

AMCS

ACTIVITIES  
NEWSLETTER

Number 27 May 2004





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# 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](mailto: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 the original slide or negative must be available for professional scanning.

This issue was edited by Bill Mixon, with help from Katie Arens, Oscar Berrones, Yvonne Droms, Rodolfo "Fofo" González, Elizabeth Hernandez, Orion Knox, Mark Minton, Guillaume Pelletier, Denise Prendergast, Bev Shade, and John "Solo" White.

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Front cover

Guillaume Pelletier rappelling down the entrance pit of La Ciudad, Hoya Grande, Puebla, during Mexpé 2002. Photo by Gustavo Vela Turcott.

Back cover

Terry Raines views soda straw stalactites in a cave in northern Mexico. Photo by Dave Bunnell.



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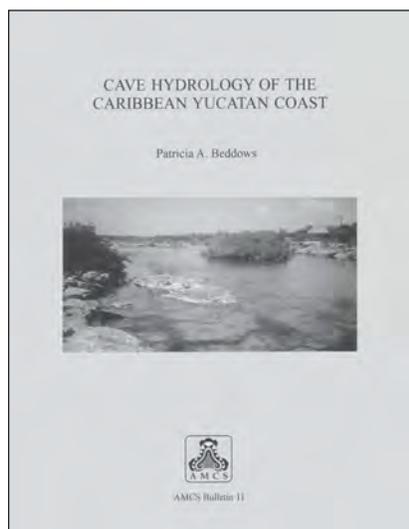
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## NEW AMCS BULLETINS

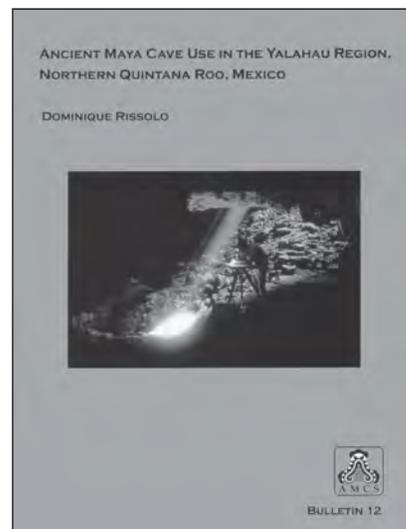


AMCS Bulletin 11. *Cave Hydrology of the Caribbean Yucatan Coast*. Patricia A. Beddows. 2003. 8.5 by 11 inches, 96 pages, softbound. \$15.

The author's masters thesis on an area with over 350 kilometers of underwater caves. Studies of flow, saltwater mixing, tidal influence. 42 figures, 17 tables.

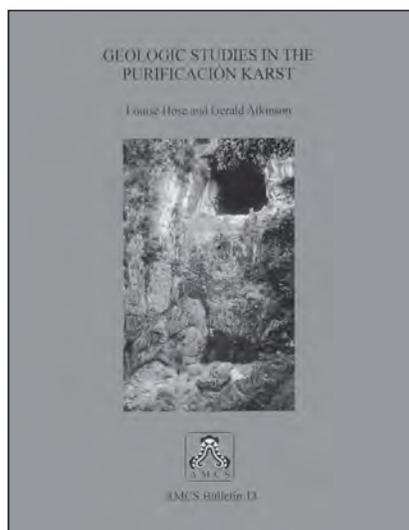
AMCS Bulletin 12. *Ancient Maya Cave Use in the Yalahau Region, Northern Quintana Roo, Mexico*. Dominique Rissolo. 2003. 8.5 by 11 inches, 151 pages, softbound. \$20.

The author's PhD dissertation, newly typeset from a 400-page original. The study area is unusual in the Yucatan for having surface water, but pools in caves still had ritual significance to the Maya. 167 figures, 28 tables.



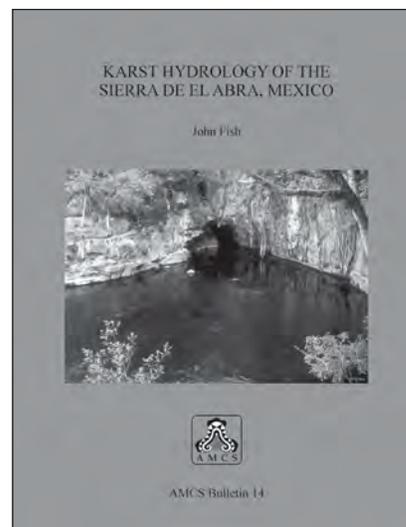
AMCS Bulletin 13. *Geologic Studies in the Purificación Karst*. Louise Hose and Gerald Atkinson. 2004. 8.5 by 11 inches, 87 pages, softbound. \$15.

Hose's masters thesis, "The Geology and Hydrology of the Sistema Purificación Area, Villa Hidalgo, Tamaulipas, Mexico," and Atkinson's senior thesis, "Planktonic Foraminiferal Biostratigraphy of the Tamabra and Mendez Formations in the Conrado Castillo Area, Tamaulipas and Nuevo Leon, Mexico." Foreword by Peter Sprouse. The area contains the longest dry cave in Mexico, with more than 93 kilometers of passage. 68 figures and tables, including one in color and three foldouts.



AMCS Bulletin 14. *Karst Hydrology of the Sierra de El Abra, Mexico*. John Fish. 2004. 8.5 by 11 inches, 186 pages, softbound. \$25.

The author's PhD dissertation on an area in Mexico that contains some of its most famous caves and two karst springs with average flows of more than 20 cubic meters per second. Many cave descriptions and maps. Foreword by Derek Ford, preface by Gerald Atkinson. Newly typeset from 469-page original. 126 figures, including 8 foldout maps, and 33 tables.



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Photo by Dave Bunnell.

# MEXICO NEWS

Compiled by Bill Mixon

## CHIAPAS

Since 2001, the Sociedad Espeleológica Jaguar in Tuxtla Gutiérrez (grupojaguar@yahoo.com.mx) has conducted Proyecto Espeleológico San Fernando. They have explored over seventy caves in the San Fernando area, nearly fifty of which have been mapped and recorded. Among them is **Cueva del Sumidero** (or **Puercoespín**), which is 323 meters deep and 700 meters long. All members of the Jaguar group are Mexican, but American, Cuban, and Italian cavers have worked with them on the project. Several members of the group have joined the Italians' Río La Venta group, which has done much work in Chiapas in the past. *Source:* Calvin Smith.

In February and March 2002, a four-member French team (Gérard Ayad, Eric David, Fabrice Faivre, and Cathy Frison) of the Explorations Karstiques Sud-Américaines group continued exploration in an area of Chiapas first visited during M'expé 1993, during which **El Chorro Grande** had been discovered and surveyed to a length of 10 kilometers. (See article in *AMCS Activities Newsletter* 21.) EKSA's explorations centered near Roblada Grande, a village located on the Meseta Belén, a karst plateau 40 kilometers south of Tuxtla Gutiérrez. Various members of the Mexican speleo club Vaxakmen also participated jointly with the French in some of the explorations.

The 2002 expedition's main objective was to find an upper entrance

Special thanks to Yvonne Droms for finding or translating material on European expeditions.

to El Chorro Grande on the plateau 350 meters above the cave, and if that failed, to explore upwards at the end of the western branch of the cave, where high leads had been noticed in 1993. A few days were spent checking an area just north of El Portillo, where a creek sinks during the dry season and turns into a lake during the rainy season. Most likely the detergent bottles found in the cave come from that sinking creek, making it the likely source of the river in the eastern (main) branch of El Chorro Grande. However, all holes that were checked were clogged with sand after a few meters.

The area directly above the Rivière Inattendue at the end of the western branch of El Chorro Grande was then checked, and two pits of 45 and 56 meters were found. The area directly above the end of the eastern branch was also checked, resulting in finding a cluster of three insignificant sinks clogged with soil. In addition, prospecting in the area turned up various other pits, the main one being **Sima de la Tortuga**, which was surveyed with members of the Vaxakmen club to a depth of 69 meters and a length of 119 meters. An impenetrable fissure ended the exploration.

El Chorro Grande, located at the bottom of the Río Suchiapa canyon, was revisited, but due to route-finding and equipment problems, no further exploration was possible. Across from the resurgence, two large openings on the cliff face remain unexplored; aid climbing will be necessary in order to reach them.

Twenty kilometers farther to the east, on a plateau bordering the cliffs overlooking the Río Santo Domingo, two pits were found 50

meters apart and named Simas Gemelas del Tío. **Sima del Tío 1** was surveyed to -80 meters, where they ran out of rope in mid-pit. **Sima del Tío 2** was surveyed to -150 meters and left hanging at a dome-pit estimated to be 25 meters deep, due to lack of gear, rope, and time. The fact that the Simas Gemelas del Tío are located at the highest point on the plateau at an elevation of 1100 meters seemed very promising, considering that the river is 650 meters below, but after later examining the surveys, they discovered that they are heading to the west, away from the river. Could there be a larger system there than first thought? A reconnaissance trip into the Río Santo Domingo canyon to look for a resurgence only yielded one little spring, which became impenetrable after 50 meters.

In March 2003, the French EKSA team, this time composed of Eric David, Fabrice Faivre, and Gérard Ayad, returned to the area of Meseta Belén to continue the previous year's explorations. The Simas del Tío, now renamed **Sima del Tío Natán 1 and 2**, were the main objectives of the 2003 expedition and were checked first. Tío 1 ended at a depth of 126 meters after an additional two pits were descended. Tío 2 was then tackled. The team's hammer drill fell down a 20-meter pit and disintegrated, and one of the team members was incapacitated for a week due to a serious sunburn. Despite these setbacks, exploration of Tío 2 continued, yielding two more pits, 17 and 11 meters, a series of laborious downclimbs in rotten rock, and a 25-meter drop. The condition of the rock made rigging this pit very difficult and time-consuming. At its base, a 5-meter-long passage

# Index des cavités

Notre zone d'action se situe sur le plateau « Meseta Belen »,  
à 40 km au Sud de Tuxtla Gutierrez, capitale de l'état du Chiapas.  
Le village de Roblada Grande est le point de départ de nos explorations.

Cavités repérées en 2002 (en bleu sur la carte).

Cavité N°	X (km)	Y (km)	Z (m)	Dén.(m)	Dev.(m)	Zone	Nom
02-01	479.441	1828.288	1073	45	45	-	Sotano
02-02	477.594	1823.266	1090	69	119	Roblada Grande	Sima de la tortuga
02-03	476.921	1825.667	999	66	163	Roblada Grande	Sima grande
02-04	472.040	1822.088	984	3	3	El Portillo - perte	
02-05	472.326	1822.200	983	3	3	El Portillo - perte	
02-06	472.413	1823.214	998	56	56	El Portillo - nord	
02-08	472.413	1822.977	975	45	45	El Portillo - nord	
02-09	476.889	1821.125	1165	47	47	Roblada Grande	Sotano
02-12	473.090	1819.065	1102	9	136	El Portillo	Cueva
02-13	472.961	1818.882	1127	-	-	El Portillo	
02-15	473.694	1822.859	1012	-	-	3 pertes	
02-16	477.381	1820.560	1098	45	80	Roblada Grande	
02-18	478.085	1820.831	1130	16	25	Roblada Grande	
02-19	472.198	1822.779	968	22	22	El Portillo - nord	
02-20	472.402	1821.721	970	1	5	El Portillo - perte	
02-21	471.898	1822.057	1009	3	3	El Portillo - perte	
02-22	471.937	1822.022	1003	10	30	El Portillo - perte	
02-23	473.102	1821.178	992	20	30	Gaymas	
02-24	473.054	1821.183	997	5	5	Gaymas	
02-25	493.883	1821.612	1083	80	80	El Tio	Sima del tio 1
02-26	493.919	1821.635	1083	150	212	El Tio	Sima del tio 2
02-27	493.682	1822.022	991	nd	nd	El Tio	Sima de las palmas
<b>GUAYMAS</b>	474.017	1820.642	1000	-	-	Gaymas	Grutas de guaymas
<b>PERTE</b>	472.137	1820.897	969	-	-	El Portillo - perte	

Cavités repérées lors de l'expédition M'Expé 93 (en jaune sur la carte).

Cavité N°	X (km)	Y (km)	Z (m)	Dén.(m)	Dev.(m)	Zone	Nom
93-10	476.475	1818.801	1100	65	800	-	Cueva del agua
93-17	479.264	1820.796	1145	40	40	-	Sima
93-18	479.176	1822.394	1140	25	25	-	Las Bindas
93-19	478.976	1823.770	1080	154	176	-	Sima de la Covarde
93-23	477.254	1826.759	1000	42	67	-	Sotano Los Angeles
93-24	476.921	1825.667	999	65	65	-	Sima Grande
93-25	474.462	1822.399	1100	8	140	-	Sotano El Canello
93-26	475.089	1825.532	1005	52	209	-	Sotano
93-27	476.047	1823.703	1100	101	120	-	Sima
93-28	476.400	1824.007	1060	21	21	-	Sima
93-29	476.895	1823.594	1060	7	18	-	Cueva
93-30	476.066	1825.101	1100	21	21	-	Sima de la Basura
93-31	473.963	1826.302	560	175	9650	-	El Chorro Grande
93-32	472.535	1821.786	1020	25	25	-	Sotano
93-33	475.291	1820.861	1100	15	15	-	Sotano
93-34	476.601	1825.745	1000	35	60	-	Finca Los Angeles

Les coordonnées sont en UTM 15 / NAD 27 Mexique.

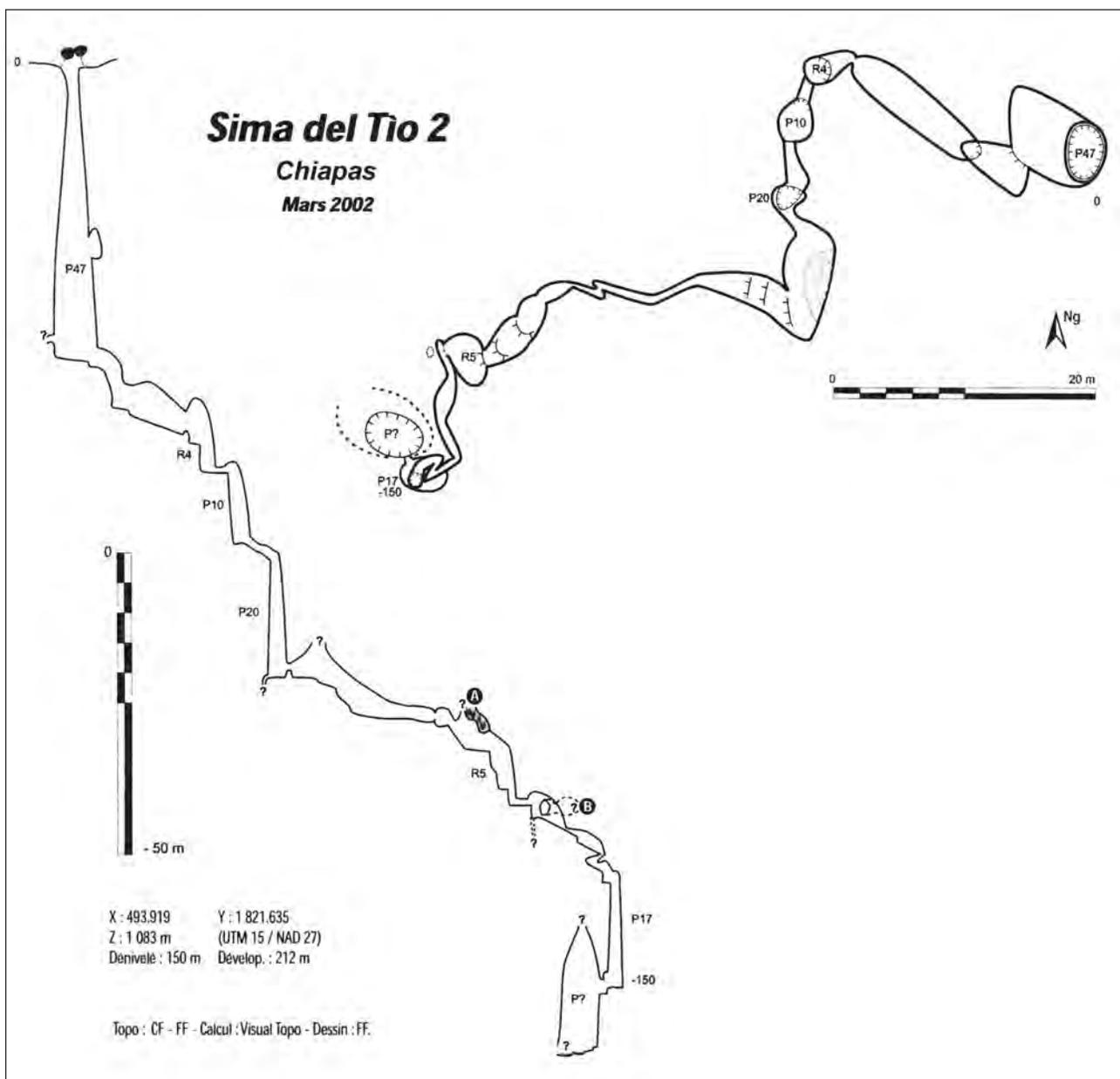
brought the team to the top of a pit estimated at 15 meters but not descended. About 450 meters of rope and sixty anchors were used in this cave. The current depth of Sima del Tío Natán 2 is 251 meters, and its length is 471 meters. The 650-meter depth potential of the area bodes well for a continuation. (The maps in this Mexico News show only the 2002 discoveries in Simas Tío.)

A number of other caves were checked and surveyed; most were less than 30 meters long or 40 meters deep. However, toward the end of the expedition, one cave of special interest was found in an area between Cárdenas and El Portillo,

the **Cueva Santo Domingo** (#03-13). An 80-centimeter-high entrance leads through a 10-meter downclimb into a large, decorated chamber. A tight, breezy crawlway used by numerous bats takes you to a 47-meter pit. Following the infeasible downstream leads to an intersection with a major river, El Decarío. Upstream takes you to a sump. Downstream leads to a series of seven cascades, beyond which the passage grows to a diameter of 30 meters. Eventually the river becomes a deep lake, where the team turned around on the last day of the expedition. Cueva Santo Domingo was surveyed to a length of 1085

meters and a depth of 118 meters. The resurgence of the river in the cave is unknown.

A pit, **Puits Paco et Gérard**, #03-15, was found during a surface reconnaissance of the area of the Cueva Santo Domingo and briefly explored. It is located above the underground river Decarío. After a 15-meter entrance pit, a 50-meter pit was reached but not descended due to lack of rope and time. The exploration of this pit and Cueva Santo Domingo constitute the two main objectives for the next EKSA expedition, slated for March 2004. *Source:* Summary by Yvonne Droms from web site <http://eksa.free.fr>.



DISTRITO FEDERAL

Two female and two male spelunkers ("We had candles, but they went out.") aged 20 to 24 were found and rescued on Wednesday, April 7, 2004, after being lost in a small lava-blister cave or old mine near Cerro de la Estrella, in Izta-palapa, DF. They were found by fire and rescue teams after a 16-hour

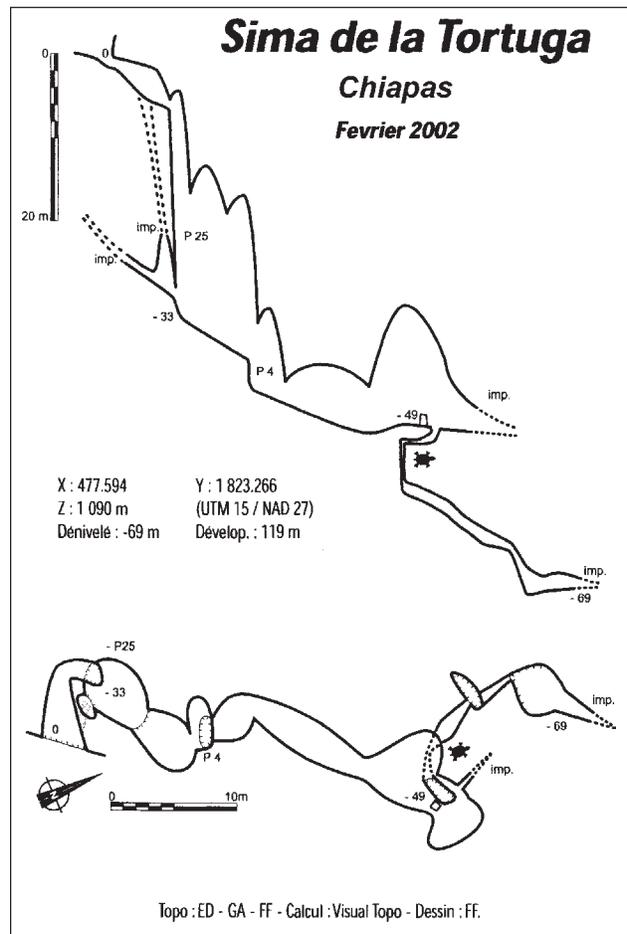
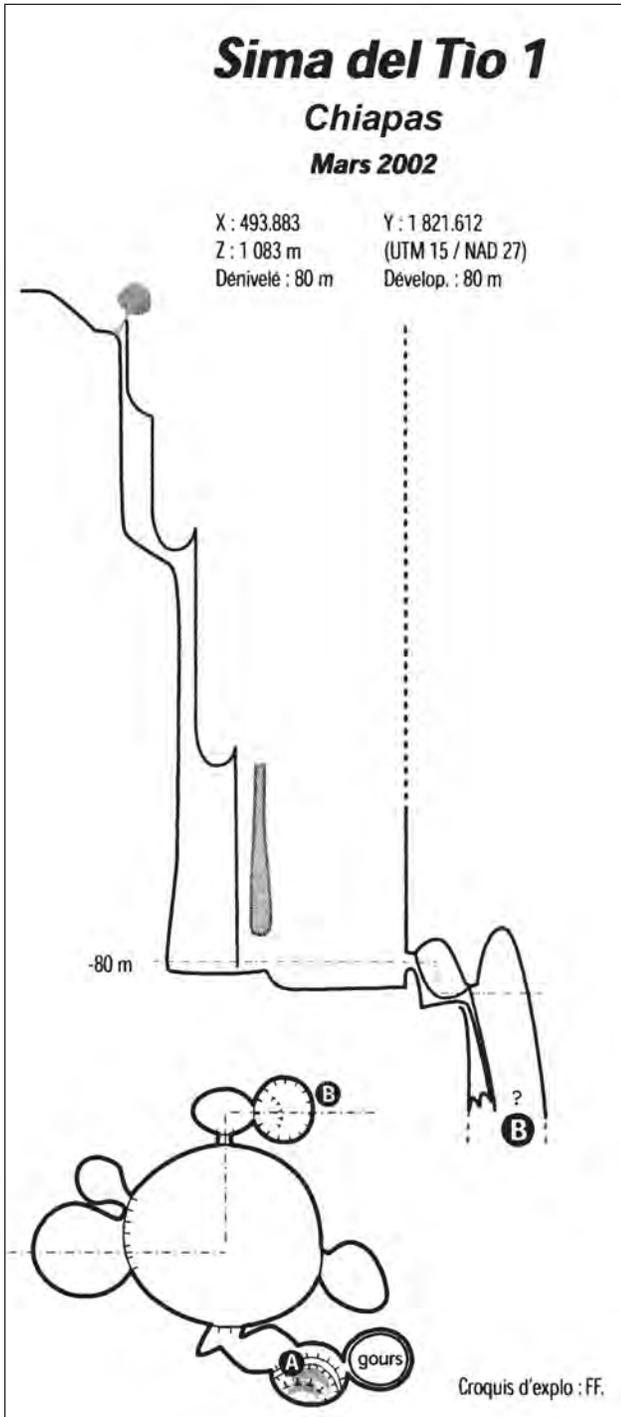
search, 300 meters inside the cave network. They entered the cave around midnight on Saturday and soon became lost. Sources: Ramón Espinasa and Reuters news service at [www.alertnet.org/thenews/newsdesk/N08634252.htm](http://www.alertnet.org/thenews/newsdesk/N08634252.htm).

