone (Guillermo Piedra)
Mayo, 2003
San Miguel
Santa Flor
El Palmar
Gris = nuevos
descubrimientos
2003
Peña Blanca
Sistema Cheve
San Lorenzo
Pápalo
Tlalixtac
Viejo
San Francisco
Nogales

SISTEMA CHEVE 2003

MUNICIPIO DE CONCEPCION PAPALO OAXACA, MEXICO

LONGITUD: 24,300 metros
PROFUNDIDAD: -1,386 metros

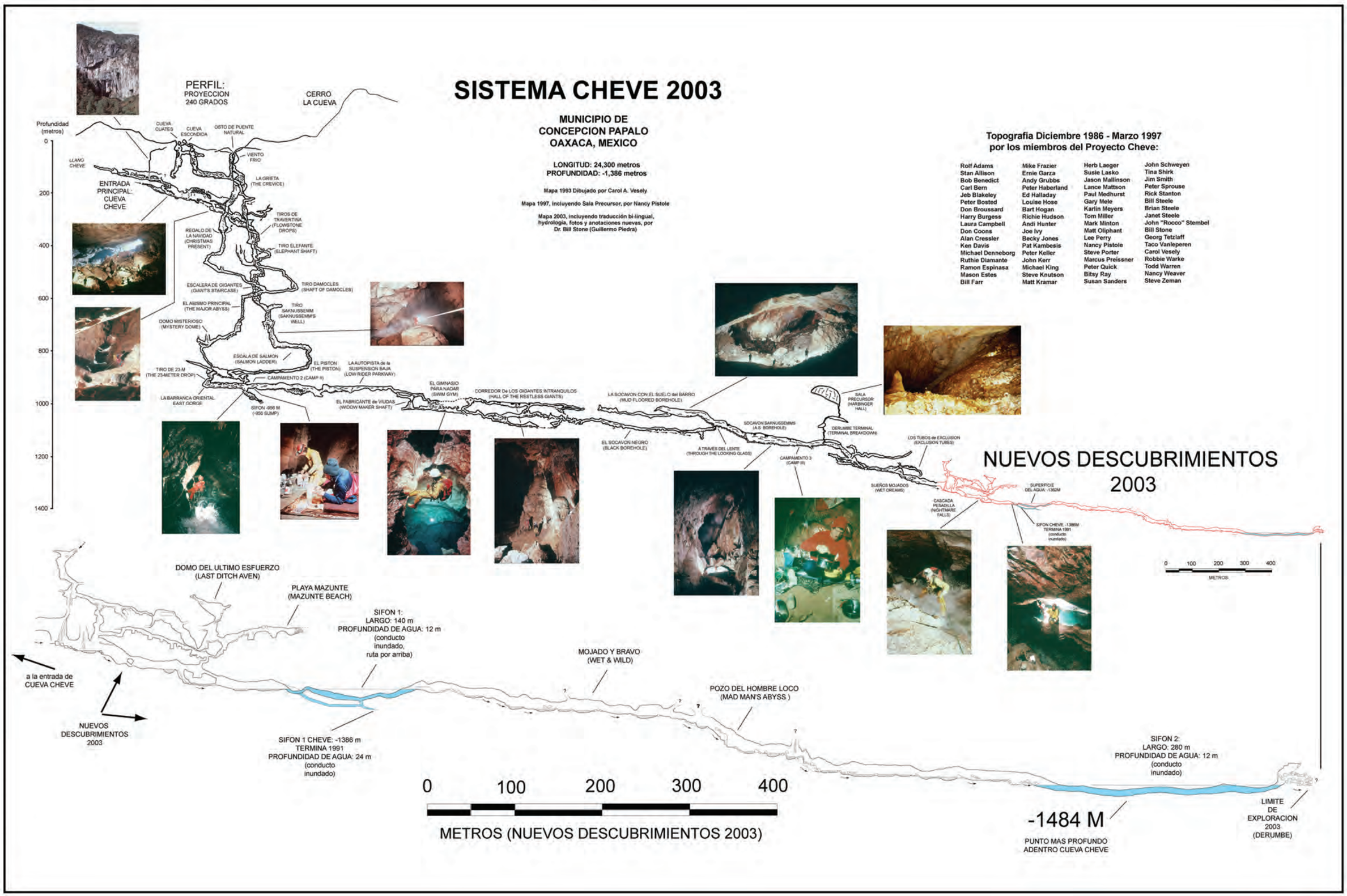
Mapa 1993 Dibujado por Carol A. Vesely

Mapa 1997, incluyendo Sala Precursor, por Nancy Pistole

Mapa 2003, incluyendo traducción bi-lingual, hydrologia, fotos y anotaciones nuevas, por Dr. Bill Stone (Guillermo Piedra)

Topografia Diciembre 1986 - Marzo 1997 por los miembros del Proyecto Cheve:

Rolf Adams	Mike Frazier	Herb Laeger	John Schweyen
Stan Allison	Ernie Garza	Susie Lasko	Tina Shirk
Bob Benedict	Andy Grubbs	Jason Mallinson	Jim Smith
Carl Bern	Peter Haberland	Lance Mattson	Peter Sprouse
Jeb Blakeley	Ed Halladay	Paul Medhurst	Rick Stanton
Peter Bosted	Louise Hose	Gary Mele	Bill Steele
Don Broussard	Bart Hogan	Karlin Meyers	Brian Steele
Harry Burgess	Richie Hudson	Tom Miller	Janet Steele
Laura Campbell	Andi Hunter	Mark Minton	John "Rocco" Stembel
Don Coons	Joe Ivy	Matt Oliphant	Bill Stone
Alan Cressler	Becky Jones	Lee Perry	Georg Tetziaff
Ken Davis	Pat Kambesis	Nancy Pistole	Taco Vanleperen
Michael Denneborg	Peter Keller	Steve Porter	Carol Vesely
Ruthie Diamante	John Kerr	Marcus Preissner	Robbie Warke
Ramon Espinasa	Michael King	Peter Quick	Todd Warren
Mason Estes	Steve Knutson	Bitsy Ray	Nancy Weaver
Bill Farr	Matt Kramar	Susan Sanders	Steve Zeman



Robbie Warke hangs from the traverse line, while Marcus Preissner rappels into the East Gorge. *Bill Stone*.

meters up a dome near the Mazunte Beach tunnel, but this ended in a boulder-filled rift nearly 70 meters above river level. The derigging effort that followed continued for nearly a week, with support arriving at Camp 2 in the form of Andy Zellner and Ashley Chan. Bivouac sites were established between Camp 2 and Camp 3 during the moving derig in order to investigate side tunnels. The most promising of these, a waterfall dome at the beginning of the Black Borehole, was scaled for 50 meters to where it joined a rarely visited extension of the Hall of Restless Giants.

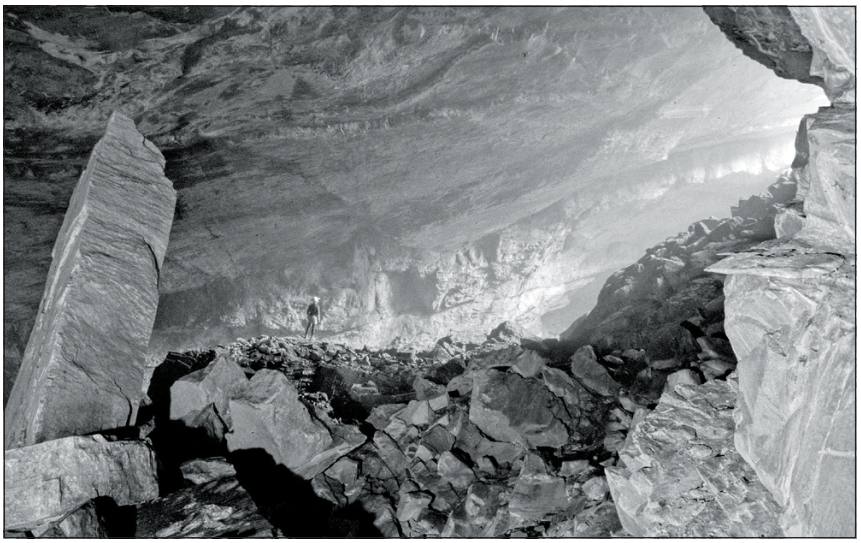
In all, the team spent thirty-three days operating from Camps 2 and 3. The cave was extended to a distance of 9.3 kilometers from the nearest entrance, at the breakdown pile blocking the tunnel beyond Sump 2. More than 700 meters of high-level tunnels were mapped above the Wet Dreams canyon area immediately before Sump 1. In addition, a small team of cavers explored Cueva Palomitas, a nearby cave whose entrance lies above the Cheve entrance, to a depth of 500 meters, where they came close to making a connection with passage in Cheve. If connected, Cueva Palomitas will be the highest entrance to Cueva Cheve.

By early May 2003, Llano Cheve was once again quiet and deserted. The additional 1.9 kilometers of passage mapped at the bottom of Cueva Cheve brought its length to 26,194 meters and its depth below the highest entrance to 1484 meters, making it the deepest cave in the Western Hemisphere and presently the ninth deepest in the world. At 9.3 kilometers from the nearest entrance, the breakdown collapse beyond Sump 2 presently represents one of the most remote point inside the earth reached by humans.

Cueva Charco is located between the main Cueva Cheve entrance and the resurgence spring. Geologically, it is in an ideal position to connect into the Cheve system, and the cave has a strong flow of air and collects water. In 1989, a small group of cave explorers investigated the entrance. Over the next fourteen years, various groups of cavers from many countries pushed deeper and deeper into the cave. In 2003, a final group of explorers reached a sump at the bottom of the cave. A dye-trace confirmed that Charco is connected to the Cheve system hydrologically, but without specialized dive equipment, further exploration is impossible. Cueva Charco is 1278 meters deep and 6.71 kilometers long.

The entrance to Cueva Charco is large and picturesque. However, after a series of short pitches, the passage quickly constricts to a very tight crawl in an area that is prone to flooding. For the next thousand meters, the cave has a series of descending ramps, tight canyon passages, low crawlways, and various short rope pitches. Small incoming tunnels add to the volume in the stream. Some low crawlways are mostly filled with water. At first the cave spirals down on itself, then it heads approximately northwest with few meanders.

One large incoming stream, entering from the only significant side passage in the cave, greatly increases the volume of flow in the stream. While most caves tend to get bigger as they get deeper, the passage in Charco remains narrow. It is best described as a cheese grater, with tight squeezes even below –1000 meters. Just before the sump the stream passage intersects



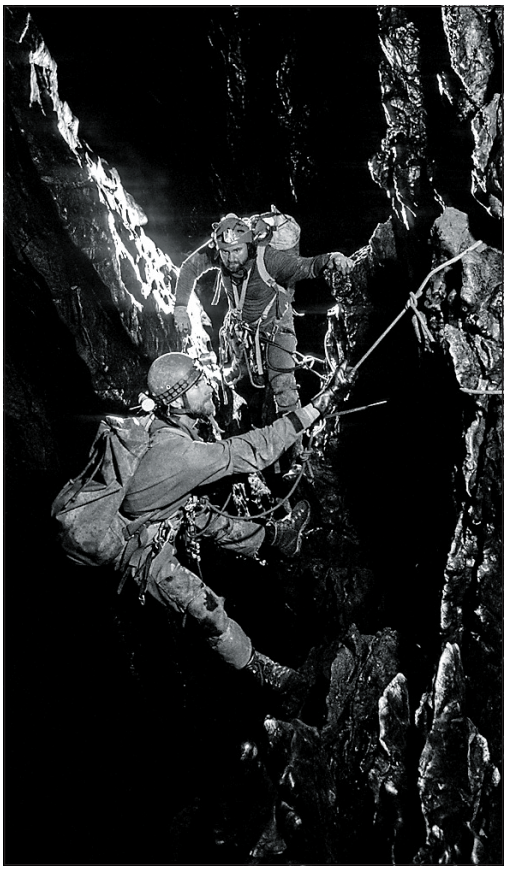
Bart Hogan on the main trail, 100 meters inside the Cheve entrance. *Frank Abbato*.

a borehole. The upstream section of the borehole is blocked by flowstone, and the downstream section leads to the sump. The sump was not investigated, although it is certainly large enough for divers to enter it. Carrying diving equipment to this incredibly remote, difficult spot is almost unimaginable.

At first, explorers were able to enter Cueva Charco on one-day trips. But soon a day-trip took longer than twenty-four hours just to get to the current end of the cave and back. In 2000, a camp was established 2.5 kilometers from the entrance at a depth of 600 meters. During the 2000 and 2001 expeditions, explorers typically worked from Camp 1 for periods of up to one week underground. It was not a pleasant place. The camp was located near the roof of the narrow fissure, where there were small ledges just wide enough to sleep on. If you rolled in your sleep there was the distinct possibility of plunging 12 meters down to the stream below. In 2003, a second camp was established at the –1000-meter level for the push to the end. Since there are no flat spots for a camp near the end of the cave, the explorers in 2003 slept in hammocks suspended from the walls using rock bolts. The present end of Cueva Charco remains one of the most remote, hostile places known on this planet.

A total of fifty-five team members from eight nations put in thousands of hours of work rigging, transporting equipment, and derigging. The expedition's success was the result of their work, together with the generosity of our sponsors and the numerous Mexican state, regional, and local governments who helped our efforts. To all of these people and organizations who made this expedition possible we offer our most sincere thanks.

Marcin Gala rappelling the slack line on the Turbine 1 traverse. *Bill Stone*.



Marcus Preissner (foreground) and Robbie Warke at the end of a traverse in the Black Borehole. *Bill Stone*.

Cheve 2003

Buceos en los sifones del Sistema Cheve en la primavera del 2003 incrementaron su profundidad a 1484 metros, convirtiéndola en la más profunda de México. El pasaje explorado buceando y otros pasajes cortos encontrados al escalar en cañones cerca del fondo conocido de la cueva incrementaron la longitud en 1.9 kilómetros, a 26 194 metros. (Otros artículos sobre la exploración de Cheve aparecen en el número 27 de la *AMCS Activities Newsletter*). Dentro del mismo proyecto, la Cueva Charco fue explorada hasta el final, un pasaje amplio que termina en un sifón. Charco tiene ahora 1278 metros de profundidad y 6.71 kilómetros de longitud. Llevar equipo de buceo al sifón sería muy difícil.

CHEVE 2004

by members of the expedition

This story of the Cheve 2004 expedition has been prepared by the editor from daily reports sent back from the field by satellite phone to the National Geographic Society. NGS editors condensed the material much more than I have, to about 350 words per week, and posted weekly summaries of the expedition while it was going on. These summaries can still be found at http://magma.nationalgeographic.com/ngm/caverace.

Introduction, Bill Stone, December 2004: Following the 2003 diving project at the bottom of Cueva Cheve, it was not particularly obvious how one might go about getting deeper there, or even how we might go about looking for an alternate way to reach the large unknown section that lies between the end of Cheve and the resurgence. The resurgence, Cueva de la Mano, had been pushed thoroughly in 2001 (see *AMCS Activities Newsletter* 25, page 53). And Cueva Charco, the great hope of the late 1990s in the middle karst had been bottomed at a zero-visibility sump in 2003 without connecting to the Cheve main trunk. No one had any illusions about the possibility of transporting diving equipment to the end of Charco, or at least no one was that desperate yet. I spent the summer of 2003 studying the topographic maps, reading old expedition reports, and staring at computer images of the patchwork of 3D lines that represented our knowledge of what lay inside the mountain. I kept coming back to Star Gorge, the Barranca Estrella, an area between Charco and the resurgence that we had first checked out in 2001. The largest surface river on the mountain, the Río San Miguel, disappears there at a point less than a half kilometer above the end of Charco. The leads there were all digs, but nonetheless it seemed worth a serious reinvestigation. That became the first item on the recon list for 2004. Southeast from Charco is the Sumidero Aguacate, which swallows up the second largest surface stream in the Cheve karst. Following our discovery of this entrance in 1989, only one exploration trip, in 1994, had been fielded to this cave, and the map generated as a result showed that it ended in a sump just under a kilometer from the entrance. Since this sump had not yet been dived, a return to the Sumidero Aguacate became the second item on our target list. Farther south, beyond the Aguacate canyon, begins the no-man's-land of death karst that runs for several rambling kilometers until one encounters Cerro la Cueva, now renamed on the new topographic maps Cerro Cueva Cheve, and the northernmost entrances to Sistema Cheve: Viento Frío, Osto de Puente Natural, Cuates, and Escondida. Taking into account the farthest recon hikes made to date into the karst north of Cheve, there still remained a 3-by-4-kilometer area completely unknown to cavers. It was into that area that we would direct our remaining recon efforts during the planned seven-week effort in 2004, all with the hopes of locating a back door to Sistema Cheve. [See the area map in the article on Cheve 2003 elsewhere in this issue.]

February 14, Bill Stone: Having only managed to crawl into our sleeping bags at 3 A.M. after two days of driving down from Bill Mixon's house in Austin, Texas, to the Tehuacan valley, we slept in until 8:30, when the hot sun began to rise above the cactus and the noise of unmuffled semis made further repose unproductive. In the distance we could see smoke rising from the stack at the sugar mill at Coxcatlán. The smell of molasses permeated the valley. Within two hours we arrived in Cuicatlán. It holds the district authority for the Cuicatec indigenous area that extends some 50 kilometers to the east and overlies the known extent of Sistema Cheve. Using our radios during the drive up the steep concrete track to the *zócalo*, we arranged to split up our chores: renting a pair of large propane tanks, securing permission from the district office for the expedition to be on the mountain, and shopping for durable vegetables for base camp. John Kerr and Jim Brown went after the propane. Andi Hunter and I met with the officials and described our progress during the 2003 expedition and our plans for this year. They wished us well. They, like most people on the mountain, knew that Sistema Cheve is something special that is well known beyond the confines of their district.

John and Jim reported that propane was out of stock, but that a delivery was expected in a few hours. Rather than all waiting around (Cuicatlán is very hot in mid-afternoon), Andi, Ryan Tietz, and I drove on up the mountain to

Concepción Pápalo, the *municipio* seat that controls the entry into the main entrance to Cheve. There we met with the proprietor of the local dry-goods store, Elfido Méndez, and picked up a thirty-kilogram drum of carbide left over from 2003. While most of the cavers on the expedition had switched to LED lights, some of the Europeans still planned to use carbide. From Concepción Pápalo we drove over the top of the mountain and down toward the village of San Miguel Santa Flor. The current end of Cheve lies less than a kilometer from the center of this village, at a great depth beneath it, of course. In the distance, across the beginning of the Barranca Estrella (Star Gorge), we could make out the terraced village of Santa Ana Cuauhtemoc. A wispy tongue of mist was moving rapidly up the valley from the east and would soon consume both valley and town.

We continued on through the fog to Santa Ana. While Andi and Ryan played soccer with the local children, stakes being a few handfuls of Jolly Rancher hard candies, I went off seeking Inmer Martínez Playas, a member of the municipal authority. Santa Ana was our second to last stop on the diplomatic chain. The *presidente*, Prospero Pérez Mariscal, was off at a meeting of the coffee-growers' association across the Santo Domingo Canyon in Huautla de Jiménez, so Inmer, the *tesorero* for the town, presided over a review of the caving progress on the mountain over the past few years. Inmer kindly offered us access to an unused house a few blocks from the municipal offices, and soon Andi, Ryan, and I were unloading the truck, mainly for the purpose of locating the Jolly Rancher candies to pay off the insistent young winners of the impromptu soccer match. About this time we began picking up radio messages from James Brown, John Kerr, David Kohuth, and Gregg Clemmer, who had come up the mountain a different way after getting the propane, but were making slow progress through the fog. Tentative plans were made with Inmer to have ten mules show up at noon the next day.

February 15, Andi Hunter: Awoken by the obnoxious cries of a donkey, we faced a huge pile of gear that needed to be sorted out. Stone left over mud-soaked roads at 7:30 A.M. for Chiquihuitlán to get permission for the east end of Star Gorge. After the mules were heavily loaded with plastic tubs and duffel bags, we headed for our base-camp location, two hours away over trails with boot-sucking mud. The evening was occupied by pruning vegetation for personal tents, clearing a group area, and setting up group tarps for the cooking area. By dark, the generator was up and running, lights were on, and we were cooking a hearty meal.

February 16, Bill Stone: With base camp established, be began our investigation of Barranca Estrella. In Santa Ana we had received a report from Inmer that a local rancher who worked the valley floor, Pedro Pérez, had, the previous October, heard a roar in the canyon and gone to investigate. He discovered that a 25-meter-diameter sinkhole more than 12 meters deep had suddenly appeared in the floor of the canyon and was swallowing the river. Truck-size boulders had fallen into an underground void. Gregg Clemmer, Ryan Tietz, and David Kohuth went to locate this shortly after breakfast.

Pauline Berendese and Jan Matthesius from the Netherlands hiked into camp through the mist, having bivouacked on the hillside. Both had been members of the Cheve 2003 expedition and were back for more. On the way to the entrance to Cueva Barranca Estrella, I met the team returning from the new sink. Gregg related that it is a clean collapse, with the river falling through large boulders. There are voids below, and Gregg had carefully negotiated his way some 5 meters down before deciding that the boulders were too precariously balanced. It did appear that the collapse was triggered by the collapse of the roof of a large cave passage below. It will be an engineering challenge to pick out the boulders one by one.

John Kerr, James Brown, Andi Hunter, and I removed logs blocking the entrance to Cueva Barranca Estrella, the first target of the expedition. This cave had been shown to Bev Shade, José Antonio Soriano, Charles Brickey, and me in March 2001. It is on the northern rim of the gorge near Santa Ana, and it is the oldest of what is now a chain of three places where the Río San Miguel in the gorge found its way underground. Its present entrance is 10 meters above the floor of the gorge. The cave is blocked by fill a half-kilometer in from the entrance. Hunters from Santa Ana had tried to close the cave entrance to prevent game, mainly *tepeizquintle* (paca) and *temasate* (a small deer) from hiding in the cave. The plug at the end makes the air in the cave foul with CO_2. Our goal for the day was to enlarge a flat-out crawlway about 100 meters in so that a crew could easily pass with large loads of equipment. After turning the crawl into a duckwalk, we proceeded another hundred meters to the first drop, a 5-meter pothole made by the river that once flowed through the cave, and then returned to camp. (A map of Cueva Barranca Estrella is on page 60 of *AMCS Activities Newsletter* 25.)

February 17, Andi Hunter: The morning was spent sorting ropes, practicing on the rebelay course set up in a tree, and gathering parts for the rebreather that would be taken into Cueva Barranca Estrella to deal with the bad air in the dig. A first team, consisting of John Kerr, Jan Matthesius, Pauline Berendese, and David Kohuth, headed for the cave around noon. A second team, Bill Stone, Ryan Tietz, James Brown, and I, headed down soon after at a slower pace, with Brown carrying the heavy rebreather equipment. Two new arrivals, Nathan Noble and Mike Frazier, caught up with us on their way to visit the cave. They had already been in the area for weeks, they hadn't showered in a while, their clothes were ragged and torn, and their vertical gear was nearly shredded. Our team would look the same after a few weeks. They went on into the cave while we sorted specialized equipment at the entrance. Finally we headed into the cave, to be greeted once again

by the long black, tarry streaks of vampire-bat guano that ran down the formations and puddled on the floor. After all the drops were rigged, Nathan, Mike, and I started digging out restrictions to try to improve airflow to the end of the cave. Everyone else went on to the dig at the end of the cave to start hauling out bucket after bucket of sand and gravel. Eventually Mike, Nathan, and I joined them. A hauling team remained out of the tight area, where others filled the buckets. A 12-foot hose with a blower was attached to a diver's rebreather so that stale air could be circulated though its CO_2 absorber and oxygen could be added. Fingers worn and joints aching, we headed out of the cave for dinner at 10:30 P.M.

February 18, Pauline Berendese: Yesterday, a team of five Polish cavers arrived, Paweł "Pavo" Skoworodko, Artur Nowak, Katarzyna "Kasia" Okuszko, Tomek Fiedorowicz, and Małgorzata "Gosia" Barcz, very welcome help for the dig. Today we said goodbye to Frazier and Noble. Starting today, we are going to have more normal working hours, two hours hiking and caving to the dig, seven hours digging, and two hours back. Gregg Clemmer, David Kohuth, Jan Matthesius, and I headed out first. Finally after the foggy days we saw some blue sky and could feel the warmth of the sun. More importantly, the trail started to firm up; there are some really steep parts. Soon after we started digging we were joined by John Kerr and the five Poles.

Bill Stone: James Brown, Ryan Tietz, Andi Hunter, and I stayed in base camp today, mainly catching up on gear preparation and doing laundry in the river. Ryan spent most of the day unraveling a kilometer-long length of dive line, some of which would be used as haul lines in the Cueva Barranca Estrella dig, but most of which would be spooled for possible use in the Sumidero Aguacate sump later, if we failed to make a breakthrough in the Star Gorge. I spent much of the day charging a pair of Ovonic nickel-metal-hydride batteries that will be used to power our Warn winches. We now have fourteen in camp and can begin working two objectives at once. The winches could be used to tackle the new collapse upstream.

Meanwhile, news of our presence had spread, and the number of visitors has increased. Three hunters from Santa Ana told us they knew of a cave some fifteen minutes up the valley that they would be willing to show us tomorrow. An entrance farther up the river would be particularly interesting, since it would be near the contact between the volcanic rock and the limestone and if a cave there went deep, it would be a great find, nearly on top of the limit of exploration in Cueva Charco, which would only be about 500 meters down from the canyon floor.

February 19–21, Gregg Clemmer: After days of digging in the low, bottom passages of Cueva Barranca Estrella, we focused our efforts on the river sink, Sumidero Barranca Estrella, 500 meters upstream. The dramatic stream collapse still farther upstream proved too unstable to dig. But because of it, our dig at the old *sumidero* was now dry. The limestone strata dipped to the north-northwest. Previous visitors had watched water spiraling into a number of swallow holes under huge limestone blocks. A solid limestone headwall on the north side of the dry creek bed hinted of cave where the stream had disappeared. Broken bamboo lay piled against one corner of the headwall, indicating the water's swirling path. Soft, deep sand was banked underneath. Digging would be easy initially, or so we thought.

David Kohuth, John Kerr, James Brown, and I began the dig by clearing the bamboo and removing four feet of sand against the headwall. A solution crack opened on our right, a joint that had been filled with sand, rotting leaves, sticks, and assorted trash. Ryan Tietz joined the crew in midafternoon. About dark, I pushed my crowbar through into a void, which caused excitement that gave way to more hard work. An opening was cleared to reveal a clean-washed cave passage that was far too tight to enter. But when we peeked beyond, it appeared to open up.

The next day we went at the dig again, taking out rock in chunks with drills and chisels. Andi Hunter wormed her way into the tightest section, head down, and handed back rock after rock, sand, and muck, lowering the floor and widening the passage for the rest of the

The Polish team, from left: Artur Nowak,Małgorzata "Gosia" Barcz,Tomek Fiedorowicz, Paweł "Pavo" Skoworodko, and Katarzyna "Kasia" Okuszko. *Bill Stone.*

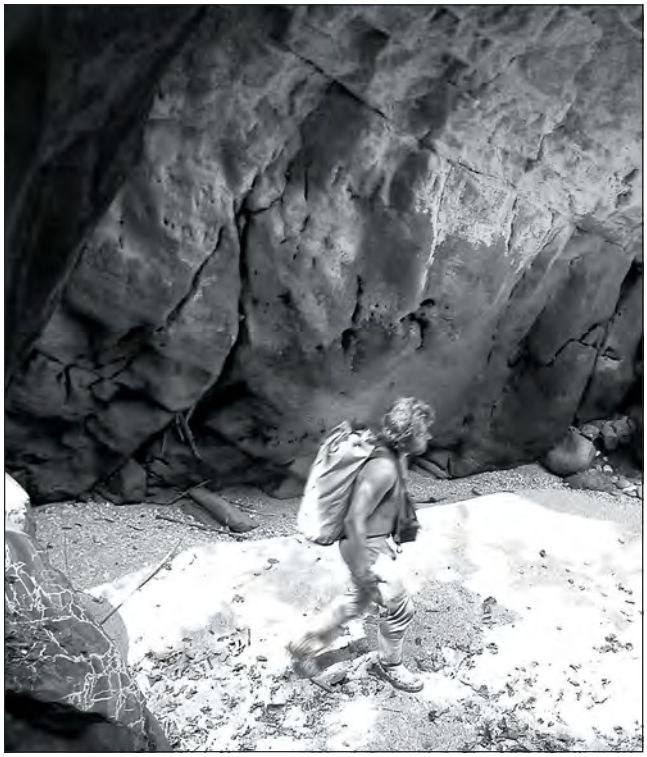
crew. We also began a second dig about 4 meters to the left of the first one. This, according to Stone, was where the water had been seen sinking the previous year. Large, ominous boulders the size of concrete trucks stood poised above this point. Safety being paramount, we lowered the floor against the headwall and kept an eye on the rocks wedged above us. I crawled into the small space, finding hundreds of daddy longlegs pulsating on the ceiling. I noted a very definite cool breeze.

On Sunday, February 21, Kohuth, Tietz, Kerr, Jan Matthesius, Pauline Berendese, and I went at both digs with a vengeance. More digging in the left-hand dig increased the airflow, but the right-hand dig offered ample evidence of limestone solution. After several hours, I had cleared a small space on the left, 4 meters deep and an irregular 1 meter in diameter, angling down into more broken rock. Fortunately the arachnid occupants had vanished. Numerous blowing holes chilled all who worked this dig. Having winched a number of boulders, one estimated at three to four tons, we pushed the dig deeper. After eight hours of backbreaking work, we closed down the operation for the night. Even the right-hand dig was now showing signs of airflow.

February 21–23, Bill Stone: On the twentieth, Tomek Fiedorowicz and Pavo Skoworodko had hiked for some two hours on the high trail toward the village of San Juan Chiquihuitlán, about 200 meters above the gorge, on the north side. There they had been shown a deep pit by local farmer Salvador Zuniga. According to their GPS location, it was relatively close to the dirt road on the north side of the ridge between Chiquihuitlán and Cuicatlán. Today seven of us, Tomek Fiedorowicz, Pavo Skoworodko, Andi Hunter, Artur Nowak, Gosia Barcz, Kasia Okuszko, and I, hiked up the mountain to Santa Ana at dawn. We picked up one of the trucks and drove east for a half hour before pulling onto a muddy, deeply rutted trail southwest over the ridge and down to the cave. Tomek rigged down the entrance shaft, trailing, with some measure of hope, a duffel bag filled with 200 meters of rope. Pavo, Andi, and I followed. It was an impressive drop, with rays of light penetrating down into the gloom and illuminating sinuous fissures extending off in three directions. When I touched down, Tomek informed me that he and Pavo had explored a deeper chamber, where the cave ended. While he ascended, the rest of us began the survey. There was some apprehension among the surveyors when Pavo pointed out some very large spiders. The lower chamber was 20 meters in diameter, with a floor of dried, cracked mud. A small stream issued from a hole on one side, crossed the width of the room, and sank into an equally small hole. Andi and I climbed tandem to measure the entrance drop, which was free for 60.7 meters up to a rebelay, and then another 20 meters to the lip. The total depth of the cave, Osto de Palo Elite, is 92 meters.

On our way back to Santa Ana on the mountain road, we met a bus

Pavo Skoworodko hiking down the arroyo to Cueva Barranca Estrella. *Tomek Fiedorowicz*.



Andi Hunter and James Brown shopping at the weekly market in Cueyamecalco. (Note the supermarket PLU sticker on the apple at bottom.) *Ryan Tietz*.

Maarten Poot, Bill Stone, and Paulina Berendese discussing cave surveying techniques at Sumidero Barranca Estrella. *James Brown*.

that held three new expedition members from the Netherlands, Tjerk Dalhuisen, Maarten Poot, and Martijn Boonman. Adding them and their gear to our truckload, we went on to Santa Ana, where we spent the night, since local Marti Gras festivities had begun and it was too late to arrange burros to haul our second winch down to the gorge base camp.

Sunday was market day in Cueyamecalco, and we drove there to buy fresh fruits and vegetables for base camp. Then we backpacked from Santa Ana down to base camp, where the Sumidero Barranca Estrella dig was still going strong. We pitched in there.

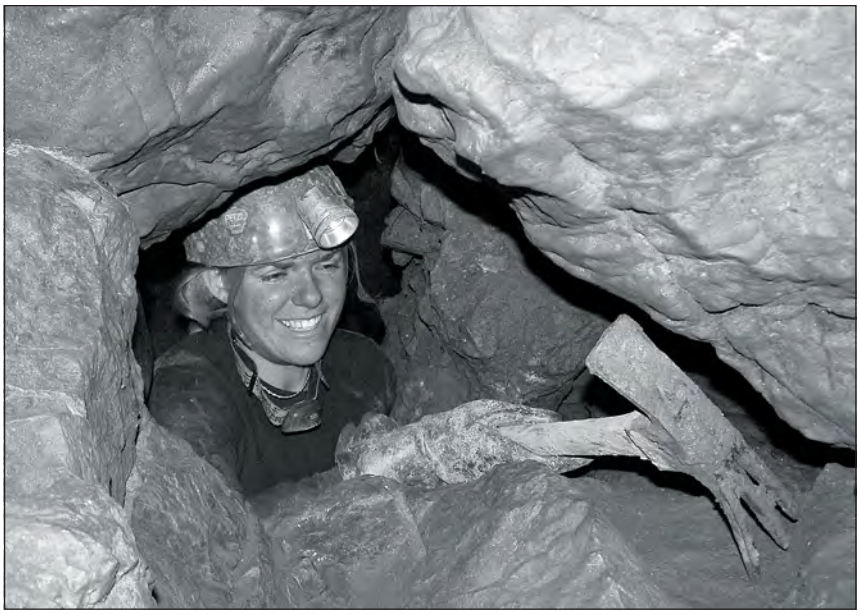
On the twenty-third, Skoworodko, Barcz, Nowak, Poot, Boonman, and I went in for one last look at the dig in Cueva Barranca Estrella, which Fiedorowicz had strongly argued was not worth further effort on our part. Substantial progress had been made since I had last seen it a week before. It was obvious I was not going to fit all the way to the end of the dig, so Pavo went in feet-first and disappeared for a long time. He had dug out a scoop full of sand, and the hole he left was slowly filling with water. There was no airflow to encourage us. Reluctantly, we decided to end our efforts there, having excavated 46 meters, and we pulled out all our equipment. We now had a week to make the digs in the *sumidero* go. If they did not, we would pull out of Barranca Estrella to pursue other tasks.

February 23, John Kerr: A team of five, James Brown, Andi Hunter, Ryan Tietz, Tjerk Dalhuisen, and I, headed to the *sumidero* dig after assembling equipment and eating a hearty breakfast. In the left-hand dig, we decided to continue down into a tight, sand-filled opening where we could squeeze into a rock-filled chamber. We had to constantly avoid touching a collection of tenuously balanced loose rocks. From the small chamber, a steady procession of rocks was passed up through the maze and out onto the ever-growing mound of debris on the surface. Several large rocks, either too heavy or oddly shaped, were just repositioned in the growing chamber. As the sandy floor was probed, a small void became apparent, and loose pebbles could be heard falling into a room below. Finally we were able to enter this bedroom-size area through a 30-centimeter high squeeze at its ceiling. The ceiling of the room seemed to be composed of solid rock, which provided a sense of security.

The right-hand dig has an entirely different character. It is a narrow crack in seemingly solid rock that is plugged with debris, sand, and mud. The redeeming quality is that stability is not an issue. We hope that we can reach a main passage via the left-hand dig and then dig from inside to reach the right-hand entrance, which would become the preferred route into the cave. Each day's digging progressed either downward or inward as the rock dictated. The tight quarters required some real contortions. Today we continued this work, removing what at this point was predominantly gravelly mud.

February 24, Jan Matthesius: Today started as a routine day like the days before. Still, something was in the air. Indeed, it turned out to be an exciting day. Maarten Poot, Tjerk Dalhuisen, Pauline Berendese, James Brown, and Martijn Boonman went to the left-hand dig and started to remove some big boulders in a narrow, horizontal passage. Slowly they worked their way to the first real pit in the dig, a 3-meter downclimb into a small chamber in big, round boulders. From that point, the cave really started to go. A small downclimb went to a black, gloomy rift off into the darkness. The floor of the rift dropped steeply, but it was possible to continue horizontally. The walls consist of heavily eroded, sharp limestone, and there was something at the end of the rift that seemed to be a 20-meter pit, but the bottom was not visible. No rope being at hand, they went out for lunch and a group meeting, where it was decided that the cave should be surveyed to that point before exploration continued. Maarten, Martijn, and I went to do that job.

In the meantime, rapid progress was made in the right-hand dig, where Bill Stone and Andi Hunter worked their way down in the clay and mud. After both digs were surveyed and plotted in the computer,



Andi Hunter digging in the left-hand entrance to Sumidero Barranco Estrella.
Jan Matthesius.

it turned out that the passages are close to each other, so breaking into the safer right-hand dig might be fairly easy.

February 25, Andi Hunter: We woke to light drizzle and a dense fog after a restless night's sleep, but the exciting lead drew us from our sleeping bags. No one wanted to act as base-camp guard, so straws were drawn. The first push and survey team comprised Martijn Boonman, Maarten Poot, and Pauline Berendese. At 2 P.M., Jan Matthesius replaced Maarten. Since the secure right-hand dig had not been connected, the only access was still through the unstable boulders of the other dig, where only those who enjoyed tight squeezes, had experience in unstable surroundings, and whose physiques were compatible with narrow fissures could go. The team descended the water-washed pit walls, surveying as they went, then finagled their way through abrasive black passages and narrow, descending cracks where handling a day pack was an arduous task. They had some frustrating moments trying to get used to sketching to scale, but ended up turning out a fine product by the end of the day. A hole across the top of the pit was seen, but it would take an aid climb to reach it.

A second team, consisting of Bill Stone, Ryan Tietz, John Kerr, James Brown, and me, made slow progress hauling one bucket of wet, sticky mud after another up the tight right-hand dig. A rebreather was installed in the crack to refresh the air, just as it had been used in Cueva Barranca Estrella. The current focus there was to dig straight down, hoping to connect with upper leads in the pit room in the left-hand dig.

February 26, Jan Matthesius: Yesterday the cave ended at station 24, a small hole going off to the left. Today we enlarged it and dug away the floor. Pauline Berendese passed through to a narrow continuation, beyond which she could stand up. After a few meters, it dropped again and became larger. There were bits of flowstone throughout this area. It became narrow again, and after about 40 meters came to a sudden stop. There was a small hole almost filled in that appeared to be the only way on. A bit of work with a hammer gave some results, but we will have to go back.

Martijn Boonman: From the bottom of the pit, a large window can be seen approximately 6 meters up. The climb went well. After four or five bolts, the window was reached; the drill battery was holding out, and a lot of solid rock was found for the anchors. Unfortunately, the window led only to an upward shaft.

Andi Hunter: We continued the gnarly mud-filled dig in the right-hand cave. The width was no more than 9 inches, so we were able to retrieve only one handful of dirt at a time. The digging was long, wet, and grim, but we continued despite the heavy rain coming down outside, which created a small stream in our digging area. Only 6 more meters to go, according to the map, to connect with the other cave. It's hard to stay motivated when you wake to rain and mud, put on your wet and muddy cave suit, and scoop up one muddy handful of dirt after another.

Bill Stone: As you can see, three days of rain and tough going underground have led to a lowering of morale. We'll hope for sunshine to dry out our clothes and invigorate the airflow in the cave, which seems to have stalled when the bad weather arrived. It was the air that kept everyone focused. Without that to guide us, the work underground is guesswork.

February 27, Jan Matthesius: The dig site at the end of the left-hand cave was attacked by Martijn Boonman, Pauline Berendese, and me. Slowly the hole became deeper and wider. All three diggers turned into muddy brown puppets. All material that was removed ended up on the floor in the small room. Little airflow was felt. Later, Artur Nowak joined us. After 1 meter, the front of the dig turned from sand into flowstone with a lot of solution holes. John Kerr, Maarten Poot, and Tjerk Dalhuisen worked later in the day, and some big rocks were removed.

Andi Hunter: Another gloomy, cloud-covered sky and a late start, but nevertheless we gathered our gear and tramped through the mud and rain down to the cave entrance. James Brown, Bill Stone, and I were headed in to do a lead climb in the dome in the left cave, a change from the usual scooping routine in the other entrance. I was still a bit leery of the unstable entrance, so we proceeded cautiously with large packs of climbing gear. Bill pushed and squeezed, but he could not fit

through the small boulder restrictions to reach the climb, and James's specialty is diving, not climbing, so I did the climb. The drill performed exquisitely, but my blow tube was too short, and I had trouble reaching the hole to blow out the dust. One bolt after another, I could feel my shoulders starting to fatigue from the drilling over my head. Finally I was able to wedge myself into a crack near the top of the dome and sit on a small ledge in order to place the last two bolts. We heard a voice coming, and to our surprise it was Bill, who had used various cave-widening techniques to reach us. I rigged a static rope from the top of the dome, and Bill climbed up to help me survey the tight fissures leading off in various directions. In all, our efforts had gotten us 10 meters up into the dome, but all of the passages leading off were too tight to pass.

February 28, Andi Hunter: Everyone slept late, and the sun finally fought its way through the clouds, so some of us declared it a day for laundry and washing dishes. Matthesius, Berendese, and Dalhuisen worked some more on the dig face in the left-hand cave, and Kerr worked on the right-hand dig, which had only 4 meters to go before connecting, according to the map.

February 28–March 3, Pawel Skoworodko: During the last few days of the Barranca Estrella camp, Osto de Cerro Voludo #2 was explored. Stone told us about this pit on the south side of the valley. He gave us the GPS location of Osto de Cerro Voludo #1, a nearby 106-meter pit that had first drawn cavers' attention to the area. Artur Nowak, Ryan Tietz, and I first went up there on February 28. Fortunately we encountered a local boy on the trail who showed us the entrance, which would otherwise have been hard to find in the karst. We had no bolt kit, so I just tied off to a boulder. Artur went down the pit, where Stone had previously dangled at the end of a 50-meter rope, first and also ran out of rope, but he had good news: unlike most of the pits in this area, this one continued down. He saw big tarantulas down there, but they are not that scary anymore. The next day, Artur, Martijn Boonman, and I returned with more rope, bolts, hammer drill, and survey gear. While Artur rigged the second drop, Martijn and I began the survey. The second pit was also about 50 meters deep, and most of it was covered in clean flowstone. At the bottom, there was a little room, with an easy 5-meter climb to a window into another pit, which contained beautiful white formations. The bottom of that pit, about 10 meters below the window, seemed to be the end of the big cave. We entered into European-style alpine-karst meander, a jagged, narrow, twisting canyon, which took us to a small pit with ankle-deep (if you're lucky) mud at the bottom. There was a small window about 8 by 16 centimeters in size through which a continuation could be seen. A rock hammer didn't accomplish much, so we decided to return with better tools. No strong airflow was noticed.

The next day John Kerr, Boonman, and I went in with drills and chisels. We finally passed the hole, and John and Martijn got into a beautiful flowstone chamber with a chimney going up and a couple of pits going down. In the deepest pit, Martijn reached a sump.

The following day, Artur and I went back to the cave to survey the new discoveries and derig. I noticed there was a tight squeeze by the sump that might be passable after a bit of hammering, and there was a chamber on the other side of it, so we decided to leave the cave rigged. We checked several leads on the way out. One of them, a tight crack out of the second pit, has the strongest airflow I noticed in the cave, but is too tight to enter. Stone and I reduced the survey data, and Osto Cerro Voludo #2 is presently 167 meters deep and 245 meters long, pretty much a succession of pits connected by some short horizontal passages.

February 29, Bill Stone: There are no supermarkets in the Sierra Juárez. But there are markets that roam from town to town on a weekly basis. On Sunday, the colorful affair is in Cueyamecalco, about 5 kilometers west of Santa Ana Cuauhtemoc. A fairly large contingent of those suffering from the mud, rain, and bugs down in the Barranca Estrella base camp made the trek up the mountain in search of culinary treats, while a few diehards remained on site to continue

Spanish, Australian, and Mexican members of the team, from left: Marta Candel Ureña, Alan Warild, Greg Tunnock, Enrique "Zape" Ogando Lastra, Estibaliz "Esti" Orella Campo, Luis Miguel Casabona Sevillano, Ignacio "Nacho" Orella Campo, and José Antonio Soriano. *James Brown*.

the exploration of Osto de Cerro Voludo #2 (see message by Skoworodko above) and the dig in Sumidero Barranca Estrella. We also zeroed in on the hardware in the market, since there were now several caves in the project competing for equipment. John Kerr bought a rather well made two-pound sledge that was destined for the bottom of the dig in the *sumidero*, now 60 meters deep and 200 meters long, heading at 330 degrees into the mountain.

Most of the crew returned to Santa Ana and base camp. Four of us, Tjerk Dalhuisen, Maarten Poot, Andi Hunter, and I, continued south on a little-used four-wheel-drive road to the town of San Miguel Santa Flor and made our way to the municipal building, where we explained the purpose of our mission. After a half-hour of friendly banter and inspection of maps showing the known caves in the area, the *presidente* read a letter of introduction from officials in Oaxaca City, signed it, and ceremoniously stamped it with the town seal. This was our permission to scout the mountain to the south, where the high karst plateau loomed in the distance.

March 1, Bill Stone: The previous evening at the *presidencia*, the town registrar had mentioned that just above town the Río San Miguel, the stream in the Barranca Estrella, splits into two parts. Half purportedly disappeared into a hole in the side of the canyon about a half-kilometer upstream from town. This morning we set out to investigate. We soon found ourselves chopping along animal paths through thick tropical foliage and into a narrow rift in limestone in a sea of metamorphic rock. Contacts between others rocks and limestone are good places to find cave entrances. Our focus was on the streambed, and shortly we found what we were looking for, a 1-meter-diameter solution hole in the side of the canyon at floor level. It was more obvious that it might have been because the locals had built a small dam of mud and rock around it to keep water in the main stream. Tjerk dropped in, and out came several tens of thousands of gnats in a black cloud. The hole was filled with boulders, either thrown in to stem the flow or washed in naturally. As an experiment, we broke the dam and diverted a fair portion of the flow into the hole. We did not see it reappear anywhere nearby downstream, so it looks like a good bet as a water entry into Cueva Cheve. But the hole soon filled up and overflowed. It drained slowly when we rebuilt the dam. An interesting prospect, but not the open shaft we had hoped to find.

We then continued down the road to San Francisco Chapulapa, at the head of the deep Aguacate canyon that leads southwest toward the Cheve plateau. In 1989 we had located another river sink, the Sumidero Aguacate, in the area above town during the same recon trip that discovered Cueva Charco. During the 1994 expedition to the Cheve area, this cave was subsequently explored to what appeared to be a terminal sump at a depth of 174 meters, about a kilometer from the entrance. Its dimensions are generous, with a large tunnel leading to a sump. It takes the entire drainage of the huge Aguacate canyon, it is in the limestone contact zone that extends all the way from Cheve to the springs in the depth of the Río Santo Domingo canyon, and it trends 330 degrees. This all makes it likely to be a significant part of the overall system of caves in the area. The Aguacate canyon also provides a point from which to search the high plateau for pit entrances that might connect to Cheve.

In Chapulapa, a few men were hanging around the municipal building chatting. Since no cavers had been there in the past ten years, we had to explain the importance of the exploration work. Eventually, one of the men, Celso Iglesius, the *registrador de hacienda* for the *municipio*, took an interest, because the expedition was willing to rent part of the mostly unused municipal building as a base for working in Sumidero Aguacate. He promptly signed a copy of the letter of permission from Oaxaca City and affixed the town seal.

With that in hand, we drove back up the mountain to an intersection I had noticed on the way into town. It had not been there in 1989 or in fact even in 2003. When I mentioned this in town, I was told that it led 5 kilometers farther up the mountain to the village of El Ocotal, exactly the direction we wanted to go to reach the high karst, saving 500 meters of elevation gain on foot trails. It also passed within a few minutes' hike of Sumidero Aguacate, as we verified in the afternoon, when we drove up to El Ocotal, passing through several canyons with black holes in their walls. Some local field workers offered to serve as guides to take us up into the area the following morning. Although we could have gone on our own, with the GPS to ensure we could find our way back in the fog, it is good to have a local guide who knows of every *osto* (pit in Cuicatec) and sinkhole. We slept in the municipal building in Chapulapa that night.

March 2, Andi Hunter: The lights came on automatically at 5 A.M., which gave us an early start at packing for the adventure in the highlands into the death karst, which gets its name among cavers from the jagged, heavily weathered limestone that can break off and send you plummeting into cactus. There is no water and only scrub vegetation, and a day up there frequently leads to sunburn, dehydration, and wounds beckoning for stitches. Dalhuisen, Poot, Stone, and I struggled to keep up with a fit local guide as we headed south of the Aguacate canyon toward the tall cliffs south above the village of Tlalixtac Viejo. At almost every turn, our guide would point out obscure *ostos*. As soon as we would top one sinkhole, we'd enter another. We had been looking for water all day when our guide pointed to a *ciénega* (swamp) of muddy, rust-colored water full of algae and cow droppings and declared it to be "sweet" water. It was the only source of water in the highlands. We recorded GPS coordinates of over twenty-five pits and potential digs that afternoon. Because of its inaccessibility, the area had never

seen a caver's headlamp, and we were determined to change that by establishing a camp in the highlands. Given the state of the local water, we would have water transported by mule. Three mules were available in El Ocotal, so each delivery could bring 120 liters of water every other day, enough for a six-person camp. Conditions would be primitive, terrain rough, and showers nonexistent.

March 3, Andi Hunter: Dalhuisen, Poot, Stone, and I slept in the cold at 2800 meters near the Cueva Cheve entrance, where we had driven to get a GPS location for it. We plotted up several of the GPS locations taken yesterday and found that one cave in particular, Cueva Jabalí, which we had briefly checked and continues on a 330-degree bearing, needed revisiting. It took us three hours on the narrow roads to get from Cheve back to Santa Ana, where we found energetic new cavers awaiting our arrival. They were Alan Warild and Greg Tunnock from Australia, Enrique "Zape" Ogando Lastra, Marta Candel Ureña, Luis Miguel Casabona Sevillano, Estibaliz "Esti" Orella Campo, and Ignacio "Nacho" Rafael Ramos from Spain, and Mexican caver José Antonio Soriano. We sent the new team over to set up a base camp at Sumidero Aguacate, and Stone and I hiked down to the Estrella base camp by moonlight. Late that night, a discussion among everyone there decided to give both Osto Cerro Voludo #2 and Sumidero Barranca Estrella one more push day and then pack up and move up the mountain to work in the Aguacate region.

March 4, Maarten Poot: By the time Tjerk Dalhuisen, Ryan Tietz, John Kerr, and I were ready to go to work in the dig in Sumidero Barranca Estrella, two other teams had already taken all of the battery-operated drills, so we decided to haul the base camp generator to the front and use the Milwaukee drill to loosen some boulders blocking the way forward. Since there was hardly any draft in the cave, the air got really bad after a few minutes of drilling. Tjerk had to be escorted out. The generator had left so much fog at the front that digging was impossible for a while, so to kill time we started to explore the main fissure upstream of the dig, where Matthesius and Berendese has previously started a climb. John dug open a hole in the floor of a small chamber, and I crawled through. Below were a couple of small chambers connected by squeezes, all in solid bedrock. Holes in the roof were plugged with boulders. The drain for the area was plugged with mud. The hole into this area was still unstable, and a big boulder needs to be removed to make it more comfortable.

Then we returned to the front, cleared out some loosened boulders, and removed all the equipment. It looks like the fissure could break out into going tunnel, but it is impossible to see ahead more than a meter. The crack, a half meter wide by 3 to 5 meters high, is full of boulders wedged there when the Río San Miguel ran through it, making progress exceedingly arduous. We finished Jan and Pauline's bolt climb, which dead-ended at the top, removed all the hangers, which were getting to be in short supply, derigged the main pit, and hauled all the gear back to base camp. I can't believe we got the generator into and out of there. Total survey in Sumidero Barranca Estrella was 205 meters, to a depth of 59 meters.

March 6, Bill Stone: The evening of March 5 we packed up the main base camp tent at Barranca Estrella, and it was a strange, exposed feeling eating dinner that night. The full moon was rising, and some local cows had decided to return to their pasture and were roaming through our tent city. Pavo Skoworodko, Marcin Gala, Artur Nowak, and Kasia Okuszko were still off on a last push in Cerro Voludo #2. The rest of us were wondering whether Brandon Kowallis had been successful in his solo mission to Santa Ana to arrange mules.

It took two rounds of eight mule loads each to get all our equipment up to Santa Ana. Then we had to get all of it and eight people into one truck. We were fortunate to locate the last fifty liters of diesel fuel in town, and, loaded down, we four-wheeled it across the mountain to San Miguel Santa Flor and on to San Francisco Chapulapa. Various parts of the team had already passed through town. Martijn Boonman, Tjerk Dalhuisen, Maarten Poot, Peter Hartley, Jon Jasper, and Brandon Kowallis had their hired truck driver take them straight to El Ocotal, from which the following morning they had hiked up the mountain to the limit of the previous week's recon to establish a high camp. Alan Warild, Greg Tunnock, and the Spanish contingent had done the same a day later and were now holed up in the *presidencia* in Chapulapa. They had been keen on getting started in Sumidero Aguacate and had just returned from a second day of rigging and exploration there. Warild had concluded that the sump would not go, but many side leads remained to be looked at, and there were a number of domes that could be climbed. Hunter, Kerr, Tietz, Skoworodko, Nowak, Gala, Kasia Biernacka, and I found unoccupied spaces in the building and crashed for the night. It rained hard.

March 7, Bill Stone: The Poles were eager to ascend the mountain and get their fair share of rain in the cloud forest above El Ocotal, so after breakfast we transported them and some 180 liters of water in twenty jugs up to the basketball court in the village, where we wished them luck in arranging burros. If the rain continued, the arrangement for water-supply by burro would be unnecessary, but the usual weather in March in the high karst is hot and dry. John Kerr and Ryan Tietz decided to join them at the last minute.

On the way back to Chapulapa, Andi Hunter and I met James Brown above the entrance to Sumidero Aguacate for a recon trip to the bottom. Warild and crew had left the cave rigged at our request, and this was our chance to finally see the cave that was one of the main targets of our expedition. In a somewhat futile attempt to remain dry, Warild had rigged the cave through a second entrance, guarded

over by a 10-meter *mala mujer* tree. When I reached the bottom, I was watching for the coral snake Warild had seen, but saw only black rock. Soon Andi and James arrived, and we headed into the main cave. Almost immediately we were crawling flat-out in the stream—so much for staying dry. The crawl opened into the first of four main pitches leading down to the –110-meter level. There was no staying out of the water on the pitches, which are separated by a few meters of walking in the stream. Finally we were in the main low-level corridor, a tunnel three-quarters of a kilometer long and averaging 10 to 20 meters wide and 5 to 10 meters high. At the base of the last large pitch, we turned into a crawl up a different stream and slithered along at a good clip for a few minutes. In the distance we could hear a rumbling sound, and soon we could feel the mist and wind from a large waterfall. The crawl abruptly enlarged into a high, arched chamber, where the water was coming down one side of a giant dome leading up some 30 meters into darkness. The flow coming down the falls did not seem to be related to the water coming in the cave entrance, since it had at least twice the volume. The water could be being pirated out of the same surface stream farther upstream, or it could be coming from cave higher up the mountain. (There is a map of Sumidero Aguacate in *AMCS Activities Newsletter* 23, page 52.)

Downstream in the main passage was fast walking over a streambed littered with Volkswagen-size boulders, polished smooth over the eons. As we neared the sump, steep walls of organic-rich mud began to ascend the walls of the widening tunnel. The stream had cut its way down on the west side, and we followed it directly to the sump. Jim maneuvered into the sump feet-first until nothing but his head was out of the froth that was brown with the mud we'd stirred up in the passage. He kicked around but found nothing passable to divers.

During our retreat, we took time to investigate the northeast wall of the final room, looking for anything that might have been overlooked to provide a bypass to the sump. We ascended a tremendous mud bank until it crested 40 meters east of the sump and 20 meters above it. Back down the other side, it soon hit the descending wall. But Andi located a narrow horizontal crack in the floor and was soon tossing out rocks and saying she could see farther down. I joined in, and within a few minutes enough loose rock had been removed to reveal blackness below to the east. Andi dropped in and said, "You're not going to believe this, but I'm in a room as large as the one we just left." Together we explored the large chamber. Like the other room, it was mud-floored, and to the northeast was a large funnel, where we carefully cut steps to look at the drain. A hole about a meter in diameter led vertically down into the gloom. It was too steep to attempt without a rope.

At camp that night, we decided there was merit in awakening fresh at the front, without having daily gone through the deluges in the

Below: Overloading the poor truck when leaving Santa Ana for Chapulapa. *Bill Stone*.

Right: Andi Hunter on the wet second pitch in Sumidero Aguacate. *James Brown.*

entrance pitches, so Bart Hogan, who had just arrived from Maryland, Andi, and I began planning a camp in the room leading to the sump.

March 8, Bill Stone: Early in the morning we heard from John Kerr by radio. It turned out that there were few mules or horses in the Ocotal area, and only one horse and part of the crew had ascended the mountain on the seventh. Most of the new crew descended today to go back up carrying what they could. James Brown drove up to Ocotal around noon to drop the Australians and Spaniards off for a recon descent through the towering canyons to the southwest of Chapulapa. With Spanish-speakers on hand, it was determined that there was only one horse available and one person, our previous guide Atanacio, game to haul gear up to the high karst. So they returned to Chapulapa and arranged for eight mules there with Vicente Navarrete, the rancher whose land contains the Sumidero Aguacate.

Andi Hunter, Bart Hogan, James Brown, José Soriano, and I packed gear for the underground camp in Aguacate. As the overall team was scattered, some tools were again in short supply. Andi sorted food and rope, and Bart modified a power supply to charge our drill batteries. (The grid power in Chapulapa was dropping down to 70 volts and our usual chargers were shutting down.) I sorted climbing gear for an ascent up the waterfall dome we'd seen the day before. James and Soriano agreed to help us haul in gear.

March 9, Bill Stone: A glorious sunny day broke over Chapulapa, and we could see blue sky extending up over the high karst as well, a welcome sight, I'm sure, to those camping above. Today the Aussies and Spanish will meet a burro train from Chapulapa to take water and equipment to the high camp. Then there will be nineteen in the high karst and only five remaining in Chapulapa. Andi Hunter, Bart Hogan, and I will disappear for the next three days into Sumidero Aguacate, while José Soriano and James Brown will, after helping us set up the underground camp, man base camp and maintain radio contact with the high camp. News yesterday was that the Dutch had returned to Cueva Jabalí, the horizontal crawlway that Tjerk Dalhuisen had entered a week ago, and come to a five-second pit, but that Maarten Poot had hurt his hand while clearing an entrance to the pit and would be out of action for a few days. Pete Hartley and crew had established a camp higher up on the ridge and were moving on into the killer karst.

The five of us left the surface at about noon. We dropped off most of the equipment at the site of the underground camp and proceeded directly to the dig in the bottom of the mud funnel in the new room. Andi and Bart did most of the digging. By the time James and I took our turn, maybe fifteen 5-gallon buckets later, it was apparent that we were not just pulling out mud, but were in breakdown. We retreated to camp and made a list of things for James and Soriano to bring in tomorrow. We dug a flat, drip-free shelf above the river, hung a clothes line, and finally dug a latrine downwind from camp.

March 10, Bill Stone and Andi Hunter: Everyone recalls hearing a loud noise last night and thinking it was a flood, but water levels have not changed. It might have been a loose rock that had been disturbed by a caver and finally fell.

We are back in camp after eight and a half hours of digging. Bart and Andi did all the digging. The rest of us, including James and Soriano, who had come back in with supplies and to help, did the hauling. Digging is not a glamorous sport, but the sound of rocks dropping below us was enough incentive. The excavation is now about 5 meters deep, and pebbles seem to drop through the breakdown about as far again. Toward the end of the day, Bart drilled five holes, and then Stone went in and hammered until some key cobbles gave way—work for tomorrow.

March 11, Bill Stone and Andi Hunter: Being camped underground has some definite advantages: no rain and no locals to distract you. Yesterday's hammer work had been very successful, and we pulled out fifteen more buckets of debris, plus a dozen large rocks, two of which required a 2-to-1 pulley system to yank out of the hole. Then we decided to take a break and do something different. Andi suggested that we go climbing. We gathered back in the main tunnel and looked for cracks in the roof. Stone had spotted something during our first trip in on March 7 that appeared to lead into blackness, another possible sump bypass. Andi did the climb. The first four bolts were exposed and went diagonally across the overhanging roof, making it difficult to gain more than a meter per bolt. The fifth bolt put her in a vertical crack that led to a chamber 6 meters wide and 10 meters long, with several leads. The climb took about nine bolts in all. An additional drill battery was sent up, along with webbing and rope. Hogan went up to help set up a traverse line over fissures in the floor.

March 12, Bill Stone and Andi Hunter: Our efforts in the high lead netted a few crawlways. It was like Swiss cheese up there, with holes going in all directions. Bart Hogan and Andi Hunter pushed and squeezed though many of the holes, but they tapered into even smaller holes, though one that Hogan found still went. So finally we pulled out the drill and the rope across the fissures and returned to the dig. José Soriano, James Brown, and John Kerr showed up at 2:30 in the afternoon. John's arrival was a surprise, a welcome one because he is a master with a hammer and had brought in a ten-pounder, with which he promptly created more hauling work in the dig for tomorrow. He filled us in on the high karst. The trails there were grossly muddy, but they'd found some deep caves, one of which was down to –180 meters. Cueva Atanacio had been mapped to a depth of 92 meters. The Dutch and the Utah cavers, Peter Hartley and Brandon Kowallis, had left the mountain this morning. With Kerr and Ryan Tietz now back in Chapulapa, the Poles, Spanish, and Aussies rule the upper camp.

Brown had come prepared to

Cueva Atanacio

Explored March 2004 by Peter Hartley, Brandon Kowallis, John Kerr, Al Warild, Greg Tunnock, Ignacio Rafael Ramos.

Cartography by Brandon Kowallis

Total Surveyed Length: 934.5 feet (285 meters)
Total Surveyed Depth: 302 feet (92 meters)

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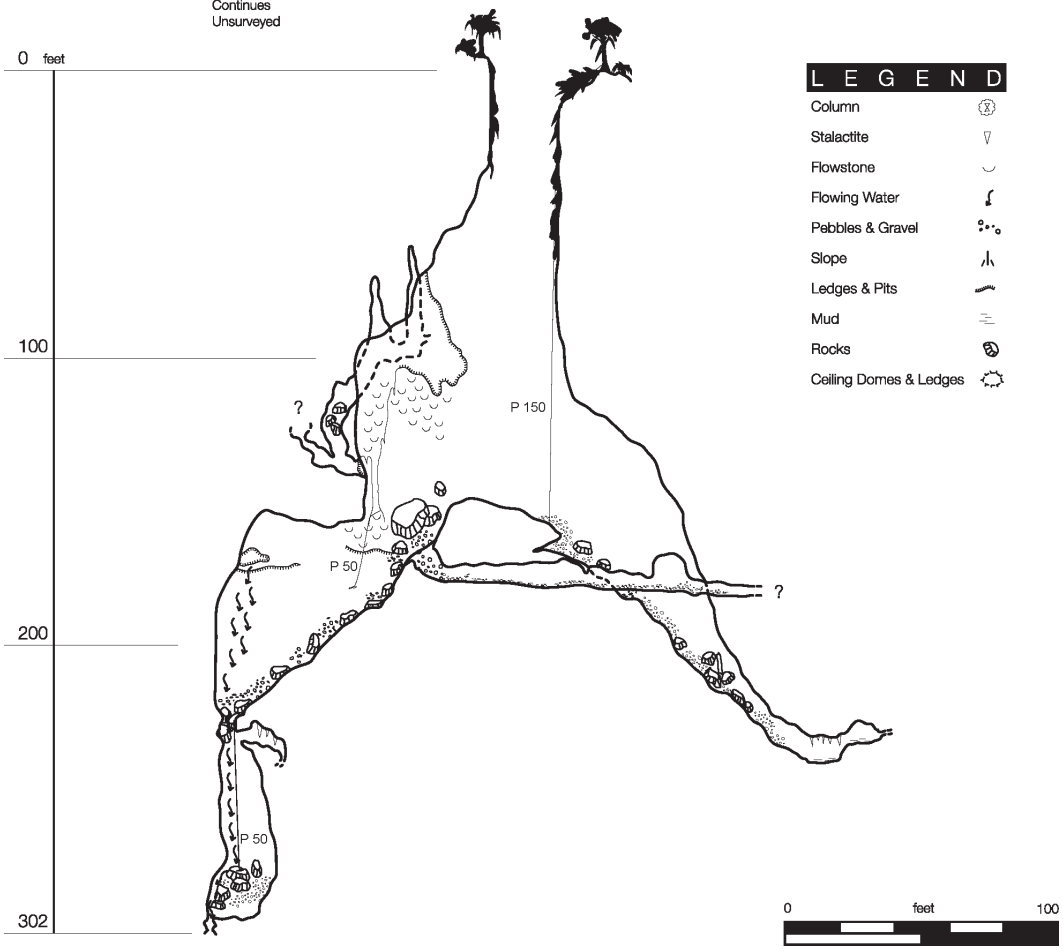


Greg Tunnock sketches the map of the floor of Cueva Atanacio. *Brandon Kowallis.*

camp for two days. Soriano and Kerr left for the surface.

March 13, Bill Stone and Andi Hunter: Today was survey day. Is the dig at the bottom of Andi's mud room deeper than the sump? We surveyed up from the bottom of the dig and down to the sump. Sketching the survey in camp, Stone found that the sump was only a half-meter below the dig. The sump was now running clear, and we could see the hole was about 1 by 0.5 meters, headed down. We pounded in the dig some more. Then James Brown and Bart Hogan went up to push Bart's lead in the maze of tubes off the high room Hunter had climbed to two days before, while the two of us struggled to complete the survey of that area, now called the Arterial Neurosis. James continued digging, and Bart prepared for a lead climb. There is some air there, and it appears to lead to an upper level, but we haven't figured out how to get there yet.

Kerr and Tietz arrived late that evening, after having hiked up to the Ocotal camp and back that day. They joined the camp crew. We have pushed all the leads near the sump and will soon have to work back toward the entrance if none of these pans out.

March 14, Bill Stone: John Kerr, James Brown, and I pulled out buckets of gravel from the dig for an hour. Bart Hogan went up to whang at the top of his climbing lead, which he topped out with four bolts, with Kerr's ten-pound hammer—no go. Hunter, Brown, and Tietz went scouting upstream, where Andi found a fissure leading east about 50 meters upstream from camp. It has a boulder blocking the way in.

March 15, Andi Hunter: I headed down to the dig again, with Hogan and Kerr, where we proceeded to haul out at least fifteen buckets of rock and mud. The "point" is currently blocked with debris from our digging efforts, but we are slowly hammering away at a large boulder blocking the passage.

After lunch, I headed for the big waterfall dome that was through the water crawl upstream from the bottom of the last large rope pitch, at about –110 meters, where Ryan Tietz and James Brown were learning how to do a lead climb, belayed by Stone. They had progressed about 15 meters up the dome, which was 40 or more meters tall. Just as the drill batteries died, the hammer drill became detached from Brown's seat harness and fell, narrowly missing Stone. Ryan and James returned to camp.

Stone and I headed for the surface on a resupply run, meeting Soriano at the entrance. We took with us trash and dead batteries. As I cleared the lip and was surrounded by vibrantly green leaves and other lush vegetation, my eyes went into overload, even though it was an overcast day.

March 16, Bill Stone: This was a day of regrouping on the surface. Kasia Biernacka radioed that she and three other members of the Polish contingent were coming down the mountain for supplies and

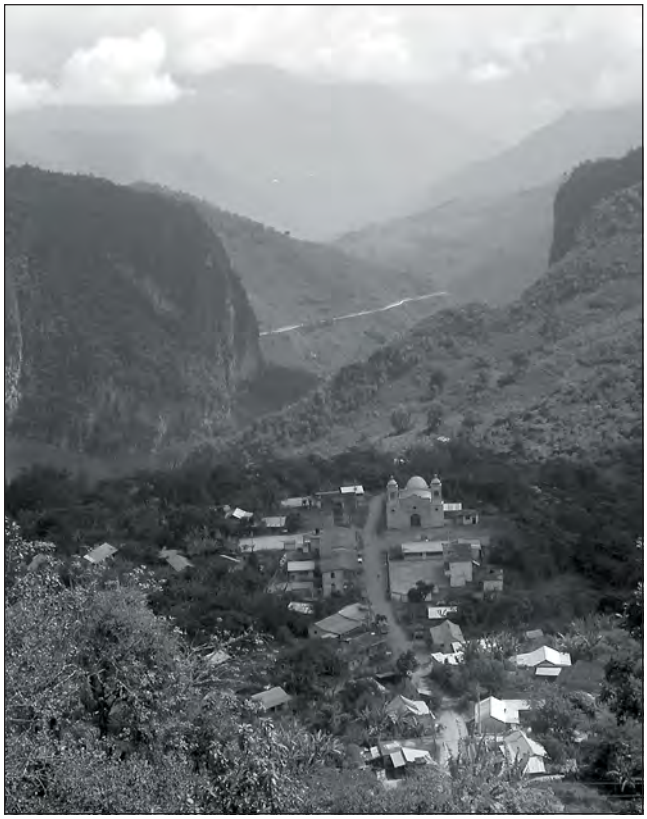
The first descent of Cueva Atanacio. Only when over the lip does one appreciate the size of the pit. *Ryan Tietz*.

needed to be picked up at El Ocotal. Soriano went to fetch them, and soon there was a reunion with team members we had not seen for over a week. Pit #25, the great hope of the high camp that had begun with a spectacular moss-covered 50-meter entrance shaft, had bottomed out at 200 meters depth in a narrow fissure filled with boulders and no wind. But they were discovering new entrances daily and had a hot new lead northwest of camp that was taking a substantial stream and had a strong wind blowing out. They were down 80 meters vertically and at the top of a deep pit. We discussed logistics and made plans to regroup in a week, at which point either we would head up high or they would come down to Aguacate, depending on who had the best leads. Around midday today, Yvonne Droms and Mark Minton arrived from Texas bearing much-needed supplies of equipment.

Andi Hunter and I entered Sumidero Aguacate this evening with very heavy packs of equipment and food, including four liters of pancakes Andi had prepared and a half-liter of real maple syrup, which we will keep secret until breakfast tomorrow.

March 17, Bill Stone: While Hunter and I had been on the surface getting supplies, Kerr, Hogan, Tietz, and Brown had been busy. They had removed the boulder from the fissure passage 50 meters upstream from camp that had been noticed on March 14 and had climbed up more than 25 meters into an old, fossil upper-level complex of rooms and crawlways that led off in many directions. After the surprise pancake breakfast, all six of us in camp went up the new lead to survey it and push a low crawl where Kerr had stopped the previous day. John Kerr and Bart Hogan took digging tools along, but nobody expected a long day. After two hours of surveying, we heard voices below. Mark Minton, Yvonne Droms, and José Soriano had come in on a day trip. They had checked the dig below the mud funnel, and Minton said, "I wouldn't waste another cent on it." I suggested that they go join John and Bart looking for the way on, while James Brown, Andi Hunter, Ryan Tietz, and I continued the laborious survey, with shots averaging 2 to 4 meters. When we came to John's crawl, there was much complaining from Jim, who was lead tape, and much giggling coming from the other side, where Bart and John had returned from their scouting. It certainly looked low and uninviting and appeared to just lead to a small muddy chamber, so I suggested I just throw the book and instruments though and let them do the last shot of the survey. But John said, "No, you *really* have to come through and see this." Suspecting a suck-in but being a good sport, I forced my way through the last meter of the crawl. "All right, good joke, now let's wrap this up and get back to the dig." But it turned out that they had found a half kilometer of new passage that contained the stream beyond the sump. John agreed to guide us through the complicated maze, continuing the survey, while Bart volunteered to stay and dig more to

The village of San Francisco Chapulapa, taken from the road to Sumidero Aguacate. *Ryan Tietz*.



Andi Hunter begins her climb in the sump chamber of Sumidero Aguacate. *Bill Stone*.

Pancake breakfast in camp in Sumidero Aguacate. From left, James Brown, John Kerr, Bart Hogan,Ryan Tietz, and Andi Hunter. *Bill Stone.*

improve the low crawl. We didn't get back to camp until 9 P.M., although we had not planned to be away long enough to miss lunch.