GUERRERO

From December 21, 2001, to January 4, 2002, Italians Luciano Filipas,

Marco Sticotti, and Paolo de Curtis of the Commissione Grotte Eugenio Boegan joined forces with Mexican members of the Sociedad Mexicana de Exploraciones Subterráneas at the invitation of Ramón Espinasa in order to explore and map the largest possible number of caves in an area near Filo de los Caballos, about 60 kilometers west of Chilpancingo, capital of the state of Guerrero. (See also article by Ramón Espinasa in *AMCS Activities Newsletter 25*.) This area, covered by deep sinkholes and located at 2000 to 3000 meters elevation in the Sierra Madre Occidental, had been checked during a summer pre-expedition reconnaissance trip by members of the SMES, after receiving some tips from an anonymous American caver, "el Gringo Solitario."

A total of thirty-six caves, all fossil pits or active insurgences, were recorded by GPS, explored, and surveyed. Of these, eleven were new finds and four were over 100 meters deep. The maximum depth



reached was at Agua del Carpintero (212 meters), and the maximum length at Agua de las Golondrinas (634 meters).

The large entrance to **Cueva del Agua de las Golondrinas** can be found at the bottom of a major sinkhole that takes a permanent stream. The cave consists mainly of a succession of meanders separated by short pits that never exceed 20 meters in depth. One large chamber in mid-cave is filled with impressive formations, and a second large chamber forms the bottom of the cave at -193 meters. The bottom is filled with clay sediment and appears impenetrable. Even though it is an active cave, it is quite decorated,

which was particularly useful during rigging.

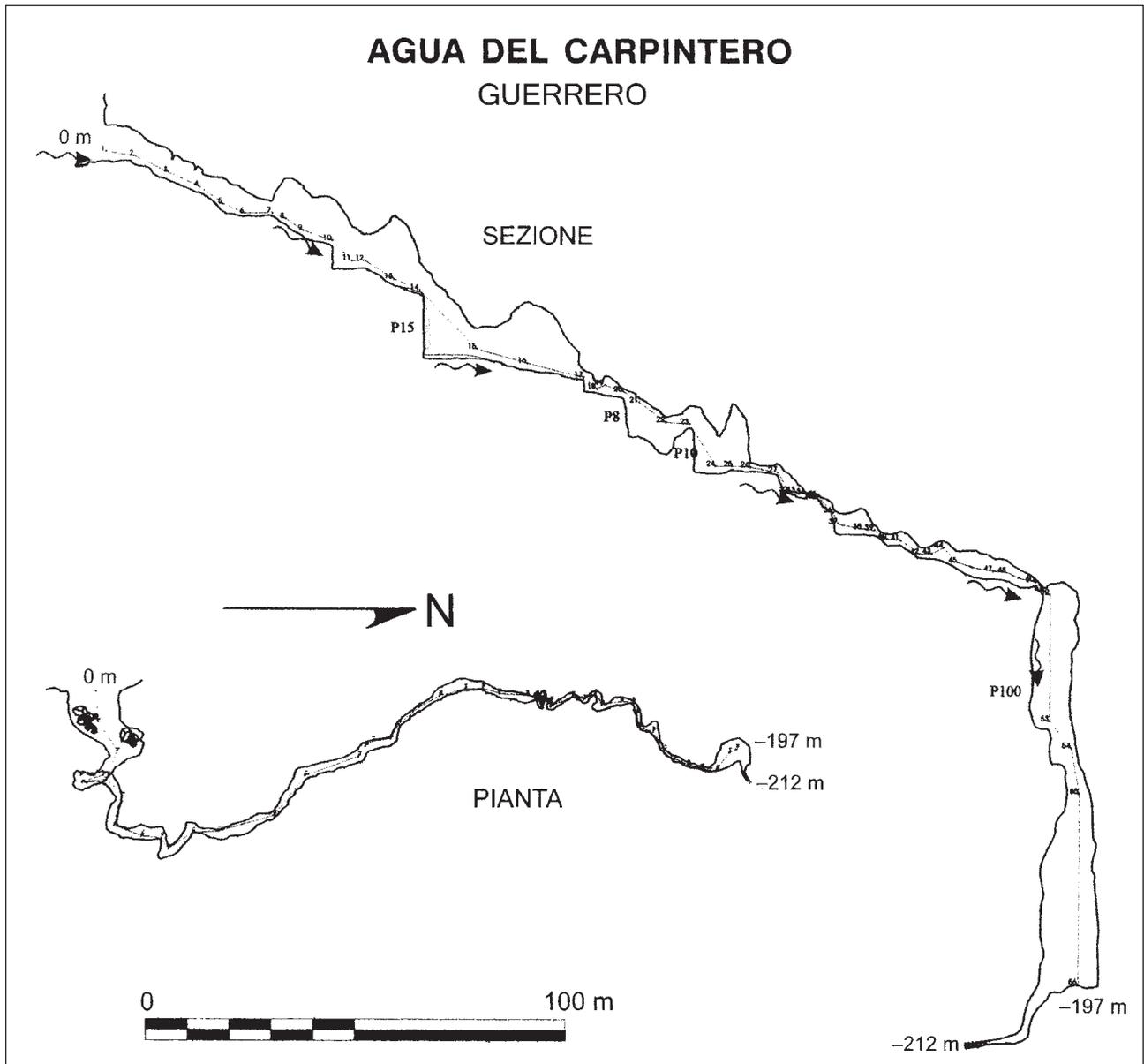
**Sótano de Puerto Fresno** is located near Puerto Fresno, on the western side of a doline. A balcony in mid-pit gives access to a gravel-floored chamber 5 by 6 meters. At the base of the pit, a meander leads downward, becoming progressively tighter until it ends in a flood-debris plug at -116 meters.

The entrance to **Cueva del Agua del Pipistrello** is at the bottom of a sinkhole and leads through a short meander into a large room with a floor sloping at 45 degrees. At its base, at -76 meters, a particularly convoluted passage, which had to be widened by sledge hammer,

leads to a large room. A continuation was found down an active meander. Unfortunately, the exploration had to be halted at the top of a short drop after running out of time at around 100 meters depth. A passage was seen continuing on at the base of the drop.

**Cueva del Agua del Carpintero** is very similar in its morphology to Agua de las Golondrinas until it reaches a depth of 100 meters. Beyond that, a 100-meter-deep cascading pit leads to an 11-meter drop at the bottom of which the cave abruptly sumps at -212 meters.

The results achieved did not meet with expectations, considering the 900-meter depth potential



of the area and the numerous entrances found during the expedition. The main factor affecting this area's potential is the abundance of soil and vegetative matter that gets flushed into the karst during the rainy season. *Source:* Paolo Bruno de Curtis and Marco Sticotti, *Progressione* 45, July–December 2002, translated from Italian and summarized by Yvonne Droms.

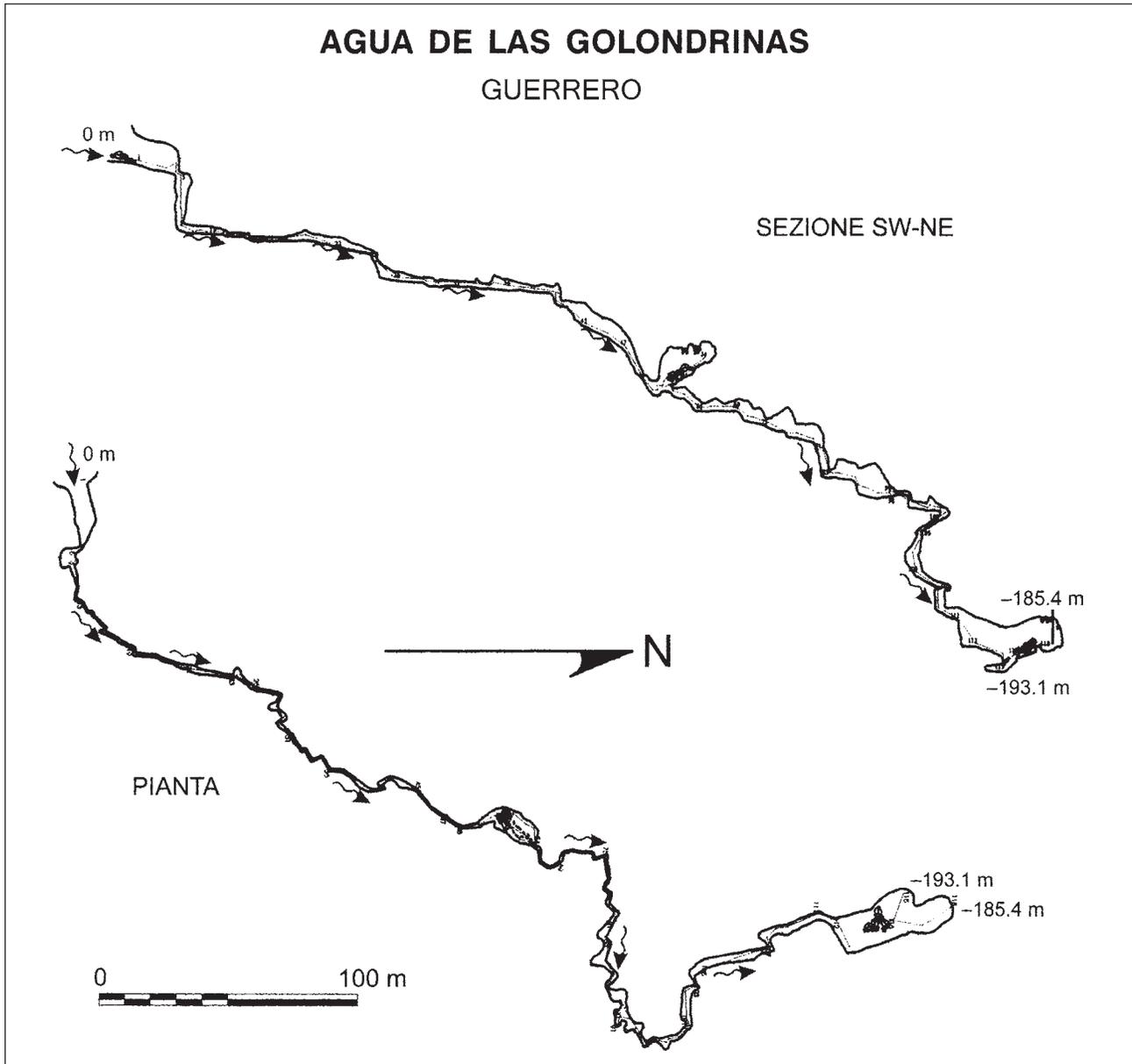
Yet another victim was claimed by the Dos Bocas caves when, on April 11, 2004, a tourist drowned in the entrance swim of **Río Subterráneo de San Jerónimo**. A group without proper lights or flotation equipment entered the cave and,

after the first two swims, decided to turn back. The entrance swim is long and has a strong current, and one of them apparently tired and drowned. *Source:* Ramón Espinasa.

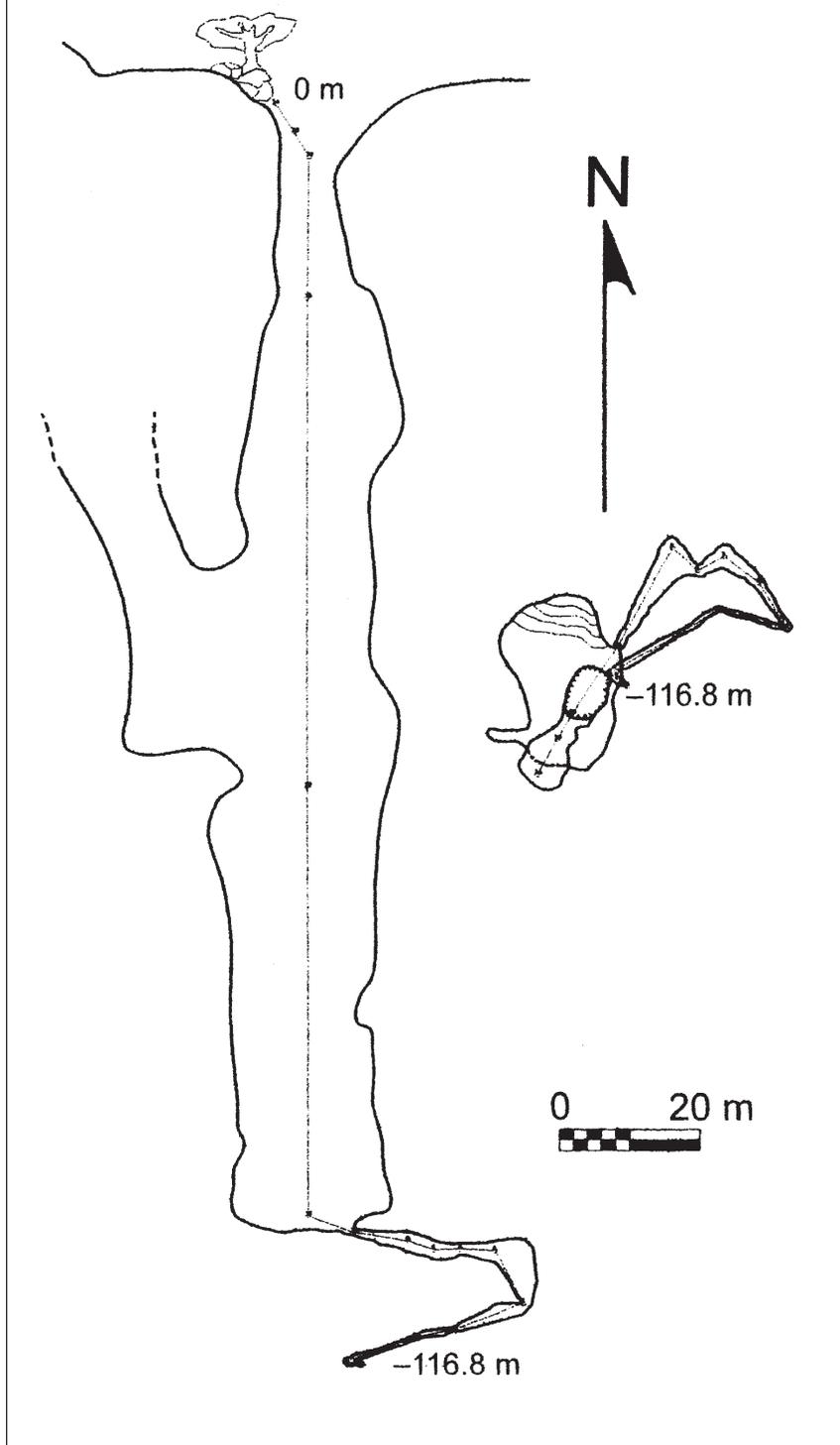
### MICHOACÁN

Back in January 1998, Chris Lloyd, Taco Van Ieperen, and Monique Castenguay did a one-day hike to recon a plateau that is shown as Cerro de La Lagunita on the topo map. It is located on sheet E13 B76 in southern Michoacán about 30 kilometers east of Maruata and 10 kilometers inland from the ocean. The average elevation of the plateau is about 700 meters. We parked at a small restaurant on the highway

just after crossing the Río Coalcomán and took the trail that starts just behind the restaurant up into the hills. The trail ascends through remnants of old-growth forest and passes vague remains of an old logging road, complete with rusted-out logging vehicles. The views over the ocean are quite spectacular. We met a local man who then accompanied us up onto the plateau, while telling us that there were no caves. Much of the top has been cleared for planting corn, and while the limestone is somewhat karsted, there are no obvious sinks or entrances. We made it to the southern-most doline shown on the topo map and found the *lagunita*



## SOTANO DE PUERTO FRESNO GUERRERO



that the plateau is named for, but there were still no caves to be seen, just as the man had said. At this point we figured we had better hike back down in order to get to our campsite at Maruata by sundown. The local man did, however, say he knew about a cave farther to the northeast from the point we reached, another two hours' hike (which would probably translate into at least three hours for us non-locals). Anyone attempting to reach that cave should probably carry bivvy gear and plan to spend the night.

More recent investigations, in 2003, have identified three limestone plateaus with dolines marked on the topos in Michoacán near its border with Colima and within 5 kilometers of the beach. One is at 300 meters elevation, the second is at 600 meters, and the third at 1100 meters. None of them has road access. Hiking access to the 600-meter one has been located, and a local living partway up it confirms that there are caves up there. This is the same hill where John Pint and fellow Zotz cavers located a small cave just uphill from the highway many years ago. Now we just need to get up on the top to see what is there.  
*Source: Chris Lloyd.*

### NUEVO LEÓN

Minas Viejas, in the mountains across the highway from Bustamante, is the site of **Pozo de Montemayor**, which has two long drops and numerous shorter ones leading to a depth of 483 meters. See articles on the cave in *AMCS Activities Newsletter* numbers 18 and 19 and the map in "Mexico News" in number 25. There are also numerous old mines that intersect natural cavities. The ranch is now being operated as an attraction, and the web site features rappelling, though apparently mostly on surface cliffs. However, one photograph was taken in Montemayor. *Source: <http://www.realdeminasviejas.com.mx>.*

Mexplore, an adventure tourism outfit, is offering a three-day tour of Bustamante, including a day in **Gruta del Palmito**. Price is \$1190. That's dollars, not pesos. It's a whole lot cheaper to attend the Texas

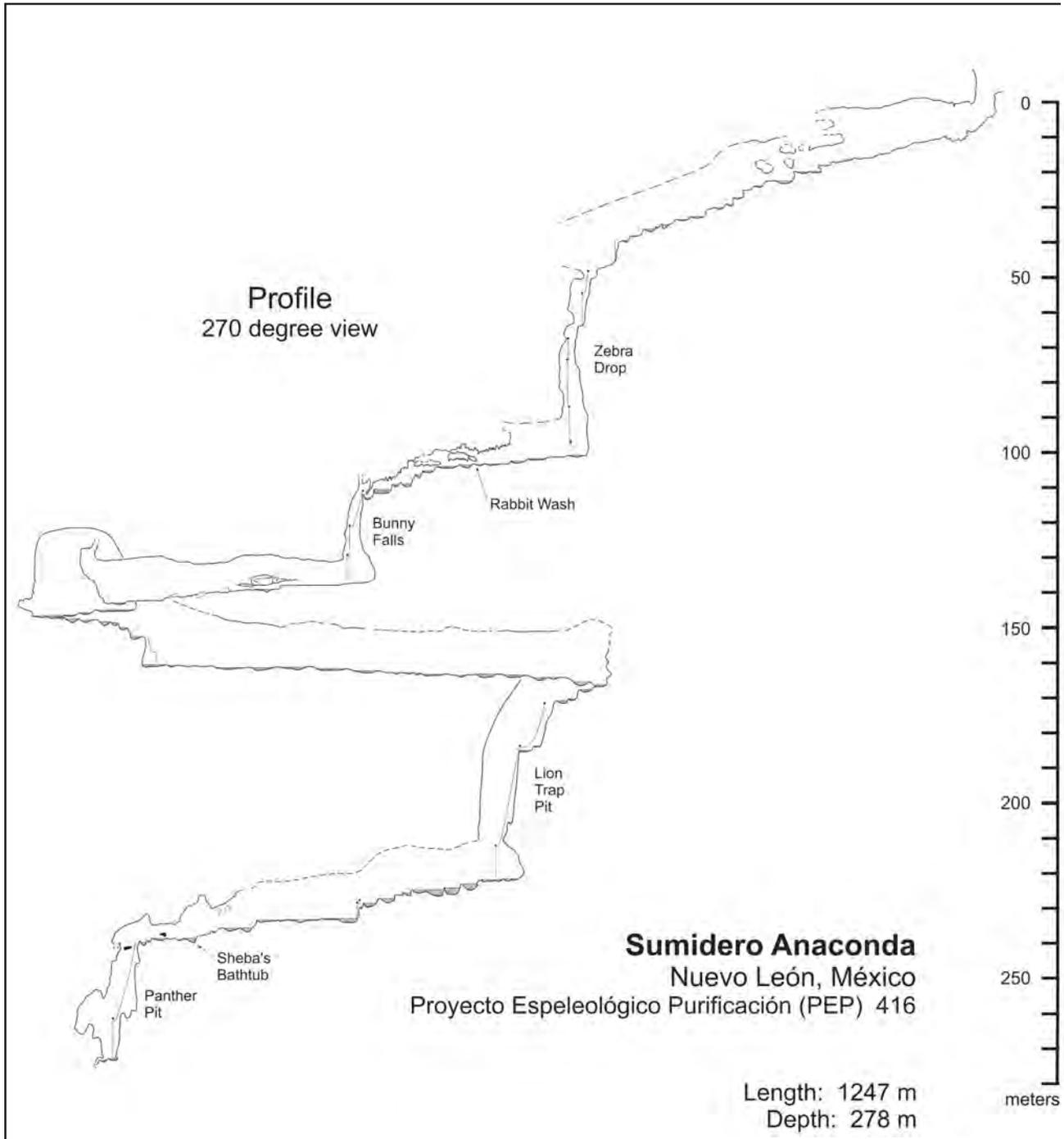
Speleological Association's Labor Day projects at the cave. *Source:* <http://www.mexplore.com.mx/trips02.asp>.

The seventh annual Bustamante project at **Gruta del Palmito** took place over the Labor Day weekend in 2003. (See *AMCS Activities Newsletter* 26 for an article on past projects.) The road from town to the bottom of the mountain was being

paved, causing some delay and detours. Much work was done smoothing the trail from the upper parking lot to the cave, and a hand-rail was installed down to the entrance gate. As usual, there was graffiti removal and work on signs and lighting inside the cave. A special sightseeing trip to Minas Golondrinas was arranged for Sunday. Registration for the project, which is sponsored by the Texas

Speleological Association, was 144, of whom 111 entered the cave. *Source:* Susan Souby in the *Texas Caver*, October 2003.