March 18, Bill Stone: We had agreed last night to return to the new passage with rigging gear, so I made a solo run to the high dome where we had been climbing on the fifteenth to fetch some things we needed. John Kerr, Bart Hogan, Andi Hunter, Ryan Tietz, and I left camp at 12:30 P.M. and reached the new river at around 2:30. Following a Huautla tradition, I started the "30-minute run" clock, the amount of time we would scoop before turning around to survey. We went swiftly some 400 meters downstream to where the stream was pirated into an impassable rift. But the canyon we'd been following continued, still 2 to 3 meters wide and 3 to 10 meters high. It was floored generally with small, flat cobbles that made for easy walking. About 100 meters farther, the ceiling dropped to about 1.5 meters, and we were crawling or duck-walking. At this point we sent Ryan back to the river for water, while the rest of us continued in the dry passage, which opened back up. There was one stretch of 30 meters of narrow canyon, but it was mostly open walking passage with no vertical pitches. The fact that there had been little elevation loss in what was probably 1 kilometer or more of passage beyond the sump mystified me. Finally we got to the end of the tunnel we had been running down. Shortly after a nearly right-angle bend, we came to a sand crawl. I'd seen this many times before in the region—a dramatic change in direction followed by a blockage. The passage was jogging to the east, a bit uphill, toward a new tunnel down-dip toward the resurgences, and this had provided a place for the stream to drop its load of sediment.

Kerr whipped out his titanium crowbar, the only tool we had with us there, and began to dig. He eventually got some 50 meters ahead of Bart, who was following him. Meanwhile, Andi and I started surveying back, starting with arbitrarily named station 500. Soon Ryan joined us. We had progressed about fifteen stations when Bart and John caught up with us. John had had an alarming time with sand slumping down on him as he dug upward, but he thought the upward trend was a good sign, and he wanted to go back and push it some more. To speed up the survey, Ryan and John handled the tape, Bart read instruments, and Andi and I shared the sketching chores, since fortunately we had two pencils. By 12:30 A.M., after 810 meters of survey, we were all tired and making mistakes, so I had Ryan find a final station, number 587, to flag. This happened to be in the only large room along the way, about 25 meters high with an open lead at the roof.

March 19, Bill Stone: This was mainly an R&R day. Around 1:30 in the afternoon, Yvonne Droms and Mark Minton showed up. We had been expecting them to camp, but they were doing another day trip. James Brown, fresh from a rest day in camp yesterday, volunteered to help them survey in from station 110 in the Soda Straw Room, a small chamber with some of the only formations in the cave, located about 150 meters before the beginning of the new streamway. The weather had been sunny when Vonny and Mark entered the cave, and they had heard by radio that the Spaniards would be coming down the mountain on the twentieth; their time was up. So we decided to have one more push in the new territory on the twentieth and then head out for a meeting on the twenty-second and an opportunity to wash camp clothes. Bart will have spent twelve days continuously in our underground camp. The surveyors got to station 151, about 50 meters into the new river passage.

March 20, Bill Stone: Last night's chili con carne dinner, made with black beans Hunter had been soaking for several days, had a devastating effect on everyone. We rationed toilet paper and had Pepto-Bismol tablets for breakfast. All except Ryan Tietz felt well enough by noon to carry on with the planned push. John Kerr, Anti Hunter, Bart Hogan, and I left camp about 2 P.M. and reached station 151 about four o'clock. We tied that survey into station 587 in the big room by 6:30, and we ate lunch. We continued on to the sandy dig, where Andi and John disappeared to extend the lead, while Bart and I checked high leads back toward the point where the stream disappeared, hoping for an easier way to cross over to a new canyon. We free-climbed 15 to 20 meters at a dozen or more places, but none of these went.

When we returned to the dig, I was concerned that Andi and John had been gone so long in what I

presumed was a 50-meter-long body-tight tube. Bart volunteered to go check up on them. About thirty minutes later I head scuffling. John reported that there was about 180 meters of cave in there, with walking beyond the crawl. Bart, John, and I surveyed through the crawl and on to an end at another place where John was digging out sand. We reached camp at 6 A.M.

March 21, Bill Stone: Another rest day for the underground camp crew. Yvonne Droms and Mark Stover, Robert Monczka, and Matt Covington, three new arrivals the day before, came in, and we briefed them about leads this side of the stream piracy in the new section. They returned about midnight, having surveyed some 50 meters in a passage to the east with an incoming stream.

March 22: Bill Stone: Everyone else in camp headed out loaded down with trash, laundry, and survey notes. I had to go back into the new section to recover a camera box inadvertently left near the stream piracy. It had the memory cards with the photographs for the past week, some of which we would need to send to National Geographic along with our exploration narratives while we were on the surface. Lightly loaded, I caught up with the rest on the way out.

In base camp in Chapulapa, we found that important progress had been made in high camp at Ocotal. Marcin Gala reported that they now had two new going caves, one down to –250 meters and the other to –320 and carrying a stream and wind. Marcin, Kasia Biernacka, Al Warild, and Greg Tunnock were out of time and would be coming down on the twenty-third to return home, leaving only Pavo Skoworodko and Artur Nowak at high camp. And they were out of rope. We had brought 1500 meters of rope, but with rope rigged in Aguacate and several deep caves above Ocotal, it was all being used. We decided that all who remained would go up to high camp to carry on there for the coming week, likely derigging one of the deep caves to get rope for the –320-meter cave. Suddenly, six weeks into the expedition, breakthroughs have come.

March 23: Bill Stone: Shortly before noon, Pavo Skoworodko, Marcin Gala, and Kasia Biernacka arrived with details of high camp's three new caves. J1 is a large entrance that drains a large area near the bottom of a deep canyon. J2, a multi-pitch vertical cave, is presently 320 meters deep. And Tetris is a very tight vertical cave where the first 60 meters is down through a pile of loose breakdown. John Kerr, Mark Minton, Yvonne Droms, Ryan Tietz, and Matt Covington went up today with supplies. Pavo, Andi Hunter, Mark Stover, Robert Monczka, Bart Hogan, and I will follow tomorrow with six mules.

March 24, Andi Hunter: The trails leading up to high camp above Ocotal were slick with calf-deep mud. Seven mules, donkeys, and horses followed us carrying colorful cans of water or fuel and pack after pack of heavy vertical caving gear. The high camp has a water-collection system of tarps, but it is still necessary to have water brought up every few days. We were thankful for the sunny day, because most of our days so far have been cloudy and filled with mist, making it difficult to dry out wet caving gear. However, this also made our hike up to 2450 meters a hot task. Matt Covington, John Kerr, and Artur Nowak went into Tetris Cave today to derig, so that we would have rope to push the deepest cave, J2, otherwise known as Osto Faustino. That evening, we huddled around a campfire in the fog.

Survey party at the entrance to J2. From left, Bart Hogan, Matt Covington, Andi Hunter, and Ryan Tietz. *Bill Stone.*

John Kerr views formations in the Soda Straw Room in the sump bypass in Aguacate. *Bart Hogan*.

March 25, Andi Hunter: We awoke to another sunny day. Bill Stone and John Kerr climbed a tree 40-plus meters high that extended high above the canopy. This resulted in a grand view of the karst areas we had been unable to see due to misty days and thick vegetation. The high point also would allow us a clear satellite connection to upload our daily logs to National Geographic.

Yvonne Droms and Mark Minton went into J2 to do some additional widening with hammer and sledge. Pavo Skoworodko and Artur Nowak also went into J2, carrying three bags of rope, to continue rigging as far as they could get. They returned at 3:30 A.M., having run out of rope.

Mark Stover: After helping haul gear from camp to J2, Robert Monczka, Matt Covington, and I headed down the mountain to Chapulapa with a list of supplies to be procured. When we broke out of the cloud forest into the very steep, newly cleared fields, local workers showed us a new hole. It was a 1-meter-wide hole that dropped straight down 6 meters to a rocky floor that sloped down into darkness. After thanking our new friends, we recorded the location with GPS and continued down into town.

March 26, Andi Hunter: Five of us headed down the trail to J2 with a mission to survey. Bill Stone could not fit through the gnarly squeeze above the second drop, so only four of us, Matt Covington, Bart Hogan, Ryan Tietz, and I, continued onward. The cave got wetter and muddier the farther down we went, but we were determined to complete our survey chore. Fifteen drops down, I noticed that the gritty ropes had eaten a hole into the hollow middle of my stainless-steel top bar and, fearing that the exposed sharp edge would cut the rope, I got into a stable position on a sandy platform, where Bart and I rearranged the bars on my rack. The survey was difficult, given its completely vertical nature, and we were in waterfall spray the entire way. We had to try to sketch or read instruments on rope while warding off hypothermia. The bottom came quickly—not the bottom of the cave, but the bottom of the last rope that Skoworodko and Nowak had rigged.

Bill Stone: Pavo had warned me that the cave was very tight and "you aren't going to like it." I had been braced by this warning not to expect much here. I had been in tight caves before, and they are not my forte. Although I make a point of staying trim, it is the bone structure that ultimately determines whether you get through the cave or not. When we reached Pavo's tight spot at the top of the second pitch, everyone else forced their way through. Bart Hogan was heading on down the rope when I slipped my way in, feet first. My feet were dangling over 20 meters of space, but I had a safety line attached with a locking carabiner to the rope leading out over the drop. Slowly I realized that I was slipping farther and farther into a vise through which I wasn't going to fit. I could hear

Kasia Biernacka surveys in Tetris, which was pushed to 300 meters deep and continues. *Marcin Gala*.

Andi on the rebelay below, offering tips and encouragement, but it was no use. I found a good handhold and did a series of pull-ups and was out.

I told the others that they'd have to go on without me. For the first time in memory, I'd been left behind. I hoped the others would be careful, for a rescue here would be most difficult. I turned and headed back toward the entrance in search of hammer and chisel. Caving is team work. Those below would bring back the data. I and those coming in to enlarge the crack would make the cave safer.

Yvonne Droms: Mark Minton, John Kerr, James Brown, and I set out along the very steep, muddy path toward the headwall above the cave entrance. Jim was carrying the camp generator, which we'd be using to power a large hammer drill to try to enlarge the tight squeeze leading to the second drop in J2. Once at the entrance, James settled in to tend the generator, which had a way of turning itself off way too easily. John, Mark, and I slithered down the tight fissure, pressing against both walls to control our slides. We rappelled down the first drop, then negotiated various constrictions leading to the second pit. We found Bill waiting near the top of the drop swatting the large, annoying flies that pestered us in the upper part of the cave. John went through the tight spot and pulled up the rope in the pit so that rocks we loosened would not cut it when they fell. We spent the day drilling, chiseling, and hammering rock away, and we were successful in enlarging the passage enough to be somewhat more comfortable. John reinstalled the rope, and we all headed out and back to camp.

March 27, Andi Hunter: At midnight, the beginning of the new day, Matt Covington, Bart Hogan, Ryan Tietz, and I were standing on a breakdown pile 300 meters vertically below the entrance, looking down into a dark abyss below. The water and wind whirled down into the vertical shaft. The cave was going down fast, and the wind meant it was going to go a lot farther. The survey was done, and it was time to head out. Skoworodko, who had rigged this part of the cave, had warned us of a large, unstable rock near the end. We had all passed over it without realizing it on the way down, but we were more cautious on the way up. We finally made it out of the cave and back to camp at 7:30 A.M.; a nineteen-hour day trip had come to an end.

Mark Stover: Artur Nowak, Pavo Skoworodko, and I headed into J2 for what was sure to be a long trip to continue rigging and surveying down the dramatic fissure. It took several hours of squeezing and rappelling through tight spots and water spray to reach the end of the previous survey at approximately –350 meters. Artur went ahead rigging, while Pavo and I began the survey. After 45 meters of nearly vertical shots taken while hanging from bolts, we reached the bottom of the fissure at nearly –400 meters. Our final rappel landed in a small room with a light but steady waterfall and a 1-meter-wide fissure heading downstream. We continued downstream for several hundred meters at a fairly steady direction of 320 to 360 degrees through narrow canyons, tight climbdowns, breakdown piles, and a thin meander that required stemming over small potholes full of water. Loose rocks were often underfoot, and handholds were often suspect, so Pavo made judicious use of a bolting hammer to test them. We reached a point where the stream becomes a waterfall dropping approximately 10 meters into a room at least 12 meters in diameter. From the top of the waterfall, we could not see the full extent of the room or where the water left it. The batteries in our drill were dead, and we were many hours from the surface. During our trip out, we still needed to stage-derig the ropes in the cave to protect them from the flood waters of the next rainy season. Rather than attempt to survey the complexities of the stream passage, we headed to the surface, satisfied that at least we had reached a new level of the cave.

March 28, Bill Stone: We awoke to find the final push team from J2 sitting around the campfire. They had just returned from an 18-hour trip in which they had reached the bottom of the shaft series at a depth of 391 meters by using a 50-meter dynamic rope, the last piece of rope in camp. Beyond, they had forced their way through 400 meters of stream tunnel, encountering a junction with a major stream that tripled the flow in the passage. They came to a wet pitch where the water arched out into the blackness of a large chamber. They were unable to survey the part of the cave below the shafts, but estimated that they had dropped another 50 meters.

With the entire expedition rope supply rigged, we had no choice but to pull back, leaving J2 as the target for a future trip. We decided to arrange for mules for the following day and to return to Sumidero Aguacate for the final week of the expedition.

Before leaving high camp, we still needed to check out a sinkhole in the death karst at very high elevation, near 2800 meters, some 3.5 kilometers northeast of Cueva Cheve. So Bart Hogan, Andi Hunter, and I set out on a marathon recon into this mysterious area. It took two hours to climb up through wet trails of the cloud forest and break out into the barren area of death karst, jagged, heavily eroded limestone ridges and pinnacles separated by cactus-filled sinks, fissures, and pits. The tips of the ridges frequently break off underfoot, and our pace slowed dramatically. Three hours of thrashing later, we reached the peak, 2875 meters according to the GPS, from which we were able to get a grand view of the entire Cheve high karst. In the distance to the south was the mystery sink we were aiming for, along with dozens of others not shown on the topo map. We bushwhacked into all of these, unfortunately finding no cave entrances. The main sink was, amazingly, floored with grass that looked like a golf course, rolling with sub-sinks all about. Most of the latter are also grass-floored; one that Andi and Bart investigated takes water but is blocked by a constriction. By 6:15, thick clouds had rolled in, visibility had dropped to 5 meters, and it had begun to rain.

Fortunately, we had a string of GPS waypoints, taken to record the location of karst features, to follow back home.

March 29, Bill Stone: Pavo Skoworodko had gone down the mountain to arrange for mules for 9:00 A.M. No one in camp believed this schedule, however. Time in the mountains is usually plus or minus five hours. I was still sacked out at 9, when I heard the unmistakable whistling of burro drivers coming up the trail. I rushed to meet them at the campfire, where Mark Minton and Yvonne Droms were already busy packing group equipment. The locals seemed quite content to sit around the fire drinking coffee and watching the circus as gringos scurried about. Within two hours we had reduced the camp to around thirty duffel bags. By 3:00 in the afternoon we had reached the trailhead at El Ocotal, and by 4:00 we were at our municipal-building headquarters in Chapulapa, where we emptied the packs, cleaned and sorted gear, and prepared for a final four-day underground camp in Aguacate.

Andi Hunter checks a sinkhole in the "death karst" below the 2875-meter peak. *Bill Stone*.

March 30, Yvonne Droms: While most of the team was getting ready for a second underground camp in Sumidero Aguacate, Mark Minton and I prepared for a day trip into the cave to check some leads that had been noticed during earlier surveying. Since we had to leave for home the following day, we unfortunately could not participate in the cave camp. When we got to the entrance, a nasty surprise awaited us: the entrance rope was gone. Rope is a very coveted commodity in these rural mountains. We returned to Chapulapa to get more rope and discuss the situation with the team. It could turn into a crisis if the rope was removed while the team was in the cave.

Having rerigged the entrance pit, Mark and I rappelled down the series of ropes leading to the main passage. It must have been raining hard for a while higher up on the mountain, because the waterfalls were very forceful. We were mostly at the edge of them, since the ropes were rigged to avoid the full force of the water, but sometimes I'd swing into it.

We were carrying a number of large batteries for the team, and we dropped them off near the passage where they would be used for a dome climb. We then located our lead, a narrow side tunnel off the main trunk heading southwest about halfway between the final rope pitch and camp, and started into virgin territory. That particular area of the cave is extremely muddy, which made crawling very difficult; we sank deeply into the oozy mud. But the cave continued ahead, and it lured us onward.

We took turns climbing or squeezing into any possible lead we found. Some minor, unimportant-looking holes netted large, echoing chambers or pretty domes glistening

with water droplets. One waterfall came in handy to wash off some of the heavy muck that coated our coveralls and packs. After a couple of hours, we had found a network of interconnected routes where water once flowed, as well as an active passage that held promise of continuing. We were stopped at an exposed traverse over a pit. It was late, and we needed to turn around and leave. It was the end of the expedition for us, alas.

Bill Stone: There was a flurry of activity at our base camp in San Francisco Chapulapa. We had only four days to push Sumidero Aguacate, and we wanted to make the most of them. Ryan Tietz, Andi Hunter, John Kerr, Bart Hogan, James Brown, and I planned on a three-day push from camp at –170 meters. Our last act before loading up the trucks was to upload the week's reports to National Geographic and get e-mail. We received an e-mail from Bill Mixon in Texas:

> Don't know whether you've heard anything about the fuss over an "accident" and "rescue" in Cuetzalan. Some Brits, many of whom happened to be members of UK military, got trapped by high water. They were prepared for that and had arranged backup from some Brit cave divers who came over and got them out. But the Mexican press created all sorts of nonsense—like the Brits were military spies looking for uranium in the cave. This led to politicians doing stupid and hasty things. Result is that the Brits were cleared of all charges but expelled from the country (after being detained and questioned for a few days) for doing research on tourist visas. Officials are now claiming, hopefully temporarily, that all caving in the country needs research visas. And Ramón Espinasa reports that one of the Mexican TV networks is encouraging viewers to report all foreign cavers to the authorities.

I immediately called a meeting to discuss this. We had permits for our project and were well known on the mountain. But we had recently had some unusual conversations with the locals. At high camp, one of the mule drivers asked us about our permission and was shown our letters. The *presidente* in Chapulapa asked for a list of team members and their nationalities. These were pointed questions from someone high up in the mountains, where life tends to be casual to an extreme. The e-mail perhaps explained this, and also some vandalism to the trucks that we discovered when leaving town at the end of the trip. But the unanimous team vote was to proceed with our original plan of a camp in Aguacate.

Andi Hunter: We awoke to the squeal of a pig being slaughtered at first light, followed by howling dogs and hungry donkeys. The early arrival of the mules at high camp yesterday had caught us off guard, and the gear piles were highly disorganized. It was hard to get motivated to go back underground, given the current political situation, the increased scowls of the locals, and the possibility of our rope being taken again from the entrance. But finally we mustered all our gear by early evening and headed underground.

March 31, Bill Stone: Last night we arrived in camp worried about what might greet us when we surfaced. At least we were secure in the knowledge that no one was going to pester us at camp. Wednesday morning, though, everyone was excited about having another go at Aguacate. John Kerr rounded up Matt Covington, James Brown, and Bart Hogan and headed for the sand-crawl dig at the northern end of the cave, now 300 meters below the village of La Hierbabuena northwest of Chapulapa. A second crew, Ryan Tietz, Andi Hunter, and I, headed back to the base of the shaft series 110 meters below the entrance, where an upstream passage carrying more than twice the flow of the surface Aguacate stream entered the system. This tunnel ended in a high dome, where a climb had been begun during the first camp. This was far enough west of the entrance that it might just continue on southward toward El Ocotal and perhaps, we thought, be a potential route for the J2 underground river. I took the first lead and managed to extend our line another 15 meters upward, to where the static line I was trailing ran out. There was no ledge there, so the next leg of the climb would have to be belayed from bolts on the wall.

American cavers near the end of the expedition. From left, Bart Hogan, James Brown, Andi Hunter, Bill Stone, Mark Minton, Yvonne Droms, Matt Covington, Ryan Tietz, and John Kerr. *James Brown.*

John Kerr in the final sand crawl in Sumidero Aguacate. *James Brown.*

Andi Hunter: Stone came down after four hours, and we had a break for an hour drinking hot chicken bouillon and splitting a can of tuna. I agreed to lead the next climb, while Tietz and Stone would hang from harnesses for four or five hours and belay me. Attached to two dynamic ropes and trailing a static one, I slowly bolted my way up an overhung diagonal crack. The sound of the waterfall was so loud that communication was impossible. I followed the waterfall, and after several necessary deviations, continued up a dry route, not expecting it to go anywhere. After several more bolts, I was out of gear and battery power. Ryan and Bill were wet from spray and very cold from waiting for me at the belay station.

April 1, Bill Stone: Predictably, no one was up until around 11 A.M. There was some early talk of the entire team going out to the dig, given that this point was farthest in the direction of a potential connection to the Cheve system. But both leads were of considerable interest, so we decided to send a four-person crew to the dig and two to the climb. Matt Covington had to leave today to catch a bus to Mexico City and his flight back to California, and he headed out shortly after Andi Hunter and I went off to finish the climb.

When I reached the end of Andi's route, I hung far out in the shaft and saw, around a corner, that there appeared to be a higher level that she had missed. The small fissure above the belay stance looked like it might provide a dry bypass around the direct route up through the waterfall. Sure enough, three bolts later I was into the fissure and found that it spiraled around and led up some 20 meters higher into a 7-meter-diameter chamber with a ledge leading out over the shaft and up onto a still higher platform. By the time we had fixed lines rigged and Andi had joined me, we were 70 meters above the floor of the pit and looking up a giant shaft full of fog and spray. After lunch, Andi took the next lead, but she found she did not feel confident this day, so I was soon back at the point. Unlike some of our previous pitches, this one had ample foot- and handholds, all covered with a gritty layer of flowstone, which made for good free climbing. They also made niches to stow the heavy drill and battery pack while I did more traditional free climbing, with 5 meters or so between bolts. But at one point I dislodged the battery pack, and it fell 15 meters onto rock. Incredibly, when I hoisted it back up, it still worked, although the outer shell was crushed. I continued confidently up, and with two more bolts discovered to my surprise that there was a horizontal tunnel leading off toward the sound of a waterfall. I rigged a fixed line, and Andi came up. We soon found ourselves at the base of yet another cascade, this one 12 meters high, coming into a flowstone-coated chamber. By climbing the walls, we were able to gain another 10 meters into a stalactite-festooned room and a dead end. The waterfall was the way on, and we were out of static line, so this was the end for this expedition, a lead heading south into the mountain. We surveyed out and made it back to camp by 3:30 A.M. Less than forty-five minutes later, the other four returned from the dig. They had progressed only another 5 meters. Bart still believed the dig would go, but it was more work than they had bargained for and would require a few days' effort, something that wasn't going to happen this year. The known length of Sumidero Aguacate had grown by 2171 meters to a total of 3225 meters

April 2, Bill Stone: As I was groggily awakening at 10 A.M., a bright light appeared in the distance. It was Pavo Skoworodko returning from a brief trip to Mexico City to change his flight schedule. He had met there with Ramón Espinasa and had much more news about the Cuetzalan affair, which he filled us in on.

Andi Hunter: We were full of energy this morning, and at breakfast we decided to work as a team and move our gear in stages. The arduous task of derigging camp and carrying out the large loads did not seem as difficult as it would have seven weeks earlier. I guess our bodies had acclimated. I was actually looking forward to hauling the heavy loads and viewed it more as a challenge to see how many separate loads I could haul through the tight spots. We staged the ten duffels of equipment every couple of rebelays and spread out the team so that each person was focusing on specific sections of rope. Several of us found it amusing to attempt to haul two heavy camp packs at once on the more open drops. Ryan Tietz and John Kerr pulled the ropes behind us. Back in Chapulapa we started dropping like flies. We'd had another successful push, and now we could sleep.

April 3, Bill Stone: Base camp was packed by midmorning, and by 11 A.M. the trucks were being loaded for the long trek north. The *presidente* walked up at the scheduled time for our briefing, almost to the minute. We walked up to his

office, laptop in hand, and over the next hour I stepped through the progress of the preceding seven weeks for him. The results of the project have been all that we had hoped for in what was basically a reconnaissance expedition. We left the mountain having more than tripled the length of Sumidero Aguacate, where several promising leads remain. We had a major going cave, J2, at high elevation and surveys of dozens of smaller caves and pits. In total the expedition discovered and mapped more than 5 kilometers of new cave, including nearly 2 kilometers of vertical extent.

Cheve 2004

Durante la primavera del 2004 una gran expedición visitó el área del Sistema Cheve, Oaxaca, buscando nuevas rutas hacia la cueva que estén entre la cueva conocida y su resurgencia en el Río Santo Domingo. En la Barranca Estrella, la excavación al fondo de la Cueva Barranca Estrella tuvo que ser abandonada después de varios días de trabajo al comenzar a llenarse de agua. Dos rutas a través de rocas de derrumbe en el Sumidero Barranca Estrella, donde el río se disipaba antes de que una nueva dolina apareciera río arriba, llevó a cuevas pequeñas y difíciles, pero sin progreso real a través de ellas. En el Sumidero Aguacate, campamentos subterraneos llevaron al descubrimiento de un pasaje alterno al sifón que había marcado el final de la cueva. El pasaje más allá del sifón y otros pasajes pequeños explorados al escalar domos, incrementaron la longitud de la cueva en 2171 metros, a 3225 metros. Los miembros de la expedición fueron guiados a varias cuevas verticales en el karst arriba de El Ocotal. La cueva más prometedora ahí, J2, fue explorada hasta aproximadamente 440 metros de profundidad, a un tiro en un pasaje amplio con agua. En total la expedición exploró y registró más de 5 kilómetros de nuevos pasajes, con un total de casi 2 kilómetros de desarrollo vertical.

PROYECTO CERRO VERDE

Gustavo Vela Turcott

In May 2003, three members of Sociedad Mexicana de Exploraciones Subterráneas, Luisa Estrada, Roberto Rojo "Chibebo," and I, undertook a reconnaissance trip to the Cerro Verde area in Oaxaca. Motivated by the findings of the 1995 and 1996 trips by Ramón Espinasa to Flor Batavia, we decided to look for caves in the high and middle elevations of Cerro Verde. As the trip was to be devoted to hiking and finding entrances, we did not take vertical or photographic gear. We traveled from Mexico City through Tuxtepec, San Felipe Jalapa de Díaz, and finally Flor Batavia. There we met with the local authorities, and they were interested and very supportive.

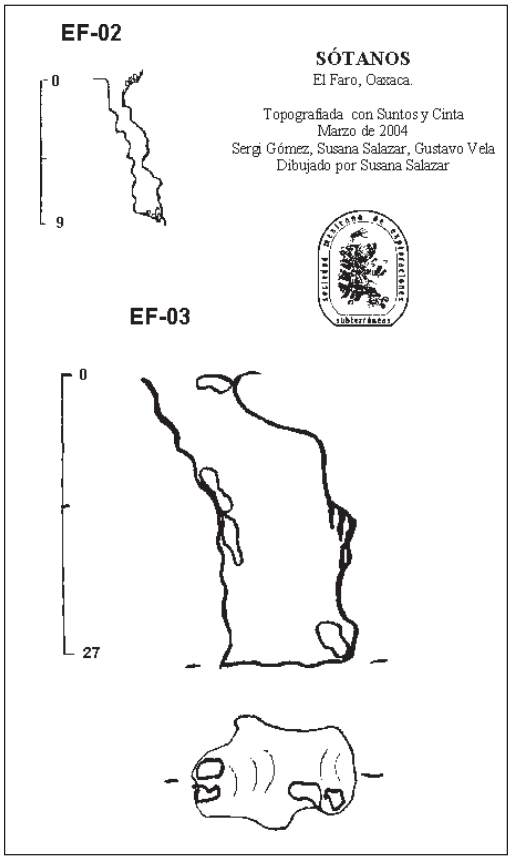
The next day we walked in dense forest to the small village of La Escalera, where we were welcomed by the only family that lives there. During a long walk of several hours, Higinio and his brother-in-law showed us caves near the village. We recorded locations with the GPS of the entrances to three pits about 25 meters deep and saw four other entrance to small caves that did not go.

The next morning, choked by the early heat, we started the long uphill walk toward the *ranchería* Piedra Colorada. There, Don Juan and his family received us. Two more hours walk from there, Don Juan showed us a cave that seems very promising, with an entrance 8 meters high and 2 meters wide. We went down a slope and stopped at the edge of a 5-meter pit. The cave clearly collects the rainwater from the surrounding area.

The next day we walked about eight hours in the forest looking for caves, again guided by Don Juan. He took us to a 30-meter pit, but we were not able to get a location with the GPS because of the thick foliage, although we wasted a half hour trying. Besides that, we found only some small dolines and very small caves.

On the following day, we started off to San Andrés Teotitlapan, and on the way we looked at some dolines with small entrances and recorded their GPS locations. In San Andrés we talked with the local authorities, and they were friendly and interested. We enjoyed a sunny evening there. During those days of long hikes, we reached the conclusion that it was certainly necessary to have the aid of local people in order to find any important caves, because otherwise we would be lost in the forest, where the vegetation made it impossible to see entrances. During the six-hour bus ride to Cuicatlán we could see the change in vegetation from forest to desert. From there we took another bus back to Mexico City.

In early March 2004, members of SMES once again headed to the middle part of the Cerro Verde. This time Susana Salazar and Sergi Gómez from Spain and I went to El Faro, west of Santo Domingo del Río, Oaxaca. The first day we checked some very large dolines hoping to find cave entrances, but to our great disappointment everything was covered with mud. On the following day, three people from El Faro guided us in the forest,



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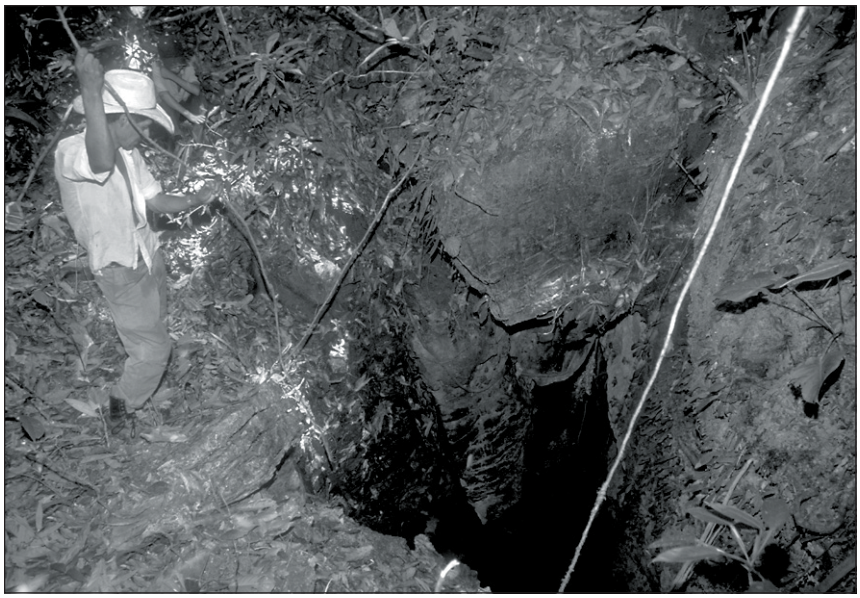


A pit entrance near Piedra Colorada. *Gustavo Vela*.

and during seven hours of walking we identified several dolines and four small pits that we explored and recorded on the GPS. The deepest was 27 meters.

In the morning of the next day, we went down to the small town of Piedra Ancha, guided by the rumor that after rains water from a cave floods the road about a kilometer past the town. We tried to visit the authorities there, but the office was closed, so we decided to look for the cave and return later to speak with the authorities, a decision we regretted later. We found a cave near the road and descended a 12-meter pit that led us to a passage 15 meters

On the trail on Cerro Verde.
Gustavo Vela.

high and wide. We began by mapping downstream until we arrived at an end after about 200 meters. We returned to the entrance pit and went upstream in passage 12 meters wide by 10 meters high, sloping upward at 3 degrees for 500 meters toward the southwest. We stopped the survey at the base of a climb. Because the entrance is only 30 meters above sea level, the temperature, 24°C, was exhausting.

Having found a good lead, we thought that Piedra Ancha would be a good place to take a larger expedition, and after we had left the cave and were planning where to put a camp, two farmers with machetes in hand approached, very displeased because we had been in the cave without permission. They took us to the office in town, where we explained to the five people there that we had found the office closed in the morning and had planned to come back and talk to them later. They called more people, to whom we explained that we were exploring and mapping the cave just for sport. As apparently the town is very democratically run and decisions are made by all the people, they called more, and we had to explain again. We spent two hours explaining and asking to be excused for trespassing on the *ejido*. They examined our surveying equipment, thinking it was useful for finding gold. After a total of five hours and our refusing to pay a fine of 2000 pesos, the authorities let us go. Four days later, having finished our reconnaissance in the general area, we passed again through Piedra Ancha. Some of the same people who had judged us before invited us to visit the caves as long as we asked permission, while others said it would be better if we did not come back.

The SMES had planned a trip later in March, with four Mexican cavers, two Hungarians, and one Canadian, to the areas of Flor Batavia and El Faro, but the publicity about the incident in Cuetzalan caused us to cancel the trip, fearing that instead of caves we would find problems.

Based on our two excursions to Cerro Verde and study by Ramón Espinasa of the topographic maps, we think there is good potential for caves, but their exploration will not be easy. The caves of the high part around Piedra Colorada are waiting to be mapped, and more can be found with local guides. In the lower part of the mountain there are also caves, but it will be necessary to handle the local people very carefully. What we have found so far impels us to continue looking, and no doubt the project there will take several years.

Proyecto Cerro Verde

Miembros de la SMES visitaron el área de Cerro Verde, Oaxaca, en mayo 2003 y marzo 2004. Visitaron varias cuevas en el área que fueron encontradas con la ayuda de guias locales. Topografiaron una cueva cerca del poblado de Piedra Ancha, pero tuvieron problemas con los habitantes locales.

JOURNEY THROUGH THE PURIFICACIÓN KARST

Mark Minton and Don Broussard
with a contribution by Diana Tomchick

Minton: We did a long through-trip of the mountains, going up into them at Los San Pedro, Tamaulipas, and back down to the west to Zaragoza, Nuevo León. The water was as low as I've ever seen it, with the first river-crossing dry. There have been some improvements to the road, and there is a new concrete bridge at the last Río San Pedro crossing. They're building a new steel sawmill building in Los San Pedro, so things must be going well.

First we stopped near Llorona and hiked around some new territory near the Edge of the World. I found a nice but short cave, Cueva Inclinada, which has some unusual cave pearls that look sort of like brain-coral. I've never seen pearls like that before. Then we visited the entrance to Calenturas and the cliffs above the Corona resurgence, before camping in a clearing near Tamaulipeca, below Revilla, where we explored several short pits, none of which went, but all of which appeared to be virgin. A couple of the deeper ones, the Before Breakfast Pits, were surveyed.

Broussard: On December 22, we packed up camp and ground down the road to El Chihue, then back up to Yerba Buena. There we collected twenty gallons of water dribbling out of the pipe to the village cattle and clothes-washing trough. We continued up the mountain past the spring where Yerba Buena gets its trickle of water. Lumbering activity was seen in many places along the side of the steep, rocky road, where men were sitting beside pine logs 2 feet in diameter, all sawn into 3-meter lengths. Eight-inch pine logs are used as ramps to roll the larger logs up onto flatbed trucks, using muscle power and levers.

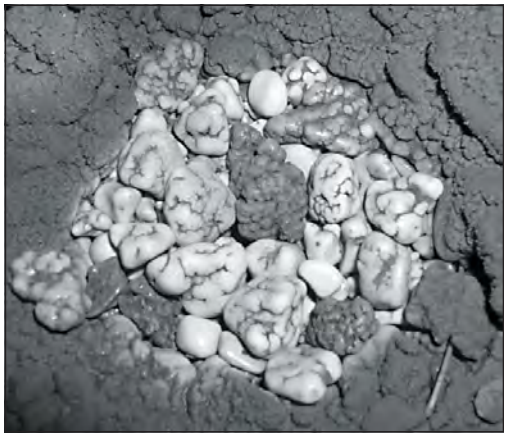
Minton: Next we moved to a camp at Arroyo Luna near where the concrete bridge crosses a side arroyo. We checked a cave and a couple of pits Yvonne Droms and I had found walking an old road there a couple of years before. The pits didn't go, but the cave, Cueva de Nochebuena, is an active wet-weather *sumidero*. We surveyed 200 meters in twenty-nine stations and left it going, with slight airflow. The passage is small, 0.5 to 1 meter in diameter, but washed clean and taking lots of leaves and sticks. I explored ahead about 50 meters, and it continues just the same, making many 180-degree bends, both vertically and horizontally. In some of the pools there were hundreds of blind, white isopods and also inch-long blind, white, flat worms (planarians?), which I've never seen in the area before. Wetsuit bottoms would be nice for further surveying.

Broussard: Snow on Christmas morning. Dinner included a brandied fruitcake.

Minton: The next day was warm and nice, and we did a canyoneering trip down a side arroyo and a couple of kilometers down Arroyo Luna, but it wasn't particularly interesting country, and we didn't find any other caves. Next we moved to Cañada Verde and checked that area. The side road there goes way beyond what the maps show, crossing Arroyo Agua Nueva and ultimately ending at a spectacular overlook above upstream Arroyo Luna. The road hadn't been driven in years, so we had to do a lot of clearing of rocks and deadfall, but it was, remarkably, not washed out.

Broussard: On December 29, we walked down to Rancho Agua Nueva, where we found a guide. He took us to a huge entrance 45 minutes more or less horizontally along the ridge. Bill Steele, Diana Tomchick, and I surveyed Cueva Sinalosa, 340 meters in circumference, 100 meters across, and 30 meters

Peculiar cave pearls in Cueva Inclinada. *Bill Steele*.



A version of this article appeared in the April 2005 *Texas Caver*.

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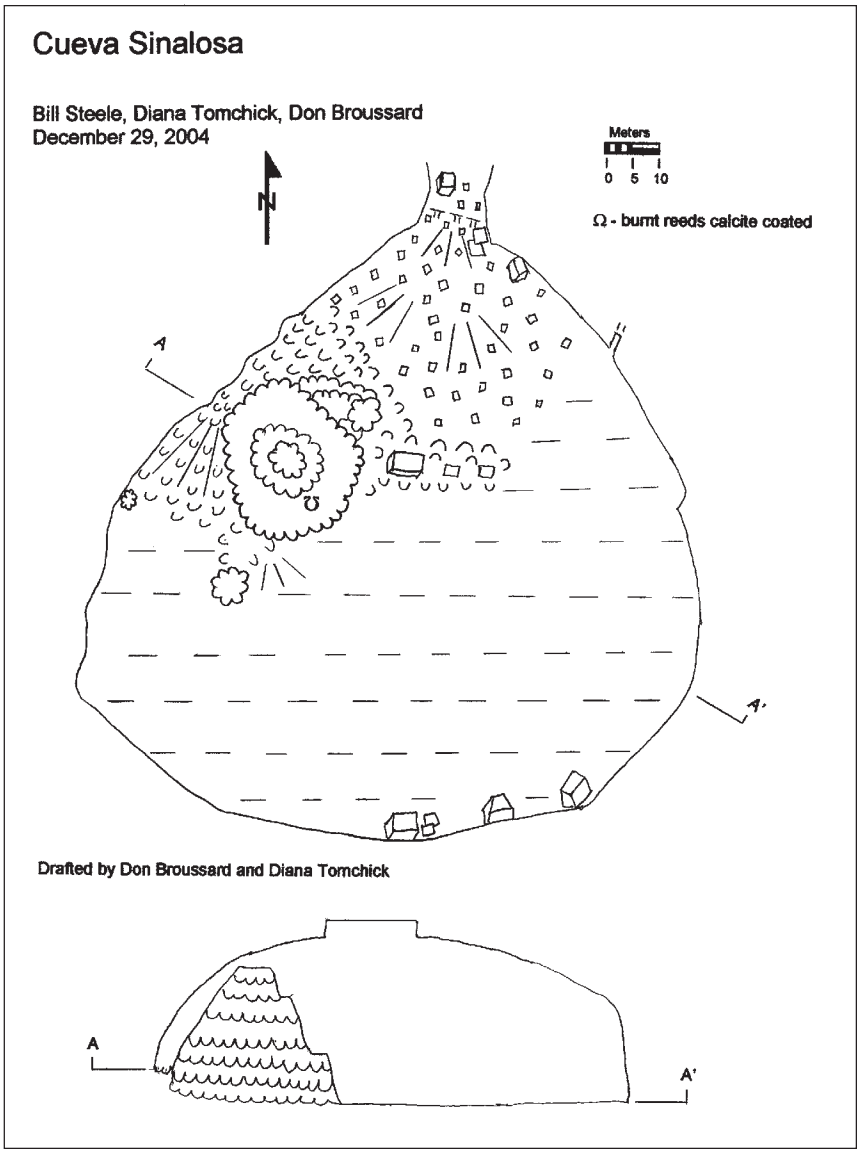
high, with a floor-to-ceiling flowstone mass occupying the northwest corner of the large room. While we were surveying, the guide took Ernie Garza and Mark Minton to a 50-meter blind pit.

Minton: We visited the abandoned phosphate mine, La Revanche, shown on the topo map near Cañada Verde. It would be interesting to go down some of the many shafts there, because they look like mined-out natural pits, but we hadn't taken any rope on that hike. We also found a small 30-meter pit near the road that didn't go, and then followed another side road, where we found a large-diameter 40-meter pit we called Sótano de Cañada Verde. Perhaps this is one of the pits mentioned in *Death Coral Caver* 4, page 36. While there, we met some mining executives over from Dulces Nombres whom we had also met the year before. There were very friendly and gave us some leads and their e-mail addresses, saying they would send us more leads, maps, and aerial photos. They invited us to stay at their headquarters in Dulces Nombres, so we may visit there next year and tour the mines.

Just up the road past the 40-meter pit is another abandoned phosphate mine called Tinaja Verde. It also looks like a huge mined-out natural shaft, wide and very deep—a four- to five-second drop. Alas, we had no time to check it out. I suspect there is a lot more to be found in that area.

Broussard: We slowly bumped along the road, over a last pass, more than 2500 meters in elevation, south of the massive cliffs surrounding the peak of El Vieja, 3500 meters.

Minton: We went down to Zaragoza and visited El Salto, then drove to Bustamante for our last night. It was a wonderful trip, and we ended up with more leads than we started with.



Don Broussard gazes at the massive formation in Cueva Sinalosa. *Ernie Garza*.

We were packing up camp one morning when we heard them coming. Imagine my shock when I saw two adult men being dragged through the lechuguilla, cactus, and assorted thorny things by a two- to three-hundred-pound heifer. Had they no idea how to tame her? Instinct set in, and I lunged for her, but it had been almost a quarter of a century since I had handled cattle on a daily basis, so it took me several tries to wrestle her to the ground. Once down, she had that oh-my-god-am-I-gonna-die-now look cows get when they know they've been bested. I sat on her for a few minutes, scratched her behind the ears, and told her she was a Good Cow, then let her up. She arose quickly, but then stood there staring, unmoving, at the activity in camp as we finished packing. It took two *vaqueros*, one on each end, to get her moving, and then they were gone, crashing through the underbrush once again. Bill Steele says that the Mexican men were speechless during all of this, and that they'll no doubt be talking about the legend of La Macha for many years.

—Diana Tomchick

Don Broussard in Cueva Inclinada. *Diana Tomchick*.

Viaje a través del karst de Purificación

Durante las vacaciones navideñas del 2004, espeleólogos realizaron un largo viaje a través del área del Proyecto Espeleológico Purificación al noroeste de Ciudad Victoria, desde el poblado de Los San Pedro, Tamaulipas, en el margen oriental hasta Zaragoza, Nuevo León, en el oeste. Revisaron probables continuaciones en cuevas conocidas y exploraron antiguos caminos madereros.

HISTORY

EL ABRA TRIP REPORT FROM THE 1800s

Sylvester Baxter

The following is from a travel novel written in the late 1800s by Sylvester Baxter, a Boston gentleman. It chronicles the adventures of a group of Boston gentry who travel through Mexico by train in a private car that was built especially for the occasion. The following excerpt relates their excursion to the Sierra de El Abra in San Luis Potosí and their visit to Cueva de Taninul Number 4 and Cueva del Nacimiento del Río Choy. Though a fictional piece, the book is obviously based on real experiences by either the author or his sources. Those who have visited the described caves will instantly recognize them despite the quaint writing style of the day. From:

Baxter, Sylvester. 1891. *The Cruise of a Land-Yacht*. Boston: Author's Mutual Publishing Co., iv + 263 pp. Excerpt from Chapter 17, "Down Among Tropical Marvels," pp. 233–241.—Jerry Atkinson.

It was long before daylight when the train started, and when they were up they found themselves at the entrance of the passage through the last range, before reaching the coast plain. The pass was called El Boca del Abra.

"Now we shall take a look at a cave," said Mr. McCotter, after they had eaten breakfast. He guided them up the slope of the pass beside the track and a short climb over the rocks brought them to the entrance of the cave. Here they found themselves in a large rotunda-like space, with walls of pure, grayish tints, stained here and there with delicate green and other subtle shades of color by the mineral-charged water that had seeped through and also formed the graceful fringes of stalactites depending from the roof.

It was quite different from Harry's conception of a cave, for they needed no torches with which to see their way. Instead of having to peer through deep gloom and half imagine the shapes of things about them, the place was filled with a pleasant mellow light that poured down from above, through an almost circular opening in the dome-like ceiling. Looking up, they caught bright glimpses of the blue morning sky through a canopy of foliage sprinkled with sunshine. The roots of trees grew downward through this opening and exhibited various stages of growth, from fringes of delicate filaments suspended in the air to strong, slender columns that formed an irregular ring in the centre of the rotunda, apparently supporting the roof, in rivalry with the stalactites. Directly beneath the opening there grew a mass of shrubs and plants in the light which it afforded, forming a sort of natural flower-bed.

They passed on through a series of chambers, some still loftier and others low and spreading, but all having the skylight feature. Some of the rooms were at higher levels than the others, and from one they could look down through an opening with a sort of balcony into another in which they had already been.

"This is the most delightful sort of cave I ever heard of," said Florence.

All the caves in this part of the country are like this; they all have skylights," said Mr. McCotter. "At one place further down the line you can see in the distance an opening in the side of a mountain, like a great arched portal. It is two or three hundred feet high, and is called *La Ventana*, or the Window. The cave is something over seven hundred feet high from floor to ceiling, and forms a magnificent great hall, well lighted from above. It was once the abode of a band of robbers, and in the walls are still the iron rings where they used to tie their horses. It is really a hollow mountain, a sort of great stone shell.

"Here are the tracks of some animal," said Mr. Brinkley, pointing to some footprints on the floor.

"Fresh tracks, too," said Eliot. " It must have been quite a sizeable beast."

"Why, they are tiger-tracks!" exclaimed Mr. McCotter. "Tiger-tracks!" shrieked the ladies, in unison.

"Why, perhaps he's still here!" cried Harry.

"I think not; he's probably gone out to look for his breakfast!" said

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Thanks to Ed Sevcik for calling this book to our attention and Jerry Atkinson for providing the book and scanning the text. Maps of both caves can be found in AMCS Bulletin 14, the Choy as figure 6.1, p. 92, and Taninul as figure 6.13, p. 109. There is a somewhat more detailed Taninul map in AMCS Bulletin 1, p. 80.

Mr. McCotter.

"Well, I for one do not intend to give him a chance to find it here," said Mr. Brinkley.

The ladies had not waited for further explanations, but had rushed off in the direction whence they had come. The others followed, by no means slowly. "Suppose we really had seen the eyes of the tiger himself glaring at us out of some of those dark recesses in there, like two balls of fire! How we would have come piling out of that cave then!" said Harry, when they were outside, and breathing freely again.

"It makes me shudder to think of it!" cried Florence.

"I shall always insist that we have had a narrow escape," said Mabel. "The fresh tracks bring the real tiger near enough, and I shall make the most of it when I tell about it at home. It is too good an opportunity not to be improved. Now after we once get started again on the train, I should really enjoy a sight of His Tigership peering over the rocks at us."

"But the tiger is an Asiatic animal," said Harry. "How is it there are tigers here?"

"It is really the jaguar," said Eliot. "But it is also known as the American tiger, and the Mexicans call it the *tigre.* It looks something like a tiger, and is beautifully spotted, but is much smaller."

Just as they had reached the train they were startled by the sharp report of a gun in the direction whence they had come, followed by another. What could have happened?

"I saw some of the men going out with guns just before we started to go to the cave," said Harry.

"The second one was a rifle-shot," said Mr. McCotter, "but then they might have fired at a parrot with a rifle by mistake. Jack Bliven, the fireman, has a shot-gun and rifle combined."

Very shortly there appeared up on the slope above them two men bearing the limp carcass of a tawny animal.

"They've shot the tiger sure enough!" exclaimed Eliot. "What luck!"

It was Bliven and Antonio, the latter a Mexican brakeman. There was great excitement all around when the tiger was laid on the ground before them, and the two men were highly elated.

"Mighty lucky my shot-gun was a rifle too!" said Bliven. "Antonio and I went out after birds, and we came suddenly upon the tiger. Antonio saw him first and gave a yell; he was crouched among the rocks not over ten paces away, all ready to spring at something. I raised my gun and fired a charge of bird-shot at him, not thinking; it peppered him and maddened him so that he gave a leap right at me, when I remembered the rifle and fired instantly. The beast dropped dead right at my feet."

"How splendid!" exclaimed Mabel. "Now the whole adventure is complete!"

"What an elegant creature," said Florence, looking sympathetically at the supple, graceful form, with its beautiful, delicately marked skin, and the yellow eyes, glassy in death and no longer fierce. "The poor thing!"

"Suppose the 'poor thing' had jumped at you in the cave," said Eliot with a laugh. "I am afraid that it is a waste of sympathy to expend it upon tigers."

The train started and shortly passed through a tunnel and out of the last mountain gorge. The great plain of the coast stretched ocean-like before them, covered with a forest which, with its varied tints of foliage, looked much like a New England woodland in spring-time. As was the case with their previous descents to lower levels they went along the precipitous face of the mountain, gradually approaching the even ground of the plain.

"We are getting near the great Choy cave," said Mr. McCotter, while they were still descending, and at his suggestion they all went out onto the "quarter-deck." "Now look down at the track. This bridge is built directly across the 'skylight' of the cave."

As they were passing over a substantial iron bridge, the train moving slowly, suddenly there yawned beneath them a deep, pit-like chasm. Far below, in the shady abyss, they saw the glinting of a stream rushing rapidly over the rocks. "It is two hundred and five feet from the bridge down to the water there," said Mr. McCotter. "Just back of those rapids the water in the cave is deep and still, and reaches back a long ways, covering the floor to a great depth—over fifty feet, at least, so that Bunker Hill monument, which is two hundred feet high, could be stood upright in the chamber with plenty of room to spare between its top and the roof."

The train stopped and they walked back to the bridge, through the open-work of which they peered down into the dizzy depths. From the side of the track the mountain side was an almost perpendicular wall of rock down to the plain, nearly two hundred and fifty feet below. The Choy river came tumbling out of the cave in a lively cascade and then meandered briskly off into the plain. The young men lost no time in descending into the cave to enjoy the morning bath they had been promised there. The ladies wandered up and down the track, enjoying the grand prospect and gathering the wild-flowers which they found growing in great profusion. Among them were two beautiful kinds of the passion-flower, one small and delicate, with stems and sepals moss-covered, like the moss rose.

Mr. Brinkley accompanied the young men down the steep path over the rocks in the face of the precipice to an upper entrance to the cave, something more than half way to the bottom. The chamber where they entered was partly filled with loose rock that had been blasted away in the construction of the railroad, and Mr. Brinkley decided not to venture his considerable weight down the uncomfortable slope, but content himself with a survey from above, where there was a good view over the interior.

The cave was composed of two adjacent chambers, narrow and lofty, something in the style of a cathedral with a double nave. The farther chamber ran back into the mountain for some distance, and the two were connected by a broad, high arch, resembling that of a

theatre proscenium, though grandly irregular in outline.

The young fellows were soon in the water, and the vaulted ceilings resounded with their merry cries as they sported about. The water was crystal clear and of a rare azure hue, through which the gleam of their white bodies had a strangely pallid and unearthly effect, in contrast with the dark translucence about them.

"It seems as if this were some ancient abandoned cathedral converted into a grand swimming-bath," said Eliot. "But isn't it delicious! The temperature of the water is perfect; we could stay in here all day without fear of a chill!"

"I, for one," shouted Harry, "am ready to turn merman on the spot and take up my permanent residence in Choy cave!"

"How remarkably buoyant this water is!" remarked Ignacio.

"It strikes me as being even more so than salt water. I can't account for fresh water having such a property," said Eliot.

"Some of the boys," said Mr. McCotter, "think that it is probably due to the force of the water as it somehow comes welling up from below, and so having a greater sustaining power."

"Isn't it because it perhaps carries in solution a large amount of lime, or other minerals, just as salt gives the water of the ocean its density?" asked Harry.

"I shouldn't wonder if you had struck the true reason, Harry," said Eliot. "As all these mountains are limestones, this water must certainly carry a large amount of lime in solution, and it would naturally have such an effect."

"Do you know there is a second story to this cave, in back there?" said Mr. McCotter. "One time a number of the railroad men were up here and while Mr. Whorf was looking around up the mountain, the rest of them went in swimming here in the Choy. Mr. Whorf and his party found the entrance of another cave up there, and went in to explore it. They saw that at one end it fell away into a dark pit of unknown depth, and they began to throw rocks down into it to see how far it went. The rocks went rolling and crashing down, when suddenly their blood was almost frozen in their veins and their hair fairly stood on end at the sound of a succession of piercing yells of the most frantic and panic-stricken description. A Mexican servant with them dropped on his knees with terror, and for a moment they were prepared to believe in the existence of the gnomes that are said to inhabit the crevices of the earth. They had sent their shower of rocks down among the swimmers here, who were naturally terribly frightened, but fortunately no one was hurt."

Out of the water, in the back part of the cave, there rose a pinnacle to a height of something like twenty feet, looking, in that position, like a pulpit. Its face was nearly perpendicular, and natural steps in the rear made its top accessible.

"What a place for a dive!" cried Eliot, and the swimmers made for it.

With one of the young men poised like a statue on the peak, ready for a plunge, some clambering up the sides or grouped on its sloping flanks, and others in the water and clinging to its base, the scene was a subject for a sculptor. It seemed like the realization of some imagined scene from classic mythology.

The time for them to leave seemed to come all too soon, although they had been for over an hour in the water. The prolonged whistle of the locomotive, sounding strangely down from above, warned them that the train was ready to start, and brought them back into the nineteenth century from the days of ancient Greece, in which for the moment they were living.

El Abra, Reseña de un Viaje de 1800s.

Esta es la reimpresión de una historia sobre las visitas a la Cueva de Taninul Número 4 y Cueva del Nacimiento del Río Choy en la Sierra del Abra, SLP. Originalmente apareció en una novela publicada en 1891, pero las descripciones de las cuevas son precisas.

BRITISH CAVING IN CUETZALAN BEFORE 2004

Tim Allen and Paz Vale

The Cuetzalan area was first explored by the American Nevin Davis in 1972–73, traveling the area with his wife and occasionally a friend. Most of the caves he reported were explored for only a short distance and left still going. Much of his exploration took place farther to the west than the area we now call Cuetzalan, but he did visit Atepolihuit de San Miguel, Coahuatichan, and the Octimaxal caves. His efforts were well reported in an early AMCS publication.

In 1976, the British caver Peter Lord moved to Mexico City to work. He wanted to find a caving area close enough to the city to make weekend trips possible, preferably to caves that required minimal equipment. The North Americans showed him the Nevin Davis report, and he made the first of many trips to the area that year. On his first weekend trip he was shown twenty-five entrances, including Chichicasapan, Atischalla, and Resistol, three of the main entrances that now make up the Cuetzalan system. Some of the caves that were shown to him that day are still being explored thirty years later.

Between 1977 and 1980, there was much activity in the area as cavers from Texas, California, Canada, Mexico, and Britain joined in. The Chichi, Resistol, and Atischalla streamways were linked together to form the Cuetzalan system, which approached 20 kilometers in length. Atepolihuit de San Miguel was pushed to a "nick point" taking a large quantity of water 6 kilometers into the cave. Some exploration took place in Zoquiapan and San Andrés, as well as a number of lesser caves. During this time all the entrances were linked together by a surface survey, and the explorers began to understand the size of the drainage system beneath them. However the much sought-after resurgence for the system was never found. Most disappointingly, the exploration over these years was never fully reported, and few surveys were published.

In 1980 and 1981, a Belgian group visited Cuetzalan and made some significant discoveries. They broke through a 500-meter-long choke in downstream Chichi and explored a further kilometer to a "low passage, hands and knees in water." They also pushed the wet passage in San Miguel to a sump. Unfortunately they were unable to follow up these leads due to an accident, and they remain unpushed today.

Despite being reported as "one of the finest and most going cave systems in the world," interest in the area fizzled out after the Belgians departed. The reasons for this are speculative, but three factors seem to have contributed. First, the exploration had been undertaken by several loosely coordinated groups, and surveys were often duplicated or impossible to tie in. Although some resurveying was attempted, it must have been very difficult to know who had done what and where. Second, there seems to have been some break up in the relationships of the key players, which no doubt led to further mix ups with the survey data. And third, other great caving areas were being opened up in other parts of Mexico that were undoubtedly more appealing than sorting out the mess in Cuetzalan.

During the rest of the eighties no further new exploration was attempted, although a number of Mexican groups made tourist trips into various known caves. Late in the decade a few cavers from the Northern Cave Club of Great Britain visited the area with Mexican caver Ramón Espinasa and members of the Sociedad Mexicana de Exploraciones Subterráneas. During two visits, Huayateno cave was resurveyed and the potential of the area confirmed. Many attempts on both sides of the Atlantic were made to obtain detailed information on the caves, but little of use could be found. In the end it was decided to start again from scratch, and the first expedition of NCC and SMES cavers was planned for Christmas 1991.

Ten British cavers and half a dozen Mexicans turned up for various periods of time over the Christmas and New Year month. Low

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Most of this summary is taken from the history page at the web site http://www.vale.org.uk/caves/cuetzalan, accessed in January 2005. Much additional material is on this site, including many well-drawn, but low-resolution cave maps. The 2003 information is from a report by Paz Vale submitted to the Ghar Parau Foundation.

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cloud and drizzle persisted without respite for the first two weeks, and this hampered initial efforts to locate entrances and routes into the caves. Rumor had it that Cruz Verde had been connected to the Cuetzalan System and offered a short cut to the farthest reaches. A lot of time and effort was wasted proving this rumor false. Most of the main routes in Cruz Verde were surveyed, however, and the downstream leads pushed to a conclusion. In total, 12.5 kilometers of the Cuetzalan System was surveyed, including some virgin passage. However, the known connections between Chichicasapan, Resistol, and the Atischalla remained elusive. Exploration in Chichi was halted half way through the Belgian Boulder Choke in what seemed a hopeless route. In the huge upper fossil passage, the Bockstiegel connection, which reportedly connected with downstream Resistol, was somehow missed. Resistol itself proved a hard entrance to find, and it was the tailenders of the team who eventually pushed it down to the pitch at Bob's Folly. Over a kilometer of new fossil passage was discovered above this pitch. In Atischalla Norte, the end choke was penetrated for quite some distance before the way on became too obscure, and Atischalla Sur was abandoned at a very tight bedding. In the Cuetzalan catchment area, several other caves were rediscovered, including Cueva Sin Nombre and Octimaxal 1 and 2. Farther east, new discoveries were made, including Sima Talcómitl, Sima Grande, and Sima Zoquita. Only the latter was fully explored to sumps both up- and downstream. Simas Talcómitl and Grande were both left going with a number of main leads. A large, previously unknown resurgence was discovered bubbling up from the dry river bed below the village of Tonalix. In the wet weather an incredible volume of water rose here, but alas there was no enterable cave. It proved, however, that the depth potential of the area was around 900 meters. With around 19 kilometers surveyed on the trip and a good insight made into the area, a return was inevitable.

No major expedition was mounted during 1992, although Mexican cavers led by Ramón Espinasa made a few weekend trips to the area in April and May and made a significant find in Chichi. Toward the end of the year a small British team visited the area and, along with the Mexicans, did some exploration in San Miguel.

During March and April 1993, thirteen Brits from the NCC and the Army Caving Association visited the area, most of them for a month. They were joined by four members of the SMES for as much time as they could manage. The Atischallas, Resistol, and Chichicasapan were finally reconnected and all the original passages resurveyed (we think). The Belgian Choke was busted and the way on left wide open beyond a second choke at the head of a very wet pitch. The survey reached over 21 kilometers, with a depth of 464 meters, less than the Americans' figures, but with more cave surveyed. The San Andrés System was stumbled upon via a 55-meter shaft known locally as Sima Ixtahuata, but by us as Alum Pot. Several entrances were found upstream and linked together. Downstream, another huge choke was found that took several attempts to pass. Beyond, the passage kept going and going until we ran out of time. Our first brush with flash flooding occurred on one of these trips, when two members were trapped by flood water between an impassable pitch and a sumped-off low section. Water rose over 10 meters, and the trapped party was extremely lucky to find an escape route up into a roof passage. In all over 8 kilometers was surveyed in this system. Sima Chapultepec was discovered just outside Cuetzalan town. The entrance, located in the side of a choked shakehole, led to a series of four tight pitches before gradually opening up. After 2.5 kilometers, this entered a much larger, rubbish-strewn passage that we immediately recognized as Zoquiapan. Although none of us had been down this cave, it was one of the few well-documented by the previous explorers. High above the San Miguel sink, Cueva Tasalolpan was rediscovered in the upper limestone. Also in the upper limestone, Cueva de la Providencia was found. This horizontal cave is often visited by Mexican tourists. A number of other smaller caves were found, including Cueva Grotbag and Bat in the Face Cave, none of which were very pleasant. The resurgence below the village of Tonalix was revisited. In the drier weather, no sign of the resurging water seen last year could be found, and the river bed remained dry for several kilometers downstream. On the last day of the trip Cueva de Alpazat was shown to us. Located down in the Tozán valley, it appeared to be the flood overflow for much of the area. Beautifully decorated, it was explored for only a kilometer, although the size of the draught indicated much more to come. After the Brits had left, the Mexicans surveyed nearly 2 kilometers, leaving the way on wide open at a major stream junction. Over 24 kilometers was surveyed during the trip.

In December 1993, the Army Caving Association cavers who had been on the previous trip launched their own expedition to the area. They resurveyed Atepolihuit de San Miguel as far as the "nick point" and discovered some new inlet passages nearer the entrance. Sima Zoquiapan and Cueva Pilostoc were also resurveyed, and both were connected up with Sima Chapultepec to form a system over 6 kilometers long. Again the flash-flooding struck, and a team was forced to spend a night underground when floodwater prevented them from ascending the 75-meter entrance pitch to Sima Zoquiapan. Cueva Quichat and Sima Bagshaw were discovered on the small hill above Cuetzalan. Although both end prematurely, the size of the passages shows that they must have once been part of one of the main systems of the area. Archaeological remains in the main passage of Quichat suggest that the cave has been used by the locals for quite some time. Cuevas Chapultepec and Scorpio, located near Zoquiapan in the upper limestones, were also new discoveries. The most significant discoveries of the trip were

made in Chichi. Near the main entrance, the Jawbone Series was reentered and extended through a duck, giving access to nearly 3 kilometers of passage. And via the Chichi entrance, the left-hand choke at the bottom of Resistol was revisited, and this time a route through was found and a small tunnel entered that was left going at the top of a pitch after 1.5 kilometers. When the survey was drawn, the pitch was found to be almost directly over the main passage in San Miguel. Unfortunately the team had run out of time. Around 20 kilometers was surveyed on the trip.

A few months later, over Easter 1994, another NCC expedition visited the area. This was the largest yet, with seventeen Brits and six Mexicans. The Cuetzalan system was connected to San Miguel via the open pitch left from the Christmas expedition. This increased the length to over 34 kilometers and the depth to 658 meters. Elsewhere in the cave only minor extensions were made. Several attempts to push downstream of the Belgian choke all ended in failure, mainly due to flooding paranoia. The San Andrés system was pushed downstream for several kilometers to within a short distance of the fast-expanding Alpazat. Unfortunately this ended in a choke just downstream from the entry of a major inlet. As this was being investigated, the five-man team was hit by a flash flood, cutting off their escape. At the height of the flood the team were left with only 5 meters of airspace in a passage 30 meters high and wide. Cueva Alpazat was rapidly extended, mainly by the Mexican contingent. Two major leads were left heading up into the hill. A semi-active passage ran southeast towards San Andrés, while the main streamway snaked its way southwest towards San Miguel. Above Sima Talcómitl, a new shaft that descended to a streamway was located. This was followed for several kilometers both upstream, which became too narrow, and downstream to a connection with Talcómitl. In Cueva Tasalolpan, a few small extensions were made. At the same level farther up the valley, Cueva Coyoxochit was explored. Other minor caves were explored, including Cueva Tarantula, Cueva Dragfold, and Sima Tres Simas. A total of 11 kilometers was surveyed on the expedition.

In January 1995, a smaller expedition was launched. The main aim of this trip was to connect Alpazat to San Miguel and San Andrés. To overcome the fear of flooding, a telephone line was installed in Alpazat. This worked successfully as an early warning system, as the expedition was again hampered by flooding. The route towards San Andrés ended in a very large, complicated boulder choke with a large stream present. The streamway route towards San Miguel ended in a large sump pool. However, well over a kilometer of dry, complex fossil passages were explored in this area, and the expedition ran out of time before these could be fully explored. Two new stream caves were connected to Sima Talcómitl, adding 2.5 kilometers to the length, but no significant progress could be made downstream. Over to the east, a new resurgence was located near to the village of Tepetzala. A total of 7 kilometers was surveyed.

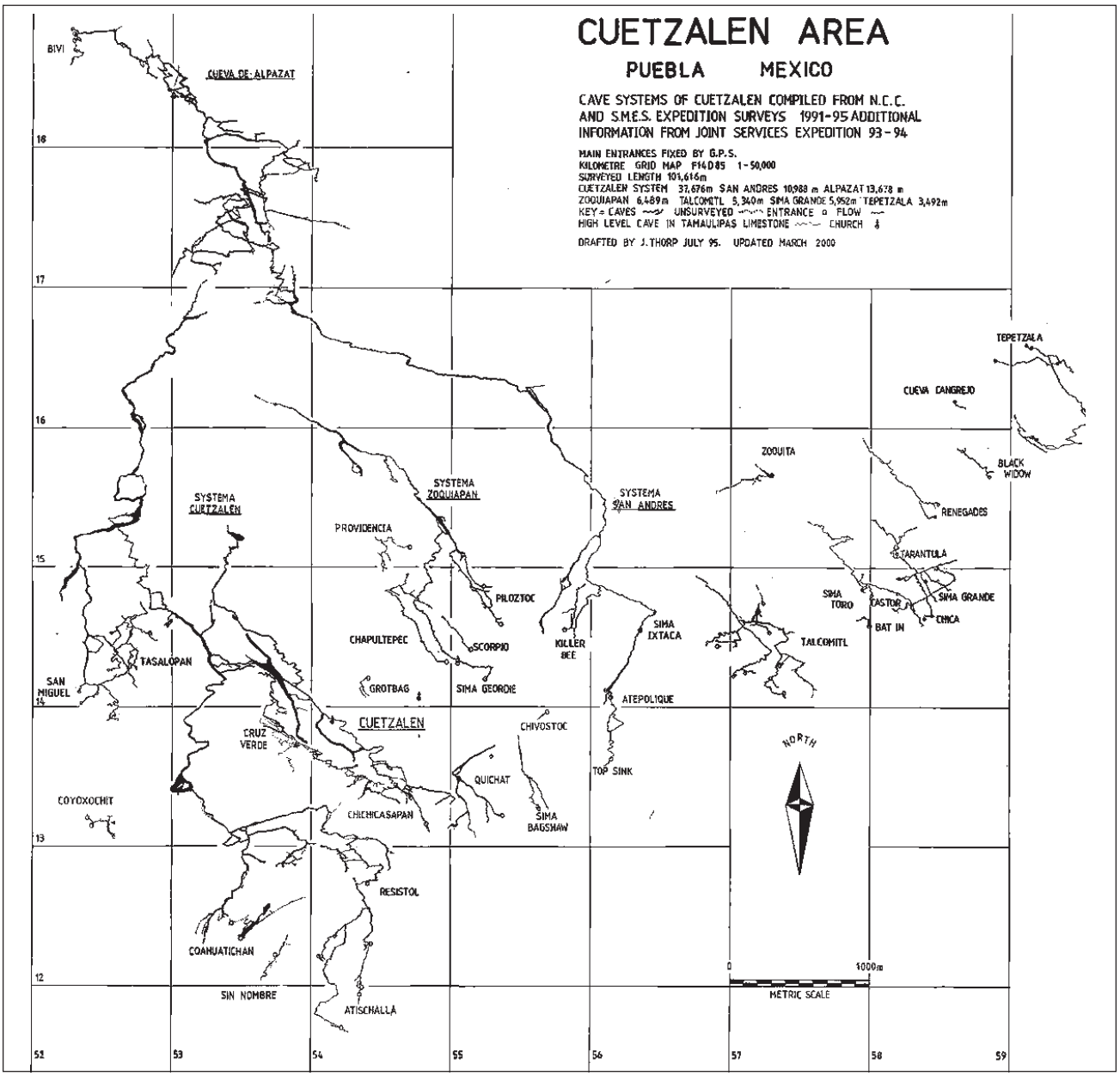
In January 1996, another small expedition visited the area. The main aim was the continued exploration of Alpazat, but because Mexican cavers were not represented on the expedition, the team had to abandon this objective. The team instead concentrated their efforts on the area to the east between the Talcómitl and Sima Grande systems. Main exploration concentrated on a newly discovered entrance, Sima Castor, which led after a series of crawls and short pitches to a large fossil passage. The southern section of this passage led to an active streamway, El Presidente Streamway, which appeared to be very close to surface. A second streamway, Cholera Streamway, was pushed to a connection with Sima Grande. The northern section of the fossil passage was investigated, but leads led to nothing, with the exception of a pitch, located at the end of the expedition, that appeared to drop to a large streamway. The resurgence located the previous year near the village of Tepetzala was also investigated but found to choke just beyond the limit of daylight. However, another entrance, Nacimiento Tepetzala, was located just above river level approximately 1 kilometer downstream from the resurgence. A dry entrance passage led to an intersection with a streamway. Downstream was explored to a second entrance located in the river bed. The upstream lead was pushed to a large chamber, Pink Comb Chamber, with a possible continuation visible high in the roof. Elsewhere, some small extensions were made to the upstream section of San Andrés and in Quichat. Around 4.5 kilometers was surveyed.

In January 1998, a large team visited the area. Their initial explorations concentrated on Sima Castor, primarily the lead down the pitch located in 1996. Unfortunately, the passage at the base of the pitch terminated in a sump almost immediately. The team spent considerable effort in both Sima Castor and Sima Grande, and although some minor extensions were made, no significant leads were discovered. To the east of Sima Grande, a minor active cave, Sima de los Renegades, was discovered, and a number of blind surface shafts were investigated. In Nacimiento Tepetzala a significant extension was made just downstream from Pink Comb Chamber, with the discovery of a large fossil passage leading to a second major streamway. However, as is usually the case in Cuetzalan, the weather, which had been unstable throughout the expedition, deteriorated to the extent that paranoia levels rocketed, and it wasn't until the last day of the expedition that a return visit was made, and the passage was left still going. Elsewhere, an attempt on Alpazat was abandoned due to the unstable weather, and a large area to the northwest of the town of San Miguel was investigated, unsuccessfully, in the hope of finding entrances that might connect to the lower reaches of the San Miguel system. To the south of Cuetzalan, the Xocoloyo system

was resurveyed and an investigation made of the surrounding area. A total of 3.5 kilometers was surveyed.