**Sumidero Anaconda** is located 3600 meters south-southeast of Garza, at an elevation of 1730 meters, UTM (NAD27) 431860E 2656140N. It lies a few hundred meters north of Cañón el Infierno in a drainage that used to feed into

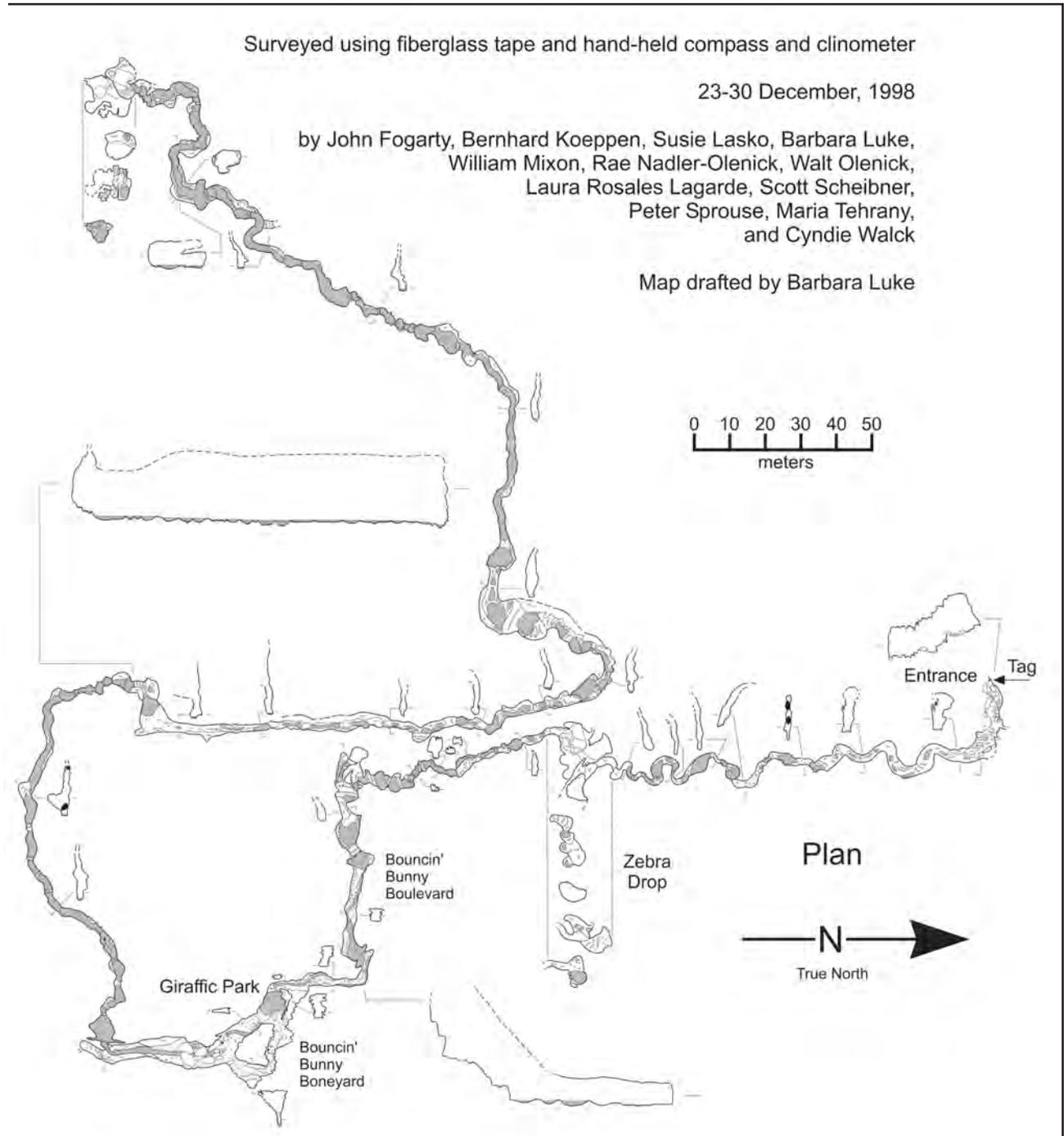


the canyon. Now the drainage is all swallowed by the 13-meter-wide cave entrance, which lies under a 20-meter-tall headwall. From the entrance, the cave slopes down through a narrow, winding, snake-like passage (hence the name) punctuated by pools, most of which can be negotiated without getting wet above the knee. After 150 meters, the first drop of the Zebra Drop series is encountered. This 60-meter

descent features fractures filled with white calcite zigzagging across the dark limestone. At the bottom of this, a large passage lowers after 25 meters to the Rabbit Wash, an unavoidable duck-under through a waterfall. Then a series of short climbs into pools leads to Bunny Falls, a 25-meter pitch. A long stretch of horizontal passage called Giraffic Park follows, only a few meters wide but with a ceiling that

twists up out of sight. A stream flows actively through this section, which after more than 500 meters reaches the final drop, Panther Pit. The cave pinches out in small flowstone holes with no airflow.

Sumidero Anaconda was discovered on December 22, 1998, by a group of cavers checking stream sinks along a shale contact. They initially explored for 50 meters. The next day John Fogarty, Bill Mixon,



Susie Lasko, Scott Scheibner, Walt Olenick, and Rae Nadler Olenick formed two teams to begin the survey. They descended three drops and stopped at a fourth. It was clean-washed, with good airflow. John and Susie continued the survey the next day, along with Laura Rosales. Bernhard Koeppen and Cyndie Walck rigged ahead, passing through the Rabbit Wash, but ran out of rope at a drop. On December 26, John, Susie, Cyndie, and Scott Scheibner went to Anaconda to continue the survey. They mapped to the top of a drop, then quit, cold and tired. It was then 712 meters long and 157 meters deep. The push continued two days later, with Bernhard and Cyndie rigging ahead, while Susie, Peter Sprouse, and Maria Tehrany mapped down the next two pitches. Then they were in tall, straight canyon passage with a flowing stream. They met the rig crew coming out after they had run out of rope, again. A 12-meter pit had gotten them to the top of an impressive 30-meter pitch. Once at the bottom of this, it was one shot to the top of a 10-meter drop. The next day, Scott, Maria, and Cyndie continued the survey in Anaconda, while John and Carlos Nasby rigged ahead. The survey stopped at

the top of a drop, and the rig crew reached a flowstone end. The following day, the survey was finished by Susie, Laura, and Barbara Luke. *Source: Susie Lasko and Peter Sprouse in Death Coral Caver 12, 2002.*

### OAXACA

About forty cavers from six countries participated in Bill Stone's Cheve 2004 expedition, which lasted from February 12 to April 6, including travel time to and from Austin, Texas. The expedition visited neither Sistema Cheve nor its resurgence, but concentrated on caves with a potential to lead into the unexplored gap between them. The first part of the expedition, through March 4, was mainly devoted to caves in the Barranca Estrella. The dig at the bottom end of **Cueva de la Barranca Estrella** (map in *AMCS Activities Newsletter 25*, p. 60) was pushed, using a CisLunar Mark V rebreather rigged with blowers, so it didn't have to be worn, to refresh the air, which otherwise quickly became too stale for digging.



Osto de Cerro Voludo #2, Oaxaca. *Kasia Biernacka and Marcin Gala.*

Eventually the dig had to be abandoned when it reached a point where the hole began filling with water. **Sumidero Barranca Estrella**, where the river had sunk when cavers last visited the area, turned out to be dry, a new sink having collapsed upstream. The new sink was deemed too unstable to dig, but the old sink was attacked, using electric truck winches hauled to the area on burros and powered by nickel-metal-hydride batteries to drag boulders out of the way. Diggers succeeded in finding about 200 meters of small passages to a depth of 59 meters, but eventually this too was abandoned when leads became too small to push. Meanwhile, members of the expedition also explored **Osto de Cerro Voludo #2** to a depth of 267 meters.

The second planned target was **Sumidero Aguacate**, which had been surveyed to about 1 kilometer in 1994 and ended at a sump. The sump proved undivable, but climbs and digs bypassed the sump, and

The bottom of the entrance pit of Osto Atanasio, Oaxaca, explored during the 2004 Cheve-area project. *Kasia Biernacka and Marcin Gala.*



2171 meters of new passage was explored and mapped, making the cave 3225 meters long and 216 meters deep. This cave was the site of underground camps during the expedition, including a six-day one in early March and a three-day one at the end of the trip. While Aguacate was being pushed, other cavers camped in high karst above El Ocotal and found numerous pit entrances. **Pit 25** has a spectacular 50-meter entrance shaft and was bottomed at a depth of about 200 meters.

The last weeks of the project were devoted to high caves in the El Ocotal area. Cave **J1** has the largest entrance in the area except for Cheve's, and it ends at an easy dig 200 meters in that is likely to connect to a large chamber in **J2**, also called **Osto Faustino**, which got most of the effort during this time. Its survey reached a depth of 391 meters and a length of 643 meters, but during the final trip some 400 more meters of stream passage was found, with an estimated 50 meters of additional depth, to a junction with another stream that tripled the water flow. This cave and Aguacate will be subjects of future pushes. All told, the expedition claims a total of about 1800 meters of new vertical extent and 5400 meters of survey. *Source:* Expedition reports from the field sent to the National Geographic Society by satellite phone, most written by Bill Stone or Andi Hunter. See also edited weekly summaries of these reports and some photos at the web site [www.nationalgeographic.com/magazine/caverace](http://www.nationalgeographic.com/magazine/caverace).

Renato Dorantes García, of Huautla, Oaxaca, died at the end of January 2004. He had been battling cancer for years, and upon his return from treatments in Puebla, he suddenly succumbed to the illness. Renato was an early friend of the cavers who passed through Huautla on the way to explore caves at San Agustín, and he held many happy gatherings at his home, showing cavers his latest video or slides. He had a deep interest in the history of the Mazatecs and was head of the Casa de la Cultura, a cultural

museum in Huautla. Renato was fifty-five years old when he died, and he will be sorely missed by the many cavers who knew him. *Source:* Ernie Garza.

## PUEBLA

In late March 2004, six British cavers on a Combined Services Caving Association expedition to the caves of Cuetzalan were trapped by flood waters in **Cueva de Alpazat**. After a planned night in Deep Camp, they found the cave in flood and managed with some difficulty to reach Camp One, which was well stocked with food and lighting supplies and had a cave radio for communication with those on the surface. The passage out proved to be sumped, and the cavers settled in for a wait. For two days, the water-level was dropping nicely, and it was hoped that the sump could soon be free-dived. But additional storms in the area caused the water level to rise 10 meters, and it was necessary to follow a prearranged plan to call some experienced British cave divers in to evacuate the trapped cavers. The route through the sump had been lined to facilitate this. (Others caving in northern Mexico during March recall a very wet "dry season.")

Two British cave divers flew over and assisted those who had been trapped, only one of whom had any previous experience in cave diving, out though the 200-meter-long sumped section, a very committing first dive, with near-zero visibility.

So far so good. But of course the press got wind of all this, and the Mexican authorities too, which could hardly have been avoided. All sorts of wild stories circulated in the press and on television, including some dispatches by Reuters, which should have known better. Much was made of the fact that the trapped cavers were mostly British military personnel, and they were said to be on a secret training mission and even prospecting for uranium in the caves. The cavers allegedly refused Mexican assistance in favor of waiting for "help from the Royal Navy." Local authorities claimed they were unaware of the expedition,

which was ridiculous, considering that the CSCA had been visiting Cuetzalan in the spring for many years. Goaded by the press, Mexican politicians, including President Fox, made hasty and unfortunate remarks. When they got out of the cave, the trapped cavers were interrogated by the military and, despite being cleared of all the ridiculous charges, expelled from the country for doing "research" (i.e., cave mapping) on tourist visas. Television stations told Mexicans to report any foreign cavers to the authorities. The Mexican immigration people have since declared that cave surveying requires a research visa, expensive and difficult to obtain.

In fact, the Combined Services Caving Association is much like any other caving club, and the members were on vacation, supported by their own money and a small grant from the Ghar Parau Foundation, a private British group that supports several foreign caving expeditions by British cavers each year. The decision to call in experienced sump divers, as arranged, was entirely appropriate, and in fact Mexican rescue groups did support the rescue efforts. While it is likely that little could have been done to prevent all the fuss, it may be that the tradition among cavers of justifying their hobby as "research" in order to get access to caves controlled by some difficult owners, together with the fact that the British Ministry of Defense probably justifies sponsoring groups like the CSCA to its taxpayers as "good training," may have contributed to the misinformation deluge. In fact, the head of the British Army is quoted in a BBC dispatch as saying that the detention of the men was simply the result of "a grave misunderstanding," but he couldn't resist adding that it was a "joint service adventure training expedition." Such little lies can come back to bite you.

Considerable efforts are being made by Mexican and foreign caving groups, including the Mexican national caving organization Unión Mexicana de Agrupaciones Espeleológicas, which strongly supports foreign caving in Mexico, to get the

newly stated visa rule overturned. Meanwhile cavers should proceed with caution. Unfortunately, even if the rule is formally rescinded or just not enforced at the national level, local authorities will remember what they saw on television, and a return to normal visa rules for caving is unlikely to make the evening news. *Sources:* numerous, including BBC web site, Reuters dispatches, Ramón Espinasa, and Jonathan Sims.

During the week of April 9 through 18, cavers and cave divers from Mexico and the U.S. worked together near Puebla to search for Mariano Fuentes Silva, who was presumed lost in **Resumidero Oztoquito**, Municipio Tzicatlayocoyan, Puebla. Mariano and other members of the Draco caving club had been exploring the caves near San José Balvanera for many years and were especially interested in finding a connection between Oztoquito and **Resumidero el Oztoque**, separated by about 1 kilometer surface distance. The caves are located at a boundary between basaltic lava and severely tilted limestone. On Tuesday, April 8, Mariano and two other cavers entered the cave by the 122-meter entrance drop and proceeded upstream about 500 meters to an unexplored sump. With the help of his companions, Mariano entered the sump, using modified open-water scuba equipment and a line reel with polypropylene line fed in from the surface. When Mariano failed to return from his third sump dive in the cave, his companions were able to contact cave-diving instructor Juan Carlos Carrillo, from Mexico City, who made a dive, but was unable to find Fuentes in the extremely low, silty passage. Two cave-diving instructors from Quintana Roo, Germán Yañez and Alejandro Álvarez, were flown in, but were similarly unable to locate the missing caver. More than seventy people gathered at the base camp established near the cave entrance to participate in the rescue activities, which were coordinated by Juan Montaña Hirose, president of the Mexican caving federation UMAE. A unit of the Mexican Army,

members of the National Guard and state police, City of Puebla firemen and paramedics, four state delegations of the Red Cross rescue organization, and numerous cavers, many of them friends of Mariano, were among the people assisting in the effort. The press arrived as well, with three satellite-television trucks and reporters from a radio station and several newspapers.

On Monday, April 12, the Mexican Consulate in Austin arranged special visas for travel into Mexico, and the following day U.S. sump divers Steve Ormeroid from Ohio and R. D. Milhollin from Texas arrived at the site. In a series of dives that lasted until the following afternoon, they were able to locate Mariano's body floating in a lake chamber on the far side of the sump, about 70 meters in. An examination of his equipment showed all equipment in place, the valves open and regulators fully functional, but the air cylinders were empty. The sump divers would have been able to bring Fuentes' body back through the underwater restrictions only with great difficulty, and upon consultation, the family elected to leave his body in the chamber.

Mariano was a gifted biologist who specialized in troglobitic life and an accomplished caver who participated in many projects throughout the Mexican republic. *Source:* R. D. Milhollin. (A plan map of Oztoquito appears in two parts in *Draco*, magazine of the Mexico City caving group Base Draco, numbers 5, 1989, and 8, 1991. A profile map of Oztoque is in number 6, 1989.)

Following the success of the Mexpé 2002 expedition (see article in this issue), a team of six cavers from Quebec and two from País Vasquo, Spain, went to the Sierra Negra in April and May 2003 to pursue exploration in the Hoya Grande area. Although at one point



Guillaume Pelletier rappelling into the 46-meter entrance shaft of TP6-03-8 during Mexpé 2003. *Alain Goupil.*

some paranoid cavers considered stopping the expedition because of the unusually high concentration of huge black and hairy spiders, the situation quickly returned to normal after a local man from Tepepa explained that these cave inhabitants are non-lethal — “¡Te pica y duele mucho!”

Exploration was mainly concentrated in **Gimnástica Selvática**, **La Ciudad**, and **Mygalomania**. At first, the main objective was to find new entrances to Gimnástica that might allow reaching a fossil level seen in 2002 and possibly bypassing the -426 sump, thus confirming the junction with **Las Brumas**. Unfortunately, even an aid climb upstream of the sump did not lead to a connection. But the Gimnástica system now has seven entrances, for a total length of 3206 meters.

During a lazy ridgewalking afternoon near base camp, two impressive entrances were discovered. **TP6-03-8** and **TP6-03-9** finally connected to the enormous room, 150 by 240 meters, in La Ciudad, a cave explored during Mexpé II, back in



The body recovery at Sótano de La Garza, Puebla. *Protección Civil Estatal del Estado de Puebla.*

December 1989.

Finally, the Mygalomania cave gave them hope, up to the end of the expedition, of connecting to the Afluente de los Alrededores, the local collector stream in **Sistema Tepepa**, but unfortunately both active and fossil passages became too tight, although the air current was still really strong. According to the survey, only 130 meters distance and 53 meters depth separate the ends of this potential connection.

With more than 4 kilometers of passages mapped, the 2003 expedition showed that lots of new discoveries lie ahead in the Hoya Grande area. This is also shown by the sinking surface stream of 0.5 cubic meter per second that has not yet been found underground. Does this water flow toward the Río Coyalapa, as proposed by Steve

Worthington in 1989, or is it going toward the Río Petlapa to the south? *Source:* Guillaume Pelletier.

On Friday, April 16, 2004, just after breaking camp after the Oztoquito diving accident, the Cruz Roja cavers from San Luis Potosí were asked by the Cruz Roja and Puebla's Protección Civil to help recover the body of a 20-year-old man, Jaime Hernández Cruz, who had drunkenly committed suicide by jumping into a pit thought by those in Rancho La Garza, near Zitlala, Municipio Huitlalan, in the Sierra Norte de Puebla, to be 300 meters deep. The pit turned out to be about 60 meters deep, with the body on a ledge 45 meters down. The next day, firefighters, Cruz Roja members, and members of Espeleo Rescate México recovered the body in 3.5 hours. The pit had no name, so locals and the cavers involved named it **Sótano de La Garza** (20°01'47"N, 97°41'93"W). Local people say there are many more like it in the vicinity, and that nobody, Mexican, gringo, or otherwise, has explored them. *Source:* Antonio Aguirre Álvarez. (See also <http://ermexico.tripod.com/lagarza/lagarza.htm>.)

The 2003 annual Belgian expedition, which took place between February 19 and March 21, focused on its project area of Tetepán, located at an elevation of 1000 meters in the Tzontzeuciculi range in the state of Puebla. Also called the Sierra Negra, the Tzontzeuciculi massif is part of the Sierra Madre Oriental. In 1985, two major resurgences were discovered, and it is believed that together they drain most of the area of the massif. One of the resurgences, **Coyalatl**, was explored by the Groupe Spéléo Alpin Belge in 1985 and is located at an elevation of 380 meters. The cave is 19 kilometers long and 240 meters deep.

The 2003 expedition had two

major objectives. The first was to explore the pits in the Tetepán area in order to find a connection to the known passages upstream in Coyalatl. The second objective was to do a surface survey of all area caves in order to locate them accurately on a topo map, since many of the sites that were explored before 1990 were only approximately jotted down on a map, without using a GPS unit.

The GSAB team, composed of eleven Belgian cavers and two Mexicans from SMES and UNAM, started out by continuing work done the previous year in **TZ-48**, or **Hueso Dos**. During the 2002 expedition, a major route heading toward the resurgence of Coyalatl had been found there, and exploration had stopped at the -240-meter level at the top of a 40-meter pit. (See Mexico News, Puebla, *AMCS Activities Newsletter* 26.) The 2003 team descended the shaft, followed a stream canyon to a 10-meter pit, and then continued down the strike along a large passage, until at -45 meters the team reached a major intersection. Ahead, the stream flowed along a 10- to 20-meter-wide, almost level passage, with ceiling out of sight. A series of infeeders increase the river's flow considerably over the next kilometer, but then a sump bars the way. A well-decorated upper level near the sump enabled the team to bypass the flooded section, and the river was rejoined. However, a few hundred meters farther, a second area of sumps again stopped forward progress. Team after team searched the area, where strong air disappears into huge piles of breakdown. No way on was found, frustratingly, because according to calculations, the team was less than 100 meters from reaching the passages upstream in Coyalatl. TZ-48 is now 3840 meters long and 470 meters deep.

**TZ-44**, whose entrance was discovered in 2002, was then explored. Successive pits and downclimbs brought the team to a very large meander at -140 meters. This passage, intersected by pits, took them to the -270-meter level, where progress was stopped by breakdown

piles, with good airflow. A good lead remains in TZ-44 where a side stream plunges into a pit at -110 meters, yet cannot be found farther down in the cave. TZ-44 is 630 meters long and 270 meters deep.

**HU-40, or Tepechicuatli**, was (re)discovered during the surface survey. A large opening 20 by 30 meters at the bottom of a huge doline leads to a gorgeous, breakdown-filled entrance room bathed in green light. Two pits give access to a horizontal gallery of great dimensions (15 by 30 meters) followed by a narrower network of passages that end at the -170 meters at an impenetrable water-filled constriction. After surveying 410 meters, and shortly before the terminal constriction, the team found boot prints in a muddy side stream. It turned out that this was **Aztutla**, a cave previously explored in 1987, but misplaced on the old maps.

Despite the fact that two participants had to abruptly leave the expedition after getting hurt—one with broken ribs from a 4-meter fall and the other hit on the knee by rockfall—the 2003 GSAB expedition was a success, having returned with a -470, a -270, and about 5 kilometers of passage surveyed. *Source: Summary by Yvonne Droms of notes in French by Richard Grebeude, Serge Delaby, and Sophie Verheyden, Regards 48, May-June 2003.*

See also the material on Tlaloc 2002 under Veracruz.

## QUINTANA ROO

The year 2003 marked the second QRSS convention, which was held in Playa del Carmen on the evenings of September 5 and 6. It was our intention to provide the local community with two evenings of presentations on the status of various cave investigations in Quintana Roo. Two new maps of underwater caves were presented during the convention. Several presentations addressed the expanding pursuit of dry-cave exploration and survey in this region. The event was free to the public, and over three hundred people attended. Here is the roster of talks:



“Conservation and Safety Projects: Past, Present, and Future,” by Bernadette Carrion and Scott Carnahan.

“Dry and Wet Cave Connections,” by Fred Devos.

“Underwater Caves of Bacalar,” by Andreas Matthes.

“Understanding the Hydrogeology of Quintana Roo: Hydrogeology and Underwater Exploration,” by Luis Marín.

“Methods for Mapping,” by Sam Meacham.

“Ancient Maya Rock Art and Ritual Cave Use in Northern Quintana Roo,” by Dominique Rissolo.

“Closed Circuit Rebreather Exploration,” by Steve Bogaerts.

“Sistema Camilo,” by Renee Power.

“The NSS-CDS in Mexico,” by Steve Ormeroid.

“What is the Quintana Roo Speleological Survey?” by Jim Coke.

“Underwater Cave Photography,” by Denis Tapparel.

“Surface Ecology and Biodiversity of Cenotes,” by Jamie Rotenberg.

We would like to thank all of our speakers for two evenings of superb presentations and their willingness to share their work with others. We would also like to thank our volunteers for their help, Greg Brown for his assistance at the projector table and Laura Bush for attending to the duties of Master of Ceremonies. *Source: Jim Coke in Underwater Speleology, November 2003, and NSS News, December 2003.*

A major expedition to push **Ox Bel Ha**, longest cave in Mexico and the longest underwater cave in the world, was held during November 2003. A helicopter was used to take gear to the base camp, moving 1.5 tons in an hour. Despite constant rain, the camp held up well. In approximately thirty dives over two weeks, divers Sam Meacham, Bil Phillips, Steve Bogaerts, Roberto

Chávez, and Andrés Labarthe explored and surveyed more than 15 kilometers of new passage, making the cave 122 kilometers long. Bil and Steve accounted for 90 percent of that. At the end of the trip, there were seventy known cenote entrances to the system. *Source: Sam Meacham.*

In a span of two weeks in early 2004, two new connections from **Sistema Ox Bel Ha** to other caves were discovered. Connections to Yax’chen and Upstream Ayim added over 10 kilometers to the overall system, which now has 133,439 meters of underwater survey, which should make it the ninth longest cave, wet or dry, in the world. *Source: Jim Coke.*

In February 2003, the Comité Départemental de Spéléologie du Val de Marne had an expedition of about ten cave divers, mostly French, to the east coast of the Yucatan Peninsula. The agenda included mainly jungle cave dives in the heart of Maya country, but some dry caves were also included. No less than 5.3 kilometers of virgin passage, 5 kilometers of which was underwater, was discovered, mostly at a single large system near the X’el Ha *laguna* and nature park. The system **Pitch-Xunaan Ha** will be 20 kilometers long when a connection is made. The flow of 5 cubic meters per second indicated that human passage should be possible, even if areas of collapse are encountered. An exit to the sea will likely be found in X’el Ha if a very fractured area can be passed. A 300-meter section of highway that passes over the area collapsed a few years ago. The fresh-water conduits are very large.