In February 1999, a small team mounted an investigation of the area to the north of Alpazat cave. The lower Tozán river and the Malacayotan rivers were investigated in an attempt to locate entrances that might connect to the farthest reaches of Alpazat. A number of small entrances were located between the villages of Tonalix and Xaltipan; these were mainly small, immature resurgences, although a resurgence cave was located to the south of Tonalix. A detailed investigation was made of the Zempoala river valley upstream from the Tozán inflow, and two major resurgence areas located. The first of these was located near Reyes de Vallarta, 11 kilometers to the north and 850 meters below Cuetzalan, and had an outflow of 1.5 to 2 cumecs measured in low water conditions. The second area, 6 kilometers upriver, was of a similar size, and a small cave was discovered, but not pushed. Comparisons with Mike Boon's line survey of the area, published in the late '70s and conversations with Boon suggest that this second site is the location of a resurgence cave located by the Americans in the 1970s. The cliff above this resurgence area has been subject to recent collapse, particularly at the point of largest outflow, and it seems likely that this original entrance is now blocked. During this expedition a reconnaissance was made of an adjacent (and hydrologically separate) area 11 kilometers to the west of Cuetzalan, and cave entrances were discovered near the town of Atlequizayan, above and to the west of the Zempoala canyon.

February 2000 saw a large Combined Services Caving Association expedition visit the area. The principle objective was to push Alpazat



beyond its known limits in the hope of connecting the cave to San Andrés and San Miguel. Exploration was hampered in the first week of the expedition when, following the first trips into the cave, the cave flooded, closing the entrance for the best part of a week. With exploration of Alpazat impossible and investigation of adjacent cave entrances fruitless, team members then concentrated their attention on other leads, mainly in Chichicasapan and the Resistol/Atischalla area. A new entrance to Atischalla was discovered, and as a result the Atischalla West entrance was rediscovered from below. In Chichicasapan, attempts were made to push the Belgian Boulder Choke but, unfortunately, a route through the lower reaches of the choke could not be found. Once water levels dropped and the Alpazat entrance opened, the majority of the team concentrated their efforts pushing the cave. A route was discovered heading toward San Andrés, and this was surveyed to a point that places this section almost directly above the end of San Andrés. This passage was explored for around 150 meters beyond the survey point, and a connection seemed imminent. However, the Cuetzalan weather struck again, and wet weather sumped the entrance passage before the team could reenter the cave. In frustration at having such a promising lead suddenly placed out of reach, the upper Malacayotan and Tixapán valleys were again investigated in the hope of finding another entrance. Cave entrances located in 1999 were rediscovered, and one, the resurgence located to the south of Tonalix, Cueva Ostonocapan, was, strangely, given the weather, found to be open and surveyed for 120 meters. The area to the east of Cuetzalan was also explored during this trip. Nearly 1 kilometer was added to the length of the main downstream lead in Nacimiento Tepetzala, and some minor caves were located in the area. The main sump in Zoquita was dived but found to be impassable, and a new entrance to Sima Castor, Bullpot of the Midges, discovered. During this expedition a small team visited the western area reconnoitered in 1999, this time the area surrounding the town of Caxhuacán. Cave potential of the region was confirmed and around 160 meters of new cave surveyed. Around 6 kilometers was surveyed during the expedition.

November 2000 saw a brief visit by a small team, during which a major extension was made to Nacimiento Tepetzala. The main downstream lead was pushed to a large streamway that was followed in walking-size passage for over two hours to a large chamber where no obvious continuation could be found. Regrettably, this team did not survey their discoveries, and it is impossible to speculate how this find relates to the other caves in the area, in particular known leads in Sima Grande and the resurgence area. Given the burden that had already been placed on the first NCC and CSCA expeditions by having to resurvey earlier discoveries and the constraints this practice places on the ability of future expeditions to concentrate on pushing into virgin territory, it is hoped that this does not become the norm.

There were no British expeditions to Cuetzalan in 2001 or 2002, but in 2003 a small group from the Eldon Pothole Club went to the area in February. The main objective of the expedition was the exploration of the area to the east of Cuetzalan around the villages of Tepetzala and Pepexta. A major task in this area was the survey of passage discovered in December 2000 in the Nacimiento Tepetzala resurgence cave. The first fortnight was marked by changeable weather, with one or two days of dry, humid weather alternating with periods of wet and stormy weather. The rain held off for most of the remainder of the trip, although there was an almost continual threat of thunderstorms that effectively prevented long trips into the deeper sections of the major caves. Because of the weather, only three trips were made into Nacimiento Tepetzala. Around 600 meters of the cave was surveyed. A secondary objective was to reconnoiter the area north of Cuetzalan, where we concentrated on the area around the village Xiloxochico and the Río Malacayotan valley. A number of sinks and shafts around Xiloxochico were investigated, and all were chocked, but they take a considerable volume of water in wet weather. In the Malacayotan valley, a number of fossil resurgences were located. Two of these were significant, and the most important was surveyed for 300 meters to a pitch into a large stream passage. The weather hampered exploration here, because both entrances close for about five days after rain. North of the Río Malacayotan, some limited cave development was observed, although much of the area is covered by calcareous sandstones, impeding major cave development. A few small caves in the sandstones were discovered. In other areas, a new entrance was discovered to the San Andrés system that may give speedier access to the lower reaches of the cave, and an area to the south of Cuetzalan close to the Xocoloyo system was investigated, yielding numerous shafts, sinks, and collapsed dolines, but nothing significant.

Exploraciones Británicas en Cuetzalan previas al 2004.

Este es un resumen de las visitas de espeleólogos británicos a Cuetzalan, Puebla, anteriores al 2004. Realizaron viajes prácticamente cada año durante los 1990s, y regresaron en el 2000 y 2003. Muchas cuevas exploradas por otros en los 1970s pero documentadas inadecuadamente fueron redescubiertas y topografiadas de nuevo. Adicionalmente encontraron nuevas cuevas y conexiones.

CUETZALAN 2004

Michelle Gigg, Toby Hamnett, John Taylor, and Jonathan Sims

The first part of this article, by Michelle Gigg, Toby Hamnett, and John Taylor, appeared in slightly different form in Descent *178, June-July 2004, edited by Chris Howes and reprinted by permission. Uncredited photographs are by expedtion members Toby Hamnett, Johnathan Sims, or Steve Whitlock.*

The dim lights of the LED headlight grew a little brighter as the dark shadow slipped under the ledge and into the sandy area that was the living area of Deep Camp, six hours from the surface in Cueva de Alpazat near the town of Cuetzalan in central Mexico. "Yeah?" came the question from one of the five bodies lying in the dark in sleeping bags around the camp.

"Much the same, maybe down a few millimeters," was the reply as the light clicked off.

The analysis of the river level was received in grim silence, and all six turned into their sleeping bags and their own thoughts as they contemplated the trip ahead, through the omnipresent roar of the river as it began its breakneck descent into Horror Inlet. This was the second day of waiting. Hopefully, today's attempt to descend would be more successful than yesterday's, and the six would reach the safety of Camp One at the other end of Horror Inlet and the Río Korwa. It was accepted, although not voiced, that with the rise in water levels, the sump near the entrance series was probably closed and we could expect a wait at Camp One for the water to fall.

The six made up two exploration teams from the thirteen members of the expedition, a mixture of civilian and military cavers from the Combined Services Caving Association who had taken advantage of a five-day weather window to spend forty-eight hours exploring the deep parts of the cave. We were then halfway through the four-week Cuetzalan Tiger expedition, the latest in a series of UK-based expeditions that had been to the area since 1991 and had surveyed over 100 kilometers of passage.

Many of the caves in this region contain active streamways that drain toward the resurgence, Cueva de Alpazat, whose entrance lies hidden at the base of a steep hill covered in jungle and maize fields, some 300 vertical meters below the small village of Ayotzinapan, north of Cuetzalan. Our main objective was to connect this resurgence with the extensive systems higher in the catchment area, in particular the San Andrés and San Miguel–Cuetzalan systems. In order to achieve this, the expedition would explore upstream in Alpazat using Deep Camp, located far into the system above the main streamway, which could rise significantly following rain.

Information from previous expeditions and data loggers showed that there was also a significant risk of the 200-meter-long Sump Series, which lies only 700 meters from the entrance, filling after heavy rain showers, after which it could take up to a week to empty. This factor was addressed as a priority, and on the first day a safety camp, Camp One, was stocked with food, fuel, carbide, sleeping bags, and a Hey-Phone. The cave radios were tested across the flood-liable section, and a dive line was laid through the passage.

Setting up the camp and laying the line formed essential parts of our backup plans. Rick Stanton, our contingency diver back in the UK, had suggested adding the line, though the chance of it being required was reduced by local forecasts sent daily from the UK Met Office to help warn of impending rain. We also held a number of training weekends, including a simulated cave rescue in Wales, survey training in Derbyshire, and radio testing and training in Yorkshire. Assisted by John Hey, a technical team of Michelle Gigg, John Welch, Kevin Welch, and Steve Whitlock spent a year building two cave radios for any incident involving the Sump Series; we later borrowed another two from John, as a backup. During testing in the UK, the radios worked for distances in excess of 600 meters, but due to the local geology their range through rock was reduced to 250 meters in Alpazat. This meant that, aside from the sump-safety link, radio communications were severely restricted in the deeper parts of the system.

We certainly made use of the extra luggage allowance across the Atlantic, filling twenty-six bags

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Descending Cueva de los Perros Muertos.

weighing thirty kilograms each, which was fun at the airport. Thankfully, we had help waiting for us at Mexico City, and eight hours later we arrived in Cuetzalan. After a few hours' sleep, we caught the local *colectivo* and descended through the jungle to Alpazat. The cave was more beautiful than photographs could ever show, containing an abundance of untarnished formations. With the air temperature at 20 degrees C and the water not much lower, it was fun swimming across the Entrance Series lakes.

With both camps established, exploration commenced above Horror Inlet. Teams began to push toward the larger systems in the hope of a link, but at the end of the first week, clutching the latest weather report, we decided to withdraw from Alpazat. No sooner had we done so than, on cue, rain fell and the sump filled. This is not unusual, as many expeditions have observed, so the team simply turned its attention to higher karst to the southwest of Cuetzalan.

The first cave we found in the escarpment, drawing on the local knowledge of an expat American, was Koyoxo Chiko, Elephant's Head Cave. Michelle, Kevin, and Jonathan Sims, a Cuetzalan veteran of fourteen years, set out through the huge entrance into very well decorated fossil passage and began to survey the cave. As we explored farther we discovered that locals regularly visited this site; their lighting was sticks with rags wrapped round the end, soaked in fuel, and ignited. On a second trip here, we found a small chamber crammed with well-defined fossils and pushed the cave to a conclusion with a total of 882 meters of passage.

Farther along the escarpment, Bat Cave, surveyed to the end by Simon Cornhill, Toby Hamnett, John Taylor, Baz Norton, and Nikki Rowland, seemed to follow the same development, and the survey data, once on the computer, soon revealed a link between Bat and Koyoxo Chiko. Judging by the presence of old torches, Bat had also been visited by the same local Mexican Indians. The escarpment did reveal some virgin cave passage, though, but Cueva de la Boda did not live up to its promise and closed down after only 40 meters. All in all, 1.5 kilometers of passage were surveyed along the escarpment.

An open pot, Sima Arvo, was pushed by the group, including Paul "Chips" Rafferty, who was only with the expedition at the start, but then had to leave due to work commitments. Arvo finally went after three trips. Breaking into a large boulder choke, Neil Brammer, Charlie Milton, Chris Mitchell, and John Roe surveyed a route into a large and going passage. The data quickly showed that this was a new entrance to the San Andrés system and, more importantly, that it broke in on the downstream side of the 300-meter boulder choke that makes San Andrés such an arduous undertaking. This will have significant implications for future exploration.

Meanwhile, a local caver, Galdeno, led Jonathan and a few Mexican cavers from the Sociedad Mexicana de Exploraciones Subterráneas who had joined the expedition to a new entrance not far from Cuetzalan. The entrance was an 8-meter pitch and was dropped with a ladder; unfortunately, this led directly into a passage full of rubbish, including two dead dogs. The cave was aptly named Cueva de los Perros Muertos, Dead Dogs Cave. Fortunately a second, rubbish-free entrance was discovered, and this was bolted and rigged for SRT to descend the 15-meter pitch. From here the cave was pushed for four days.

We were excited, because we thought the cave had the potential to be big, as the passages became larger and more complex as we explored. The system was initially surveyed along the streamway, and when leads were found, the team split in two to survey onward. The streamway team then hit a choke, while the team in the passage above was unable to carry on because the floor was unstable. The two groups could hear each other, and a couple of the higher group found a way through the floor into the streamway, proving our concerns. We came together in the high-level passage and tried to find a safe route on, but then decided to return with Mr. Makita (our drill) and bolt a traverse across the unstable section.

Unfortunately, Mr. Makita didn't bring us any more cave, though it made light work of placing bolts. The passageway narrowed and the cave floor was rotten. We were convinced that the cave continued, but we just didn't find a way on. All that was left were a few leads noticed while drawing up the survey, which we tied up. The cave ended at 1 kilometer.

The weather, meanwhile, stayed dry, and the Alpazat sump emptied. And so, at the beginning of the third week of the expedition, the two teams, six cavers in all, made the most of a forecast five-day weather window and re-entered the cave, through the now wide-open Sump Series, during the afternoon of Monday, 15 March. While the forecast predicted five days of clear weather, our plan was to leave after

forty-eight hours. The remaining water was not unusually high, and both teams were soon, after a good feed, settling into their sleeping bags in the comfort of Deep Camp, looking forward to pushing out into the new passage that honeycombs the area above Horror Inlet. At the top of the inlet rift Simon carefully placed a marker in the river to keep an eye on the water levels; a couple of centimeters rise in the river here would become significant farther down the inlet.

The following morning, an early start allowed the team to look at a variety of options that might link Alpazat with the other big caves in the area and confirm that we were dealing with one of the largest systems in Mexico. As one group headed for those passages close to San Andrés, Simon and the other team headed upriver from the top of Horror Inlet to have another look at a sump he had free-dived during an earlier visit; it might forge a link with the San Miguel system. Unfortunately, when he broke surface, Simon looked around a corner and was dismayed to see a further sump, far less friendly to free-divers.

So we turned to a known lead beyond Deep Camp, in Roger Irrevellant's Lunatic Labyrinth. Some ten hours later we returned with about 1 kilometer of passage surveyed, ending at a station which had clearly been placed from a different direction. We would, unfortunately, have to wait until the computers had crunched the data to confirm where we had made the link with San Andrés.

Back at camp the other team had also finished for the day, and we greedily fed. Then, before finally falling asleep, we checked the level of the water in the streamway. It had risen slightly, and the marker was at the waterline. However, by the following morning, when we had originally planned to head out of the cave, it was fully submerged.

It was Wednesday the seventeenth. The water level was checked continually, and when it looked like was dropping, we set off at noon. Our first attempt to descend Horror Inlet ended at about 2:30 P.M. Climbs that had been dry on the way in were now seething walls of whitewater. We turned back; we waited. The second attempt at lunchtime on Thursday proved more successful. After we had descended Horror Inlet with the utmost concentration, a mixture of creative ropework and courageous route-finding in the Río Korwa by the lead pair brought us safely to the climb out of the rapids and cascades of the river.

The section near the entrance was not on our minds; merely gaining the safety of Camp One was. The team finally made it, to enormous relief. The closure of the sump ahead of us was not a matter of concern. We had warmth, food, and time to relax, having descended from Deep Camp in the highest water that had yet been attempted on that route.

At the prearranged time, a radio check with the surface put the rest of the expedition members' minds at rest, and down we sat, prepared for boredom while we hoped that the sump would drain. However, by day four we realized that our contingency plan would be triggered and the divers would be called, and so we prepared for a potential dive out. Then, on Thursday, 25 March, the tenth day we had spent underground, the sump surface bubbled and broke. Jason Mallinson looked up. "So, I guess you guys owe us a few beers then?"

Meanwhile, on the surface, the remaining seven members of the expedition were undergoing some different experiences. John Taylor takes up the story:

On Wednesday, 17 March, another team of three cavers, armed with an extended clear-weather forecast, entered Alpazat, intending to explore at the far end of the system, but they discovered that the sump was shut. On the far side were the six expedition members who had entered on the previous Monday and were due out that day. Our contingency plan for this situation was to attempt radio contact with the isolated cavers at six-hour intervals. However, the HeyPhones could not transmit to the surface from the vicinity of the flooded section, so this required trips underground to make each radio attempt from the entrance side of the sump, where comms did work. There was no reply.

It had rained heavily, and we knew that the team would be beyond two flood-prone passages, Río Korwa and Horror Inlet, so it was with trepidation that we began our second day of radio checks on Thursday. Both the 6 A.M. and noon transmissions met with silence. At 6 P.M. it was my turn to call. As I turned on the HeyPhone, I was relieved to hear a beacon signal, which could only have come from

Flowstone in the entrance series of Cueva de Alpazat.

The exit from Horror Inlet at normal flow.

the radio at Camp One. I called through.

"Camp One, this is JT, radio check, over."

The response came loud and clear. "JT, this is Camp One, receiving you, over."

"Are all present and OK, over?"

"JT, all present and OK, over."

Excitement and relief made me forget efficient radio comms, and I started to chat with Simon. He described their delay at Deep Camp due to the high water in Horror Inlet and their sporting return.

Three frustrating days of sump and radio checks followed. The water in Sump Series fell progressively, but the passages failed to empty, each short burst of heavy rain slowing the draining process. On Sunday, 21 March, Steve Whitlock made the decision to begin preparations for diving them out, with a target date of Thursday, the twenty-fifth. Steve called our standby diver in the UK, Rick Stanton, early on Monday morning, and he and Jason Mallinson began arrangements to fly out. Kev, along with the local Mexican cavers who were helping us, brought his team together to plan the exercise. During the week, the Mexican Special Forces offered their aid, so Kev and I took them caving to show them the nature of the task. Realizing that this dive would be a specialized job, they agreed to let us carry out our plan and offered their support, which was gratefully accepted.

A warm wind blew past our faces as the army pickup bounced down the rough track toward Ayotzinapan. It was 7:30 A.M. on Thursday, 25 March, the day that we would help Rick and Jason dive the sump. We had two pickups full of equipment that needed to be carried down through 1 kilometer of steep jungle and maize fields, so we were glad that the military were there to help, despite their being armed to the teeth. Accompanying us were eight Mexican cavers, the six best local cavers plus Ramón Espinasa and Humberto "Tachi" Tachiquín from Mexico City. The world's press, which had been following the story for a few days, were beginning to work themselves into a frenzy, and so when we arrived at the village, we were pleased to see military cordons keeping them at bay. Before starting our descent to the cave entrance, we unloaded the equipment and set up our first base, comprising the compressor and its operator, both of which had been hired by Rick and Jason in Mexico City.

The approach to Alpazat was awash with four hundred members of the media, but our military and police escort managed to ring the ledge at the cave entrance, where we set up our second base, Access Control. Steve elected to coordinate events on the surface and, together with Michelle, ran this base, while the rest of us made our way into the cave. A Tyrolean traverse had already been rigged by Kev and Nikki, and this proved invaluable in transporting equipment past the narrow entrance swims, so we soon started to spread out along the beautiful lakes of the entrance passage. As the radios could not transmit from the sump direct to the surface, Neil set up a radio halfway in. This was our third base, Relay.

Our Cuetzalan caving friends forced their bags along. Their lack of kit was more than compensated by their desire to help, and by 10:30 A.M. all of the equipment had reached the sump. Dive Base was our fourth control point, meaning that all four HeyPhones were now in use, and in order to leave the dive area quiet and undisturbed, the radio and stove were placed a short distance from the sump.

Kev, Ramón, and I stood by, helping to organize dive kit. Nobody spoke, and an air of concentration settled over the team. As the murky green water enveloped the lights on Jason's helmet and the sump fell silent, I returned to the radio to send a message. "Camp One, divers entered sump at 1040 hours. ETA with you 1100 hours, out."

Even then, the day's objectives were firm only as far as establishing the extent and severity of the dive. We hoped the dive team could finish the job that day, but Rick and Jason had complete authority to choose their course of action—to attempt the extraction or to supply the camp and wait for the water to subside. We waited quietly until the radio crackled and began to receive, and I made the following notes in the radio log:

1059 Divers have made contact with Camp 1. All in order, kitting up two at Camp 1

1122 First diver on his way back to dive base plus one of Camp 1 team
1125 Second diver on his way back to dive base plus one of Camp 1 team

The divers had made their decision. We were to bring the guys out today. The tension was palpable, but we had great confidence in Rick and Jason, despite knowing the difficulties they and the cavers on the other side faced. To prevent media overreaction, Steve had chosen to keep the news that the rescue was under way from the press, having briefed them that the dive was purely a reconnaissance.

Checks of the survey data showed the sump to be 200 meters long and 10 meters deep. The return dive would start with a steep descent over silt, where visibility would be poor until two-thirds through, where a gravel floor would help. Added to the difficulty of the dive was the question of diving experience. Jonathan, himself a cave diver, was the most capable. Simon had some experience, with around ten dives, Chris was a qualified open-water diver, Charles, a submariner, was familiar with breathing apparatus, while John had used scuba gear indoors, but Toby had no experience at all. Jonathan had prepared the team by spending hours talking them through the dive. Toby received special training, as he lacked confidence in breathing through his mouth and not his nose, and, at Jonathan's suggestion, he had spent an hour the previous day lying with his nose in a full mug of water, breathing and talking through his mouth. All the team had the mental fortitude and physical stamina required, but an important part of Rick and Jason's job would be to instill enough calm confidence to get them through the dive. Criticism has been leveled at the expedition for calling in help from the UK and not using Mexican divers. This dive was a job for experienced cave divers who could coach our guys through their task; Rick and Jason are two of a very few, worldwide, who meet those requirements.

I prepared brews for the lads and awaited their arrival, though it wasn't long before I could note the following:

1144 Chris Mitchell and Rick at Dive Base OK
1200 John Roe and Jason at Dive Base OK

On the surface, when Steve released the news that cavers were coming out, the hounds of the world's press were baying at the cave entrance. Messages from Access Control came in thick and fast, but it was my job to keep any tension or stress away from Dive Base. Once Kev and the divers were happy with the situation and ready to progress, at 12:10 P.M. we sent a message to the surface. "Divers have brought out two intermediate divers. Are returning to assess bringing out one novice and one experienced diver. Estimated that we will refill four cylinders, one already on way to surface." I was glad to be by the sump; I could not imagine the pressure that Steve was under, out there, surrounded by officials and press. I later learned that the news of Chris and John's successful dive had reached the British press mere minutes after I sent the message.

It wasn't long before Camp One transmitted the message at 12:56 P.M. that began our second tense wait. "Two divers returning from Camp One, two kitting up." Then, at 1:10 P.M., "Diver plus one novice enter sump at Camp One."

I left the radio with Ramón and walked to the sump, where all eyes were fixed on the green pool. We watched in silence for a long time before dive lights and bubbles began to glitter in the dark water. It was Jason and Simon. I was glad to see Simon's face again, as he removed his mask and asked if he could go back in the water. By 1:30 P.M. I was back at my radio when Toby sauntered around the corner. He was almost beside himself with excitement, having enjoyed his fifteen-minute dive. He sat down and we started to chat.

With four cavers now out, the operation was two-thirds complete, but further progress was halted by a lack of air. Our divers had decided to wait until two cylinders were recharged and returned to Dive Base. Rick later told me that they could have completed the job without the refill, but it increased the margin of safety; this was typical of his experience and professionalism. The radios and control bases made the refill logistics very straightforward, and the radio log noted:

1345 Dive Base to Access Control: dive bottles for refill ETA at Access Control 1400 hrs
1405 Access Control to Dive Base: Three cylinders at Access Control ready to go up the hill

As those who had completed the dive sat and chatted excitedly about it and their experiences on the other side of the sump, the atmosphere was happy but not euphoric; none of us could relax fully, not until Charles and Jonathan were safe. When they were ready, the four made their way out to their first sight of daylight in ten days.

With time to kill until more air arrived, Rick and Jason came to Dive Base control. I brewed up and offered them sandwiches. As we chatted I marveled at their composure. Jason even stretched out and had a quick nap!

The recharged cylinders having arrived a Dive Base, at around 3:45 P.M. the pair re-entered the sump and soon the radio signaled their arrival at Camp One. This was the final wait. At 4 P.M., the message came. "First two divers in sump returning from Camp One. Camp One signed off and packing to leave." I made my way to the sump and joined the vigil there. It was not long before the water began to boil once again and Charles's grinning, hirsute face emerged. Jonathan and Rick followed soon after:

1643 Charles Milton and Jason at Dive Base OK
1656 Jonathan Sims and Rick at Dive Base OK

We had done it: the completion of an exercise believed to be a world first in terms of numbers of people

The Alpazat Six in Camp One. From left: Toby Hamnett, Chris Mitchell, Charles Milton, Jonathan Sims, John Roe, and Simon Cornhill.

and length and depth of dive, mixed with the varied experience of the group. As I made a final note, "Extraction from Camp 1 successful," a wave of relief swept over me. Meanwhile, Steve met the rescued cavers just inside the cave entrance to have a quiet chat to let them know the chaos that had occurred over the previous few days and prepare them for the media circus that lay a few meters away. All that remained was to bring everyone out of the cave safely and haul the equipment back to our hotel. Kev, Baz, Neil, Nikki, Michelle, and I finished stripping the cave and carried the equipment up the hill, finally arriving at the trucks at 10 P.M. The complicated exercise had been executed extremely successfully, which is to the credit of everyone involved, British and Mexican alike, and we were pleased with our contingency plan, as it had worked perfectly.

Despite the setback, the expedition was very successful, returning with 5.5 kilometers of new passage surveyed. Cueva de Alpazat has been extended by about 1.5 kilometers, and we believe that two of the major systems in the area, Alpazat and San Andrés, have been linked. Cuetzalan still has a lot of potential, and much more cave awaits to be found. The relationships we have built with the locals are strong, and there is no doubt that British cavers would be welcomed back to the area. Had the expedition ended there everyone would have been very happy.

Of course, as most know from the varied standards of reporting across the world press, it did not end there. All thirteen members of the expedition team were interned by the immigration services while allegations of visa violations and associated criminal activities were investigated. It required only one day of interviews and kit inspection to prove our innocence of criminal activities, and, considering that the Mexican legal system works in a significantly different manner from that in the UK, we felt that the expedition had been vindicated. We were, therefore, a little surprised that the immigration authorities took a contrary view to the investigation made by the police; they believed that our caving was, and had been at the time of our entry into Mexico, a scientific activity that required a permit in addition to the paperwork that we already held. On the basis of this alleged visa violation everyone was expelled from the country.

At the time of writing the expedition members are appealing the decision, which limits a return, but this has been impeded by our inability to obtain full written reasons for the expulsion from the Mexican authorities. The sport of caving in Mexico thrives on foreign expeditions, and the people, both locals and the cavers, are welcoming and supportive in their cave-rich areas, as shown by the locals in Cuetzalan, where they had planned a party for us on our last night, had we not been taken into custody. While the caving is remarkable, given the flexibility with which the immigration authorities apply visa regulations, anyone planning a journey to Mexico may currently wish to consider whether it would be administratively safer to visit one of the world's many other extensive and unexplored karst areas. However, anyone who braves the paperwork in Mexico will be rewarded with fantastic caving and welcoming people.

This part of the article was originally written by Jonathan Sims for the East India Club.

"What time is it?"

"Nine-thirty."

"When did we leave Toby?"

"Eight o'clock, and we said we'd be back in thirty minutes."

"How much new passage have we surveyed?"

"Four hundred meters. I think we should head back now."

"Let's just do a couple more survey legs first. Toby is bound to be asleep, and I think I've got passage fever."

We were deep in Cueva Alpazat at the end of a long day's exploration. The area of cave we were in was completely dry, and Toby Hamnett had gotten a little dehydrated, so we had left him to rest while Simon Cornhill and I checked out an exciting new passage. We found a small pool of water, enough for our lamps and a small sip each.

"Right. Let's name this passage and head out. We've surveyed 600 meters since we left Toby."

"What shall we call it?"

"Well, we've both been suffering from passage fever, so let's call it Fever Passage."

An hour later, the three of us

were back at Deep Camp with the rest of the team, very thirsty after fourteen hours of exploration. We drank all the water in camp, and I went down to the river, just above the top of the Horror Inlet, to refill the containers. The river here is 8 meters wide, but flows into the 1-meter-wide and steeply descending Horror Inlet canyon just a few meters away. The roaring of the turbulent water was louder than I remembered, so I checked the level. "The water level is up one inch; the best thing to do is get a good night's sleep and check again in the morning," I said. After we had eaten, Toby went down to the river and reported that it was up two inches. The cave was flooding. Horror Inlet and the Río Korwa would both be impassable. During the night we could hear the roaring and booming as the swollen river crashed down Horror Inlet, and we were thankful that we had not attempted a quick exit.

The next morning the river was up farther, but it had been much higher during the night and was now starting to drop. We checked it every hour, and between checks we just lay quietly in our sleeping bags. We were all apprehensive about descending the flooded canyon, but we were also conscious that we had little food in Deep Camp. With thunderstorms forecast in two days' time, we would have to try to get out. Two o'clock was the appointed hour, giving time for the river to drop, but getting us clear of the canyon before afternoon rains. At 1:30 we were all ready to go, and I made a pot of mashed potato and noodles that we ate with six "racing spoons." The water level was still two inches higher in the wide part of the river, and as we entered the canyon the roar was deafening. John Roe, an experienced climber and mountain-rescue-team leader, traversed over the first set of cataracts and secured a rope; we followed. After another 20 meters of relatively easy traversing, the canyon widened slightly, forcing us down into the rapids. The force of the water was too great, and we had to retreat.

For the next twenty hours we lay in darkness in silence, except for the roar of the river. We did not have enough food to waste energy. The next day at noon we tried again. This time the stakes were higher, as it was our last chance before the forecast storms, and failure would have meant several days without food. The water in the river was down to just one inch above normal, and there was considerably less water cascading down Horror Inlet. This time we could hear each other shout. There was still, however, three to four times the usual flow, so it would still be difficult and dangerous. We left many things in Deep Camp, but took all our rope with us for traverse lines over the worst of the whitewater. Everything went well, and we reached a series of high traverses well above water level. These, unfortunately, ended in a 20-meter abseil next to a waterfall, picturesque under normal conditions. The rope was on the wrong side of the waterfall, so we were faced with trying to get through the full force of the water in a deep plunge pool at the bottom. The abseil was simple, and then I traversed along a narrow ledge two feet under the water. As I entered the waterfall, the force slammed me against the wall, but I struggled through. It was easier than it looked, because the force of the cascading water held me on the ledge, and the danger lay in falling into the deep and turbulent pool. An hour later we came to the spout into Slab Highway, which marked the end of the 200 meters of Horror Inlet. We had survived two hours of the most difficult caving imaginable.

We now had the 2-kilometer-long Río Korwa passage to descend. It carried the same water as Horror Inlet, but it was not as steep and slightly wider. It provided a few extreme challenges, interspersed with more reasonable stretches. Progress here was much faster, as we could often afford to go with the current, rather than having to battle to keep out of it. Two hours later, we climbed out of the river and headed through dry passages to Camp One, where we had enough food and other supplies to last a considerable time.

But Camp One was less than an hour from the surface, so we headed straight out. As we approached the low passage before

The divers with the first two trapped cavers to reach Dive Base. From left: Rick Stanton, John Roe, Chris Mitchell, and Jason Mallinson. *Ramón Espinasa.*

the entrance series, we entered the Wind Tunnel. There was no wind. This cold only mean that the low section of the cave was full of water and our exit blocked. Sure enough it was. We were disappointed, but not surprised, as we had all known that this would be the case, but no one had wanted to mention it and dampen the spirits of the team.

We returned to Camp One and prepared ourselves for a long stay. Fortunately we had considered this eventuality during expedition planning, and as a consequence we had sleeping bags, lots of food and light, and a communication plan, and a guide-line had been laid through the passage that was now sumped so that divers would be able to find their way through. As far as we were concerned, we were now safe and faced a few days of boredom until water levels dropped. At 6 P.M., dead on time, the cave radio crackled into life, and the surface crew established communications. They had been understandably worried and were relieved to hear that we were safe.

Time for a routine. Up at 9:00, two people to the sumped passage to check the water level. Daily radio check with the surface team at 10:00. Breakfast, one boiled sweet, at 10:15. Sump check again at 3 P.M. Four o'clock, food! This time one sachet of instant porridge and a few apple flakes mixed in two liters of water and divided among the six of us. Sump check at 9:00, followed by dinner, the highlight of the day, generally a three-course affair, with a watery soup, a delicious ship's-biscuit entrée, and a Bonbon Brulee to finish. I was in charge of rations, and I was mean; we did not know how long they had to last. Toby took charge of entertainment, making a Nine-Men's-Morris board and a pack of cards.

During the first two days of our confinement, each sump check reported a decrease in the water level, and we were hoping to get out in time for pizza and the Toca-Toca disco in Cuetzalan on Saturday night. That afternoon, Simon and I had a good look at the sump using our diving masks. We estimated it was just 30 meters long and would be free-divable after just another 1-meter drop in water level. It had already dropped 7 meters. That evening we were all anticipating a quick packing session and a dash for freedom, but Charles Milton and John Roe returned from a check to report that the water had risen 10 meters, higher than it had been two days before. We were devastated.

On Saturday morning we had agreed with the surface team that they would call our backup divers if we were not out by Sunday morning. This they did, resulting in an estimated extraction time of Thursday. This gave us a clear end-game, as either we would dive out then or be resupplied with food by the divers. Rations were therefore increased considerably, planned to last until Friday to allow for a bit of delay. Our next few days were spent preparing for the dive out. I was the only experienced cave diver in the team, so it fell to me to train the rest of the team members as best I could with no diving equipment. I focused entirely on stress management, as the greatest danger during a cave dive is panic. As Thursday approached, apprehension about the dive grew, especially in Toby, who had never used any form of breathing apparatus before.

On Thursday morning we moved the radio to the sump and waited for the divers. At 10:30, they surfaced. "Hello, Rick."

"Hello, Jonathan."

"What is going on on the surface."

"You don't want to know."

We decided to dive out, and Rick asked me to be the last man out. As the trapped cavers were escorted by the divers out through the 200-meter submerged tunnel with near-zero visibility and numerous side leads, I reflected on the extraordinary courage they displayed, putting on diving gear for the first time to undertake a dive of twenty minutes with no option to quit.

As we left the cave, we were nearly blinded by camera flashes and were astounded by the media circus. To us this had been just an adventure. We had planned for the worst, the worst had happened, and the plan had worked. Our subsequent detention was both unfortunate and unnecessary, caused by an over-reaction from the press and politicians and had nothing to do with either our activities or the sport of caving.

Cuetzalan 2004

Seis miembros de una expedición británica en Cuetzalan, Puebla, estuvieron atrapados en la Cueva de Alpazat cuando intensas lluvias inundaron los pasajes de entrada de la cueva. Después de esperar varios días en el Campamento Uno, que había sido aprovisionado con alimentos y equipo adicional para en tal eventualidad esperar que el nivel de agua bajara, finalmente fueron auxiliados por buzos ingleses para salir a través del sifón. Los autores incluyen tanto a miembros de la expedición que estaban atrapados en la cueva como a algunos que ayudaban en la superficie.

CUETZALAN IN THE PRESS

Chris Lloyd and Chris Howes

A VIEW FROM MEXICO

This note regards the reaction of the Mexican press to the British cavers who were trapped in a flooded cave in Cuetzalan in March 2004. It is interesting to see how the press managed to turn what should have been a minor cave-rescue event into an international diplomatic incident, all in just two days.

I was first alerted to the situation when I woke up on Tuesday, March 23, in my hotel room about one hundred kilometers east of Cuetzalan. At about 7:10 A.M., a TV station was talking about British cavers who were trapped in a cave and refusing Mexican help to rescue them. There were comments that the cavers still on the surface were refusing to answer questions about just what they were doing, and there was speculation that they did not have the correct permission to be there. Having seen that, I quickly sent off a note to a friend in Britain, whom I requested to try and relay it to my friend Jonathan Sims, who I knew was on the trip, and the British ambassador to Mexico, to alert him that some of his citizens were going to be in big trouble with the Mexican government very soon. Of course, Johathan didn't receive the message, because he was trapped in the cave. If the British ambassador did, he certainly didn't heed its warnings.

On Wednesday, March 24, the 9 P.M. news on three different TV channels led off with news from Cuetzalan. The first channel started off with the Secretario de Gobernación, the second most powerful person after the president, giving a press conference outlining the problem of the British cavers and saying that the government police were going to investigate very thoroughly. This was followed by a report that the Secretary of Energy said that the British cavers definitely didn't have permission to look for uranium and that they would be investigating this serious matter. Then someone from the Instituto Nacional de Migración went on about how they had no idea what the cavers were doing and whether they had permission.