But the system defends itself well. Virgin leads are increasingly hard to reach, and up to 7.75 hours of diving through very mazy sections is required to get to them. But machetes, perseverance, and modern techniques will allow explorers to continue to make progress. To be able to explore these cenotes, which were water sources for the great Maya civilization, in the midst of the Maya ruins on the peninsula, is absolutely magical. *Source:*

anonymous note at <http://www.speluncamundi.com/dev/actualite/depeche/php?numero=878>, translated from French by Yvonne Droms.

The fourteenth French Yucatan expedition was held from January 30 to February 17, 2004. Participants were Frédéric Bonacossa, Philippe Brunet, Bruno Delprat, Christophe Depin, Anne Dutheillet, Bernard Glon, Philippe Imbert, Christian Thomas, and Marco Rotzinger. More than 10 kilometers of virgin cave rewarded the efforts of the eight cave divers, who continued the French exploration of the cenotes on the east coast of the Yucatan Peninsula that they began in 1996. The expedition's main objective was to pursue cave-diving leads, but some dry caves were also on the program, all in the heart of the Maya lands in the south of Mexico.

The underground river in the **Cave of Pitch** was not connected to its continuation in **Xunaan-Ha** in spite of the fact that 1.5 kilometers of new flooded passage was discovered downstream. There are still a few dozen meters missing from a connection that would create a 23-kilometer system.

Farther south, **Cenote Sole**, which runs under a hotel, was pushed. Two kilometers of passage led downstream to an underwater resurgence at -5 meters in the ocean and upstream into a convoluted network of passages.

A new start at the downstream endpoint of **Altar Maya**, beyond a collapse that we were able to locate in the jungle by GPS from our survey data, allowed us to progress a few kilometers in a network developed parallel to the coastline.

To the north, the cave Aluxes is similar to Altar Maya, but out of the water. The addition of a few kilometers of passage makes it the longest air-filled cave in the Yucatan. *Source:* An e-mail posting to the French caver list-serve by Frédéric Bonacossa, translated from French by Yvonne Droms. See also the *Spelunca Mundi* web site <http://www.speluncamundi.com/dev/actualite/depeche.php?numero=992&aces=1>.

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The Local Speleo Survey Project was introduced in 2002 to bring local caver divers into the exploration, survey, and cartography community. The targets selected were **Cenote Angelita** and **Cenote el Balneario**. Permission to survey Angelita was denied by the local INAH representative. The exploration and resurvey of el Balneario was conducted in mid-2002, and since then the data have been sitting idle, largely due to a strong high-tourist season. Matt Matthes has now finished the first draft of the map. *Source: ProTec Newsletter, August 2003.*

A new cavern tour has been established in the Kukulkan section of the **Chak Mol** (or Chac Mool) cave system. The installation had two main objectives. First was to create a new cavern tour for the growing cenote tour business in order to take some of the pressure off of other entrances and distributing the visiting divers among caverns. The second was to give cavern guides an option not to use the restriction between the Little Brother entrance and the Kukulkan cenote. The original white line has been replaced by new yellow main line, and new warning signs have been placed close to the restriction and the Kukulkan passage.

The partially deteriorated yellow guide lines in **Ponderosa-Eden** have been replaced. In the river run, the first 500 feet have been changed to new line, and a warning sign has been installed at the beginning of the passage. In the main cavern area toward the Coral cenote, all of the line has been changed to a new yellow line, and a warning sign has been installed at the jump line toward the Chapel. The Chapel jump line has been cut back some 80 feet (24 meters), as well. *Source: ProTec Newsletter, August 2003.*

During March 2003, members of the Cambrian Foundation dive team met in Akumal to conduct its fifth expedition to **Sistema Camilo**. About 1422 meters of new cave was added to the system, and 828 meters resurveyed. The cave, whose main Camilo entrance is a karst window

with marginal flow, now has more than 9 kilometers of passage. Depths range from 10 to 25 meters, mainly the deeper part of that range, which is unusual for that part of Mexico. The halocline is in the range from 21 to 24 meters deep. Most of the cave is very dark, but the run between Calavera and Muchachos cenotes is much lighter and highly decorated; it is also the shallowest part of the cave. The expedition conducted some scientific work, some educational outreach to students in the U.S. by e-mail, and some filming for *National Geographic Today*. *Source: Underwater Speleology, July 2003* (where there is a small, totally illegible map of the cave).

## SAN LUIS POTOSÍ

During a BASE-jumping expedition to the **Sótano de las Golondrinas**, there was an accident on November 19, 2003. For many of the participants, it was their first time at the cave, so they were all rappelling in to inspect the landing area and get a feel for the dimensions of the cave before making their first jumps. They were using Petzl five-bar racks on nearly new 11-millimeter static PMI rope.

Dave Flannell was approximately 120 meters from the bottom of the 330-meter rappel when for reasons unknown he lost control of his descent. Three team members already on the bottom reached Dave within thirty seconds, and resuscitation efforts were begun. Another team member who is an EMT was lowered from the top and took over twenty-two minutes after the fall. After forty-six minutes, with no sign of recovery, CPR was stopped. The next four hours were spent carefully recovering Dave's body and extracting [with a winch] the remaining team members from the bottom of the cave. Dave's body was not moved from the top of the cave until after a prayer ceremony by a Huastecan priest and a candle placed by Dave's body had burned out late at night. The Huastecs' genuine care and concern was very moving. The group called off their plans to jump into the pit out of respect for Dave's friends and family

and the local people.

The victim was wearing rappelling gloves but no helmet. Total weight on rope was about 210 pounds (95 kilograms). There was no gear failure of any kind. No drug or alcohol was involved, the weather was cool, and the victim was well hydrated and had water with him during his descent. *Sources:* Bryan [last name unknown] on BLiNC magazine message board at [www.blincmagazine.com/forum/](http://www.blincmagazine.com/forum/), post number 15614, November 23, 2003; and reply by Jay Epstein Ramírez, post 15473, November 29.

Note: It is likely that a rappel into Golondrinas is the first rappel for many of the BASE jumpers. Golondrinas would not seem to be a good place to learn to rappel. Another comment on the BLiNC forum (#15461) by a BASE jumper says, "If you can be a confident skydiver and BASE jumper, a free rappel is a walk in the park." Now they know.

On December 1, 2002, Michel Menin from France and Catherine Léger from Canada crossed the top of **Sótano de las Golondrinas** on a tight wire 131 feet long, up to 1131 feet above the floor. This was a women's record for Léger. Midway, the two funambulists passed on the wire, another world altitude record. *Source:* Catherine Léger.

A group from Saltillo did **Golondrinas** the day after the BASE jumper's accident. They were rock climbers who occasionally try their hands at other activities, apparently. The group, obviously inexperienced at what they were attempting, had rented a 13-millimeter rope and had great difficulties using their racks. At least one person took two hours to reach the bottom. One "added a safety carabiner to his rack, which allowed him to relieve some of the pressure of the rope" and descend in 25 minutes. Two others declined to go down at all, and one descended 10 meters before climbing back out, following which "she was lowered down to the bottom attached to the rope." *Sources:* Mónica Ponce and Fofó González.

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Mercedes Otegui and Gilberto Torres prepared a report on the sacred caves **Cueva del Brujo** and **Cueva del Aire**, located at the western end of the town of Hueichihuayán, *municipio* of Huehuetlán, on Rancho San Juanito, and their importance to the local Tenek, Nahuatl, and Pames indigenous people of the Huastecan region. Based on their ritual importance and the ecology and biodiversity of the area, the governor of San Luis Potosí arrived there on December 27, 2003, and declared the site a "wild and protected place." *Source:* Jim Sherrell.

This old map of **Sótano del Nopal Grande**, which is near Sótano de los Monos in the Sierra de El Abra, was recently discovered by Bill Russell and has been redrawn by Bev Shade. The profile was previously published in the AMCS's *Sierra de El Abra Cave Map Folio* in 1989, but the plan has not been published before.

## TAMAULIPAS

**Cueva de El Abra** is a roadside cave south of the town of Ciudad Mante on the main highway south to Valles. You can't miss the huge entrance if you are heading north during the day. You can now drive your car to the base of the trail, and there is a new concrete stairway with pretty orange handrails all the way to the cave and through the horizontal section. It appears that someone has been clearing an area in the cave of breakdown, perhaps to make a level area for tourist talks. You can now do the upper part of the cave, back to the domepit, wearing flip-flops. *Source:* David Locklear.

The Mexican magazine *Expedición*, September-October 2003, contains an article on a Proyecto Espeleológico Purificación underground camp in **Cueva del Tecolote**. The article is by Rodolfo González Luna and Gustavo Vela Turcott and is

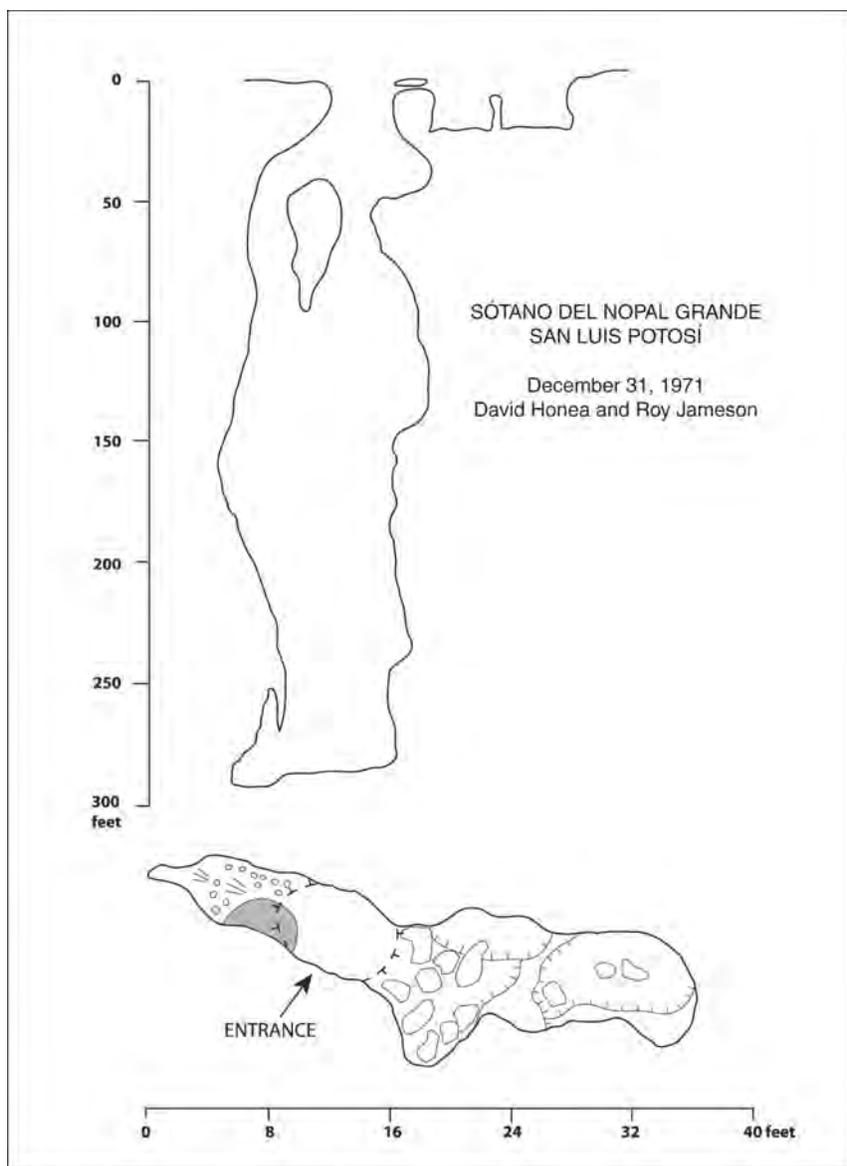


Wire-walkers over Sótano de las Golondrinas. *Ben Kim.*

heavily illustrated with photographs by Gustavo. The same March 2003 trip, which added 3913 meters of survey to make the cave 40,475 meters long, is the subject of a report in *Death Coral Caver 13*.

Recent attempts to reach the Dragon River section of **Sistema Purificación** from the Cueva del Brinco entrance have been thwarted by a sump at the Mud Funnels, which used to sump only in wet weather. Perhaps shifting breakdown downstream of the sump has made it permanent. Further attempts to push the Dragon River will be made from the Sumidero de Oyamel entrance. *Source:* *Death Coral Caver 13*.

**Cueva Oscura**, Los San Pedros, Tamaulipas. Length 120 meters, depth 95 meters. UTM coordinates 458752E, 2641500N. Cueva Oscura is located 3.6 kilometers northwest of Los San Pedros at an elevation of 1881 meters. It is north of the Los San Pedros-El Chihue road. From the entrance sink, a steeply sloping



passage leads under a 10-meter headwall, soon reaching the top of a pit, which drops down through an opening in flowstone and then vertically 15 meters to a tilted mass of flowstone across the bottom of the pit. The passage at the bottom was once large, but is now mostly plugged with flowstone. After about 30 meters, there is a second pit, only 22 meters deep but requiring a 35-meter rope. At the bottom of this pit is another mass of eroded flowstone. Behind the flowstone, a window leads to a 5-meter drop to a climbdown, where the cave definitely ends in a small pool. Throughout the cave there is extensive eroded flowstone, evidence of a change from a period of deposition

to a time of erosion. Cueva Oscura was found on October 18, 1985, by Mark Minton and Nancy Weaver, who explored the first drop. They and William Russell surveyed the



cave on January 1, 1986. *Source: Death Coral Caver 13, 2003.*

**Cueva de El Violín**, La Canoa, Tamaulipas. Length 169 meters, depth 5 meters. UTM coordinates 454621E, 2648300N. This cave is located 3300 meters east-southeast of Conrado Castillo. It is located on a ledge in a massive cliff at 1160 meters elevation. In the wet season a stream flows out of the entrance and cascades off the ledge to the bottom of Cañón la Cueva. There are many pools throughout the cave, and five sumps. There is an upper level near the entrance that ends in a sump. The dry cave passages are floored by bedrock and flowstone. About 60 meters into the cave are three sumps clustered together south of the main passage. The cave was surveyed to a length of 162 meters and explored southeast another 90 meters to a fifth sump. This is a very promising cave that probably leads into a major cave system located parallel to and between Sistema Purificación and the caves of the Río Corona drainage. It should be revisited during the driest season, when the sumps may be open.

The existence of Cueva de El Violín was inferred during an airplane flight by the Oztotl Flying Club in September 1989, when a waterfall was spotted coming off a ledge in the wall of Cañón la Cueva, below the meadow known as El Violin. A group of cavers bushwhacked to a point where the cliff could be rigged from above on November 27, 1991. Peter Sprouse made a 150-meter rappel to the forested ledge and located the entrance. Since a short rappel was required to reach it from the ledge, he had to cut a short piece off of the main rope. He then radioed for John Fogarty to come down, and they explored and mapped the cave. The long climb back up the cliff in the dark afforded views of the city lights of Santa Engracia. *Source: Death Coral Caver 13, 2003.*

The *Death Coral Caver*, source of some of the material in this "Mexico News," is the annual magazine of Proyecto Espeleológico Purificación.

### Purificación Area Speleometry

#### Long Caves

	Length (m)
1. Sistema Purificación, Tamaulipas	93,755
2. Cueva del Tecolote, Tamaulipas	40,475
3. Sótano de Las Calenturas, Tamaulipas	8,308
4. Sistema Cretacico, Nuevo León	6,065
5. Cueva de La Llorona, Tamaulipas	3,540
6. Sótano de la Cuchilla, Tamaulipas	2,716
7. Cueva del Río Corona, Tamaulipas	2,301
8. Cueva Paraíso Difícil, Tamaulipas	1,799
9. Sistema Manicomio Paralelo de Satanas, Nuevo León	1,639
10. Cueva del Borrego, Tamaulipas	1,464

#### Deep Caves

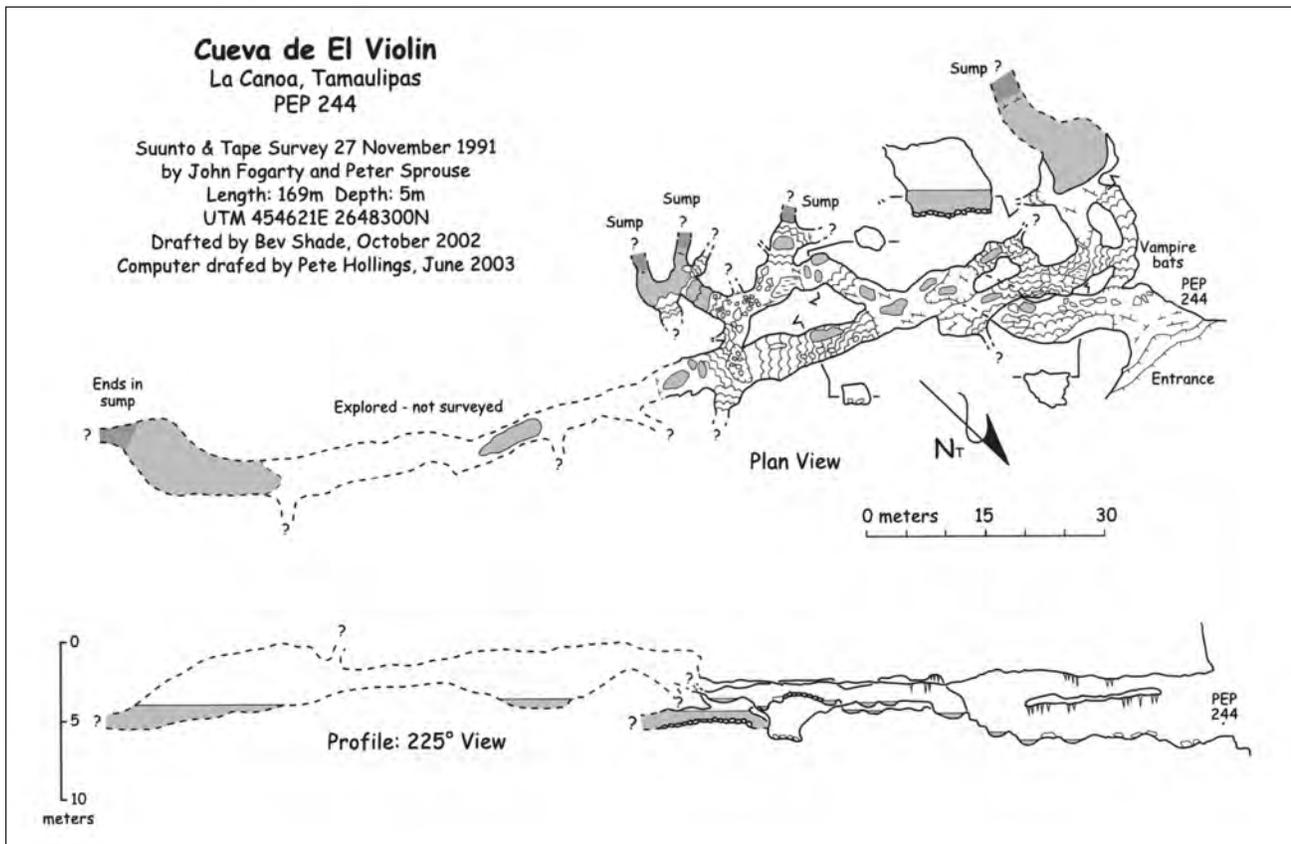
	Depth (m)
1. Sistema Purificación, Tamaulipas	953
2. Sistema Cretacico, Nuevo León	465
3. Cueva del Tecolote, Tamaulipas	424
4. Cueva de La Llorona, Tamaulipas	412
5. Sima Chupacable, Nuevo León	402
6. Sistema Manicomio Paralelo de Satanas, Nuevo León	326
7. Sótano del Caracol, Tamaulipas	301
8. Sumidero Anaconda, Nuevo León	278
9. Sótano de la Cuchilla, Tamaulipas	207
10. El Hundido, Tamaulipas	186

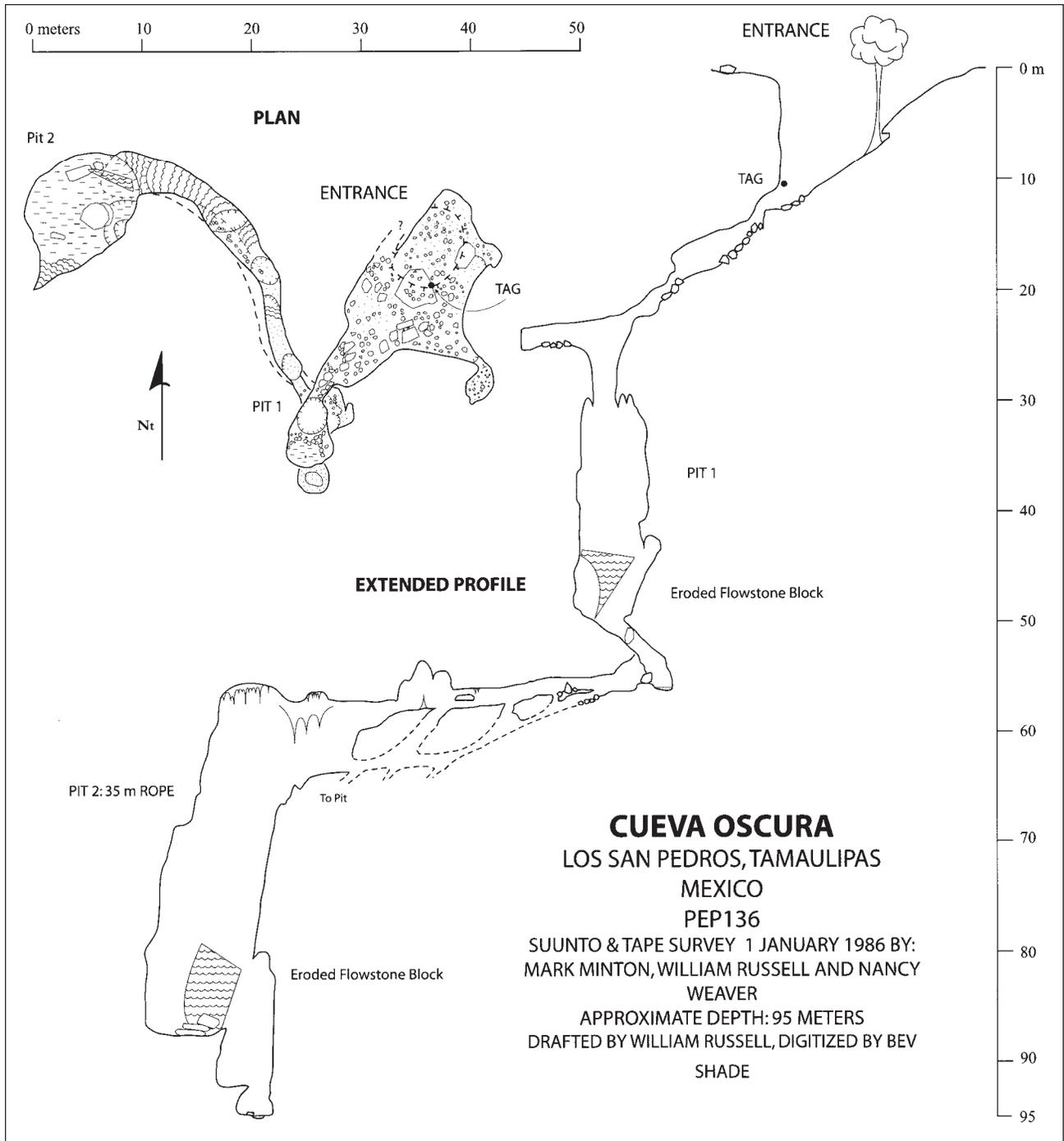
revised from Peter Sprouse, *Death Coral Caver* 13, 2003.