The anchorwoman on the second channel did her job trying to be interesting and rachet up the tension level by going on about how nobody knew what the Brits were doing and that they were refusing to say, with lots of uncomplimentary innuendos.

On the third channel there was a least some footage from the scene, showing police sitting in the cave entrance waiting to make sure the cavers didn't escape once they came out. The reporter here made it clear that the cavers would be apprehended and forced to clarify what they were doing inside. Lots of talk about permission and immigration status.

The 7 A.M. news on Thursday, March 25, opened with the Cuetzalan story and the President of the Republic—yes, the president—making an announcment that he was sending a stong letter of protest to the British government asking just what a group of British soldiers was doing in his country. So this story got all the way to the top. Even the Québécois cavers hadn't managed that (see *AMCS Activities Newsletter* 24, pages 25–30). And it only took two days. Then there was lots of footage from the scene, where they were saying they expected the cavers would be rescued shortly and that still none of the Brits would talk to the press about what they were doing. A fuss was made about how they were doing studies on radon gas, which was a product of uranium, and so on. This went on for fifteen minutes of the prime morning news show.

Then at 8 A.M. there was a follow-up report from the scene that said the extraction was underway. Then there was a big fuss about how a fence had been put up to block press access. How could a bunch of foreign tourists keep the Mexican press from doing their job? What were they hiding? They showed the six ambulances that were waiting to take the cavers away to the hospital to be checked out and interrogated.

The Mexican material has been adapted by the editor from a long e-mail message from Chris Lloyd on April 9, 2004. Newspaper photographs by Jordi Fernández.The British material is reprinted, slightly revised, from an article by Chris Howes in *Descent* 178, June-July 2004.

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"No satisface" a Fox respuesta británica

*Exige explicación clara sobre labor de los militares en Cuetzalan

***Envía la cancillería una segunda nota diplomática a Londres**

*Serán expulsados si no justifican sus actividades, advierte Derbez

***Interrogan a espeleólogos; deja Segob el caso en manos de PGR**

ALBERTO ESPINOSA, Enviado, FRANCISCO JAVIER MARTINEZ y MARTIN TAKAGUI

MANAGUA, Nicaragua.- El presidente Vicente Fox advirtió que la respuesta del Gobierno de Gran Bretaña a la nota diplomática de México "francamente no satisface", ya que su administración quiere saber con claridad "de qué se trata este asunto".

Mientras, en México, la cancillería dio a conocer el envío de una segunda nota diplomática al gobierno de Londres, en la cual solicita nuevamente una explicación sobre la presencia y actividad de los espeleólogos, quienes comenzaron a ser interrogados en la estación migratoria de "El Vergel", en Iztapalapa, en tanto que sus equipos son revisados por especialistas, para conocer su utilidad.

El canciller Luis Ernesto Derbez advirtió que en caso de que los británicos no justifiquen que efectivamente entraron al país para llevar a cabo las actividades que les permitía su visa, serán expulsados. No obstante, por la noche, la Secretaría de Gobernación se lavó las manos y puso a disposición de la PGR a los británicos, para que determine si existieron conductas constitutivas de delito.

CUSTODIADOS por agentes federales llegaron los espeleólogos ingleses la estación migratoria "El Vergel", donde fueron interrogados sobre los m

More fussing about radon and uranium, lack of permission, and incorrect visas.

At 8:52, they showed the reporter on site complaining that he had not been granted access to view the rescue, but that yes, five reporters were being allowed down to the cave, but it was not clear who was going. (Of the five press people allowed in, at least two were foreign, and I know one was the BBC. I heard later that the British ambassador had requested that the army keep the press out, except for the BBC, so the Mexican press did have a legitimate complaint.) It is a good thing that Mexico does not have a 24-hour news channel, or this sort of thing would have been on all day.

The 10:30 P.M. news had a long piece on the rescue that showed the lads coming out of the cave. The six were lined up, and only Jonathan Sims was heard to say anything. His comment was that he "needed to have a beer in his hand." Typical Jonathan. He was all smiles, while the others were looking a little pensive. Fortunately the Mexican army held back most of the press, or it would have been a real circus down there. As it was, there were members of Proteción Civil, a couple of Mexican cave-rescue folks, including Ramón Espinasa, local, state, and federal police, a representative of Human Rights Watch, and the army.

Unfortunately, the cavers refused to give any interviews to the press, or at least the Mexican press, and this just pissed them off more. The British ambassador also refused to talk to anybody other than the BBC, and I know he could speak Spanish reasonably well. The cavers were then quickly herded up the hill with their gear, where they were met by the hoards of press, and they again refused to answer any questions, even those posed in English. All the lads were looking a bit haggard at this point, quite overwhelmed by all the attention. The British ambassador refused again to clarify anything and just helped the lads into the waiting army truck that took them away. The report then cut to a quick interview with Ramón Espinasa, who was only allowed time to say that, yes, Mexicans were part of this expedition and helped in the rescue. Again, much was made of the fact that the cavers weren't explaining what they had been doing.

All this was repeated *ad nauseum* on various other channels.

The 7 A.M. news on Friday, March 26, opened with views of the lads in the van in the dark, presumably arriving at the hospital the previous night. They looked tired and didn't want to talk to anybody. What were they hiding? Then there were tapes of interviews with various members of parliament the previous day who said there should be lots of investigations into what these guys were doing. This went on for a full fifteen

minutes, making it out to be a big scandal involving various agencies at all levels of government. It was asked why some over in the UK were saying that this was an official function of the army, a training exercise, while others were saying they were just tourists practicing extreme sport. They even had a Mexican nuclear arms expert on, who said that for sure these soldiers must be training for exploring the caves of Afghanistan and should be treated as spies.

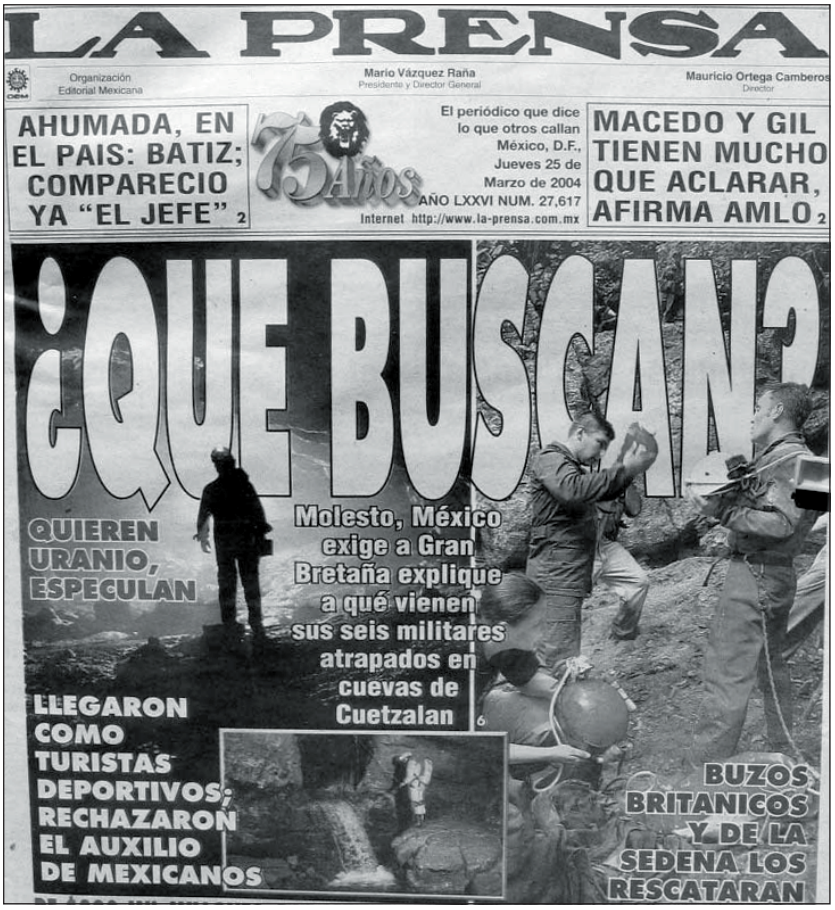
It wasn't until 8:40 A.M. that TV news finally got Javier Vargas, president of Grupo Espeleológico Universitario at UNAM, Ramón Espinasa of the Sociedad Mexicana Exploraciones Subterráneas, and famous Mexican alpinist Ricardo Torres Nava on the phone. They started with Ramón, and he was able to give a simple account of what was going on and make it clear that these lads had been coming over as toursits for eighteen years, had been publishing about these trips all along on the web and other places, and were not doing anything secret or illegal. The alpinist repeated many of the same things and explained that it was a tourist activity just like his going to various other countries to climb. He also explained that they were checking the level of radon gas because it could be dangerous to them if it was too high. Then Javier explained further what speleology is and said that he knew the caves there and that the Brits had not been doing anything illegal. At this point the anchorwoman, who for the last three days had been worrying loudly about all the mystery, spoke up and said, well, we were making a big fuss about nothing, then, at which the two cavers agreed, saying yes, things have been blown way out of proportion.

Obviously the news channel could have gotten these guys in for an interview a couple of days before, instead of just giving time to government officials who knew nothing and who had a vested interest in generating controversy so that they would look more important. I hope that Jonathan and company realize just how big a favor Ramón, Javier, and Ricardo, as well as a few other cavers from the rescue group, such as Juan Montero, have done them with interviews. It may not have helped much with immigration, but it has certainly helped to finally turn public opinion and get the press pointed in the right direction.

The evening news featured all the same stuff, with actual footage only of one reporter who made a big effort to go down to the entrance and take a camera into the cave to show viewers just what it looked like. He showed a pool he claimed was the sump the cavers had been brought out through, though I found out later from some friends that that pool is only 20 meters inside the entrance and that the actual sump pool is some 350 meters farther in.

I managed to catch a bit about the affair on a news channel Saturday morning. It just showed the guys going into and out of somewhere official and lots of footage of their belongings being searched. Sunday morning on Spanish CNN was much the same. Nothing had been resolved, but then it was the weekend, and the immigration officials don't work on weekends. The British ambassador had let them down big time. And if they had just declared earlier that they were just continuing visiting the same caves they'd been going to for years instead of trying to keep their heads in the sand, they wouldn't have been, effectively, in jail for the weekend. The British Ministry of Defense didn't help matter by saying they were on a training exercise, something that definitely falls outside the rules for a tourist visa. Later the MoD tried to qualify that, but the damage had been done.

[The BBC News web site reported on Sunday that the head of the British Army, General Michael Jackson, had said that the detention was simply the result of "a great misunderstanding." But then he went on to say, "This was a joint service adventure training expedition. We do a lot of that to bolster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AHUMADA, EN EL PAIS: BATIZ; COMPARECIO YA "EL JEFE" 2

75 Años

El periódico que dice lo que otros callan
México, D.F., Jueves 25 de Marzo de 2004
AÑO LXXVI NUM. 27,617
Internet http://www.la-prensa.com.mx

MACEDO Y GIL TIENEN MUCHO QUE ACLARAR, AFIRMA AMLO 2

¿QUE BUSCAN?

QUIEREN URANIO, ESPECULAN

Molesto, México exige a Gran Bretaña explique a qué vienen sus seis militares atrapados en cuevas de Cuetzalan 6

LLEGARON COMO TURISTAS DEPORTIVOS; RECHAZARON EL AUXILIO DE MEXICANOS

BUZOS BRITANICOS Y DE LA SEDENA LOS RESCATARAN

initiative and courage." Perhaps a good thing to say to the British taxpayers, but, under the circumstances, unfortunate, to put it politely, wording.—editor]

On Monday, March 29, the morning news finally put Cuetzalan at the bottom of the hour and devoted only three or four minutes to it. They expected a resolution that day, and mentioned that nothing illegal had been found in the luggage. They also read a letter written in 1992 by the Insituto Nacional de Migración saying that no special permission was needed to explore caves.

The regional newspaper waiting on my desk that afternoon had a headline on the front page, "Cavers comply with the law." A smaller headline read, "Cavers likely to be expelled from the country." On TV at 5:45, during a talk show, the same three who had been interviewed before, Vargas, Espinasa, and Torres, plus Gustavo Vela, another caver from Mexico City, appeared. The moderator lady was understanding and attempted to explain to the public what a lot of nonsense this had all been. She read questions from the public and let the experts answer. Unfortunately, 5:45 P.M. is not exactly prime time.

The 7 P.M. news announced that the lads had not been found to have broken any laws and were on their way to the airport, being expelled from the country. During a phone interview, Santiago Creel, the Secretario de Gobernación, explained that while they had not broken any laws per se, they were in breach of an administrative technicality in their visas. He said that what the lads had said they were doing did not agree with what the British government had said, and they must have been on a training exercise, which needed special permission, not just a tourist visa.

The Tuesday-morning news cleared up a bit of the confusion. They showed the press conference by someone from the Instituto Nacional de Migración, who said that while the cavers weren't in breach of any laws outside of immigration regulations, they had violated sections 36 and 60 of the Ley General de Pobulación. Specifically, they were mapping a cave, which constituted a scientific endeavor for which they didn't have a proper visa, and they were on a military training exercise according to their own government, which was also not allowed with a tourist visa.

[A press statement by Armando Salinas Torre of Immigration is on the web at http://www.governacion.gob.mx/templetas/conferencia.php?id=2915. A rough translation by Bill Stone reads, "The expulsion was carried out for the following reason. They filled out on their entry cards that they were tourists, even though later, following investigations by the Immigration Department, it became clear that these people carried out exploration activities, scientific studies, and training exercises. The fact that they were engaged in these activities was corroborated on several occasions by officials of the British government, as well as by person statements of the thirteen citizens of that nation."—editor]

Forty-five minutes later there was an update that the lads had given a press conference in England, and Jonathan Sims was quoted as saying they had been pawns in a political game.

Unfortunately, another sensational cave accident occurred in Puebla shortly thereafter, the cave-diving death of Mariano Fuentes Silva (see *AMCS Activities Newsletter* 27, page 18). All the publicity about both accidents prompted a lot of calls for the government to regulate caving, and the International Union of Speleology and the Unión Mexicana de Agrupaciones Espeleológicas (UMAE), which under its then president Juan Montaña Hirose was even less representative than the UIS of exploration cavers, sent a set of proposed regulations to the Mexican government. Just what we need. Where was the UIS earlier, when it could have spoken up to point out that cave exploration is considered a recreational activity everywhere else in the world?

A VIEW FROM BRITAIN

Cuetzalan caves possess a certain notoriety for, shall we say, a damp nature. The latest flooding in Alpazat is just that: the latest, not the first or last. There have been several such incidents, even during the dry season from February to April. The cavers from the Combined Services Caving Association had laid competent plans to deal with a flood. The question is, What was so different about this trip that led to such a media frenzy? What caver did not notice the extravagant claims that appeared in the world's press? There were few facts to work with, indeed. Let's see what can be summed up in a couple of sentences. Six cavers were trapped by flooding, leaving seven on the surface. Several days later they were rescued by two divers who had flown out from the UK, then faced a political storm and were deported. But as the story broke in a flurry of words:

The cavers became trapped after part of the cave collapsed. . . . Underground there are very strong currents and this is what stopped them getting out. *Reuters*, March 23.

Scientists trapped in cave turn down rescue offers. Six British divers stuck for five days in rising water. *CNN*, March 23.

A rescue mission has been despatched and should arrive on Tuesday morning. UK Foreign Office, March 23.

Half the group has emerged from the vast caverns safely, but the fate of the remaining six remains unknown. . . . The Mexican army has sent in 20 experts, including three divers, in efforts to reach the trapped explorers. But the search is being complicated by the size of the enormous size [sic] of the famous caverns, which stretch for more than 50km. *News 24/Agence France-Presse*, March 25.

[Steve Whitlock] added that the spirits of the trapped Britons were high. They had a bath in the cave yesterday, he said, and had made a deck of cards out of their notebooks. *The Times*, March 25.

These soldiers must be on a training exercise to find weapons of

mass destruction in Afghanistan and should be treated as spies. Mexican television interview, March 26.

The Foreign Office official said: "Every day the cavers are underground breeds a new spate of anti-British headlines and unfortunate television coverage in Mexico. It has been a public-relations disaster. . . ." The Mexican energy minister, Felipe Calderoon, also waded into the row by saying he would send members of the country's nuclear research institute into the caves because of rumours that the British were looking for uranium deposits. *Daily Telegraph*, March 26.

Immigration authorities interrogated the [expedition members] for more than eight hours and had academics from Mexico's National University examine the Englishmen's equipment, backpacks, and computers. *Scotsman*, March 27.

[President Fox said] that his government had asked Britain for "clear information about what they were doing." Britain's response was "frankly unsatisfactory," Fox said. *Scotsman*, 27 March.

Our cave men are not spies. *Daily Record*, March 27.

It was clear that all the correct permits, which hundreds had used before, had been in place . . . . The group was now being held in a "posh block" of a camp for illegal immigrants. *BBC News*, March 28.

Mr. Sims said, "The best bit was when we were in the cave." *ITV News*, March 28.

[The situation] descended into farce amid claims that the MoD-sponsored expedition was a secret uranium prospecting exercise and that precise details of the trip were not forwarded to the relevant authorities. *Guardian*, March 29.

Although they had the right papers for exploring the caves, they were also mapping them, a common practice for potholers. Mapping comes under "scientific" activity. *Scotsman*, March 29.

Under armed guard, the Britons were transported to Mexico City's International Airport aboard an immigration police bus with bars across the windows. *Guardian*, March 30.

[The expedition] would be similar to having Russian military scuba divers enter the UK on a tourist visa then conduct a military diving exercise on a British river without telling any British authorities. *Council on Current Events Analysis*, March 31.

Out of the morass of tales, idiotic ideas, and half-facts from organizations and individuals alike, a mere two pieces of journalism stood out above the rest. On May 2, after the uproar had died down, the *Sunday Telegraph* printed an interview with three of the cavers involved, opening with a wonderful description of Rick Stanton's abode. And Adam Nicolson had previously written in his opinion column:

The cavers weren't in any trouble. They had so much food that when they came out, they even left some in there . . . . Waiting for the British underground diving experts to arrive was by far the safest and wisest option. The only hysteria was in the media scrum at the cave mouth: half a pork scratching of a story and a slavering and angry press pack clamouring for every crumb it could get. This is the underside of celebrity culture. On the internet yesterday morning, there were 580 press stories on this non-incident. *Daily Telegraph*, March 29 (written March 27).

Then there was the now-infamous photo that first appeared in the *Sun* of the trapped six posing in the Monty, wearing nothing but, well, a helmet, wellies, and a tackle-bag or other like-sized artifact held in an appropriate place. As for the stories: No, there was no uranium, an idea that perhaps leached its way into the press because someone spotted radon dosimeters being used. This wasn't a military training exercise; it was a bunch of guys on holiday, some of whom happened to be in the armed services. (The CSCA is open to serving and retired members of the military, as well as Ministry of Defence civilians and dependents.) Mexican aid was certainly not refused as reported, the paperwork had been completed, and Jason and Rick are not Royal Navy divers.

So there endeth the lesson: Newsprint or telly, neither can be believed; when things come to the crunch, if there isn't a story at the start, there can be one soon. As for the expedition, it was well planned and executed, but was unfortunate in bearing the brunt of this new world we live in, where satellites transmit images and hacks copy and paste without checking their facts, and each digital-day's dawning means that the world sees *everything*, immediately. Ultimately, the media's wild reports have left the caving community with a nasty taste and a problem to solve.

Oh, and that photo in the *Sun*. Bear in mind that it was printed on April 1, and that payment for its appearance was donated to the Ghar Parau Foundation, which supports caving expeditions with grants. Out of the circus comes one piece of good news.

Cuetzalan en la Prensa

Los autores discuten la reaccion de los medios en México y el Reino Unido al incidente de los espeleólogos británicos atrapados en la Cueva de Alpazat en marzo del 2004. La mayoría de los reportes publicados fueron exagerados e inadecuados.

LOOKING FOR THE WINDOW

James Sherrell

Over the Christmas 2003 holidays, I flew down to Mexico to spend two weeks with my wife Leticia's family in Huichihuayan, San Luis Potosí. Things were great, as usual, in the town, and the state's governor helicoptered into town to sign a declaration making Cueva del Aire and Cueva del Brujo a protected wild place. (See separate article in this issue.) I enjoyed the *posadas* of Navidad, but I was getting cabin fever and decided to explore a little. About 8 kilometers north of Huichihuayan on the Inter-American Highway is the small crossroads town of Xolol, about halfway between Aquismón and Limonsito, the turnoffs for Golondrinas and Guaguas, respectively. Many times while riding by there on a bus I had seen a little gleam of light near the very top of the cliffs of the Sierra Madre, and I decided to try to find out what it was. I started asking around Huichi, and many people had seen it, but no one knew how to get to it. I took a taxi to Xolol, where several people knew of it. Most of them called it La Ventana.

It was difficult to find a guide, but finally I hooked up with Choc, a 22-year-old man who spoke Spanish as well as Hausteco. After satisfying himself that I was sincerely interested and aware of how difficult it would be, he agreed to take me there. He gathered his machete, a handline, and water. I bought a few bags of chips and some Cokes. We headed off toward the great cliff face. I asked him how long it would take. He said two hours. I laughed and said, "For you maybe, but double it for me."

Off we went, up a little dirt trail past a great stone and concrete pyramid of a water tank that reminded me of an ancient Aztec structure. We crossed a dry creek bed of boulders cemented with tufa from the mineral-rich spring that had been diverted to the tank. Up past bananas, sugar cane, cabbage palms, and dry fields of scrawny purple Indian corn we went, then across a field of boulders and into overgrown jungle full of flowers and butterflies. Finally from the maze of trails we emerged into a clearing where we got a good view of the immense cliff face. Choc pointed out La Grieta, a humongous slab of rock that had broken away from the cliff and forms a talus cave some 200 meters high and 400 meters long. He offered to take me there, but I wanted to save my energy. He said he'd show it to me from the top, still a long way up.

We hiked upward at a 45-degree angle for forty-five minutes and finally reached the bottom of the cliff, where we rested and snacked.

Somewhat rested, we walked along the base of the cliff for awhile, until we came to a rickety ladder made from small trees and twine. We ascended the shaky device for about 15 meters and then followed a hidden route along a ledge with a wooden handrail and sometimes little wooden steps, emerging onto a slope that led to a pass into a lost world. It was apparent that the great vertical massif is a facade, a giant slab of limestone hiding a very large and complex sinkhole-filled valley. The slab of limestone is several kilometers long, 200 meters high, and only about 100 meters thick.

We left the trail and hopped through barren karst with no obvious trail, then climbed higher toward the back side of the mass, chopping our way through dense jungle for twenty minutes. Suddenly a covey of quail exploded around us and flew toward an oval-shaped cave entrance about 6 meters wide and 5 high. I asked Choc if this cave had a name. He said it did not, so I dubbed it Cueva de Codorniz, Quail Cave. Inside, it is much larger, a room about 60 meters long, 15 meters tall, and with a skylight entrance 20 meters up. Some coins, candles, and Haustecan pottery were present, showing that this is a native-healer cave. A passage 1 meter wide and 2 meters tall continued, but there was no wind, and I knew the other side of the limestone couldn't be far away, so we left and continued bushwhacking up the rear of the escarpment for another twenty minutes.

Occasionally I got a clear view of the sinkhole valley. There has to be something big there. Scanning the area, I spotted what looked like a giant opening in a small hill. I could see on the horizon the antennas of Tamapatz, several kilometers away. We continued along a faint trail among grotesquely dissolved boulders. Every rock had ankle-twisting

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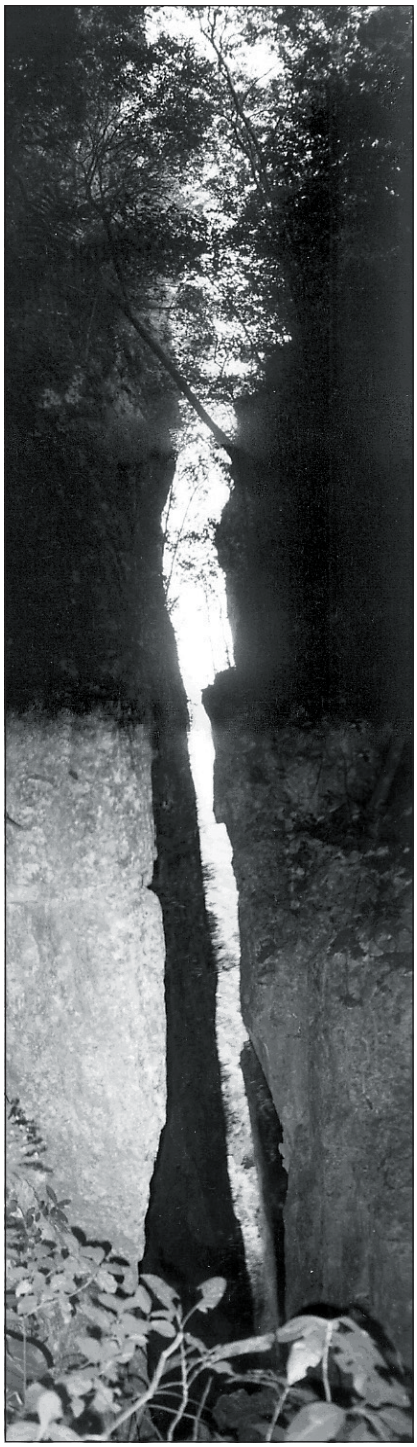
holes in it. I spotted another cave about 10 meters off to the right. It has a circular opening with a flowstone tongue, draperies for teeth, a rounded stalactite for a palate, and a small tunnel receding into darkness. It looked like staring down someone's throat. I scrambled down about 15 meters to where I smelled vampire guano. The red guano on the floor and about fifty bats overhead made me retreat hastily.

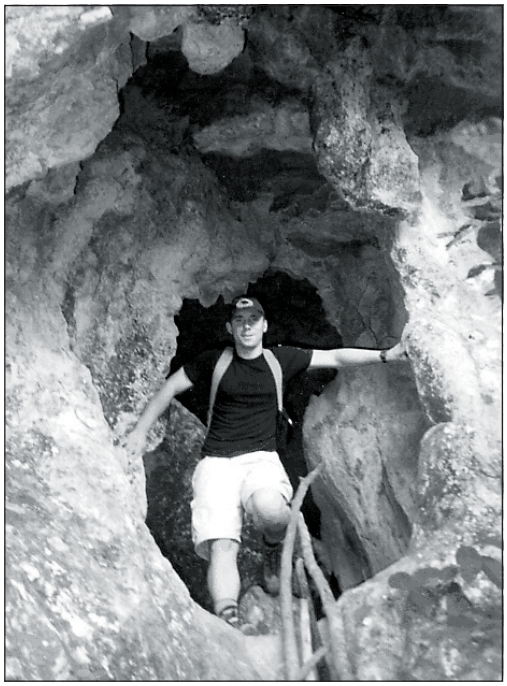
La Grieta. *James Sherrell*.



We headed on, still slightly upward, for a few hundred more meters. We walked by some more cave entrances, which we ignored. Soon the back entrance to La Ventana came into view. The window is about 10 meters high and 6 wide. The view out the front is fantastic. You can see the town and the highway, and the coastal plain fades off flatly toward Tampico. Rocks dropped down the face took between six and seven seconds to hit the bottom of the cliff.

As we left La Ventana, I started to retrace our steps, but Choc signaled for me to follow him farther along the ridge. I was baffled and tired, but did not hesitate as we chopped a little trail. After about fifteen minutes, we came to a large overhang with three small caves in it. The shelter offered little protection, but on the right was a small flat-floored, dry grotto. This is obviously used at times as a bivouac by Huastecos. There were a pot to gather drip water and some rusty cans for makeshift oil lamps. To the left was an opening that went into darkness, but we did not enter it. Above, at the top of a 5-meter tree, was a round opening about a meter in diameter. It did not look very impressive, but the leaves on the tree were shaking.

The Indians had put a scaffold of thin poles from a ledge into the tree and the cave. It was intimidating, but I inched my way across. Many of the poles were very old and creaked under my weight. Some were newer and appeared strong enough. The tree in the middle gave me comfort. At the entrance, a gale-force wind was blowing out of the cave. The way on is a short tunnel, partly blocked by a large rock, and then the cave opens up into a gigantic room some 150 meters long and 30 meters across, full of old dead formations of all types. On the other side, there is a large entrance some 25 meters high and 15 meters wide, with large trees and jungle obscuring the view from it, though with some effort you can see the highway through the branches. Side rooms and tunnels lead off in various directions. This cave deserves a quality map.



Dan Laming in the small rear entrance to Cueva de Pila, taking during a subsequent visit. *James Sherrell*.

Choc sat down and lit a candle in a glass jar for a blessing. He explained that the cave is called Cueva de Pila. I was puzzled, because a *pila* is a water tank such as that found on the roofs of many houses in Mexico. Choc smiled as he climbed to the top of a boulder 8 meters high and showed me a natural tank holding about 700 liters of clean, clear water, a great resource for anyone wanting to camp here.

We left Cueva de Pila though the large back entrance and cut a trail along the front face of the ridge toward La Grieta. In the process, we startled a pack of what Choc called *tejones*, not badgers, but something like a cross between a raccoon and a spider monkey that he said is good to eat.

We carefully made our way another 300 meters to a very jumbled area of tunnels, breakdown blocks,

and deep drops. We had intersected La Grieta about halfway down, a hundred meters from the top or bottom. There was a solution cave here too, going into the cliff, that I entered for 30 meters or so. From this point, the crack was spectacular, since you could see its full height. It was only about 6 meters wide, and I walked across a bridge of rocks, dirt, and trees. As there has been little traffic here, I was leery of every step. It looked like it might be possible to chimney down in a narrow place, but Choc, who had seen it from the bottom, said it would be impossible. I dropped some rocks straight down, and they bounced and rolled a considerable distance toward a dripline 150 meters away. On the other side of this bridge, another drop led to a slope down toward the other end of this fantastic talus cave. A pull-down rappel here would save some hours of walking on a return trip.

We went back the way we had come, and the trip back to town took less than half the time we used on the way up. In Xolol, Choc and I had a few beers in a dirt-floored *palapa* with some friends of his. It was well after dark when I got back to Huichihuayan for dinner.

Buscando La Ventana

El autor describe la visita a La Ventana, una cueva pequeña que se extiende a través de una cresta angosta en caliza al oeste de Xolol, en la Carretera Panamericana en San Luis Potosí. Durante la caminata hacia la La Ventana visitaron otras cuevas, incluyendo la Cueva de la Pila, una cueva con un salón amplio que también cruza la sierra, y La Grieta, una cueva tectónica de 200 metros de altura y 400 metros de longitud formada cuando parte de la caliza se separó del resto de la montaña.

View of the karst around the Tlamaya valley, San Luis Potosí. Photo by Sam Young. (See page 22.)

THE SACRED CAVES AIRE AND BRUJO

Mercedes Otegui and Gilberto Torres

The Sacred Cueva del Aire and Cueva del Brujo, a site called *Tam bokom mim* by the Teneks, were decreed a Sacred Natural Site due to their importance to the Tenek, Nahuatl, and Pames indigenous peoples of the Huasteca region in southeastern San Luis Potosí. These caves are places where rituals take place that transmit traditional knowledge, where shamans or traditional healers seek enlightenment, and where midwives' invocations ensure safe pregnancies. These caves belong to a more extensive network of rocky places, springs, and caves that have a central role in the cosmic vision of the Huastecan peoples. The Aire and Brujo caves are located in a relic of a tropical forest that, in the 1970s, covered most of the Huasteca territory and that has been devastated by uncontrolled cattle grazing throughout the region. This relic forest has become a reservoir of medicinal plants used by the local shamans.

This is extracted and adapted from the English version of a report on the new Protected Natural Area. The map is a previously unpublished composite. The two caves are in fact connected. The cave names Aire and Brujo are used by the Spanish-speaking people in the area and in Frederico Bonet's published report on the area. The Huastecos call them Cuevas del Viento y la Fertilidad, and the original report adapted here used those names. They are also called Cuevas de Xomokonko in a local language.

The Tenek, Nahuatl, and Pames indigenous population is scattered throughout an area that encompasses eighteen municipalities, though most of the population, approximately 170,000 people, is located in the thirteen municipalities of San Martín Chalchicuautla, Tamazunchale, Tampacan, Tampamolón, Tancanhuitz, Tanlajas, Xilitla, San Antonio, Matlapa, Aquismón, Ciudad Valles, Coxcatlán, and Huehuetlán. About 6500 live in Tamuín, San Vicente Tancuayalab, Tamasopo, and Tanquián. The indigenous individuals constitute about 45 percent of the total population of the Huasteca area.

The caves are located in the western end of the village of Huichihuayan, municipality of Huehuetlán, on the lower slopes of the Sierra Madre Oriental. Both caves are located on the private Rancho San Juanito and are approximately 100 meters away from a tributary of the Río Huichihuayan in Ejido Chununtzen. Both cavers are located on the same slope, one above the other. It is widely assumed that both caves are connected, creating a system of caverns probably associated with the Río Huichihuayan.

The nearest cave on the approach path, at the bottom of the hill, is known as Cueva del Aire because a cold wind blows out of it. Its entrance, an ellipse 3 meters wide and 1.3 meters high, leads to a hall that gives way to diverse pathways leading to other chambers. The main hall displays two levels united by a mud ramp, and a variety of ritual objects are scattered randomly. Votive candles are to be seen everywhere, especially on top of rock formations. There are copal burners, *papatla* leaves covering comestibles offered in rituals, and wax figurines on the cave's floor.

The upper cave, Cueva del Brujo, has a smaller entrance that is located in a vertical wall. Access to this cave is made possible by a series of wooden stairs. From the entrance, one descends into the cave's main chamber. It is in that hall beside the largest column that the main rituals are performed.

The caves were decreed a Sacred Natural Site along with Wirikuta, the sacred place of the Huichols in the northwest part of the state. The caves belong to a more extensive sacred landscape of the Huastecan karst, which is dotted with a large number of caverns and subterranean systems. The caves are among nineteen sites in the state's network of Protected Areas. A committee of local traditional healers and shamans will be in charge of the area's management. SEGAM, the environmental authority of the state of San Luis Potosí, coordinated the studies leading to protected status and is in charge of the work of the local committee.

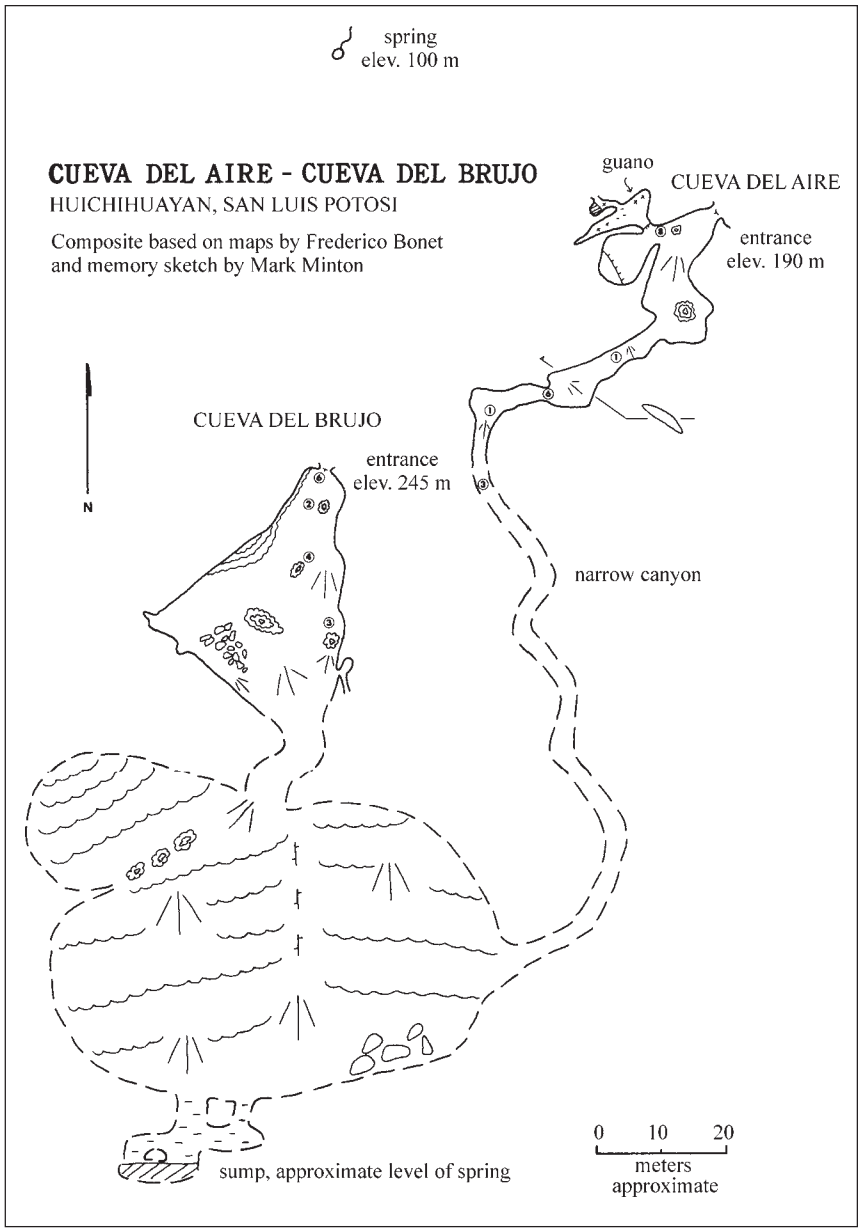
The area encompassing both caves was protected due to the threat posed by a road whose constructions would have menaced the physical integrity of both caves. The healers' association organized protests to stop the development and asked for the help of the state government to protect the sacred space. The caves were decreed Sacred

Natural Sites in June 2001, and they were declared a Protected Natural Area in December 2003. The area has been donated by its owner to the state due to his interest in protecting the sacred space. The management plan will seek to familiarize visitors with the sacred nature of the site, reduce the amount of litter left in the caves, halt vandalism to the rock formations, and limit visitors to the established routes to the caves.