Issues of the magazine are available from the AMCS or the PEP. For more information on the PEP, see [www.purificacion.org](http://www.purificacion.org).

Number 303 (May 2002) of *México Desconocido* contains "The Fantastic Underground World of the Southwest of Tamaulipas," by Jean Louis Lacaille Músquiz. Featured are **Cueva de El Abra**, **Grutas de Quintero**, and the **Nacimiento del Río Mante**. Several other caves in the Sierra de El Abra and the El Cielo Biosphere Reserve in the Sierra de Guatemala are mentioned. The article mentions that machinery used in mining phosphates in Quintero has caused much damage to the cave, part of the good conservation message in the article. An English version of the article was found at the magazine's web site <http://www.mexicodesconocido.com.mx/english/deportes/terrestres/>.

NASA has approved a substantial (for caver projects, if not NASA) three-year grant for principal investigator Bill Stone and others to enhance the sonar cave-mapper





technology developed for Stone's Wakulla II Project in Florida. (See, for example, the *NSS News*, September 2000.) The goal of the DEPTHX project is to build a system capable of autonomous underwater exploration and return navigation, without the divers that drove it at Wakulla, and of searching for and returning with biological samples. Caver Marcus Gary will be in charge of logistics at the project's

field-testing location, Rancho La Azufrosa, Tamaulipas, where the device will be used to explore the deep cenotes, including *El Zacatón*.

### VERACRUZ

A joint Italian and Mexican caving expedition, Tlaloc 2002, was held in December 2002 and January 2003 in east-central Mexico. Twelve to fifteen cavers participated in two reconnaissance camps, the first

from 18 to 29 December 2002 in the Hueytamalco area, Puebla, and the other from 6 to 9 January 2003 around San Andrés Tenejapan, near Orizaba in Veracruz.

The Hueytamalco area had previously been checked in 1998, when several caves were explored by some of the members of the current expedition. One notable cave was found, *Miquizco*, previously called *Amiquisco*, with a length of about

1.5 kilometers. It is a large insur-  
gence located at the bottom of a  
blind valley. A sizable stream flows  
into it, and it can also be accessed  
by means of two *ojos*, parallel pits  
approximately 70 meters deep. In  
addition to a few side passages in  
Miquizco, other interesting and to-  
tally or partially unknown caves  
were explored and surveyed: **Cueva  
del Cocinero**, 190 meters long and  
57 deep, and **Sótano de los Cochi-  
nos**, over 500 meters long and over  
80 meters deep. The second of those  
shows potential. The in-cave river  
was partially followed, both up-  
stream and downstream, and the  
area it traverses bodes well; its sur-  
vey is incomplete. Numerous other  
entrances found in the area should  
be checked better in the future.

In the San Andrés Tenejapan  
area, new to us, we concentrated  
mainly on two caves, **Capaka**, 161  
meters deep, over 350 meters long,  
and which showed no trace of pre-  
vious exploration, and **Petlacala**,  
168 meters deep and over 200  
meters long, in which evidence was  
found of a partial prior descent by  
unknown cavers. The entrances, lo-  
cated just minutes away from camp,  
were pointed out to us by some lo-  
cal villagers. We believe that much  
more could be discovered by en-  
larging the area of search.

In addition, another very inter-  
esting region was checked in the  
vicinity of Santa Catarina Ocotlán,  
near Nochixtlán in Oaxaca, where  
Mexican cavers are exploring some  
pits. However, here we had to deal  
with the hostility of some of the lo-  
cal authorities, who did not look  
favorably on the presence of stran-  
gers in their territory. Therefore we  
had to break camp after only one  
night.. The situation should have  
been cleared up since, thanks to the  
intervention of some supporters of  
local caving, an encouraging pros-  
pect for the future.

A special team dedicated itself to  
the photographic documentation of  
the expedition, while also checking  
out some other caves of esthetic in-  
terest, both karst and lava, among  
which Juxtlahuaca in Guerrero  
should be mentioned. The name  
Tlaloc refers to the Aztec god of rain  
and water. His attentions blessed

the entire expedition, in spite of re-  
sults that did not meet our expecta-  
tions.

Participants were from Gruppo  
Speleologico Cai Belpasso, G. S.  
Bergamasco le Nottole, Speleo Club  
Ibleo, Unión de Rescate e Investiga-  
ción en Oquedades Naturales, and  
the speleological section of the  
mountaineering club at Instituto  
Politécnico Nacional. *Source:*  
Giorgio Pannuzzo in *Speleologica* 47,  
December 2002, translated by  
Yvonne Droms.

## YUCATÁN

An INAH underwater archaeol-  
ogy project took place in cenotes in  
northern Yucatán in March 2001.  
One of the major sites, dubbed in-  
formally The Well of Time, was en-  
tered by a 20-meter drop through a  
shaft into a large room. The lake  
covering the floor of the room  
yielded many valuable finds, in-  
cluding the first well-articulated  
Maya skeleton found in an under-  
water cave and a burial, obviously  
ceremonial, with pots of offerings,  
including the skull of a dog. Unlike  
some well-known sites, such as the  
cenote at Chichén Itzá, these sites  
did not have a lot of gold and jew-  
elry. A cave off the coast, entered  
where freshwater resurges, was  
pushed to back under the mainland  
during three dives, the longest of  
which reached a penetration of 482  
meters. *Sources: National Geographic  
Magazine*, October 2003, and *Ad-  
vanced Diver Magazine* 16, 2004.

The web site [http://mexico.aim-  
net.mx/Yucatan/](http://mexico.aim-net.mx/Yucatan/), evidently some  
sort of tourist promotion site, has  
some information, in poor English,  
on caves in the state. Included is a  
crude map of **Actun Kaua**, called  
here Gruta Kaab de Kaua, made by  
Espeleogrupo Yucatán A.C. in 1991.  
The text says, "To enter the cavern  
first you have to through a small  
entry, that has 4 meters length and  
5 of width. You can also enter by  
making holes with explosives. . . ."

The May-June 2004 issue of *Ar-  
chaeology* magazine has an article on  
underwater archaeology in Yuca-  
tán. Many of the cenotes contain  
skeletons, pottery sherds, or other

evidence of the ancient Maya. One  
photo in the article shows a stone,  
once part of a monument of some  
sort, containing the glyph for 3 Ix,  
a day in the 260-day sacred count  
made by combining thirteen num-  
bers with twenty day names. The  
sacred date and the day of the 365-  
day year together combine to form  
a date in the Calendar Round that  
won't repeat for roughly 52 years.  
The article mainly discusses the  
work of Guillermo de Anda, a cave-  
diving archaeologist at the Univer-  
sidad Autónoma de Yucatán. There  
is, according to a footnote to the  
article, an interactive web site on the  
subject at [www.archaeology.org/  
interactive/cenotes](http://www.archaeology.org/interactive/cenotes).

## MAPS

There's an interesting interactive  
map of Mexico at the INEGI site  
[http://galileo.inegi.gob.mx/website/  
mexico/viewer.htm](http://galileo.inegi.gob.mx/website/mexico/viewer.htm). You can click to  
enable different features like con-  
tour lines or geology. There's even  
a button to show cave entrances, but  
they don't seem to have actually put  
any cave locations there. *Source:*  
Peter Sprouse.

I recently heard from someone  
with contacts in the Mexican map  
agency INEGI. He helped answer a  
question I'd been wondering about  
for quite awhile, What datum were  
their topo maps in? While they  
stated NAD27, they did not specify  
whether it was NAD27 CONUS  
(continental US) or NAD27 Mexico,  
both of which appear on GPS  
menus. There is a difference of  
about 2 meters, which could be sig-  
nificant to cavers. According to my  
source, they used NAD27 CONUS.

INEGI has now switched to  
ITRF92 datum, which you probably  
won't find listed in your GPS. I am  
told that it is essentially the same  
as WGS84, however. I understand  
that WGS84 (or ITRF92) is about 8  
centimeters more accurate than  
NAD27, but I'm not sure it was  
worth switching. Now we will have  
adjoining maps with grids that  
don't match up by 200 meters.  
*Source:* Peter Sprouse.

## SEVENTH MEXICAN CONGRESS OF SPELEOLOGY

The Federación de Espeleológica de América Latina y el Caribe, the Unión Mexicana de Agrupaciones Espeleológicas, and the mountaineering club at the Instituto Tecnológico y de Estudios Superiores de Monterrey invite you to the Seventh Mexican Congress of Speleology and the Fifth Congress of FEALC in Monterrey, Nuevo León, February 2–6, 2005. The meeting will be at Monterrey Tec, with the theme Legislation and Protection of the Subterranean Environment. The

event will have a strong international component, both in speakers and participants.

Events will include a welcome dinner, a formal dinner, a field trip, and a closing dinner. Registration is US\$50 until October 1, 2004, and \$100 afterward and covers events, entrance to the conference, and a registration package. (Students and members of UMAE receive a 50 percent discount.) Lodging and meals other than those mentioned above are the responsibility of those attending. There will be hotel rooms with various prices available, as well as camping.

There will be both poster and oral

presentations. The deadline for submitting abstracts is November 1, 2004. Subject of presentations is open, but they ought to have some relation to the theme. Send abstracts to rogonzalez@cydsa.com.

Prospective vendors should contact Denisse Ovale (denisseovalle@hotmail.com) or Andrés Castro (andrescastroherrera@yahoo.com).

For further information, contact Rodolfo González, rogonzalez@cydsa.com or see <http://www.montanismotec.com/congresoUMAEE2005>. *Source:* Fofó González.

# DEEP CAVES OF MEXICO

Mark Minton  
May 2004  
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 Ndia Kijao	Oaxaca	956
10	Sistema Purificación	Tamaulipas	953
11	Sistema Perrito	Oaxaca	906
12	Sistema Tepepa (Ehécatl+Niebla)	Puebla	900
13	Nita Cho	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	826
18	X'oy Tixa	Oaxaca	813
19	Nita Ka	Oaxaca	760
20	Sistema H31-H32-H35	Puebla	753
21	Sonyance	Oaxaca	745
22	Nita Xonga	Oaxaca	740
23	Yuá Nita	Oaxaca	704
24	Aztotempa	Puebla	700
25	Sótano de los Planos	Puebla	694
26	Sótano de Alfredo	Querétaro	673
27	Sistema Cuetzalan	Puebla	658
28	Sótano de Tilaco	Querétaro	649
29	Nita Nashí	Oaxaca	641
30	Cuabtempa Superior	Puebla	640
31	Sistema Atlalaquía	Veracruz	623
31	Cueva de Diamante	Tamaulipas	621
33	R'ja Man Kijao	Oaxaca	613
34	Sistema de los Tres Amigos	Oaxaca	604
35	Nita He	Oaxaca	594
36	Meandro Que Cruce (H54)	Puebla	588
37	Sistema del Encanto	Puebla	584
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	Sótano de Ahuihuitzcapa	Veracruz	515
47	Sistema Soconusco	Chiapas	513
48	Sótano de las Golondrinas	San Luis Potosí	512
49	Hoya de las Conchas	Querétaro	508
50	Sótano de Los Hernandez	Querétaro	507

Updates and corrections:

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Mark Minton  
 May 2004  
 Length in meters

# LONG CAVES OF MEXICO

1	Sistema Ox Bel Ha	Quintana Roo	133439
2	Sistema Purificación	Tamaulipas	93755
3	Sistema Nohoch Nah Chich	Quintana Roo	61143
4	Sistema Dos Ojos	Quintana Roo	56672
5	Sistema Huautla	Oaxaca	55953
6	Cueva del Tecolote	Tamaulipas	40475
7	Sistema Cuetzalan	Puebla	37676
8	Kihaje Xontjoa	Oaxaca	31373
9	Sistema Tepepa (Ehécatl+Niebla)	Puebla	26500
10	Sistema Cheve	Oaxaca	26194
11	Sistema Sac Actun	Quintana Roo	24404
12	Sistema Soconusco	Chiapas	21733
13	Sistema Naranjal (Najarón-Maya Blue)	Quintana Roo	21374
14	Coyalatl	Puebla	19000
15	Sistema Aerolito	Quintana Roo	18000
16	Sistema Nohoch Kiin	Quintana Roo	17386
17	Sistema PonDeRosa (Pondazul, Eden)	Quintana Roo	15019
18	Grutas de los Aluxes	Quintana Roo	14200
19	Cueva de Alpazat	Puebla	13678
20	Sistema Yaxchen East	Quintana Roo	13090
21	Cueva del Río La Venta	Chiapas	13000
22	Atlixicaya	Puebla	12200
23	Cueva Pitch	Quintana Roo	12000
24	Sistema San Andrés	Puebla	10988
25	Cueva del Mano	Oaxaca	10841
26	Sistema Taj Mahal - Minotauro	Quintana Roo	10600
27	Actun Káua	Yucatán	10360
28	Grutas de Rancho Nuevo (San Cristóbal)	Chiapas	10218
29	Cueva del Arroyo Grande	Chiapas	10207
30	Sistema Abejas	Quintana Roo	9743
31	El Chorro Grande	Chiapas	9650
31	Sistema Tepetlaxtli	Puebla	9600
33	Sistema Chac Mol - Mojarra	Quintana Roo	9193
34	Cueva Quebrada	Quintana Roo	9000
35	Sótano de Las Calenturas	Tamaulipas	8308
36	Gruta del Tigre	Quintana Roo	8200
37	Nohoch Actun	Quintana Roo	8200
38	Xel-Ha	Quintana Roo	8000
39	Sumidero Santa Elena	Puebla	7884
40	Cueva Yohualapa	Puebla	7820
41	Cueva de la Peña Colorada	Oaxaca	7793
42	Cueva de Comalapa	Veracruz	7750
43	Sistema Xunaan-Ha (María Isabella)	Quintana Roo	7600
44	Sistema Camilo	Quintana Roo	7397
45	Sótano del Arroyo	San Luis Potosí	7200
46	Sistema Perrito	Oaxaca	7148
47	Cueva de la Puente	San Luis Potosí	6978
48	Sistema Huayatenos (Guayatenos) -Tecaltitlán	Puebla	6911
49	Sistema Actun Koh/Heder	Quintana Roo	6800
50	Cueva Charco	Oaxaca	6710

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# DEEP PITS OF MEXICO

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Mark Minton  
 May 2004  
 Depth in meters

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1	El Sótano (de El Barro)	Entrance drop	Querétaro	410
2	Sótano de las Golondrinas	Entrance drop	San Luis Potosí	376
3	Sótano de Tomasa Kiahua	Entrance drop	Veracruz	330
4	Zacatón	Entrance drop	Tamaulipas	329
5	Sótano de Alhuastle	P'tit Quebec	Puebla	329
6	Nita Xonga	Psycho Killer	Oaxaca	310
7	Sotanito de Ahuacatlán	Second drop	Querétaro	288
8	Sótano del Arroyo Grande	Entrance drop	Chiapas	283
9	Sistema de la Lucha	Entrance drop	Chiapas	280
10	Sima Don Juan	Entrance drop	Chiapas	278
11	Hálito de Oztotl	Entrance Drop	Oaxaca	250
12	Sima Dos Puentes	La Ventana	Chiapas	250
13	Resumidero del Pozo Blanco	Entrance drop	Jalisco	233
14	Sótano del Aire	Entrance drop	San Luis Potosí	233
15	Sistema Ocotempa	Pozo Verde	Puebla	221
16	Live in Busch	Entrance drop	Oaxaca	220
17	Sótano de Eladio Martínez	Entrance drop	Veracruz	220
18	Sótano de los Planos	Puits Tannant	Puebla	220
19	Sótano de Coatimundi	Entrance drop	San Luis Potosí	219
20	Sótano de Sendero	Entrance drop	San Luis Potosí	217
21	Resumidero el Borbollón	Tiro Grande	San Luis Potosí	217
22	Sima de la Pedrada	Entrance drop	Chiapas	217
23	Sima del Chikinibal	Entrance drop	Chiapas	214
24	Cueva del Tizar	Third drop	San Luis Potosí	212
25	Kijahe Xontjoa	Son On Jan	Oaxaca	210
26	Nacimiento del Río Mante	Macho Pit	Tamaulipas	206
27	Hoya de las Guaguas	Entrance drop	San Luis Potosí	202
28	Sistema H3-H4		Puebla	200
29	Kijahe Xontjoa	Lajao Se	Oaxaca	200
30	Sima La Funda	Entrance drop	Chiapas	198
31	Sótano de Soyate	Entrance drop	San Luis Potosí	195
31	Sótano de Alpupuluca	Entrance drop	Veracruz	190
33	Cuaubtempa	Pozo con Carne	Puebla	190
34	Sótano de Tepetlaxtli no. 1	Entrance drop	Puebla	190
35	Sótano de Puerto de los Lob	Entrance drop	San Luis Potosí	189
36	Sótano de Hermanos Peligrosos	Second drop	Veracruz	186
37	Sima de Veinte Casas	Entrance drop	Chiapas	180
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39	Sistema Soconusco	Darwin	Chiapas	180
40	Hoya de la Luz	Entrance drop	San Luis Potosí	180
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## THE BURRO AND THE PICKLE: PROYECTO CERRO RABÓN 2004

Mike Frazier

It was a snowy, cold January evening in the Rocky Mountains. Mike Frazier and Nathan Noble had packed the Burro, a '93 four-wheel-drive F-150, with the necessary supplies for a long journey. Like an old burro, the truck sagged under the load, but it began to work its way south toward the Mexican border and beyond. Minutes, hours, and then days passed. They arrived at San Bartolome Ayautla, the place beneath the clouds, home of their friend Enrique and his family. They rented a secure room, distributed baby clothes to local families, and prepared for the days that followed.

A morning found the duo clinging to the back of a small pickup truck as it made its way up the mountain. Their destination was the Río Santo Domingo canyon. In the canyon are the resurgences to several large cave systems. Arriving at the put-in, a bridge just outside of Quiotepec, at dusk, they inflated the Pickle. The Pickle was a bright green whitewater raft. They floated to just past the town and made camp. The following day was windy. They ran several rapids and portaged another. Then one of them hit himself in the eye with a back-pack frame. Blood poured out, which could have been bad because of the remoteness, but it turned out to be only a lacerated eyelid. They were both getting a little sick, but were happy nonetheless.

The third day on the river proved a little more sporting. They had agreed at the start of the trip that because they were a small team on

a remote, basically unknown river, it would be best to err on the side of safety and portage any questionable rapids. Several times one of the pair insisted that the rapid just ahead could be run. Several times the other talked him out of it. "I think we can make it," said one. The other shook his head. "Dude," he said, "I don't think so." Finally machismo or perhaps stupidity prevailed. Gently eased into the channel, the bright green boat was quickly grabbed by the current. They attempted to back-paddle, but the water quickly enveloped them and pushed them over a 2-meter drop. Things soon turned from bad to worse, when the inflatable hit a rock and flipped the pair like hotcakes into the boiling froth. Most whitewater enthusiasts know to keep their feet down-river, so as to bounce off rocks with their legs rather than their heads. The river had different ideas and shot them headlong into the next rapid, up and over some large boulders. They were both fortunate to find refuge on a branch sticking up out of the water. Even more miraculously, they had both held onto their paddles. From their vantage point, they could see the boat bobbing upstream, apparently caught in a tug-of-war between water and rock. The dry-bag was still attached to it like a giant yellow leech. They decided that one of them would have to try to retrieve the boat, while the second stayed at the tree like a near-drowned rat to catch it in case it worked itself free. Swimming up the river was out of the question.

The only possibility was to swim downstream across to the opposite shore, hike upstream, and approach the boat from above. This of course involved swimming the rapid all over again. By carefully picking his way along the opposite shore, testing the water depth with his paddle, one of them was able to work his way to the boat. A good nudge freed the boat, and he quickly threw himself onto it. Safely passing the rapids, he picked up the river rat.

Onward they descended. They would take unwanted baths two more times before reaching the end of their journey, beyond the resurgences of the Cheve and Huautla cave systems, respectively the deepest and second-deepest in the Western Hemisphere. The water from the many limestone springs greatly increased the flow and turned the river a clear aquamarine color. One's eyes can't help glazing over when they gaze across the remote, rugged landscape. How many uncharted leads remain to be found? In some places the river cuts canyons with cliffs hundreds of meters high.

Since the start of the river trip, the two had been sick, with vomiting and an evil dose of Montezuma's revenge. They had lost the last page of the map to an malevolent wave, but thought that they must be nearing Ayautla. They were weighing their options when they passed under a footbridge swinging some 5 or 10 meters above the river. A bridge meant there was a good trail, and good trails generally lead to people and towns. They

maneuvered the Pickle into an eddy and onto the sandy shore.

The day was still young as the pair rolled up the heavy boat and attached it to the backpack frame. Although the burdens were heavy and the trail immediately headed steeply upward, they were enthusiastic, because they had finally gotten relief from the sickness that had plagued them for several days. Trading packs now and then, they climbed upward through banana and orange groves for several hours. The heat soon became intense, and the water in the hundred-ounce Camelback they shared began to dwindle rapidly. More hours passed, and they ran into three men picking coffee beans in a field. "Ayautla?" they asked, gesturing to the trail disappearing into the hillside above. "Si, Ayautla arriba," replied one of the men, pointing toward the top of the mountain. This gave them renewed hope. They had guessed that the distance from the river to Ayautla was only a few kilometers, and it seemed that they had already come seven or eight. Looking at the ridge before them, they joked about its being a false summit. More hours passed, as they sweltered and rationed their precious water, counting gulps. The summit indeed turned out to be a false summit, the edge of a long ridge climbing ever skyward. They were looking down on what they had once seen as the top when they consumed the last of their water and the sun sank low in the western sky. Their once-crisp pace had turned into a slow, painful trudge. They had hiked the entire day, and still no sign of town. The day was turning to dusk when the cavers came upon a small thatch house. They asked the man who came out to see why his dogs were barking for directions to a spring. The farmer stepped into his house and returned with a pitcher of water. They drank it all, and the man then graciously supplied more. A woman soon appeared from inside the dirt-floored house and offered some tamales, which the cavers politely but hungrily ingested. The woman cleared a table inside and began preparing coffee. The cavers related their river

journey from Quiotepec and the hike up the mountain seeking Ayautla. The Mixtec man explained that the pair was about a half hour from San Isadoro and about an hour from San Juan Coatzacoapan, a town that the cavers had passed through on several occasions, including four days before riding in the back of a truck to the beginning of this adventure. San Juan is a Mixtec town surrounded on all sides by Mazatec areas. It is high on the southwest flank of the Cerro Rabón, a short twenty-minute drive up the mountain from Ayautla. They had left the river too soon and been on the wrong trail, which took them much higher than necessary. As darkness set in, the cavers asked about a place to sleep, and again the man showed his generosity. Only after much insistence by the cavers the following morning did he accept fifty pesos for his kindness. The pair once again set off on foot, and two hours later they finally reached the highway, where they soon caught a ride down the mountain to *la casa Enrique*.

There were a few days to kill before the caving in the Cerro Rabón was scheduled to start. Hot showers, cold beer, and a last-minute shopping spree in Tuxtepec were on the schedule. Street grunting (caver slang for buying meals from street vendors) kept one caver full and the other all too empty as he went back into vomit mode. While heading back to Ayautla the next afternoon, the men decided to take a 30-minute detour down a dirt and gravel road for a last dunk in the river. While they drove across the shifting cobbles along the river's edge, the front sway bar broke free from its mounting on the frame. It then swung under the belly of the Burro and snapped the passenger's end of the tie rod. If this had happened on the highway, it could have been deadly, and even here, 10 or 12 kilometers from a paved road, this could have spelled big trouble. The nearest town with any kind of auto parts store was a couple hours' drive down the highway, and it was Sunday afternoon and all the shops would be closed. Again they had

good luck, this time in the form of a young gentleman named Santos. First he helped pull the broken parts. Then he drove to Jalapa de Díaz to look up a friend of his who was a welder. Returning to the Burro with the repaired parts, he reassembled the suspension, and they were back in business in less than two hours at a cost of around US\$20. They made it back to *la casa Enrique* as darkness fell and were greeted by the smiling faces of Polish cavers Małgorzata Barcz, Tomek Fiedorowicz, Artur Nowak, Katarzyna Okuszko, and Paweł Skoworodko. The Proyecto Cerro Rabón team was assembled, and all that remained was to receive permission from the town.

The first year of the project, permission had been acquired through the *municipio*. The second year, permission had had to be obtained from the *municipio* and the *presidente* of the town. This year, as might have been expected, they had to have permission from the municipal government, the *presidente*, and the *conasupo* of the *edijo*, head of the community lands. Luckily, Grace Borengasser, Ernie Garza, Matt Oliphant, Nancy Pistole, and Charlie Savvas, who were in the area for caving or rafting adventures, showed up with copies of permission letters from higher authorities just moments before the scheduled meeting with the *conasupo*—the only meeting, coincidentally, where the letters were requested. At a town meeting, the cavers listened to the story of a large, man-eating bird that once lived in a nearby cave. She often feasted on the locals, until one day she picked up a fierce young Mazatec who managed to slay her with his machete. The townsfolk then banded together and delivered to the bird's hatchlings the same fate as their mother's. At the meeting the cavers also had to ease some of the standard apprehensions: No, cavers weren't looking for treasure, worshipping the devil, or paying off any of the town's leaders. They were then provided with three members of the Vigilance Group to serve as guides, guards, and carriers. (The Vigilance Group is appointed by the town to

watch over and protect the ejido resources.)

The group woke up the next morning with sleepy eyes, rushing feet, and last-minute cramming of items into pockets of the already bulging packs. At the last minute, somebody remembered the need for cooking gas. Advice about the river was given to the group that had brought the letters, and the two groups wished each other luck with the river or Sistema de los Tres Amigos.

The conasupo's office lay on one of the uppermost streets in Ayautla. After each guide was matched with a pack, the team headed eastward toward the edge of town, then began veering northward along a much thinner trail. The trail splits at a large rock overlooking the highway and the Río Santo Domingo. One branch slopes down toward the huge resurgence of the Río Uruapan [see AMCS Activities Newsletter 26, pp. 78–81]. The other turns steeply upward toward Tres Amigos. Skirting above or sometimes below steep cliffs, the trail eventually passes a spring. Just beyond the spring is a much fainter trail heading downward. This trail ends at a cave that has yet to be checked out by cavers. Their trail headed upward and north across clear-cut fields on east-facing slopes, then loosely followed the cliff line east again.

Up ahead, a team member was shouting wildly. Asked about the commotion, he said, "Just stepped on a fer-de-lance." There are several little nasties that make their homes in this cloud forest. Many are not so obvious. There is the tree whose bark is covered with a coating of thick, sharp needles just waiting for a poorly placed hand. Even more notorious is the *mala mujer*, whose nettle-like spines inject an itchy oil-based poison when they come into contact with flesh. Scratching only spreads the oil, making things very unpleasant all over.

The oldest guide, a stout man of sixty-five, was starting to show signs of fatigue. He was assured that *tranquilo es bien* and he need not race. They had all day. A while later

he caught up with the others, who were resting. The other guides appeared uncertain as to the location of the cave. Only one of the guides had ever been out this far from town, and that was as a sherpa for the project in 2003. The cave had to be close. ("Caves, they can hide, but they can't run." — Nathan Noble.) Holding a finger to his lips, a gringo turned to the guides and whispered, "*Escucha.*" The forest was full of sounds, the usual shrills of exotic birds and even the tumbling of a leaf from the canopy some 50 meters above. But the sound the team was listening for, the sound of falling water, could not be heard. "*Esperar aquí,*" the gringo said, and disappeared into the forest alone. It was only a few minutes before his voice broke the silence. "*La cueva aquí.*" He looked concerned, however. Normally a small shower of water can be seen and heard flowing from a small lead high in the entrance shaft. Now it was only an occasional drip. Hunters' tricks like cutting a vine and letting it drain into one's mouth might work well for a small drink, but it might become quite a task to collect enough water for group meals.

The team assembled in a semi-flat area just above the cave. This was to be their base camp. They paid the guides, who, after a drink of *agua de maíz*, disappeared in the direction of town and left the cavers to the work at hand. A lot had to be done, and everyone set right to the many tasks. A tarp was set up in the entrance shaft to begin collecting water. Tepolote fronds were collected and placed on the forest floor around the camp. (Tepolote is an edible plant whose flavor raw is quite bitter, but which mixes well with black beans and salsa on a tortilla.) The fronds provide a good base for beds and walking, keeping the mud to a minimum when it rains. The area gets about 6 meters of rain a year. A group shelter was erected, a latrine was established, and so on. By nightfall they had a cozy little area, where three tents snuggled happily, sides touching. There was also a modest group cooking area and a zone for group gear.

The next morning, six of the seven entered Sistema de los Tres Amigos. One group of three was headed to El Corazón de la Amiga, an immense, 5-acre room with a 120-meter-high ceiling that had been found in 2003 [see AMCS Activities Newsletter 26, pp.70–75]. They would try to push through the breakdown at the bottom of the room and scour it for other leads. The other group headed for Avenida So Co Mo Gro, a windy and dry, as far as it was known, passage that takes off from the bottom of the fourth pitch, which is 41 meters deep. The Corazón team worked their way into the breakdown floor an estimated 30 meters below the deepest previously surveyed station in the cave. The SCMG team prevailed as well, surveying open passage before them. The floor became muddy soup where a small spring joined the passage from a tight, crawly side lead. They worked their way down through meanders and several short drops to add 40 meters to the depth of this passage. The cave seemed to be going, but they ran out of water.

The morning of February 5, two groups of three entered the cave. One group returned to the Corazón room to survey the previous day's scoop and push some more. That team ended up surveying the predicted 30 meters of depth, stopping at a constriction. The SCMG team fared a little better. They ran out of rope after pushing the passage down an additional 82 meters in depth. They turned back where the cave had good air and water flow and the passage appeared to be getting bigger. During his exit from the cave, one member of that group had a close call. He discovered that his D-link had opened and he was hanging by only one side of his harness and one leg loop. Terrified, the caver hooked one leg over a nearby projection and pulled himself close to the wall to un-weight his harness so he could reattach and readjust his system. It's your ass—check your system often. It turned out to be a dramatically wet exit for both groups. Heavy rains that had begun falling earlier in the day had turned the occasional drips in the 41-meter

# Sistema de los Tres Amigos

Nindo Ka, Sierra Mazateca, Oaxaca, México  
 Suunto and Tape Survey  
 Surveyed by Proyecto Cerro Rabón  
 Te Chan Xki (Feb) 2004  
 Cartografía by Chris Andrews

EL PERSONAL  
 ENUMERA:

2002

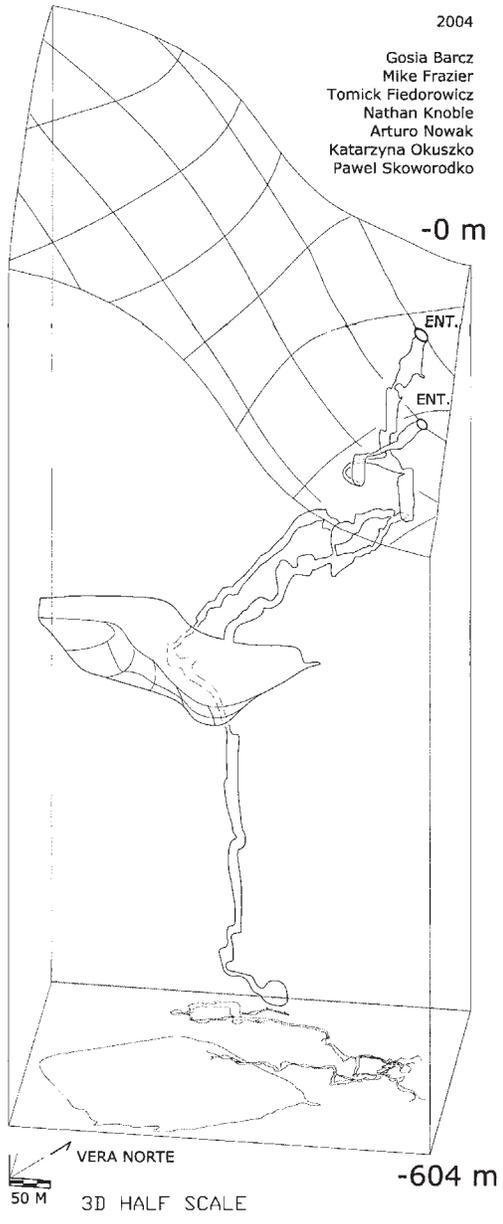
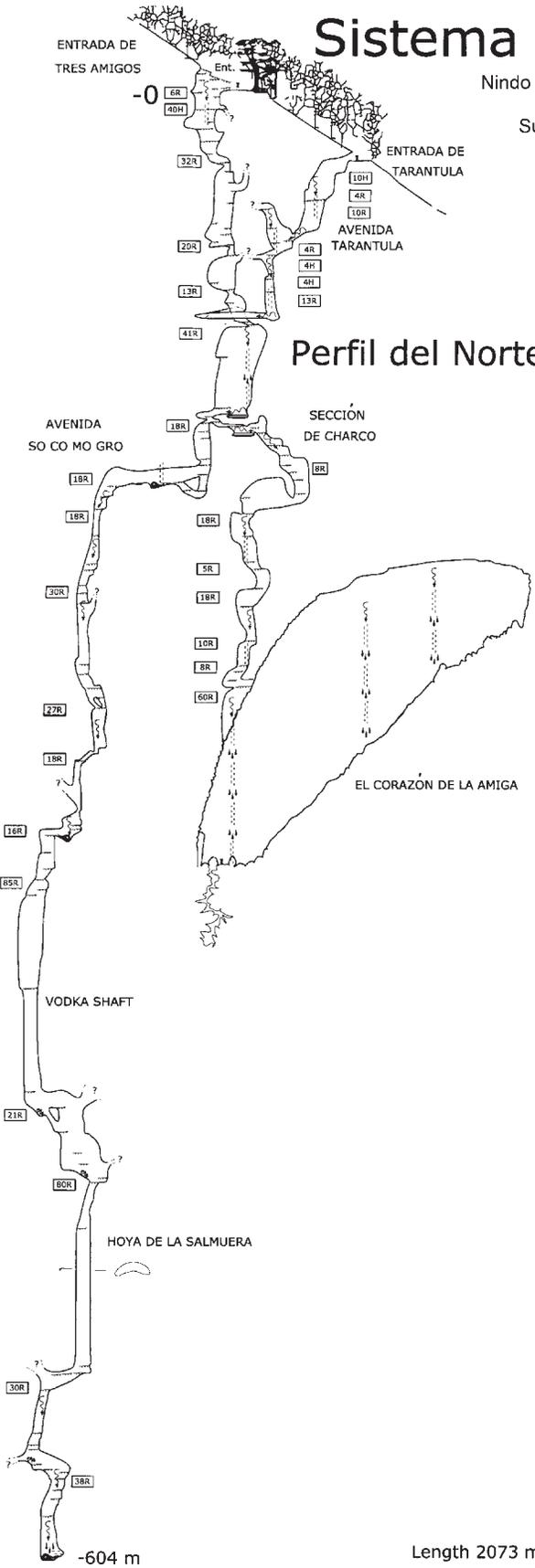
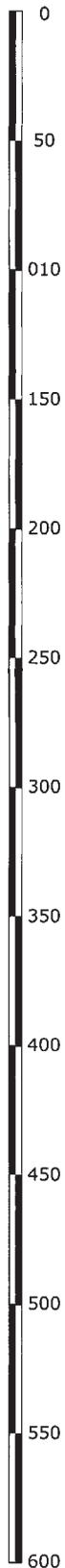
Mike Frazier  
 Randy Macan  
 Paul Mozal

2003

Chris Andrews  
 Mike Frazier  
 Patricia Malone  
 Cindy Maestas  
 Randy Macan  
 Paul Mozal  
 Mike Miskol  
 Nathan Knobler

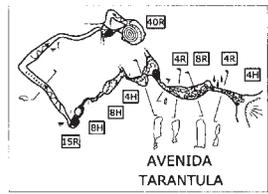
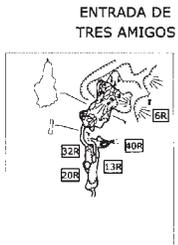
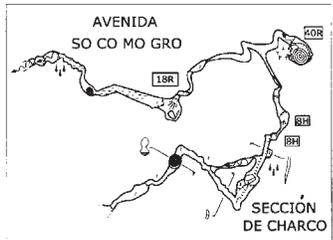
2004

Gosia Barcz  
 Mike Frazier  
 Tomick Fiedorowicz  
 Nathan Knobler  
 Arturo Nowak  
 Katarzyna Okuszeko  
 Pawel Skoworodko

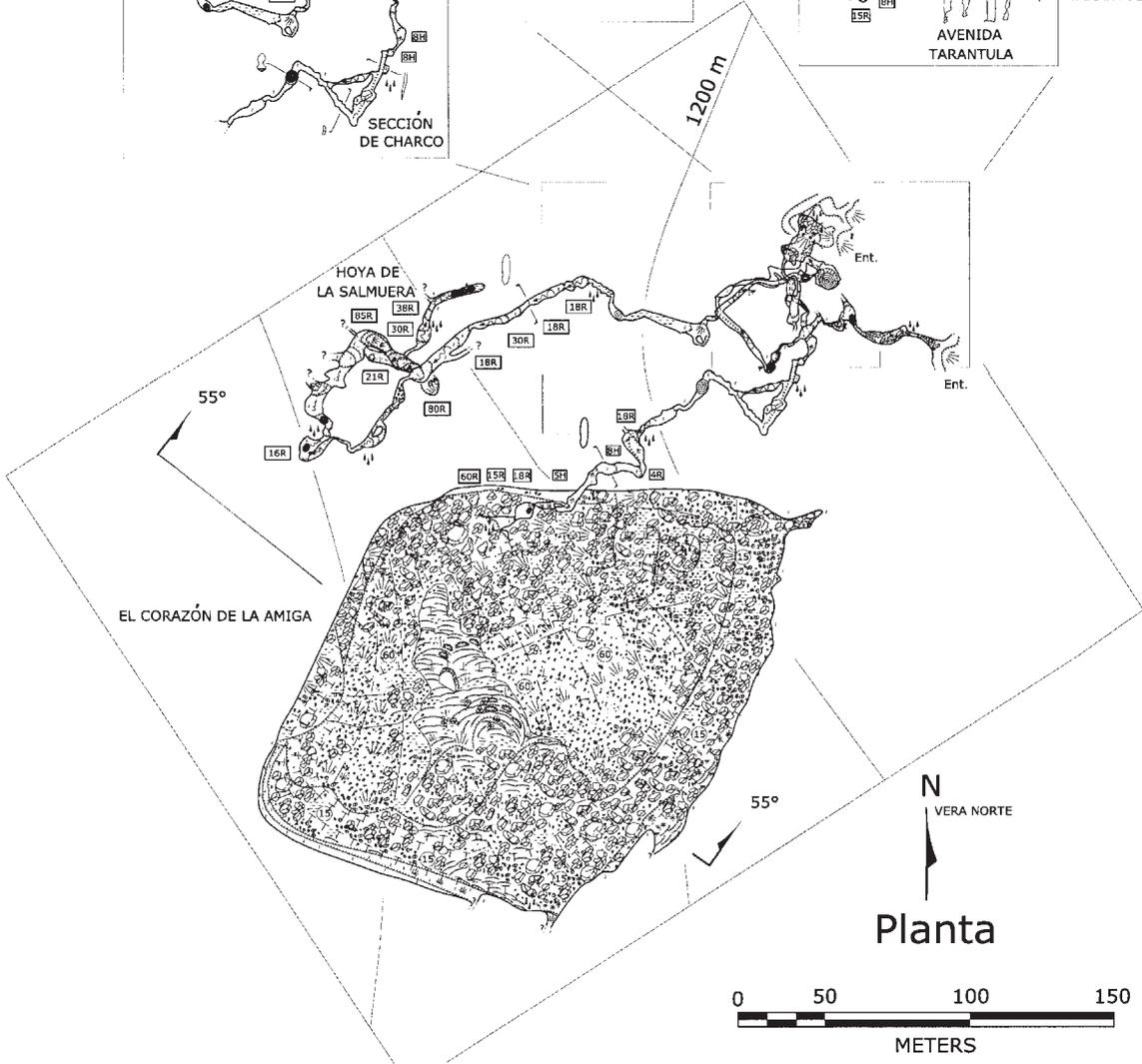


Length 2073 m (6800 feet), vertical extent -604 m (1982 feet).

EXPLICACIÓN			
	SLOPE		HUMAN SCALE
	VERTICAL DROP		STALACTITE
	UNDERLYING PASSAGE		STALAGMITE
	PIT		COLUMNS
	DOME		STRAWS
	PILLAR		FLOWSTONE
	BEDROCK		CALCITE FLOOR
	BREAKDOWN		CAVE PEARLS
	GRAVEL		HELICTITE
	MUD / CLAY		ARAGONITE
	CEILING HEIGHT (m)		POOL
	RIGGED ROPE LENGTH (m)		WATERFALL
	R: Pit; T: Traverse		



ENTRADA DE TARANTULA



pit into a pounding shower. It was a bit disconcerting for those in the group who usually cave in places so cold that being hit by falling water means you are probably going to die of hypothermia. Fortunately, everybody got out just fine. The rains continued throughout the night.

At first light it was clear that the drizzle would continue. Crawling from their nests one by one, the cavers were shocked to see that a tree about a third of a meter in diameter had fallen in the night. It ripped down part of the group shelter and missed one of the tents by centimeters. They soon chopped off enough branches from the 10-meter-long tree to reopen the trail to the latrine. A group of five entered the cave armed with all the remaining Cancord 9-millimeter rope, 176 meters, as well as the long handline from the slope in the entrance passage.

When they reached the virgin pit, three people began to survey, while the remaining two started rigging down a drop to a pool and through a short meander containing another short drop. Then, after climbing up a short distance, they reached the edge of an immense void. First a lead line was set. Then two bolts were placed for a self-equalizing figure-8. From here, one descends to the first rebelay, and after crossing it safely, down to the second, then still downward to yet another, where it is possible to take in the true vastness of the pitch. From the fourth rebelay, it is finally possible to view the sloping floor below. Once down, one can descend the slope to the top of another pit, where the team ran out of rope.

Meanwhile, on the surface, the steady rain was beginning to make its way into the floors of the tents. The surface-watch crew dug deep drainage trenches around the group of tents. They had to work quickly and became wet and covered with mud.

Since the team was out of rope and there was a deep, going pit waiting to be dropped, they decided to derig the Corazón side of the cave for rope to push the going lead. The following day a group of

three entered the cave. After an hour or so, two of them returned to the surface, citing discomfort with the water in the 41-meter pit, by now also known as Tarantula Pit for the fuzzy arachnid hanging out on a ledge partway down. The remaining caver managed to derig the big room and take the rope up to the junction just below the 41-meter.

That night everyone was awakened by the thunderous sound of a huge rock fall. The next morning the group arose to find that another tree near camp, this one perhaps twice as large as the one that had fallen before, had been snapped off like a twig during the night. Apparently a giant boulder had struck its canopy and broken the large hardwood 3 or 4 meters above the ground. Three people then entered the cave to continue derigging the other main passage and to put a re-direction in near the top of Tarantula Pit. This set the stage for further exploration the next day, when they awoke to rays of sunlight breaking through a rising fog. A day without rain was a welcome change. Breakfast was big, spirits were high, and plans came together in the usual easy-going way. Three of the seven would go into the cave loaded with the new supply of rope and push the waiting deep, virgin shaft. Two would do an ultra-light recon to the top of the ridge, where the karst rises to an elevation of over 2200 meters.

When the in-cave crew reached the top of the virgin pit, they began to make music, first the familiar ping of a hammer hitting hard rock and then the sweet sound of a measuring tape bleeding out of its reel. The cave quickly dropped another 80 meters through an area that might best be described as Swiss-cheese passage. Then after a brief 15 meter respite of horizontal passage, the music continued, and the cave dropped another 25 meters.

Meanwhile high on the mountain, the recon crew had settled into a relentlessly energetic rhythm. There was a lot of ground to cover. Using the GPS had been nearly impossible under the tall canopy of the forest lower down, but once they reached the more open pine forest

above, they were able to navigate with it quite well. Navigation wasn't the problem up there; movement was. They found themselves balancing on razor-sharp rock spires and stepping over deep crevices onto slick rotting logs while vines attempted to trip them up and pull them down onto the forest floor that lay somewhere below. Traveling on this "killer karst" can range from tricky to deadly. It can take more than an hour to go only a few hundred feet. They climbed down sinkhole after sinkhole, checking for caves. As the sun was starting to get low, the two agreed that this was no place to be after dark. They made their way to the edge of the pine forest to find a place to camp. True, the forest floor was friendlier, but it was still steep mountainside. Finding a semi-flat 1-by-2-meter spot for the hammock proved difficult. They came to a place that, if a dead tree was removed and its stump and the rocks covered with enough pine needles, might work. After sharing rations of a half pack of tuna, a candy bar, and three gulps from the Camelback, the two set in for a very long and very cold night in cramped quarters.

Early the next morning the sun once again lifted the plumes of fog to reveal the Cerro Rabón. Two cavers entered the now-familiar entrance shaft of Tres Amigos. Picking up the duffle of ropes and rigging supplies stashed along the way, they pushed onward toward the pit lead at the bottom of known passage. Once there, they rigged a 30-meter drop, which was followed by another. At the bottom of the second pitch they arrived at a funnel-shaped sump, the Swimming Hole. Mud oozed into it from a tight hole on the other side. This was not a way on. The depth of the cave is 604 meters, and the surveyed length is 2073 meters.

The two on the mountain realized that checking all five of the sinks they had marked on the map was not possible in the time they had allotted themselves. The first sinkhole alone was almost a kilometer wide and filled with scores of smaller sinks and pits. They agreed

to drop back into the first one for an hour or so and then head over to sink number five. Dropping into the killer karst once again, they began skirting the edges of deep, vine-covered shafts with dead bottoms. OK, enough of this already. They reversed direction and headed toward sink five. This sink was a little over a mile away and directly on the other side of a formidable ridge. As they struggled toward the summit, an hour or so later they came upon a 2-meter-wide shaft that, judging by dropped rocks, was fairly deep. Noting its location with the GPS, they continued. Looking down a

while later on the first sink, they saw an obvious opening in the trees, far into the sink and dark looking. They had been so close. They debated going back down there, but decided to push on. Up and over they went, recording another small shaft along the way. Sink five was friendlier than sink one, but still it was difficult to tell where the lowest point was, due to the many smaller depressions in it. Cut, bruised, and fatigued, the two made it back to base camp by nightfall.

That night somebody uttered the word *beach*. It is truly amazing how

quickly a cave can get derigged and a camp broken when rout-fever spreads. By the next evening they were back at Enrique's drinking cold beverages.

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The members of the project thank the sponsors, two of the finest caving clubs in Colorado, the Northern Colorado Grotto and the Southern Colorado Mountain Grotto. Their continuing support over the years has been the key to successful exploration in this renowned caving area.