In the Huasteca region, caves identified for ritual use are scattered around the slopes and mountains of Huehuetlán and Aquismón, together with the Huichihuayan hills where *Tam bokom mim* is located. Other caves in the vicinity include La Mascara and Can-ja, along with the caves at the *nacimientos* of the Ríos Huichihuayan and Coy, all relatively close to each other. Other caves worth mentioning are the Cuevas de Hornos and La Ventura, easily visible from the federal highway. [See separate article on La Ventura in this issue. There is a map of Can-ja in *AMCS Activities Newsletter* 23, page 15, reprinted from *Tsaval* 5. The same issue of *Tsaval* has a map of Mascara.]

Of all the caves mentioned above, the sanctuary of *Tam bokom mim* is the most important, according to the region's indigenous peoples. These caves have been used by them for centuries and are the spaces where Teneks, Pames, and Nahuatls perform the rituals that sustain their social and religious lives. They are key to ensure the survival of the essence of their cultures There are many myths and legends associated with these caves. One of them warns visitors to observe abstinence from sex and eating meat for seven days prior to a visit to Cueva del Aire, lest the spirits create such a strong wind that entry would be barred to them. In the Cueva del Brujo, those not similarly abstaining will get lost forever within the cave. Another myth says that if food is not offered or incense is not burned on entering the caves, visitors will experience visions of giant vipers watching the entrances.

There are myths concerning other caves in the mountains around Aquismón and Huichihuayan. For example, the thunder god lives in La Ventana, and those entering it will be cured immediately of their maladies. Other myths are associated with the Coy and Huichihuayan springs.



Las Cuevas Sagradas Aire y Brujo

La Cueva del Aire y la Cueva del Brujo, cerca de Huichihuayan, San Luis Potosí, son importantes culturalmente para los habitantes huastecos de la región. Fueron declaradas un Sitio Sagrado Natural en el 2001 y en el 2003 el gobernador del estado las declaró Zona Natural Protegida.

XILITLA 2004

Peter Sprouse

John Fogarty, Terri Whitfield, Bill "Carlos" Nasby, and I left Buda, Texas, in the evening of March 10 and crossed at Laredo. Driving through Monterrey sure was easy at 6:00 A.M. In Victoria we stopped to visit with our friend Dr. Paco at Victoria Tec, then toured the Natural History Museum. I slept through Cd. Mante and woke up at the El Abra pass. We drove up the road to the parking area and climbed up the steep steps to Cueva de El Abra. Driving on into SLP, we drove to El Limoncito and up to San Isidro. We asked around about the Sótano de las Guacamayas that Ricardo Arías told me about at Mexpeleo 2002, but couldn't get any information. We then took a spur road north 500 meters to the village of Alaquich, where we stopped to ask about caves. We connected with Alejandro, who knew of two caves nearby that he would take us to in the morning. We backtracked to Nacimiento de Canjá, which appeared to be plugged with debris from road construction. Towards dark, we headed north to the Cascada de Micos, where we found Ernie Garza, Denise Prendergast, and Dale Barnard. We camped for the night.

We picked up Laura Rosales at the Valles bus station, then stopped to take a look at a nice campground on the Rio Coy—www.campingriocoy.com. We had another look at the Canjá resurgence, but digging out the plugged entrance did not look easy. Then we drove up to Alaquich to meet Alejandro, who guided us up the hill above his house to a pit he called Sótano de los Murciélagos. John, Carlos, and Laura mapped this to the bottom, three drops down. Meanwhile, Alejandro took the rest of us over a hill to the south to more caves. Before the top of the hill he showed us a 2-meter-wide, 1-meter-high entrance that he said connected to Murciélagos. We continued south along a ledge and paused where he knew of a cave. We climbed upslope to the right to reach Cueva Tuzarreál, named for some animal that is good to eat. It has a walk-in entrance, but lowers to a crawl after 10 meters. It opens up again into a nice passage with vampire bats and potsherds, then lowers again to a belly-crawl that pinches. Next Alejandro took us to a pit overlooking a dolina containing a cemetery. This pit, Xol Ja, is a 15-meter drop into a spacious chamber aligned parallel to the dolina's flank, as if tectonically formed. A couple of climbdowns led to a second pitch, so Terri and I called for Dale to come down with more rope. It ended at the bottom of that pitch. We hiked back to Alejandro's in a downpour. Our host offered us a dry place to bed down for the night, which we accepted. We were fed *nopalitos y frijoles*, and repaid our host with mandolin and fiddle. Splendid, until the state police showed up, responding to a complaint that Alejandro had taken us to caves on someone else's property, without permission from the *juez* to boot. Lengthy debate ensued among the crowd, finally ending with agreement to meet at the *juzgado* in the morning.

Next day we packed up, and soon the *policia estatal* arrived to see

Terri Whitfield in Cueva Vidal Ramos. *Peter Sprouse*.

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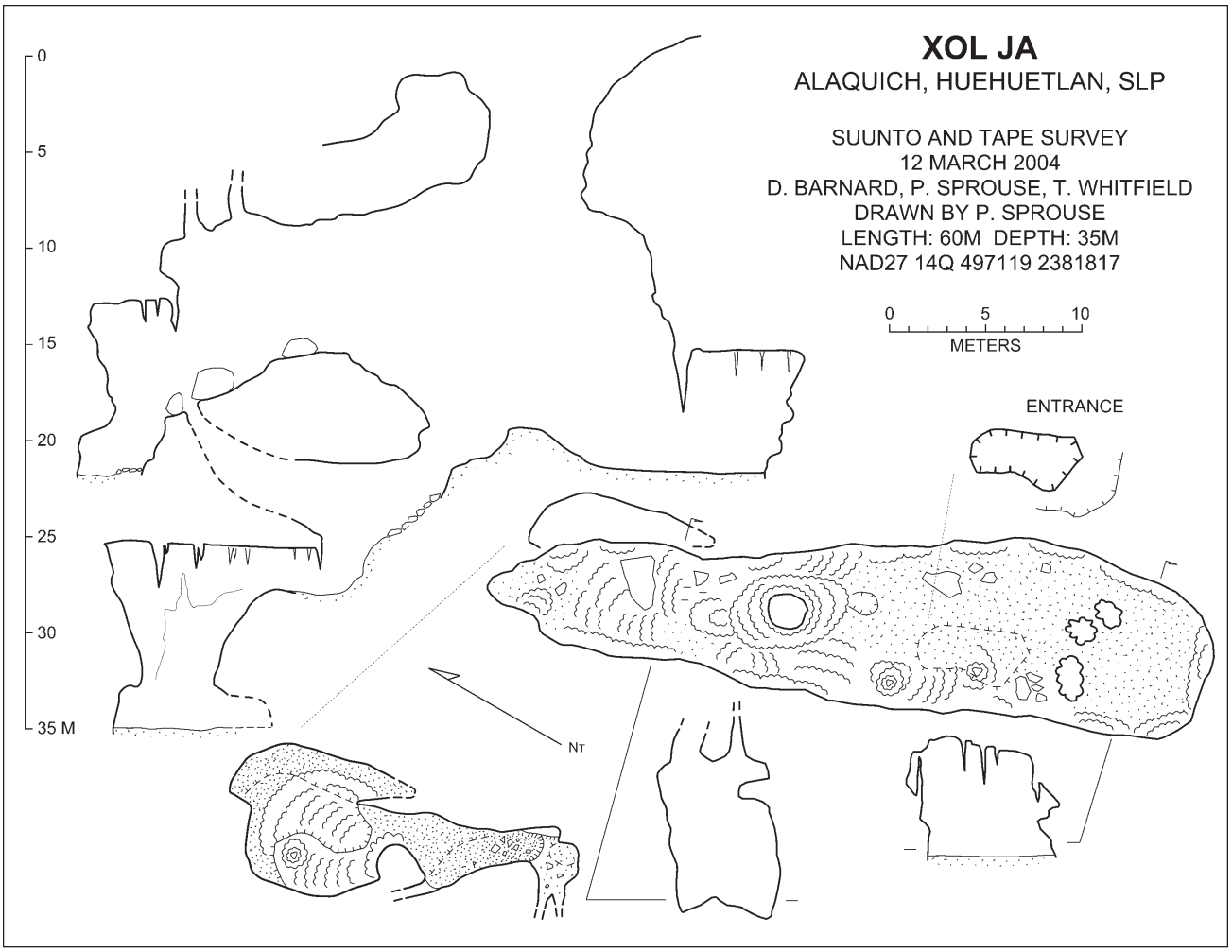
us face justice. We reported to the *delegación*, where a neatly written complaint was read to us, along with the suggestion that we pay a two-hundred-peso fine. Various arguments were put forth, including the idea that we had our own lawyer, but as soon as we had certain assurances, I agreed to pay, and we were on our way.

Our next stop was in Huichihuayan, where we met with the owner of the Canjá resurgence, who informed us that he was about to sell the land and the cave. He suggested that we check back later. So we drove on to Las Pozas, where we had a meal and met up with Guerrero cavers Gilberto, Humberto, and Fabiola. We decided to stay at the Hotel María Dolores, a few blocks east of El Castillo. The Guerrero cavers camped at Nacimiento del Río Huichihuayan. After dinner, we put Laura on a bus to Distrito Federal.

After breakfast the next day, I went to the *ayuntamiento* to look for our municipal contact. He was quite helpful and wrote us a letter of permission for all of the Xilitla jurisdiction.. Humberto and Fabiola joined us for caving. We drove southeast to El Jobo Xilosuchico and met up with the *juez*, Santos. He was our guide for the day. He first took us to Sótano de Plan de La Florida, first located by cavers in 1989, and a small cave above it, Cueva la Escondida. John, Dale, Ernie, and Carlos decided to map the *sótano*, while the rest of us were guided to other caves by Santos. Sótano de Plan de La Florida turned out to be a pretty good going cave. It has a 30-meter entrance drop that is immediately followed by a 40-meter drop. At the bottom of this drop, a traverse around a pool leads through a window and over to a downclimb, then to an 8-meter nuisance drop. After that there is some walking passage, then stooping, then the Frontal Lobotomy Crawl. The cave continues on, with some walking passages and some low areas up to a pile of rubble called Carlos' Cobble Crawl. There is a junction called Beyond the Pail, named for a pail wrapped around a fallen stal. Going left, a traverse across a pool leads to more walking passage to a 25-meter drop above a large flowstone formation named General Sherman.

Santos took us to a cave upstream of the village that had been mapped by Marcus Buck and Mary Standifer in 1985, Cueva de las Cupolas Chicas. Then we drove down a side road toward Arroyo Seco. We parked by a short cave in a switchback road cut. Humberto and his two dogs, Toto and Koni, checked it out, but it didn't go. Then we followed a steep trail down into a box canyon off Arroyo Seco, visiting another short cave. Finally, the last cave turned out to be a good one. We named it Cueva Vidal Ramos in honor of a honey collector who fell to his death in 1982 from the cliff over the cave. A prominent arroyo runs from the 15-meter-diameter entrance. We mapped about 100 meters of large passage, and it



continues. We took the guide back to the village, then Humberto and Fabiola took off for San Juan del Río, dropping Denise off in Xilitla. I waited awhile at La Florida in the dark, and Ernie came up after a bit. Local girls walking up the road were spooked by voices in the pit. Dale appeared, and then John and Carlos surveyed up.

The next day, Carlos, John, and Ernie continued to explore La Florida, while Terri, Denise, and I went back to Cueva Vidal Ramos. We mapped side leads on the right, then pursued the back. It continues as a nice streamway for a while, breaking into a large chamber, Hobbit Hall. Then it begins to ascend nice flowstone ramps with gour pools. Eventually it heads straight up. Obviously it goes, but we need to find the way in from above.

Back in Xilitla, we met Marcus Gary and Robin Havens's wedding party at El Castillo for wine and cheese, then dinner at Casa Vieja. Carlos, John, and Ernie didn't get back from pushing La Florida until 11 P.M. They stopped 680 meters in at the top of the seventh drop, with airflow.

Since the next day was rainy, the La Florida crew decided to take the day off. As we strolled around the *zócalo* in the morning, we ran into more cavers in town for the wedding. In the afternoon, Ernie, John, Dale, and I drove to Peña Blanca to look for caves. The karst was sweet along the way. We found a guide named Rogelio, who took us to a big collapse pit/sink that we could walk into. Numerous *ollas* at the bottom were collecting water. Next we mapped a pleasant horizontal maze cave, Cueva de Rogelio. We talked to the village *juez* on the way out, and he was very hospitable. We had a large crew for dinner at the Cayo's restaurant that night.

The next day, Chris Krejca, Jean Krejca, Wes Shumacher, Carlos, and John went for a big push in Plan de La Florida. Terri, Ernie, Denise, and I drove all of the high roads northwest and west of town. At Las Joyas we talked to the *juez*, who knew of few leads nearby. The road from there connects to Cerro Quebrado and on to Apetzco, where we turned west up to Nuevo Miramar. We continued on to Viejo Miramar, where we met a fellow who guided us to a new pit by the road. It is about 25 meters deep, and water could be heard dripping in the depths. Next he took us down into the big sink to a short cave, Cueva de la Pila. We quickly mapped this. Then we rushed back to Xilitla for evening festivities and slides at Las Pozas. The Florida crew didn't return until after midnight. They had reached a sump after the eighth drop and derigged.

Terri Whitfield watches Denise Prendergast traverse a pool in Cueva Vidal Ramos.
Peter Sprouse.

The next day, Dale, Denise, and I went back to Peña Blanca to try to find Cueva de las Guaguas, but couldn't find it or our guide Rogelio. In the verdant valley on the south side of the village, we got a pack of school boys to take us to a nice cave up on a hill. Cueva Tepeatl is a nice bit of borehole with archeological material. It breaks out into a collapse sink, then goes into another stretch of walking passage, before ending in fill. That evening, among the bamboo, poppies, and pools of Las Pozas, we celebrated the union of Marcus Gary and Robin Havens.

Having stayed up late partying at Las Pozas, the next day we managed mostly surface recon. John, Terri, and I drove to Cruztitla, Puerto de Belem, and Moloxco to look for caves. We picked up a mumbling guide named José, who showed us a 25-meter pit near the end of the Moloxco road. It is on the north side of the road, about 4 meters in diameter, with a steep slope into a sheer pit. Then he showed us the previously known Sótano de Don Agustín along a side road back into Puerto de Belem. We ditched José for Leonardo Hernández, an enthusiastic 18-year-old. He took us to the drainage below Cruztitla and a large cave-entrance complex in a huge sink with many skylights. He helped John and me map the entrance complex, then we went downstream. Soon we reached an unclimbable drop of 5 meters. He called this Cueva de la Chuparosa, and it seems like a possible upper entrance to Cueva Vidal Ramos. As we drove him back up the hill, he showed us a pit, perhaps 20 meters deep, on a side road. The entrance is a 7-by-21-meter T. Out of time for this trip, the next day we packed our stuff and headed north for the border.

Xilitla 2004

Un viaje de reconocimiento en los alrededores de Xilitla, San Luis Potosí.

TECOMÁN 2004–2005

Peter Ruplinger

I was joined on my third trip to Tecomán by Shay Lelegren, Brandon Kowallis, and Will Aldridge. They are college students. Shay and Brandon were with me on my first Tecomán venture in 1999. They are exceptional cavers. This was Will's first subterranean experience. On this trip we hoped to climb Volcán Nevado de Colima and map San Gabriel's deepest pit. We weren't able to bottom it on the last trip. Our ropes weren't long enough. At –100 meters Shay couldn't see the bottom.

We reached above 4000 meters, just 240 meters below the top of Nevado de Colima, and we can't reach it. The park rangers lower on the volcano were optimistic that we could, but the Protección Civil has restricted further ascent. The problem is that Volcán de Fuego, four kilometers to the south, is expelling voluminous toxic fumes and ash. They fear that the smoke will blow this way and asphyxiate us.

We arrived in San Gabriel, Colima, about mid-morning on December 28. The trail to Cara de Tigre was overgrown and hard to follow. Most of the area is sticker bushes or sharp tower-karst. Our backpacks made hiking difficult and dangerous. Eventually we were hopelessly lost in a thicket of painful sticker bushes. Will and I stayed with the packs, and Brandon went with Shay to find the cave. An hour and a half later they returned, all sweaty and beat. I didn't have to ask if they had found the cave. I could tell just by looking at their faces they hadn't. While they rested, and I went off to look myself. As luck would have it, I walked to the cave in less than ten minutes.

Most caves in Mexico don't have local names. I named Pozo Cara de Tigre because of the numerous philodendrons swarming like snakes around the entrance. During the rainy season they are plush, but most of the year they remain barren of foliage. Philodendrons are called *cara de tigre* in Mexico. The philodendron leaf looks like a tiger face.

Shay rigged the entrance with the 600-foot rope. Shay and Brandon went down and came back to report a beautifully decorated cave. One column was approximately twenty meters high. We returned the next day to map it. I didn't go down. The rigging was somewhat difficult to get on and off. I felt that after a 150-meter ascent, I might be too tired to safely get off rope and clear of the pit. Part of being a good caver is knowing what can and can not be done with safety. Shay and Brandon were really tired when they got out of the cave. Fortunately, while they were in the cave Ignacio showed me an easier trail. It would have been dangerous to find our way back across the razor-sharp tower karst and through the sticker bushes in the dark with our overloaded packs.

The next day, Ignacio showed us a virgin cave that we had missed on prior trips. It was just a hundred meters or so west of Cara de Tigre. It was impressive, forty-plus meters deep and heavily decorated. I mapped it and named it Pozo Hermoso.

After that, we went south to Michuacán. I expected that we could find another friendly mountain *pueblecito* with lots of nearby

Dave Harris at the entance to Cara del Tigre during a previous trip. *Peter Ruplinger*.

peter@ruplinger.org

caves waiting to be explored. Brandon suggested that we visit Palos María. It is located about 50 kilometers inland, at the base of Barranca Agua Fría. As we approached Palos María, the road was under construction. Although just fifty kilometers south of Tecomán, the terrain was noticeably greener. Palos María is a town of perhaps a few hundred. It is sequestered in a valley and beautiful. It has one grocery store. Several men were sitting there visiting. We asked a boy on a bike, Felipé, where the *presidente* lived. He was pleased to lead us to Presidente Rubin's house, just one block west of the store. Ruben wasn't there. His wife said he would be back in a couple of hours.

Back at the store, Felipé introduced us to Jorge. Jorge's eyes squinted as he leaned forward and whispered. "Listen, I know a cave where there are numerous clay figurines from the indigenous people of this area. I can take you there, but you must promise never to divulge the cave's location".

"Thank you very much," I responded. "That would be nice, but we are not looking for artifacts. We are just here to explore the caves and make maps of them."

"That is very good," Jorge countered, "Did you know there is much gold in these hills? Years ago an American firm was here mining. They went away. The gold remains. I am confident we can find it."

"No, thank you," I interjected. "We are not looking for gold. Just caves that hopefully have natural formations of interest."

Jorge looked rather confused. "How about mineral specimens of precious gems? Wouldn't you like to find some?"

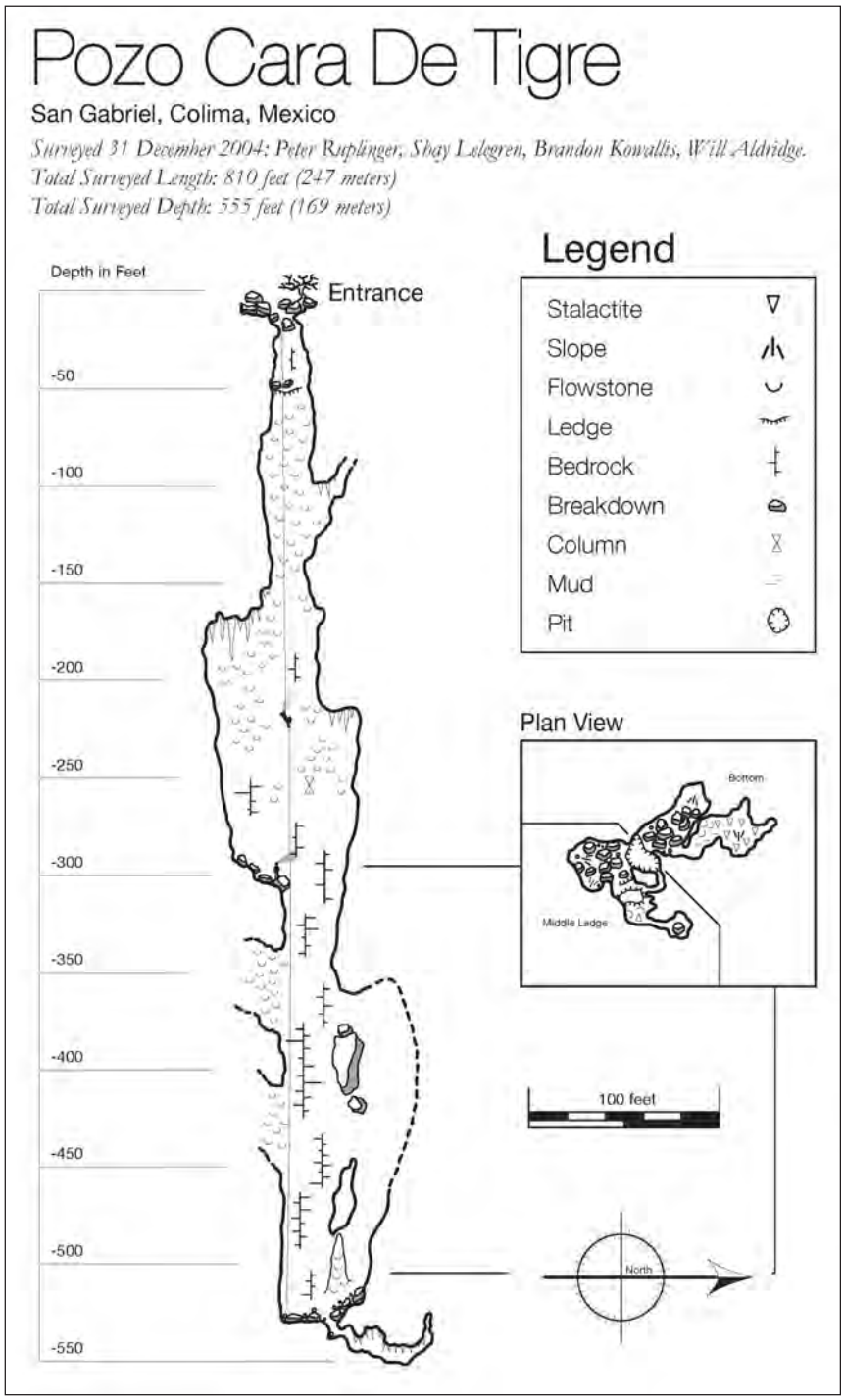
"No, we don't take anything out of the caves."

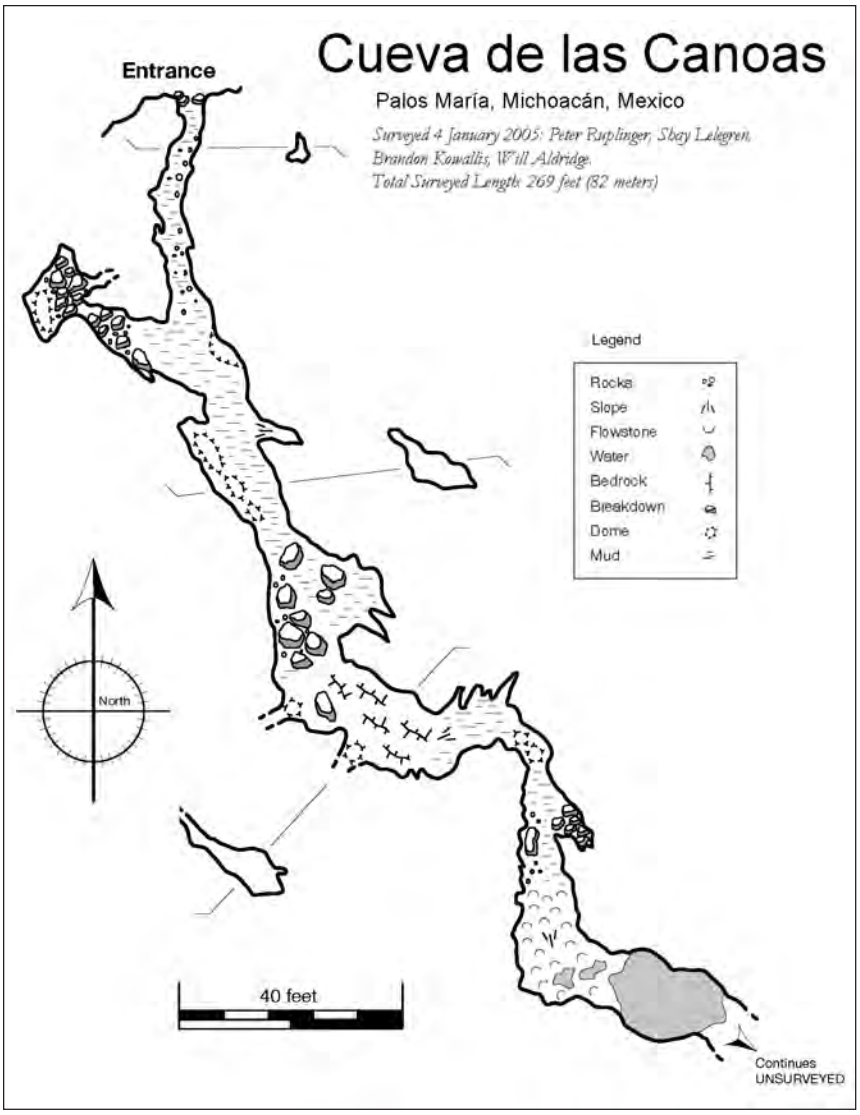
"Well, why did you come all the way to Palos Maria if you don't want to find treasure in our caves," he queried, half befuddled, half indignant.

"We just enjoy exploring and mapping caves," I repeated. "We take nothing but pictures and leave nothing but footprints."

With that finally settled, Jorge began to describe less than spectacular caves in the area. "There is one just a few hundred meters from here," he remembered. "It is where we get our water supply. We call it Cueva de las Canoas. I can take you there right now". So off we went. Felipé tagged along. We walked up the canyon a short distance from the bridge and then through the brush to a cliff. Jorge looked somewhat confused. There was nothing but a solid cliff where he thought the cave was. "That is so strange. I know the cave is here. I saw it just a few years ago."

We continued along the cliff base another ten meters or so. "Oh, here it is," shouted Brandon. There, close to the base of the cliff, was the entrance. It is just big enough for Brandon to squeeze into. We waited outside. About ten minutes later Brandon emerged, quite excited to report that it led to going passage.



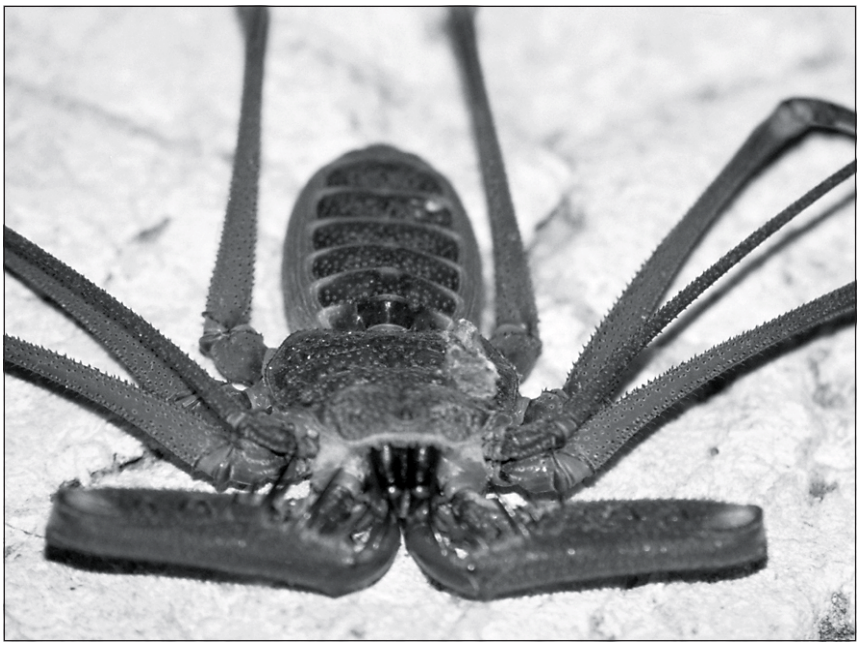


We decided to go back and check with the *presidente* before further exploration.

Ruben was home when we returned. He listened with interest as we explained why we were in Palos María. When we asked if it would be acceptable for us map caves in the area, he gazed off for a moment and responded in the affirmative. We chatted briefly.

We crawled into the cave and began mapping. Bats zoomed overhead. It felt good to be underground. Huge *tindarapos* with leg spans approaching seventy centimeters clung to the ceiling, centimeters above our heads. *Tindarapos* have eight legs, but are not true spiders. They are amplybygids, also called whip spiders or tailless whip scorpions. They resemble somewhat a cross between as spider and a scorpion. The body resembles that of a scorpion, less the tail. The pinchers are not true pinchers. They resemble the arms of a praying mantis. The front legs are slender. On one occasion I spent about forty minutes watching them slowly creeping along cave walls and ceilings. As they walk, they wave their front-most legs as if to feel the way. The variety we find in the Tecomán area is totally blind. Indeed, I have never seen them within 20 meters of a cave entrance. The

Tindarapo. *Peter Ruplinger*.



two prominent black spots that appear to be eyes are, as best I can tell, two huge jaws. I have been within centimeters of *tindarapos* without them sensing my headlamp. When they do sense my presence, I suspect it is from the heat of the lamp, or perhaps my body heat. Upon sensing my presence they quickly run off. I have observed *tindarapos* to be territorial. In a cave north of Tecomán, there were many in one room. None of them was within 2 meters of another. They just slowly wandered around in their own areas. Once, when I startled one, it ran into the area of another, and they immediately began fighting. They waved their pinchers much like swordsman. I suspect they eat moths. I've noticed many moth wings in areas with a concentration of *tindarapos*. I've also observed them in very remote areas, far from the cave entrance, where moths would be unlikely. The variety we observed in Tecomán appear similar if not identical to ones I've observed in the Dominican Republic.

We surveyed about 80 meters of passage. A gentle stream flows over a low rimstone-like dam into a tiny side passage. We believe the side passage leads to the spring that provides water to Palo María. We scooped another 70 meters or so. The passage continues, about 2 to 3 meters wide and 1.5 meters high, with typically about half a meter of water to wade through. Brandon wasn't feeling his usual super-energetic self, so we decided to survey the rest of the cave on our next trip. The cave may continue a long way.

Tecomán 2004–2005

Espeleólogos visitaron San Gabriel, Colima, y Palos María, Michoacán, y topografiaron dos cuevas.

Mariano Silva Fuentes, 33, was one of Mexico's leading cave explorers and biologists. He worked in the biospeleology lab with the science faculty at the Universidad Autónoma Nacional de México. Among many notable accomplishments, he was a member of the 2003 Sistema Cheve expedition, where he joined the limited fraternity of individuals to have reached the Cheve sump. He died on April 6, 2004 while undertaking a sump dive in the Cueva Oztoquito, Municipio Tzicatlacoyan, Puebla. (See *AMCS Activities Newsletter* 27, page 18.) He and Soriano lived on Mt. Oyameyo.—Bill Stone

Carta para un amigo — Letter for a Friend

Hoy la montaña "El Oyameyo" huele diferente, falta algo de pasión, algo de alegría. En tu casa no humea la chimenea y ya no tenemos esas pláticas donde reíamos. Nuestros vasos ahora no brindan, el vino es diferente y las cosas algo raras. Nos dejaste un poco solos, pero sigues en ese viaje explorando. Y no sé por qué, pero comparto tu pasión por las cuevas y la naturaleza. Estoy triste y creo que la búsqueda de nosotros mismos está más allá de lo que conocemos. Pero hoy sólo quiero decir que te extrañamos, todo por acá está bien. Mucha gente piensa que te has ido, pero yo te veo en cada árbol y cada flor de tu trabajo. Ahora sólo estás en una forma diferente. Me has recordado el compromiso de hacer esto cada día mejor, con todas nuestras fuerzas, porque la vida así es, sin importar el precio, si no todo es en vano. Katy, Chen, Frodo, la Chiquita, Cheve y Soriano, tus perros amigos te mandamos un abrazo, allá donde tu espíritu sigue explorando.

Today, Mt. Oyameyo smells different. It lacks the passion, the joy that used to exist here. And in your house the chimney does not smoke. No longer do we have those chats where we laughed, our glasses raised in toast. The wine is now different. Good times more rare. You left us a little alone. But you continue on that journey of exploration. And I don't know why, but I share your passion for caves and nature. I am sad, and I do believe that the search for ourselves is further away than what we know. But today I only want to say that we miss you, and that everything on this side is OK. Many people think you have gone away, but I see you in every tree and every flower of your work. Now you are just in another form. You have reminded me of the commitment to make every day better, with all our strength, because life is precious, that nothing was in vain. Your dogs and friends—Katy, Chen, Frodo, the Chiquita, Cheve and Soriano—send you a hug, over there where your spirit keeps on exploring.—José Antonio Soriano, translation by Bill Stone

THE COLLAPSING QANAT

John Pint

Cows had been vanishing for months in an area outside the rural Mexican town of Nextipac. The local people were terrified. What was going on in their cornfields? Finally, several officers of Mexico's Protección Civil responded to the farmers' pleas. "Three of my colleagues were about 30 meters ahead of me as we made our way through the fields," one of the officers told us, "when suddenly I saw them vanish right before my eyes. The earth simply swallowed them up." Two of the three survived, but the other was buried under a heap of rubble, and it took days for heavy equipment to dig down to the bottom of the long, narrow tunnel where the man's body lay. What had swallowed up both men and cows was an underground aqueduct, known as a qanat in Arabic.

My wife Susy and I first walked into Qanat La Venta in 1985, thinking it was a most unusual cave, because it had seventy-five small skylights in the ceiling, evenly spaced and more or less in a straight line. Archaeologists Chris Beekman and Phil Weigand eventually put us straight, and we helped them map and descibe as much as we could of over 8 kilometers of tunnels that had brought water to a hacienda outside of what is now the city of Guadalajara. The skylights are visible in air photographs, and that's how we measured 8 kilometers of qanat; the actual underground survey was blocked by a collapse. The new collapsing qanat at Nextipac appears to line up with the known route of La Venta, so we think it may be part of the same system. It may have been built by a Franciscan Friar in the 1700s, using technology that originated in Armenia, was perfected in Persia, then spread from the Middle East across Africa to southern Spain and from there to Latin America. We spent considerable time with a famous Jalisco historian trying to document the construction of this qanat, but were unable to find any information on its origin. Without the qanats to supply water during the dry season, Guadalajaha would probably never have become the second largest city in the country.