#### Cerro Rabón 2004

En enero y febrero del 2004, dos espeleólogos de Colorado, EUA, descendieron en balsa por el cañon del Río Santo Domingo en Oaxaca, de Quiotepec a cerca de Ayautla. Entonces, junto con cinco espeleólogos polacos, acamparon en las laderas inclinadas del Cerro Rabón, sobre el nacimiento del Río Uruapan, y exploraron el Sistema de los Tres Amigos a una nueva profundidad de 604 metros. La exploración inicial de Tres Amigos es descrita en la AMCS Activities Newsletter 26.



Société québécoise de spéléologie

## MEXPÉ 2002 — SISTEMA TEPEPA

Matthieu Lévesque and Guillaume Pelletier

During April and May 2002, eighteen cavers from Quebec, Mexico, the United Kingdom, and France met in the Sierra Negra to pursue the Société Québécoise de Spéléologie cave-exploration project called Mexpé. The whole venture started back in 1987, and Mexpé 2002 was the tenth SQS expedition to this world-famous karst zone. The expedition objectives were really motivating, since we were almost assured of making two important connections to make Sistema Tepepa almost 27 kilometers long and 900 meters deep. Furthermore, this would create a 781-meter-deep traverse between the highest entrance and the resurgence. Even though everyone was eager, there was still a lot of uncertainty about getting permission to explore in that area. [An article on this appears in *Sous Terre*, vol. 17, no. 1, fall 2003.]

As some might remember, the 2000 expedition ended in a rather large cave rescue of a friend who was injured by a serious fall in the Andromède part of TP4-13, at a depth of 340 meters. Consequently, the evacuation of the victim was quite complex, with cavers, Cruz Roja, "grupo especial," and Mexican army and police coming to the sierra to try to help us. [See *AMCS Activities Newsletter* 24, pp. 25–30.]

Reprinted, somewhat revised, from the *Canadian Caver*, number 60, 2003. A version also appeared, in French, in *Sous Terre*, volume 17, number 1, 2003. The foldout map is from *Sous Terre*.

The political and diplomatic impacts of the rescue were significant, as it involved diplomats in both Mexico and Canada. The international press did an ugly job of reporting on the rescue. Mexpé 2002 was undoubtedly going to have a difficult task of administration and diplomacy.

Once the dust had settled after the rescue, it was obvious that exploration in the area needed to continue. The Sociedad Mexicana de Exploraciones Subterráneas organized an expedition to the Sistema Tepepa resurgence cave, Xalltégoxtli. [See *AMCS Activities Newsletter* 24, pp. 39–47.] SMES cavers had been involved in the Mexpé project since the beginning in 1987, and they had concentrated their work on the resurgence zone. The April 2000 expedition was led by SMES cavers, accompanied by three SQS members, and since it was mainly Mexican and took place on Don Tutillio's private land, special exploration permits were not needed. It found an extremely important junction between Xalltégoxtli and Ehécatl. To celebrate this, it was decided to make Mexpé 2002 the first large joint SQS-SMES project, with lots of cavers from both groups.

The study area is in the southwest corner of Puebla, bordered by Oaxaca and Veracruz. It's a two-day journey from Mexico City, and transportation is now available all the way to Tepepa de Zaragoza. Up in the sierra, where Nahuatl is spoken, the locals have been receiving us with open arms

since the beginning of the Mexpé project.

Every expedition has brought back interesting results. Most of the early explorations were done in TP4-13, known locally as Olfastle de Niebla, and Sistema Ehécatl-Xalltégoxtli, both with about 10 kilometers of large passage. In January 1994, a Quebec-France expedition discovered TP4-27, which would become a key cave in the study area, with 5 kilometers of passage to a depth of 311 meters. That year the team thought they'd connected it to TP4-13, based on finding topofil thread. In fact, the connection had been made, but it was in a maze of passages where it proved difficult to hook up the surveys. The TP4-27 entrance leads to a high, fossil part of the cave, but with a stream in a canyon 30 meters below. The team explored upstream in this Afluente de los Alrededores and stopped at the base of a 25-meter, very wet cascade. In a hurry at the end of the expedition, the cavers concluded that upstream in the Afluente was probably going to connect to TP4-13, but it remained unexplored until Mexpé 2002.

In January 1997, a second entrance to the TP4-27 cave was found. TP5-17 gave quicker access, down 150 meters of vertical cave, to the Afluente stream. In fact, it completely bypassed the fossil section explored in 1994.

Data compiled in December 1999, before the Mexpé 2000 expedition, showed that a connection was possible not only with TP4-13, but also with Sistema Ehécatl-



On the way to base camp at Hoya Grande. *Gustavo Vela.*

Xalltégoxtli. According to the data, downstream in the Afluente should lead right to Ehécatl, 30 meters away vertically and 70 horizontally, where exploration had ended in 1991 at the base of a 25-meter cascade. Upstream, aid climbing could lead to TP4-13. These connections were the objective in 2000, but instead participants ended up working on the rescue.

The 2002 expedition was to make these connections. Once linked, these caves would make up Sistema Tepepa. There would also be much surface work to seek access to more upstream parts of the underground stream in the Afluente de los Alrededores and generally gain more knowledge of the whole area. The first and most satisfying connection was made at the beginning of the

Left to right, standing: Vicente Loreto, Jonathan Sims, Annick Normandin, Rich Gerrish, Humberto Tachiquin, Jesús Reyes, Joel Corrigan, Matthieu Lévesque, Christian Chénier, Guillaume Pelletier, Luc Le Blanc, Ramon Espinasa, Marc Tremblay. In front: Chris Densham, Gustavo Vela, Christian Francoeur, Jacques Orsola. *Gustavo Vela.*

trip; it was surprisingly easy to make. On March 27, a team went down the TP5-17 entrance into the Afluente. Once in the river and going downstream, they quickly arrived at the top of the cascade seen in 1991 in Ehécatl. After it was rigged, a team of five rappelled down and quickly found a permanent survey station left more than a decade before. The team then split in two, one to survey the connection and the other to seek a fossil passage going upward to TP4-13. Neither was able to complete its mission that day, but pizza and Cabernet Sauvignon were on the menu for a celebration supper at base camp that night.

The second connection turned out to be substantially more difficult. It took four trips, including the one on March 27, before we were finally able to map the 106 meters of a connection, Via Lactea, between TP4-27 and the upper part of TP4-13. We lost a lot of time trying to get back up to the fossil part of TP4-27 from the Afluente. The mapping that had been done in 1994 from the fossil part gave us the impression that we could easily make the climb, but in fact it was impossible to climb to the upper levels from the active streamway, which we were reaching via the TP5-17 entrance. After the second unsuccessful attempt, another team entered TP4-27 by the original entrance and left a rope

hanging down into the Afluente, so that, on a fourth try, a team finally managed to map a connection to TP4-13.

The TP4-13 to TP4-27 connection had been an objective of the Mexpé 2000 expedition, so it is interesting to note that during the rescue then, Guillaume had actually explored, without knowing it, the area of the connection when setting up the underground antenna of the Nicola cave radio in a small inlet. He was quite amazed to connect TP4-27 two years later through this tiny passage.

In the heat of the Mexican sun, surface prospecting is not an easy task. The difficult terrain and the dense jungle make it quite an adventure to go out and search for new caves. Many entrances are found, but few pay off. Over the years of the Mexpé project, searches have become farther away, higher up, and generally more remote. Finally, on April 6, 2002, a team of four found a tiny sinkhole at the bottom of a long gully. The terrain was so difficult that just getting to the entrance was an adventure. It was a steep downhill climb, with sharp limestone and huge cracks all over the place. About 100 meters of rope was used to just reach the entrance. We named the cave Gymnástica Selvática. It consists of an active stream flowing gently into the heart of the Sierra Negra. We immediately supposed it would lead toward the head of the Afluente de los Alrededores, and people

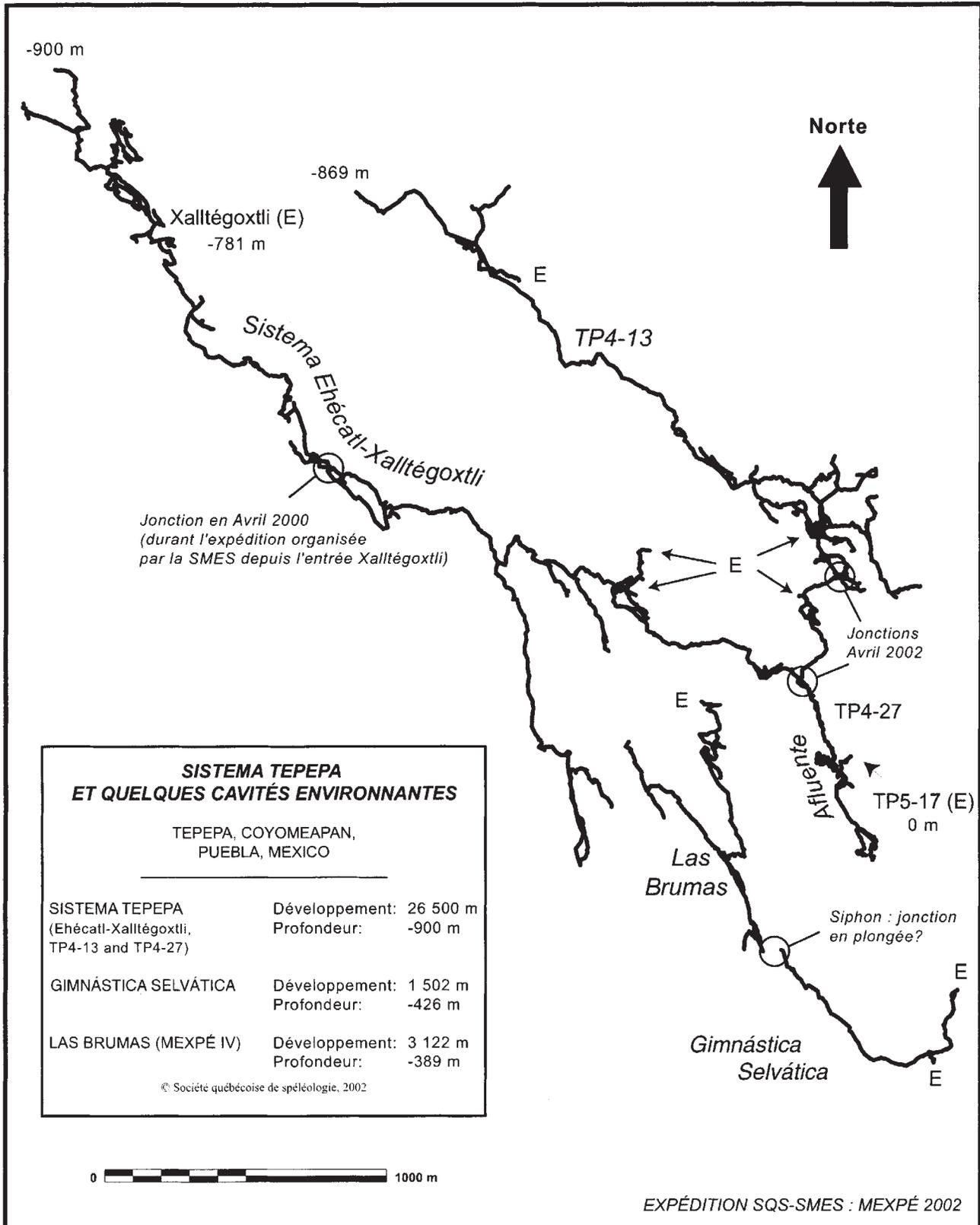


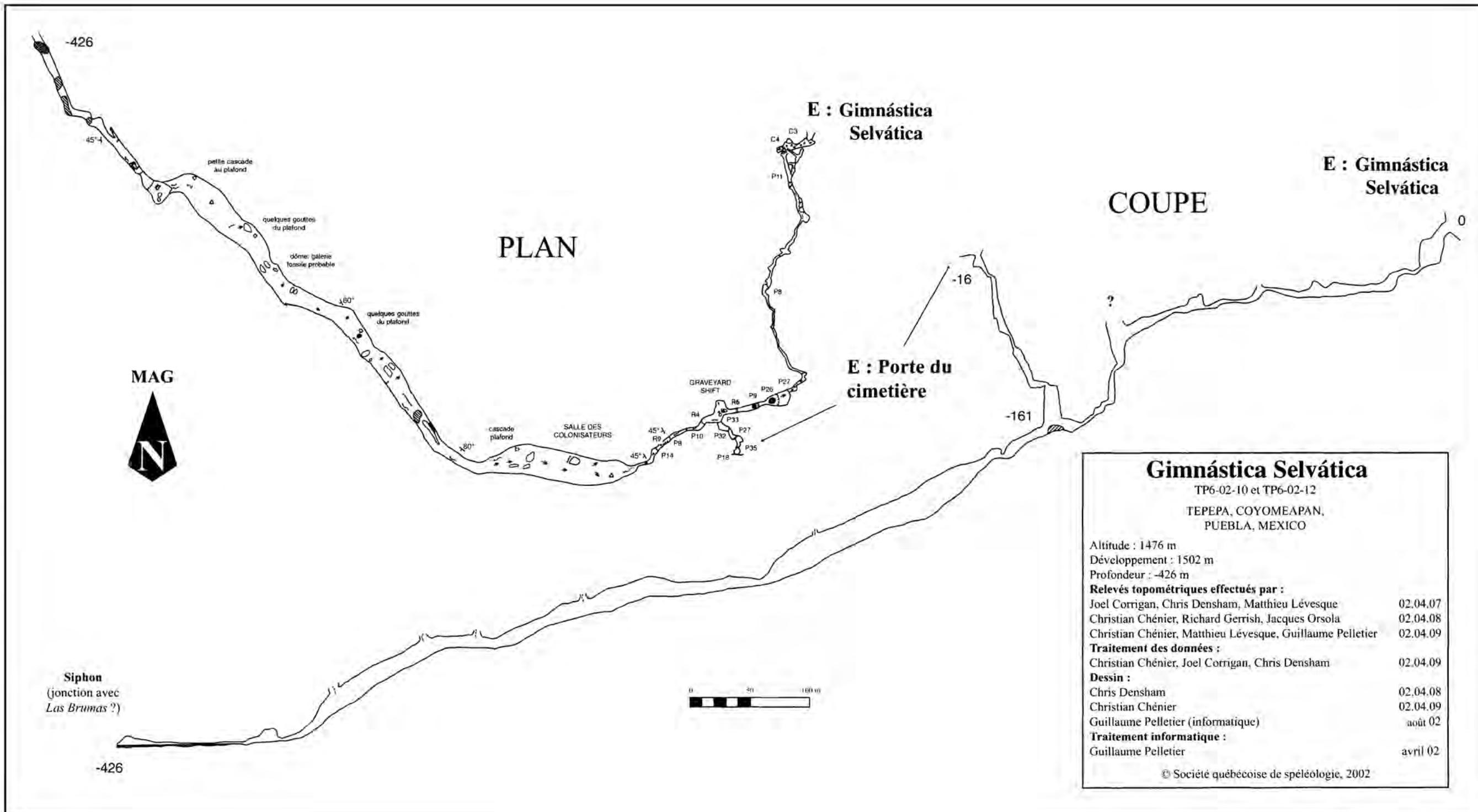
were excited by the prospect of meeting fellow cavers coming upstream in the Afluente.

From the entrance the cave follows a meander that is sometimes

more than 30 meters high. A slope reaches one of the highlights of the cave, where vertical shafts of 22 and 26 meters lead toward the Graveyard Shift hall, later the site of a

connection from the Puerte du Cimetière, a second entrance found not more than 100 meters from camp on the eve of our departure. It consists of 150 meters of pure





E : Gimnástica  
Selvática

E : Gimnástica  
Selvática

PLAN

COUPE

E : Porte du  
cimetière

**Gimnástica Selvática**

TP6-02-10 et TP6-02-12  
TEPEPA, COYOMEAPAN,  
PUEBLA, MEXICO

Altitude : 1476 m	
Développement : 1502 m	
Profondeur : -426 m	
<b>Relevés topométriques effectués par :</b>	
Joel Corrigan, Chris Densham, Matthieu Lévesque	02.04.07
Christian Chénier, Richard Gerrish, Jacques Orsola	02.04.08
Christian Chénier, Matthieu Lévesque, Guillaume Pelletier	02.04.09
<b>Traitement des données :</b>	
Christian Chénier, Joel Corrigan, Chris Densham	02.04.09
<b>Dessin :</b>	
Chris Densham	02.04.08
Christian Chénier	02.04.09
Guillaume Pelletier (informatique)	août 02
<b>Traitement informatique :</b>	
Guillaume Pelletier	avril 02

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Siphon  
(jonction avec  
Las Brumas ?)

-426

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-161

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vertical cave of amazing dimensions, and it takes you right into the heart of the cave in about one hour, once everything is rigged. Beyond Graveyard Shift there is a long, huge chamber of impressive dimensions: 120 meters by 70 meters. The name La Salle des Colonisateurs was given to underline the event of having French, British, and French Canadian cavers exploring together the day it was found. From -240 meters to the final sump, the dimensions of the cave passage are just what one expects in a Mexican cave. A final pitch of 14 meters takes one to the sump, where exploration was stopped.

Gymnástica Selvática turned out to be a fantastic 1.5-kilometer-long cave with a respectable depth of 426 meters. It was explored during three big trips on the last two days of the expedition. This gives us new knowledge of the underground drainage system in this poorly known area, Hoya Grande, the 1000-by-500-meter doline where the base camp was located. When we plotted the survey on a map of the area, we found to our

Jonathan Sims enjoying the water in the Afluyente de los Alrededores.  
*Gustavo Vela.*



surprise that the sump is about 70 meters from an upstream sump in a cave called Las Brumas, explored back in 1991 during Mexpé IV. So an underwater connection to this cave is possible. Since Las Brumas has a good chance of connecting one day to Sistema Tepepa, the whole system could easily gain another 6 kilometers of length.

As for Sistema Tepepa, we still haven't found an upstream river flowing into the Afluyente de los Alrededores, which is a big mystery. A serious amount of water, more than 1500 liters per second in a big flood, flows in this passage, hence the importance of tracing its route. Once again, this expedition showed that lots of interesting work still lies ahead for generations of cavers.

Participants in Mexpé 2002: From Mexico: Ramón Espinasa, Gustavo Vela Turcott, Umberto Tachiquin, Jesús Reyes, Juan Antonio Montaña Hirose, and Arturo Robles; from Quebec, Christian Chénier, Christian

Francoeur, Luc Le Blanc, Matthieu Lévesque, Annick Normandin, Guillaume Pelletier, and Marc Tremblay; from Great Britain: Joel Corrigan, Rich Gerrish, Chris Densham, and Jonathan Sims; from France: Jacques Orsola.



Jonathan Sims and Marc Tremblay upstream of the 25-meter cascade near the junction between the Afluyente de los Alrededores and Sistema Ehécatl-Xalltégoxtli.  
*Gustavo Vela.*

### Mexpé 2002—Sistema Tepepa

Durante la expedición 2002 de la Société Québécoise de Spéléologie al área de Tepepa de Zaragoza en la Sierra Negra, Puebla, dos conexiones se lograron. TP4-27, explorada por primera vez en 1994 fue conectada fácilmente al sistema Ehécatl-Xalltégoxtli siguiendo la corriente del río subterráneo. La conexión a TP4-13, Olfastle de Niebla, fue más difícil pero finalmente se encontró en niveles superiores. El nuevo Sistema Tepepa tiene 26,500 metros de longitud y 900 metros de profundidad. Una nueva cueva, Gimnástica Selvática, fue explorada en los tres últimos días de la expedición. Probablemente conecte a través de un sifón a Las Brumas.

# CAVING IN SISTEMA CHEVE, OAXACA

R. D. Milhollin

Sistema Cheve is the deepest cave in North America. It is located at the low end of a huge sink in the mountains of the Mexican state of Oaxaca. This cave has been explored for many years, most recently in the spring of 2003. The expedition was organized by veteran caver Bill Stone, perhaps best known for his efforts in the Mexican cave Sistema Huautla and his projects at Florida's Wakulla Springs. I had met Bill on a caving trip to the Purificación project region of Mexico and was asked to participate at Cheve.

My traveling companions for the long drive down were Melanie Alspaugh and Philippe Sénécal, who journeyed from France to attend, and Paula Grgich, who had just earned her masters degree in geology. Paula flew into Dallas from Pittsburgh, and we picked up Melanie and Philippe in San Antonio. The drive down was a little cramped, but we managed well. A couple of adventures along the way included finding a Mexican hardware store in downtown Monterrey that carries nut-grade carbide and traffic hassles when we unwisely entered the federal district that surrounds Mexico City. In the first case I drove right through the traffic to

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Adapted from a series of articles that appeared in the *Maverick Bull*, publication of the Maverick Grotto, volume 15, numbers 9–12, 2003. The reader may want to follow along on the map of Sistema Cheve that appears on page 51 of *AMCS Activities Newsletter 23*.

the store, following my memories of Monterrey from when I was last there at age twelve. That place has changed! After staying overnight in Ciudad Victoria and a fine light breakfast in the city market, we proceeded south past the Aquismón region and into the mountains of the Sierra Madre beyond Tamazunchale. Bill had advised taking the coastal route all the way to Veracruz and then turning inland through Tehuacán to Oaxaca, but we decided the route through the capital looked faster and would be more scenic and interesting. We assumed the traffic would be horrible, and we were willing to just look out the windows at the sights of the great city. But we were completely unaware of the restriction on automobiles entering into the defined urban limits. Each day only vehicles with certain ending digits on their license plates may enter. On the day we were there, my plates did not meet the mark. The traffic police wanted to issue a ticket and told us to follow them to the station, but persistent and tactful refusal by Melanie resulted in our freedom after about thirty minutes of negotiation involving at times four officers. As we skirted the city, we enjoyed spectacular views of the great volcanoes of the Valley of Mexico, Popocatepetl, which was erupting steam as we passed by, and Itzacihuatl. A few navigation snafus ensued, but nothing that could not be corrected by backtracking for a few minutes. We did get stopped outside of Puebla by the army checking for explosives. The

back of the truck was packed tight with all manner of equipment, and there was some tenseness when the friendly troops uncovered several small canisters of Coleman propane fuel. We were able to assure them the gas was essentially harmless and could not be reasonably used for terrorist purposes. They never asked to see inside the ten-gallon metal can filled with calcium carbide.

We had pretty good directions to Llano Cheve and had been forewarned that the road up into the mountains was narrow and very exposed. We did not arrive at Cuicatlan, the town at the base of the range, until about midnight, so we elected to sleep there before proceeding. Cuicatlan is a nice town with a fine market, so we stocked up on things we thought we might need or want while we were at camp for two weeks. The road on up lived up to its reputation, and we carefully made our way to the top, where the village of Concepción Pápalo balances precariously, and followed the graded road on to where the track to Cheve turns off. It took a few minutes to realize that the large valley we were descending into was in fact a huge doline. After about fifteen minutes of driving in it, we found where the trucks of the other cavers were parked. From there, it is about fifteen minutes of hiking downhill to where the base camp for the expedition was located. The "field house" was a series of tarps suspended by polypropylene ropes, with the back wall being the rock wall of the

doline itself. The shelter was complete with other walls and a series of work tables. A generator nearby supplied AC power for the light bulbs and charging power-tool battery packs. Drinking water was collected in five-gallon containers from the stream flowing over a waterfall 10 meters away. Colloidal silver drops assured water cleanliness. Large propane canisters supplied two Coleman-style cook stoves, and cookware and food stashes consumed the rest of the large space. Groups of tents were situated along both sides of the *llano*. When we arrived, there were around twenty tents belonging to cavers from several European countries and all over the U.S. A rebelay course on a fifty-foot-high rock wall had been set up at one end of the *llano*. We were supposed to be able to pass a knot and three rebelays up and down in a set amount of time before venturing into the cave. The course looked pretty easy, but was more difficult than I thought when it came time to try it. We spent a couple of days acclimating to the elevation by hiking around and working on the rebelay course, and then we decided we were ready as a team to venture in.