As soon as he heard about the collapses near Nextipac, our caver friend Luis Rojas called Protección Civil and told them that the problems were caused by a qanat system. The authorities immediately grabbed Luis, and he spent three days helping in the rescue efforts, as well as verifying that these were indeed qanat tunnels that were collapsing. Of course, Mexican television became interesst in the whole thing, and that's how Susy and I got involved. "They want to film the qanat," said Luis, "but I'm busy on weekdays. Will you take them inside?"

Well, I knew that fences with padlocked gates had been put up around the main entrance to Qanat La Venta, so the day before the filming I talked with the property owners, who assured me that the gate keeper would let us in the next morning. The following day, we met the Televisa crew at a local gas station. They were accompanied by uniformed officers and police cars. These TV people know how to cut through red tape, all right. We drove straight to the padlocked gate, but the gatekeeper was nowhere to be seen. We honked our horns and shouted, but to no avail. Then the Protección Civil people burped their police horns, but still not a soul appeared.

Time passed. I looked up at the qanat entrance only 100 meters away. Then I saw a little boy riding his bicycle. "Do you know how to get up to the cave?" I asked. Well, if anyone knows how to get where he is not supposed to be, it's a kid. "Just follow me," said the boy.

Now my problem was to convince the TV crew. "All we have to do is wind our way through that tangle of brush and slip under a fence." The PC guys gave me a funny look, but Ernesto, the TV man, was getting desperate, and so we were soon weaving our way through the weeds, thorns, and *mala mujer*, following our twelve-year-old guide. Yes, every entrance to the qanat was fenced off, but we soon found our way inside. Then, of course, the gatekeeper suddenly appeared, not too happy about how we had gotten inside.

Thick brush now fills the exit channel of the qanat, but inside it looks just the same as it did years ago, with no sign of collapse. The TV crew hung a transmitter on my belt and attached a mike to my

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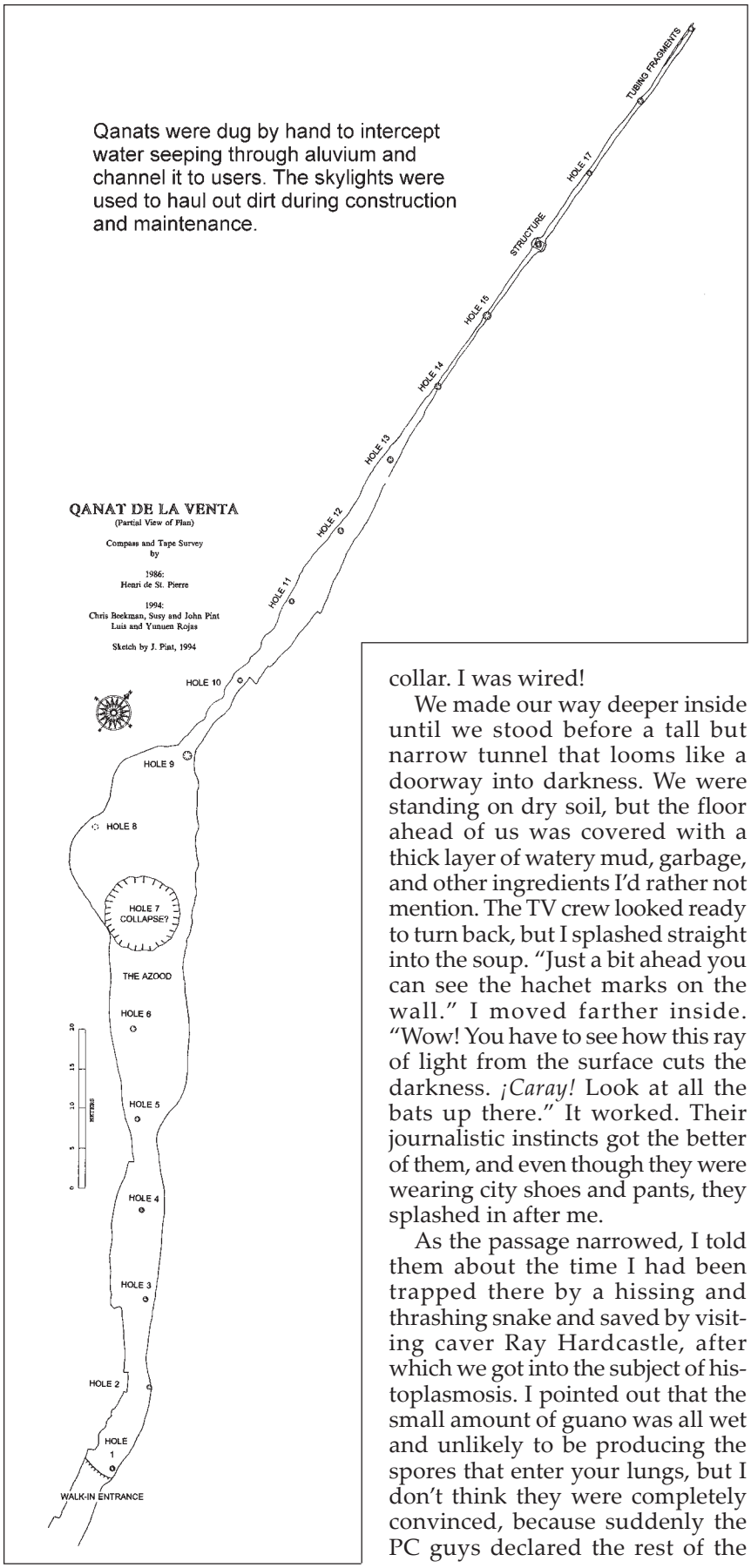


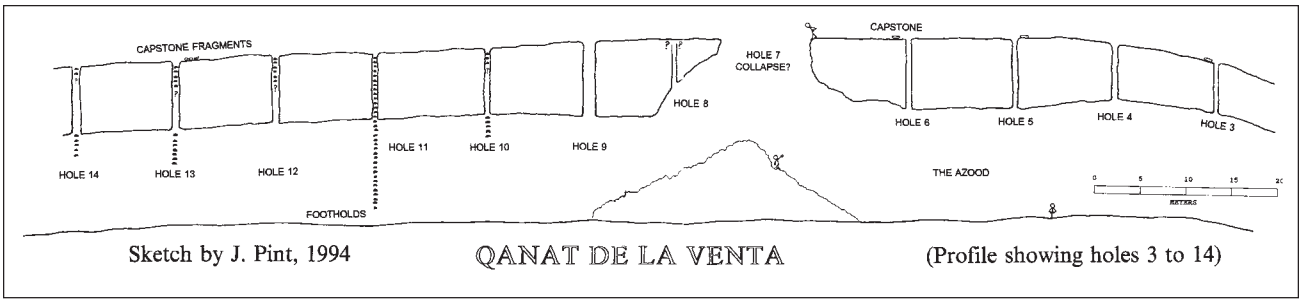
collar. I was wired!

We made our way deeper inside until we stood before a tall but narrow tunnel that looms like a doorway into darkness. We were standing on dry soil, but the floor ahead of us was covered with a thick layer of watery mud, garbage, and other ingredients I'd rather not mention. The TV crew looked ready to turn back, but I splashed straight into the soup. "Just a bit ahead you can see the hachet marks on the wall." I moved farther inside. "Wow! You have to see how this ray of light from the surface cuts the darkness. *¡Caray!* Look at all the bats up there." It worked. Their journalistic instincts got the better of them, and even though they were wearing city shoes and pants, they splashed in after me.

As the passage narrowed, I told them about the time I had been trapped there by a hissing and thrashing snake and saved by visiting caver Ray Hardcastle, after which we got into the subject of histoplasmosis. I pointed out that the small amount of guano was all wet and unlikely to be producing the spores that enter your lungs, but I don't think they were completely convinced, because suddenly the PC guys declared the rest of the qanat "dangerous and collapsing," and said that it was time to leave. Nevertheless, I took a quick look ahead and saw that what they were calling collapses were merely small piles of dirt washed in through two ceiling holes. However, the cameraman had filmed some good material, and we had several more places to visit, so we retrated and drove off to La Gotera, a much smaller qanat system only five minutes away.

No fences or padlocks at La Gotera (The Place Where It Drips), but this qanat is still producing water and must be a very good example of what Qanat La Venta looked like just after it was created. La Gotera's passages are about 2 meters high and 70 centimeters wide, with a curved ceiling and a constant but slow flow of water on the floor. A few meters from the entrance, you come to a T-junction. Chris Beekman and I once followed the left-hand passage for a long, long time and turned back without reaching an end. Now, however, I found the passage blocked by a heap of dirt that appeared to have been dumped in through the very first ceiling hole you come to. So I went off into the right-hand passage with the TV crew. After about 40 meters, we came to the first ceiling hole in that direction, and it too had a ton of sand beneath it, preventing further passage. However, to my surprise, I saw that water was trickling from under the sand. The old qanat was still working, a tribute to a great feat of engineering, although it's nearly dammed up.

Unfortunatly, as Luis Rojas points out, the ability of a qanat to gather water even when it's plugged up is probably the direct cause of the collapses in the Nextipac area. Qanats are designed to be aqueducts, not dams. As soon as the water level rises, water begins to soften the walls of the channel, which were carved out of unconsolidated sediments and not reinforced in any way. The eventual result is the collapse of part of the system, if not the whole thing. Dumping dirt into qanat holes near La Gotera could result in disasters many kilometers away. A clean qanat is a safe qanat.



Sketch by J. Pint, 1994 QANAT DE LA VENTA (Profile showing holes 3 to 14)

From La Gotera, we drove north toward Nextipac and then west along rutty dirt roads through high cornfields. Finally we arrived at a check-point crisscrossed with bright yellow *¡Peligro!* tape. As we walked toward a great mound of dirt, an officer told us that it was from the effort to dig out the man he had seen vanish there. I could see a typical qanat passage at the north and south ends of the partly flooded hole that had been dug. The GPS showed that this collapse was 7.3 kilometers northeast of the exit channel of Qanat La Venta. I asked permission to go down a take a better look at the south passage, and the Protección Civil men agreed, but only after professionally attaching a belay rope around my waist. Unfortunately, once I got to the entrance to the passage, they wouldn't let me get close enough for a good peek inside. Anyway, the passage looks about 70 centimetes high and maybe 3 meters high, with about 2 meters of dirt between the passage ceiling and the surface.

Finally, we drove over to a second, smaller collapse located 300 meters to the north. This was a hole about 6 by 8 meters and about 2 meters deep, but they told us it had been deeper before the last rain. The ground had subsided about half a meter in a line north and south from this hole, suggesting that this was more collapse of the same tunnel.

These goings-on in Nextipac sparked much speculation among officials and the media about the mechanism causing the collapses. At first, the newspapers found "experts" who claimed Nextipac was riddled with *galerías de sufosion*, erosion-generated caves that "occur sporadically, at least every fifteen years." Fortunately, the reporters kept digging and eventually contacted hydrologists of the Zapopán Water and Drainage Department, who assuered them that there is only one cause for the collapses: the tunnels of Father Buzeta. Guadalajara has a street named after Pedre Antonio Buzeta, and it didn't take much hunting for researchers to find a book called *Hydrology of the Atemajac Valley*, by Severo Díaz, that recounts how the city of Guadalajara suffered a severe shortage of water in 1730 and decided to contact a celebrated Spanish engineer who knew how to find water and how to bring it to where it was needed. In 1731, the Franciscan padre began to construct a system that would bring water from the edge of the city to its center. The price was sixty thousand pesos, which the city failed to pay, resulting in suspension of the project in 1734. Three years later, Padre Buzeta returned, and in 1740 water began to flow into the city from the outskirts. Unfortunately, we were only able to document Padre Buzeta's work inside the city limits of Guadalajara, and it is still only speculation whether he later went on to dig the tunnels that connect Nextipac to La Venta.

When you put together the 8 kilometers of qanat tunnels described by Beekman, Weigand, and Pint with those collapsing in Nextipac, you may find, according to Phil Weigand, that Zapopán could possess some of the longest qanats in the world. But the most amazing thing about these systems is that they have held up, probably for hundreds of years, and in many cases are still capable of producing drinking water for the citizens of Jalisco.

Beekman, C. S., P. C. Weigand, and J. J. Pint, 1996. El qanat de La Venta: sistemas hidráulicas de la époco colonial en el centro de Jalisco. *Relaciones, Estudios de Historia y Sociedad* 63–64: 139–185.

Beekman, C. S., P. C. Weigand, and J. J. Pint, 1999. Old World irrigation technology in a New World context: qanats in Spanish colonial western Mexico. *Antiquity*, 73 (number 280): 440–446.

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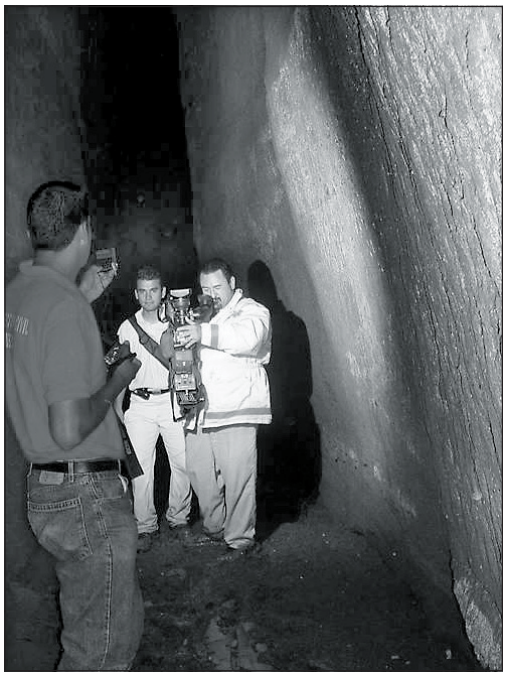
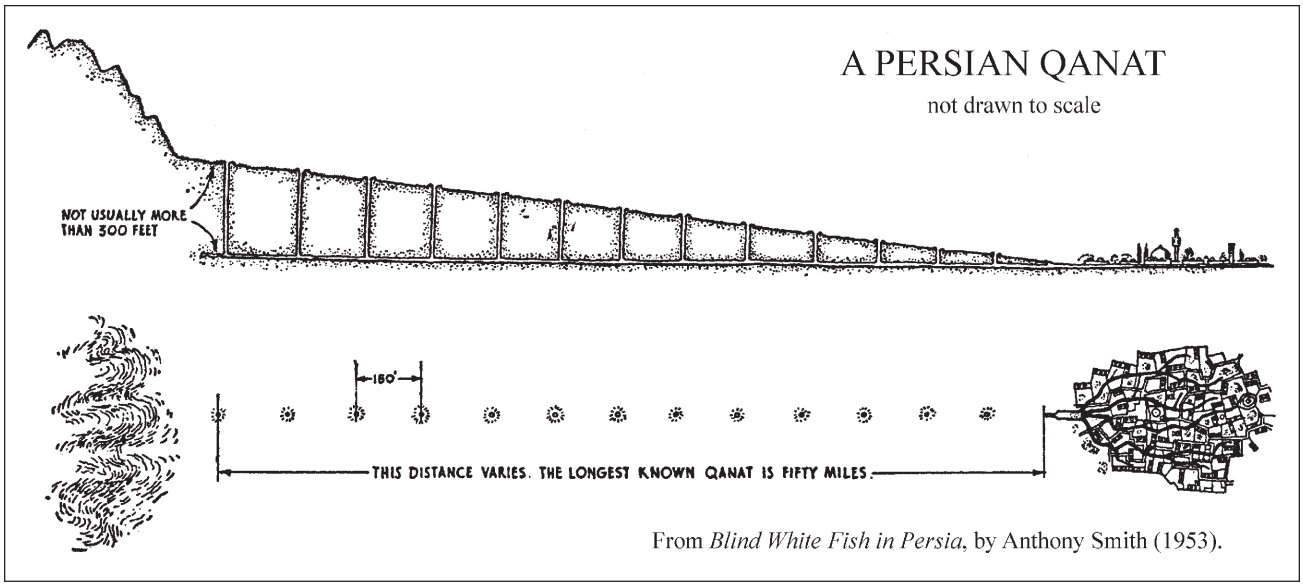
Pint, S., and J. Pint, 1996. La Cueva que se Convirtió en Qanat. *México Desconocido*, July 1966.

Pint, John. The Cave that Became a Qanat. http://www.saudicaves.com/saudi/qanat.html.

The TV crew in a Qanat. *John Pint*.





From *Blind White Fish in Persia*, by Anthony Smith (1953).

El Qanat Colapsante

Los qanats son cuevas artificiales excavadas en sedimentos aluviales para juntar escurrimientos subterraneos y canalizarlos a los usuarios. Fueron inventados en el medio oriente y algunos qanats fueron construídos en los 1730s para proveer a Guadalajara con agua. El colapso de un qanat cerca de la villa de Nextipac provocó la muerte de un oficial de Protección Civil recientemente.

Grupo Espeleológico Jaguar A.C.

THE EXPLORATION OF CUEVA DEL PUERCOESPÍN, SAN FERNANDO, CHIAPAS

Calvin Smith

On Friday, April 12, 2002, we left Tuxtla Gutiérrez at 11 P.M. in order to camp at the entrance to Cueva del Puercoespín, San Fernando, Chiapas. Tomás Torres and Paul Márquez gave us a lift past the village of San Fernando to the trail head. Roughly 6 kilometers after passing the entrance to San Fernando on the road toward Presa de Chicuasén you will see a cinderblock structure on the left side of the road; this is the entrance to Cueva de la Hierbachunta. Continuing on roughly 2 to 3 kilometers will bring you to the entrance to the Rancho San Pedro, on which is Sima del Perico, approximately 50 meters in depth. Directly across the highway from the *rancho* is the start of the trail to Cueva del Puercoespín. Mauricio Náfate, Rafael Hernández, Alejandro Gómez, and I were left there to hike in. As the car pulled away, the darkness encompassed us, and we realized that we had left the comforts of the city behind. Roughly forty minutes on the meandering horse trail took us to the site where we were to make camp. Without Mauricio's knowledge of the trail from a previous visit, we could very well have spent several hours wandering around in the dark before finding the cave entrance. We built a small fire and had a snack before hitting the sack at around 2 A.M.

Saturday morning, after a hearty breakfast of canned beans, tuna, tortillas, and coffee, we broke camp at 9 A.M. and squeezed through the massive boulders that are located at the entrance to the cave. Right away we found ourselves at the first descent, a 20-meter drop that can be rigged naturally to a large speleothem on the right of the passage, making a completely free rappel. It was a pleasant surprise to find a porcupine, after which apparently the cave had been named, sitting alone in a little nook on the left side of the passage. An amazing and majestic creature it was, sitting alone in the dark apparently meditating on the vastness of the cave. It came toward us once while we were rigging the anchors, but only for a quick sniff, and then it went back to its perch, this time facing the wall as if to clear his mind of us. We never heard so much as a growl or moan from him the whole time we were rigging and making our descent into the cave.

We lowered all of our gear, including our camping supplies, down to the second rappel, because Mauricio warned us that a theft had taken place during an earlier trip to the cave, when local farmers had apparently found packs that Vaxakmen Grupo Espeleológica members had left just inside the boulders and picked through them, taking what they wanted.

Alex and I spent half an hour sorting our gear to select only what would be needed for the rest of the cave, while Mauricio and Rafa placed a bolt for the next rappel. The second rappel immediately follows the first, and the bolt was placed on the left side of the passage, with a backup sling to a rock. This rappel was also free and about 20 meters long. After a short section, a bit over 20 meters, of horizontal passage, we arrived at the mouth of the third shaft.

The third rappel is a bit longer, nearly 25 meters. Again, a bolt was placed and backed up to a large boulder lodged about 7 meters back up the passage. A look to the left at the bottom of this drop revealed an old bolt that had been placed on the first descent of the cave by Vaxakmen in 2001. This is as far as they were able to get, according to Mauricio, perhaps because of a lack of rope. We elected to put in a new bolt at the top of the fourth rappel, backing it up to the rope left at the bottom of the third drop. For the fourth drop, I recommend that you hang your pack from your harness, because the drop is rather restricted. The descent itself is only about 15 meters long, but you must also negotiate a meter-wide chimney and then slip under a large boulder that has lodged between the walls. After this you will find yourself on a narrow stance looking down into the absolute darkness of the fifth vertical shaft.

Once again we tied into the free end of the rope from the previous drop, and then we placed two bolts in a hollow-sounding formation on the right, just beyond the lip. By equalizing the weight on these less-than-ideal anchors, Mauricio was able to go down a meter to reach some solid limestone on the left, where he placed a good bolt. The darkness envelops you even with the best a headlamps on this drop

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of 45 meters or more that spits you out into an impressive gallery that we later named Galería del Silencio.

Silencio appears to have several passages, not fully explored, that feed into it. It is at this point in the cave were we began to see running water. Following the sound of water down and to the right, you can walk and scramble in the relatively horizontal streambed for approximately 200 meters before reaching the next descent. The sixth descent is a short 2-meter drop into what might actually be a nice plunge pool during the rainy season. This drop is easily rigged from natural features in the rock to the left.

Almost immediately following this in another short drop, number seven, of 3 meters that can be downclimbed rather easily, though it would be wise to fix a small piece of rope for the return trip, as the rock is fairly slick and smooth in this section of the cave.

Continuing on through a brief horizontal section, we passed some amazingly blood-red speleothems. Continuing 30 meters farther, we encountered a shaft roughly 10 meters deep, the eighth. A bolt placed 1 meter above the lip of the drop at the left can be backed up to a boulder located 3 or 4 meters back up the passage. At this point I noted that my faithful watch read 6:30 P.M. It was difficult to grasp that it had been nine hours since we had entered the cave.

This rappel spit us out into a well-rounded slot with a clear pool of water at the bottom. We drank from the pool, as our bodies were at this point rather dehydrated.

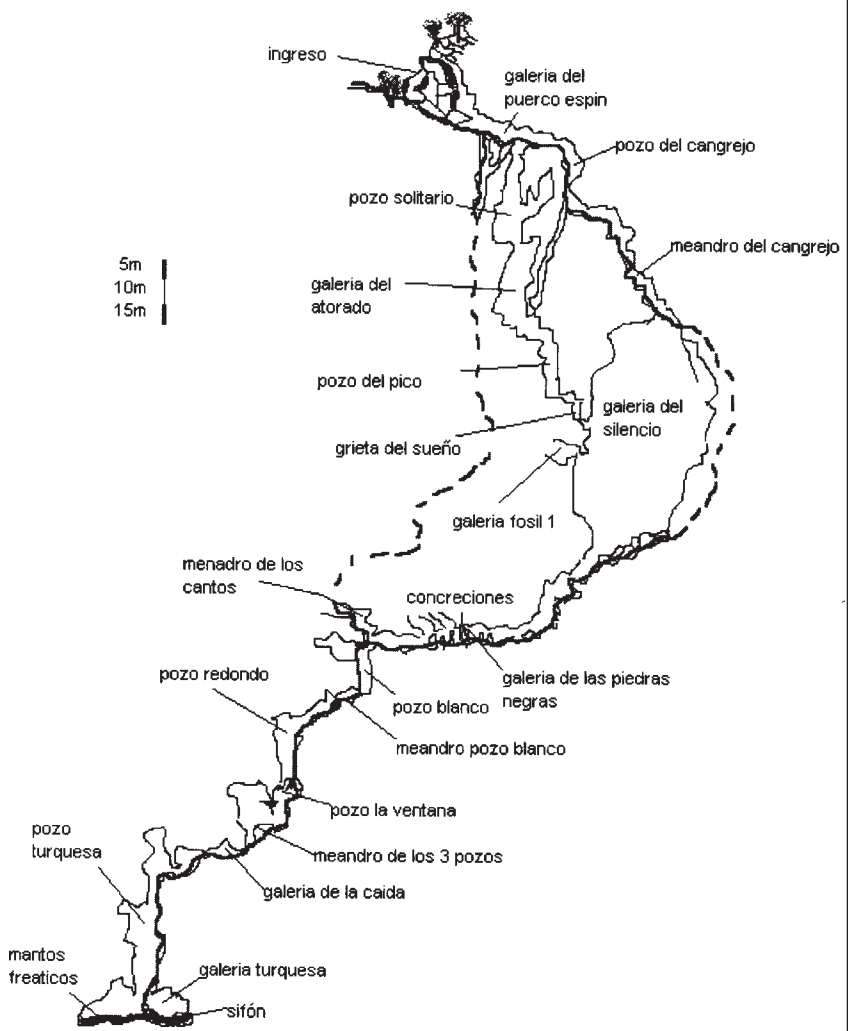
Immediately to the right of the pool there is another 10-meter drop, the ninth, that led down to more rounded, canyon-like passage, this time with a nice sand and pebble floor. Alex and I checked a small passage to the left and found that it took us closer to the bottom, and a short downclimb in a dribbling waterfall took us the rest of the way. Mauricio and Tomás lowered the packs down the more direct 10-meter drop. I wasn't the only one feeling tired, and this spot, the first flat ground in ten hours, looked comfortable enough for a snooze. But we were driven on by the desire to find the end of the cave.

Another short section of horizontal passage led us to a 2-meter drop, the tenth descent, into a cool, narrow, winding passage with small, shallow pools that can be easily avoided by boulder-hopping a bit. Following this section is a 7-meter rappel, the eleventh drop, that can be rigged to natural anchors. It spit us out into another short downclimb into an ankle-deep pool. If you want to avoid getting your feet cold and wet, there is an easy boulder route along the left-hand side of the passage, but if you slip there you will certainly get more than just your feet wet.

A bit more hopping over pools and some squeezing through a narrow section of beautifully sculptured horizontal cave found us on the edge of the thirteenth drop, a 25-meter rappel that is immediately followed by a final 20-meter rappel, the fourteenth drop, which was initially rigged with equalizing anchors to some pointed rocks and stalagmites on the right side of the passage. This got us down over a rather rough and rocky edge to a point where we could place a bolt just 2 meters lower.

At this point we could proceed no farther, because the passages that went in both directions from the bottom had large pools of wall-to-wall water, possibly collected from a number of active caves in the area. We did not have wet suits and did not want to get colder than we

Topographía Cueva del Puercoespín, Perfil, Archivo GEJ A.C.
Topographía por Gabriel Merino



already were. Again I checked my watch and was surprised how much time had passed. It was 10:30 P.M., thirteen hours after we entered the cave, and it was no wonder that we were all feeling somewhat at the edge of reality.

We had a light supper of flour tortillas and canned refried beans and tuna and tried to have a cold sleep. After two hours, we mustered enough energy for the trip out, so, with the distant hope of sunlight and warmth, we turned around and did it all over again in reverse. At 9:30 in the morning on Sunday, April 14, twenty-four hours after our encounter with the guardian porcupine, we finally did get to feel the warm, comforting heat of the sun.

La Exploración de la Cueva del Puercoespín, San Fernando, Chiapas.

El primer viaje al fondo de la Cueva del Puercoespín fue en abril de 2002 por miembros del Grupo Espeleológico Jaguar, de Tuxtla. La cueva tiene catorce tiros.

The legendary Lew Bicking at Tlamaya in 1966. He died a few months later in a motorcycle accident. The National Speleological Society's annual Lew Bicking Award for cave exploration was established in his memory. Photo by Sam Young. (See page 22.)

Proyecto Espeleologico
Sierra Oxmolon

ANTS!

Chris Vreeland

Ants. In Spanish, *hormigas*. We tend to think of them as pesky little critters that sometimes get into the sugar. Oh, sure there are fire ants. Step in a nest of them and stand there for a minute, and you're in a world of hurt. But fire ants don't roam the land in swarms, denuding the landscape of all living creatures within the wide swath of their path. No, that is the exclusive domain of the army ant, *lac* in Huastecan, we learned the next day, but *hormigas militar* was the best we could do with our limited Spanish vocabulary while gesticulating wildly, trying to explain to the locals just what had gone on in our campground near La Laja, San Luis Potosí, the night before.

Imagine, if you will, six gringos jumping up and down, stamping their feet, running around with flashlights in the new-moon darkness, and shouting random phrases of surprise and dismay, and you'll have a clear enough picture of the scene as it began. Mark Gee was the first to notice, as he wandered off into the vanguard of the storm before they had completely engulfed us. We'd been sitting serenely around our little campfire for a good while when he decided he needed something from his tent. "Man, there's a bunch of ants over here," was the first thing the rest of us heard, followed by "Shit! They're all in my tent." (Lesson one: keep your tent zipped up tight.) followed by "Shit! They're everywhere. Thousands of them."

This of course, got the rest of us up on our feet to see what all the excitement was about. "Whoa! Geez, look at all of 'em." was the first thing out of Jerry's mouth, followed pretty quickly by, "Oh, shit! They're over here too." About this time, I decided to get up from my comfy chair and see what all the hubbub was about. I grabbed my headlamp and headed over to where Jerry Fant and and Ron Rutherford were now busily exclaiming and doing a little they're-on-me dance, and, sure enough, all our caving gear that was gathered in a pile under a little rain fly had turned to an undulating mass of black. "Where the hell are they coming from?" I wondered. I started to look around the periphery of the swarm, as Ron headed for his truck to fetch a camera so he could get some shots of Mark furiously sweeping ants out of his tent. Mark at least had come prepared. His Taj Mahal-sized tent had all the comforts of home, including a full-size broom that was coming in really handy right about then.

It was about this time that Mark made a couple of observations. One was that his tent was also full of hapless bugs that were fleeing ahead of the marauding invaders, and the other was that they seemed to be underneath everything, but weren't climbing up at all. He'd sweep for a bit, then pick something up and say, "Oh, shit! There's a thousand more ants under here," followed by a fresh frenzy of sweeping and foot-stamping, until he'd brought that spot under control, whereupon he'd move something else and repeat the process. Stamp, stamp!

While the tent-decontamination was under way, Jerry, Enora Fant, Ben Kim, and I had been wandering about the campground trying to find the edges of the swarm and figure out where they were coming from and what direction they were going. What we found were several wide trails of streaming ants, moving more or less from lower to higher ground across the front third of our camp between two pastures. There was an ant superhighway at least three or four inches wide passing under Mark's tent. Another was moving right along a rain-diversion trench he'd dug behind his tent. Another large stream had begun to form in front of Ben's tent and was moving through the gear tent, where before they'd been just swarming in every direction. We began at that point to get a picture of the *modus operandi* of the invaders. They apparently have a roving band that seems directionless, but that really moves as a front, and they overwhelm whatever insects they happen upon in a path 20 to 30 feet wide. Behind the front come the columns, 2 or 3 or 4 inches wide. And they come,and they come.

While the sweeping was winding down in Mark's tent, Ron had determined that a good spray of Off would generally deter them from moving in a certain direction, so those of us who hadn't had our tents overrun yet proceeded to spray a

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nice, fat line of Off around them. We retired to the relative safety of the campfire for a while until we noticed that the swarm had taken an ominous turn towards the cooking tent. "The food!" We jumped up again and hurriedly carted all our food tubs off to various vehicles, the whole time wondering aloud what good that could possibly do should they decide to mount the vehicles. It was probably futile, but we felt like we were doing something, and as it turned out, they never moved towards the trucks.

We watched from the periphery of the swarm for a good while as they caught and devoured one hapless bug after another. Jerry spotted a spider attempting to escape after losing all the legs on one side of his body, and everywhere out ahead of the swarm was a scattering herd of bugs of all sorts doing what they could to get gone before they got et.

After finally determining that they weren't getting into the closed tents, Mark decided he'd had enough excitement and went to sleep, even though ants was still moving under his tent in a 4-inch stream. Those of us still around the fire got a good laugh watching him in silhouette shining his light in all the corners again and again. Ben decamped to his Jeep, as his tent, although shut, was still surrounded by the beasts, and he didn't think he could even get to it.

By then, a couple hours had passed, and there seemed to be no end in sight. Jerry and I sat up for a while and marveled at the phenomenon after everyone else had decided it was safe to go to sleep. Jerry and Enora's tent and mine seemed to be outside of their path, Ben and Ron were sleeping in vehicles, and Mark was there in the thick of them, with the ant superhighway going right under his tent as he slept . We could actually hear them where the swarm was sufficiently dense—a sort of crackling, rustling noise as they walked through the grass and leaves. That gave a particularly ominous feeling, in a Hitchcock-movie sort of way. These weren't, thank God, the kind of army ants that denude absolutely everything, like the Brazilian leaf-cutter ants you see on the Discovery Channel on TV. They seemed to be only interested in insects and ignored the bits of food we tossed into the swarm out of curiosity. They also stayed on the ground, except for one tree that they climbed. Although they bit, they didn't leave a stinging welt like a fire ant, which is a good thing, because we all got bit a lot. They didn't go over anything that they could go under. They gathered in dense numbers under things like ice chests or rocks that were lying on the surface, and they seemed to move mostly uphill.

When we got up the next morning, they were entirely gone. Thursday was Thanksgiving, and we had invited Juan Casillo and family to Thanksgiving dinner at our camp, as a way of paying them back for their generosity. That evening, after dinner, we tried our best to explain what had befallen us the previous night, and we managed to glean a bit of information between slugs of *caña*, the potent sugar-cane hooch that the natives bootleg up in the hills. They are indeed pretty common, and the local people pour gasoline around their houses to keep them out when they swarm. What did they do before gasoline? I have no idea. Carlos explained in his broken English that the army ants always precede a rain. Sure enough, late Thursday night it came, just like he said, just in time to wash away a second invasion as it was beginning. We had barely enough time to jump up and shout, "*¡hormigas!*" before the sky opened and carried the pesky buggers away in a brief but rather effective torrent.

¡Hormigas!

Mientras acampaban en un poblado cercano a Aquismón, San Luis Potosí, el campamento de unos espeleólogos fue invadido por hormigas guerreras.

BOOK REVIEW

In the Maw of the Earth Monster: Mesoamerican Ritual Cave Use. James E. Brady and Keith M. Prufer, editors. University of Texas Press, Austin; 2005. 6 by 9.5 inches. 438 pages, hardbound. ISBN 0-292-70586-7. $60.

The use of caves by Mesoamerican cultures was first reported over 150 years ago, in John L. Stephens' *Incidents of Travel in Yucatan* in 1843. However, the central importance of caves in Mesoamerican belief systems has been recognized only in the last twenty-five years or so. This book is the first major synthesis of current knowledge and interpretation of ritual cave use in Mesoamerica. It is the result of two academic sessions on caves, at the 1994 meeting of the American Anthropological Association and the 1997 meeting of the Society for American Archaeology.

The book consists of fourteen studies written by anthropologists and art historians with varied backgrounds in archaeology, ethnography, ethnohistory, iconography, and linguistics. The studies reflect two central themes of the book: "The strong continuity between the archaeological past and the ethnographic present with respect to the use of caves by indigenous peoples of Mesoamerica" and "Mesoamerican peoples' use of caves is and has been a fundamental part of the character of their social life."

The editors begin with an Introduction about the history of Mesoamerican cave studies, detailing the evolution from early descriptive archaeological reports to the relatively recent interpretive models exemplified in the book. The studies that follow are grouped into three geographic sections: Central Mexico, Oaxaca, and the Maya Region (Chiapas, Quintana Roo, Yucatán, Belize, and Guatemala). Four chapters focus on the archaeology of specific caves, Actun Tunichil Muknal in western Belize and Blade Cave in Oaxaca, and karst areas, the Yalahua region in Quintana Roo and the Coixtlahuaca Basin in Oaxaca. Three chapters discuss the ritual use of cave-spaces and how that may be represented by the location and types of artifacts found in caves. Ethnographic studies are the focus of five chapters that describe cave-related rituals and beliefs among the Q'eqchi' Maya of Alta Verapaz, Guatemala, the Tzotzil and other Maya groups of highland Chiapas, the Lacandon Maya of lowland Chiapas, the Huasteca Nahua of northern Veracruz, and various groups in the Valley of Mexico. The significance of caves in settlement patterns and the architectural landscape is described in two studies on the village of Acatzingo Viejo in Puebla and the Mayapan site in Yucatán.

This book is a scholarly work not intended for light reading. There are no color photographs of pretty caves or artifacts. The writing is detailed and technical, and the ideas presented are often complex. However, if you have ever visited a cave in Mexico, Belize, or Guatemala and wondered about the pieces of broken pottery or other signs of human use, this book will provide a great deal of enlightenment. *In the Maw of the Earth Monster* firmly establishes the importance of cave studies in understanding past and present cultures in Mesoamerica, and provides a solid basis for interpreting future discoveries in caves that will inevitably occur.—Logan McNatt