Two days before, a large team had departed into the mouth of Cheve, planning to stay underground for seven to ten days. The cave had been rigged a month or so before by a different team, as few participants save Bill could stay the entire duration of the project. During the initial phases, a parallel effort was being made at the neighboring cave of Charco, and another cave up the side of the *llano* from Cheve was rigged and explored for several days as well. We were late arriving, and would leave before the expedition began to pull up the mile of rope rigged below us.

As we began to make day trips into the cave, the first trip I made was solo, and I slowly made my way down four short rope drops of about 6 to 10 meters each. The cave follows a small stream in the initial section. The ropes were rigged for each of the first drops in a very straightforward fashion, with only

one rebelay at most. The second trip I took was with a small group, and we passed where I had turned back before and crossed a two-rope tyroliian affair. I personally didn't think the two ropes, one rigged taut and the other tied back at an angle and rigged more loosely, were necessary there, but it proved to be good practice for what would come later, when such a configuration was the only way to cross canyons. To cross, the long cow's tail is clipped onto the taut rope, while descender and ascender are used to first lower oneself to the bottom of the rope arc and then to climb back up to the opposite side.

The stream we had been following disappears into the wall, and from this point we crossed through a narrow vertical slot, aided by a handline, and entered what was prosaically referred to as the Birthday Passage. This is a huge room, probably 50 meters across and 75 meters high, that slants downward at a steep angle to, at this time for us, parts unknown.

My next venture, with the same group, took us downward through the Birthday Passage, past several more rope drops, to where the huge breakdown floor gives way to smooth bedrock and a stream emerges to flow along the passage once more. A couple more short drops led us down to the first major pitch of this cave, Elephant Shaft. From where the rope was rigged it dropped off into darkness, but there were three rebelays located along the 50-meter drop. A short distance from the bottom, a large stream roars down a series of pitches known as Angel's Falls. On the next trip we passed through this area, which is inherently wet and has three drops and a climb-up. The last pitch had a tricky redirect and a rebelay right next to the rushing water. It is a very good idea to be sure to make that maneuver quickly and correctly. At the bottom of Angel's Falls, a narrow, wet passage opens up into a large, boulder-floored room that leads immediately downward to the Camel's Hump, where the last vertical work for awhile, a simple downclimb, is encountered. The cave changes

personality here. The way on is over and through house-sized boulders that slope upward for as far as we could see. The gurgling stream filters away through the breakdown, and the ceiling looms massive, 30 meters above. Off to one side of the cave passage is a small sandy beach that had been designated Camp 1 by early expeditions into Cheve and had been used for that purpose early in the 2003 effort. This first camp had since been abandoned, and most of the equipment from that camp had been taken down to Camp 2. From the crest of the mountain of breakdown, the floor begins to plunge downward, and one has to carefully pick one's way through the jumble to avoid setting rocks crashing down the steep slope. This area is called the Giant's Staircase, and it took us about an hour to descend the first time. We knew that on a real trip, carrying heavy gear packs, this would be one of the most exhausting areas of the cave on the way back to the surface. At the bottom of the stairs, the ceiling plunges down and nearly meets the floor. Here we carefully picked our way along the now steeper gradient, holding onto whatever handholds we could, because we knew that somewhere ahead lay the principal vertical obstacle in this extremely deep cave, a drop known playfully as Sacnussem's Well. Just for fun, and to be sure we knew what we were getting into, a couple of our team made the drop to the bottom of the 130-meter pit, passing thirteen rebelays along the way. The top of the pit was dry but cool, but the bottom was like a hurricane, with high winds whipping atomized water from a falls of the stream, which reappears from the cave wall about halfway down the drop. Our total time to the bottom of the well and back to the surface was around nine hours.

We returned to the camp and took a day off from caving, exploring the sinkhole-pocked *llanos* in the hills high above the Cheve entrance. The in-cave teams began to wander back to the surface during this interval. The Dutch team came out, followed by some of the Poles. As Pauline Berendse and Jan Matthesius

walked through camp, their comrades prepared cool bottles of Dutch beer to celebrate their return. Jan responded by ceremonially removing his caving harness and solemnly placing it in the raging campfire. When asked what this meant, Jan, an experienced caver with lots of time in Mexican caves, replied that he was retiring, that "once you have caved Cheve, there is nothing else." The following morning he retrieved the metal buckles from the ashes of the fire. Early the next morning Bill and the British cave divers came marching out of the cave. They had made the trip in a single effort, bypassing all three camps along the way. The divers carried with them their homemade rebreathers. These "closed-circuit" scuba kits allow divers to use very small gas cylinders. Bill had designed computerized, multiple gas-mix, triple redundant, high-tech Cis-Lunar rebreathers many years before for the Huautla and Wakulla projects. But these divers had their own simple, small, but completely non-redundant units they had built themselves and were comfortable using. This was their decision, and Bill helped them carry their gear down past Camp 3 to the sump, where they would have to depend on them. At least one Cis-Lunar Mark V sat unused in the back seat of Bill's truck the duration of the expedition.

The next day reality struck, and bit. We had of course arrived just a little too late to be part of the main push that had just ended. The main exploration crew was not planning on going back down for several days. Life on the surface is very pleasant, more appreciated than usual after eight or nine days underground. Little things like sunlight on your back, a regulated and obvious difference between day and night, and stars at night make one just a little reluctant to go back down for a while. The next serious push would not be over until past the time that a couple of us needed to be heading back to responsibilities in Texas. I had taken off two weeks work to participate, and Paula was scheduled to interview with the dean of the geology department at

UT Austin for admission into the PhD program in geology. We needed to make a move, and knowing that we had only a short window of time to make a long cave trip before we had to be back on the surface to prepare for the trip back to Texas, we began to feel around for a project we could do as a small group, Philippe, Melanie, Lewis Carroll from Washington D.C., and me. Bill Stone agreed that we could proceed down to Camp 3 and pick up dive cylinders left over from the 1995 expedition and some climbing rope and other gear at that deepest camp that would no longer be needed during the remainder of the expedition. Unfortunately, since we were all new to the cave, there would be no opportunity for original exploration or survey.

We took all morning to pack. I took a close look, then a second look, at everything I put in the cave pack. How much did it weigh, was there an absolute need for that item, could another item do double duty so only one was needed, could a lighter one be substituted, how many meals would be eaten, how much for each meal, what would we need to be completely filled, without being wasteful or gluttonous? All these questions flashed by over and over again as we packed and repacked in the morning shade. Each camp had treated water and a stove with limited fuel. We needed a light pot to boil water, and each team member needed a bowl and a spoon and a cup. We packed soup and dehydrated meals, a variety so we could trade around and not get too bored with the same thing over and over. Bill showed how he put his dehydrated food through a Salad Shooter food processor to further reduce the needed number of half-gallon Nalgene wide-mouth containers we used to transport food. Nalgene was one of the expedition sponsors, and a small mountain of used containers had been sitting around the cooking tent since the last team had dumped out their packs. A few of the experienced members pulled me aside and advised not crunching the food, since what little texture there was in the food would be destroyed, and

hence one of the few small enjoyments of camp. Bill advised that each team member choose one small luxury to take along. I chose Earl Grey tea bags, because they were light and would be easy to carry, and if I left them in the food stash the Brits might use them all before I returned to the surface. By around noon all of us were beginning to look as though we were ready to make the trek down into what Bill already realized was going to be the deepest cave in the hemisphere once the numbers from the first push were entered in the survey database. One of the last decisions was what to wear into the cave. The pre-expedition notes indicated a need for expedition-weight polypropylene and PVC-coated caving suits, especially because we would be passing through or very near high waterfalls on the way to Camp 1. But we had seen Bill and a few others venturing downward in reinforced shorts over medium-weight underwear. I opted for a compromise: medium weight with the oversuit. For the first several hours of steep downward climbing things were hot, but I did not regret the cumbersome PVC suit later that night.

We made our way down through the Birthday Passage and the Elephant Shaft, familiar from my warm-up trips. Three hours had passed when we began negotiating through the Angel's Falls series, not a major thing, but tricky and a little time-consuming unless you had done it a lot. Then Camp 1 and an hour and a half down the Giant's Staircase to the top of Sacnussem's Well, where it took a couple of hours for all cavers and all gear to descend, even though we could all be on the rope at the same time. At the bottom, the cave turns wet, and it stayed wet for hours. Here is where the PVC suits were most appreciated. We waded down a short way until the passage narrowed to a point where the route goes up into an aven. There was a small supply depot here, and one of the light-weight fiber-wrapped scuba tanks we would be transporting to the surface was here. Onward, we rappelled down into the racing

river, and we were in and out of that stream for several hours. At the approach to the Salmon Ladders, the cave walls are smooth and black, polished by running water. You could look up into the ceiling and see that seasonal floods would completely fill the large canyons we were traveling through. We passed the Turbines and continued to drop in elevation, though because we were so busy with rope-work, it was hard to tell how much depth we were actually gaining. The water roared so loudly that communication between team members was impossible, and it was here that I first felt the immense sense of loneliness or isolation that can come from deep cave exploration. On this portion of the trip you could not reasonably depend on anyone else; we were each on our own. At the Piston, we dropped down into more level passage, although upper passages, some of which are fossil stream passages, some active, abound. At the Sumplands, a critical junction, a trail was marked through a dry, upper-level passage known as the Wind Tunnel, which presumably saves lots of time in the water. We passed along precariously perched sand dunes far above the stream barely audible somewhere below, and at one point we entered a chamber that is highly decorated, for no apparent reason. Most of the passage we had been traversing for the past eight hours is active streamway with little depositional decoration. But in one area of the bypass we encountered soda straws yards long, lots of them, and the ceiling was brightly decorated with multi-colored flowstone. The beauty was serene, and we stopped to admire this curious and strangely beautiful display of nature.

Almost as soon as we began moving again, we were jarred back into the reality of the dangerous nature of deep cave exploration. To the right of the path and up a small slope is a fantastic collection of stalactites and intricate flowstone. We climbed up and looked into an empty grave. We were in the Avalon Connection Room, where another cave that descends from the surface intersects the Cheve System. In

1991, nineteen-year-old Chris Yeager died as the result of a fall at the next drop, the prosaically-named 23-Meter Drop. His body was brought up the drop ten days later and buried in the alcove we were looking into, where it remained for a year, until an international group of cavers removed it from the cave. The temporary headstone was still in place. It contained his name, dates of birth and death, and his expedition nickname, The Kid.

This grim discovery put somewhat of a damper on our fun, and we realized we were tired and hungry and needed to get to the shelter of Camp 2. There was some steep hiking left in the Connection Room, and then a tricky climb-down to the 23-Meter Drop. Everything was rigged, but we stopped to inspect all anchors we could find and get to. One by one we dropped the three pitches of the drop, and one by one we descended into the East Gorge. Suddenly we went from a quiet, dry, sandy floor to a slick, wet, screaming rock world. The walls of the canyon are marbled by black and white stripes, a very distinctive look. Philippe was eager to get on, and Melanie was compelled to follow ahead quickly, while Lewis and I used a slower, more controlled pace. We trudged on through the knee-deep water, looking up for an obvious way to the camp we knew had to be in the vicinity. We were feeling exhausted, and after what seemed too long we found some indication that others had made what looked like a tricky crawl up some flowstone on the right. In our tired state it took some time to find the correct route, but after climbing up a rope out of the East Gorge, we passed through a small tunnel into an alcove about 20 feet high and 40 feet across, about eleven hours after we left the surface. Melanie and Philippe were already set up in a comfortable spot next to the supplies, and showed us where the stove, water, and latrine were located.

The twenty-four hours we spent at Camp 2 were somewhat weird. There is of course no way to tell time using any kind of natural reference; daylight is just an empty

concept that deep underground. In the center of the camp there is an open area with a big flat rock that served well as a table of sorts. Along the corridor leading deeper into the cave is an area with little alcoves just the right size for personal spots consisting of a sleeping space and a little room to stack and organize gear. Slumberjack was an expedition sponsor, and their light-duty polyester sleeping bag stuffed right into a gallon wide-mouth Nalgene bottle, so they had been pretty easy for the initial crews to pack down to the camp. Large trash bags were in the camp to store the bags in so they would stay fluffed but reasonably dry in the damp atmosphere. The camp being thus equipped with bags, stove, and fuel, all we had to pack down was personal gear and a bag liner so the shared bags would stay clean. We all seemed overly concerned about conserving battery power and carbide fuel, so much of the time we just sat in darkness. Exceptions were when someone would fire up the stove to heat some water or when someone would leave a sleeping bag to trek to the latrine. I had no idea what time I woke up, but it was late in the day, and I had slept more than eleven hours. Others had been up, ate, and gone back to sleep, but some time in the late afternoon we all decided that we needed to set a schedule and keep to it. Melanie insisted rightly that in order to be at our optimum we needed to stick to a surface schedule, sleeping at "night" no more than eight hours and traveling during "daylight" hours. We compared notes and agreed that sitting still and doing nothing was having negative effects on us. I was hearing all kind of sounds of things that were not there and seeing flashes of light, and Melanie said that her over-active imagination was making skulls out of the dim shadows cast by a carbide lamp onto the ceiling. When moving through the cave we had no time to be so distracted. We stayed in camp the rest of the day and night, and by 8:00 AM the following morning we were up, had breakfast together, and were soon departing the camp for parts unknown to us.

At Camp 2 the East Gorge stream thunders on down below to a sump and disappears. Years ago, cavers had discovered the perched beach and upper-level cave passage that led onward. The way is dry and fairly level, for Cheve, that is. We were still climbing up and over rock piles, but no rope work was required for a couple of hours. We climbed up a precarious slope into the Low Rider Parkway, a wide passage with a flat, monolithic ceiling. After another couple of hours the ceiling was lowering and the floor was becoming more uneven, and finally we came to the edge of a precipice. This is the Widow-Maker Shaft, and it seemed fairly straightforward at the top, but the lower pitch is tricky. At the bottom the route intersects the resurged cave stream, crashing along with what seems renewed vigor. We could move along, but carefully, from boulder to foothold to scramble up. This quickly degenerates into one of the more entertaining passages in the cave, the Swim Gym. Contortion and balance are the name of the game here. It is possible to keep out of the water by carefully choosing handholds, but getting wet actually helps cool one off at times. Here communication is very difficult, even with nearby team members, due to the roar of the water churning through the convoluted streambed and the need to be constantly climbing up or down, over and through holes in the rock wall. Just as I was getting tired of this, things changed suddenly. A rope led straight up a flowstone wall and through a space between large boulders wedged in the 10-meter-high ceiling. The rigging was tricky, and concentration was needed to make the right move while soaking wet and carrying a bag half-filled with water. All around us a fine finish of tiny crystals on the wall shone in our headlights. A two-story formation blocks the canyon passage, and we had to climb over and around, carefully trying not to damage the huge stalagmite. On the other side we slowly climbed down into a large chamber that seemed to emit its own soft glow. Along the left wall are huge columns and tall

stalagmites all lined up, running the length of the room and seeming to flow from a continuous crack high above. The floor is littered with broken stalactites fallen from the ceiling, and we noticed that most of the formations are cracked and broken, as if by the action of an earthquake. We were obviously in the Hall of the Restless Giants. This is more like New Mexico caving than anything else we had seen in the cave. The spray of the crashing waters is far below; occasionally we could hear a faint roar from holes in the floor somewhere down under the breakdown. There was a calm serenity here, and at the end of the passage we stopped on a high point to have lunch.

We all thought from what we had gathered by talking to other cavers that we were near the halfway point to Camp 3, but the hardest parts of the trip lay ahead. We chilled rapidly in the large room, for right behind us was a dark hole that was blowing cold air like an industrial air conditioner. Lunch over, we began to inspect the next descent. The drop was rigged from a precarious point high up a slippery flowstone slope. The rope dropped away to a redirect visible about 10 meters down. From there, it was hard to tell, but it looked as though the rest of the drop was uninterrupted for 20 meters to the bottom. We were right, the redirect was a little tricky, but the rest of the drop was straightforward. Toward the bottom the passage narrows down, and we descended into a maze of cemented breakdown and water-carved channels, now dry. After several hundred feet of stoop walking, short ropework, and squeezing through tight passages, we found the "keyhole" we had been briefed on. This is a body-sized tube that you have to climb up to, and it drops downward into darkness. The recommended technique is to drop through feet-first, feeling for footholds blindly while holding onto the rim of the hole and lowering one's weight slowly. It was a little unnerving, but took only a very short time. From there we entered a short but very confusing breakdown maze that forces the caver to dash under

small waterfalls and slither through wet crawlways. At the top of a short climb up, we popped out into a huge, quiet void our lights could barely illuminate. We had reached the Black Borehole.

The echoes were eerie. The dark walls somehow absorbed our lights. The continuing passage appeared ghost-like off in the distance, and the proportions were unclear. The hall is about 20 to 30 meters wide and up to 50 meters high in places, I think. It was hard to judge distances in this vast chamber, because there are no reliable references. We felt like small insects climbing slowly along over huge pieces of the ceiling that had fallen in some long ago geologic age. Even though we were working hard, our travel pace seemed infuriatingly sluggish. At times we had to climb up ropes rigged somewhere high above us on a piece of the wall that appeared to be suspended in space. The image that kept appearing to me was something out of some old movie, possibly *Land of the Lost*, but no dinosaur ever stuck its head out of a hole just as we were slithering along one of the many precarious ledges along the route. The blackness of the cave walls and the breakdown composing the floor were overwhelming and probably added to the feeling of physical insignificance we felt as we negotiated our way through this massive room. After a couple hours of this, the breakdown seemed to be filling the chamber more fully, and in fact at one point the boulders piled up in front of us all the way to the ceiling, completely blocking the way onward. But the wind was apparent. You can hear the wind surging through this huge rock pile, and it seems to be more powerful on the left side, and of course this is the side most difficult to get to. It took about thirty minutes to climb down onto what appeared to be a floor, then over to the left wall where the wind was blowing out. Marks on the wall indicated we had chosen the correct path; this is the beginning of a passage that leads nearly straight up through the breakdown mountain. The route was pretty well marked, but we occasionally

had to backtrack, because the body-sized squeezes limited seeing what your feet were doing at several points. Pulling the packs in Through the Looking Glass, as this section is called, was the hardest part. The body can bend and contort, and you can alternatively pull and push with arms and legs, but the bag is just dead weight and has to be powered through. Here a little teamwork went a long way.

At the top of Through the Looking Glass, the sensation was akin to popping out of a manhole cover onto a huge city street. Only in this instance the street is a cave passage even larger than the Black Borehole. The walls and ceiling here are light-colored and reflect light well, so there was a lot more to see. I didn't try, but it might be a ten-minute hike from one side of the passage to the other. This conduit is of Carlsbad dimensions, slopes steeply downward, and also continues back upward past where we had popped up into it. Just to be sure, we added another rock cairn at the inconspicuous hole we would need to spot on the way out, and we began to descend toward the faint sound of crashing water somewhere below us. This is the A. S. Borehole, named as a second tribute to Jules Verne's fictional explorer. Upslope is another large room descriptively but unimaginatively dubbed the Mud-Floored Borehole. The way we were heading was down, though, and we were all growing noticeably tired from the long, hard day. It was now around 6:00 or 7:00 PM, and fatigue and hunger were becoming factors we would need to deal with soon. The A. S. Borehole continues downward with a slight twist to the left, and within thirty minutes we were peering down to where a massive torrent of water spills from a conduit coming up from the breakdown floor. Here the directions we received called for a sharp climb up, but the trail was not well marked, and we ended up high above where we needed to be. Philippe and Melanie had gone ahead of Lewis and me, and we saw their lights off in the distance along the right wall high above the stream. They had

located Camp 3, and we were able to join them there within a few minutes.

Like Camp 2, this camp is also a sand beach perched high above the moving waters, but there the similarities to that camp end. The room we were in is a huge tunnel sloping downward, and the camp is perched at the top of a steeply sloping wall facing across the river to a massive, vertical rock wall. The ceiling is similarly of gargantuan proportions, and the sound of the water slamming the rocks far below is absorbed or muted by the tremendous volume of the chamber. Our plan for the day, formulated with the benefit of a full day of rest and a renewed optimistic outlook early that morning, called for us to reach Camp 3, drop off unneeded weight, and make a quick dash down the river passage to the first sump, 1362 meters beneath the highest Cheve entrance. Reality at Camp 3 in the early evening was that we were all exhausted and hungry, and that trip to the sump was not going to happen. This would be the end of our downward progress in Cheve this expedition.

Dinner was rehydrated something or another, and we tried each other's cups for variety. Hot Earl Gray was a treat, along with a candy bar or granola bar squirreled away for this occasion. The latrine was a mess, as we expected, but the air was being sucked downstream, or so it seemed, and up in the sleeping area we were not bothered by the smell. Sleep came easy that night. I wrote a little in my journal, but a feeling of intense isolation returned after everyone quieted down. Living in an American city in the twenty-first century, one seldom finds himself so completely separated from society and from the comforts and gadgets we are accustomed to. The knowledge that this was perhaps the farthest away from the world I knew was overwhelming, and I wondered when I would ever have the chance to experience this stark reality again. I turned off the light, sat back, and savored that rare sensation.

The night passed peacefully. In

the morning we made coffee and ate rehydrated something for breakfast, packed up our own gear, and then began gathering up the trash and excess gear we were supposed to bring back to the surface. The biggest items were a 50-meter climbing rope that was no longer needed that deep and a steel and fiberglass high-pressure diving cylinder that had been left full at the sump for several years following a previous expedition. The air inside had remained good and at usable pressure and had been used on the diving efforts the previous week. We had traveled down light, and now we would be loaded down climbing back up. We would need to carry this weight back up about 1200 vertical meters to the cave entrance.

The trip out went well. We traveled continually, stopping only to rest for no more than fifteen minutes at a time. While one of our team was climbing on rope, the others got a little reprieve from work. We made it past the big rooms and into the water passage by early afternoon, and we had to slog through the Swim Gym already tired. The last of the day's travel was up into the Low Rider Parkway, where we got disoriented and lost about a half hour trying different leads up to Camp 2. Eventually olfactory hints from the latrine led us into the proper passage, and we collapsed into sound sleep after quick nourishment.

The next morning we split up. Philippe and Melanie decided to go out at a faster pace than we had been traveling the day before, while Lewis and I were concerned about overexerting ourselves with no camp or supplies between us and the surface. This leg of the trip would require the lion's share of the climbing, with the water Olympics at the beginning of the day when we were strong. Lewis and I kept to what we thought was a measured pace, and before noon we had climbed up to the wet part of the cave below Sacnussem's Well. This was the hardest part of the trip, for we were pushing continually upward, at times almost completely immersed in the rushing stream. Both of us lost body heat here, and I

credit the PVC oversuit with allowing me to be as comfortable as I managed to be. As we dropped into the aerosol canyon leading up to the Sacnussem's Well, we knew the most difficult part of the trip was over and that the way on was primarily dry.

The problem we faced at the top of the pit was time; it was well into evening, and we knew there were many hours to go before we would see the sun or stars, as the case might be. Steadily we pushed upward, but I finally had to drop the diving tank I was carrying at Camp 1, where it would easily be found by the other teams that would be down in a few days. Besides the tank, between us we had been carrying personal gear, camp trash, and a 50-meter wet rope. I felt bad dropping the tank, but we really needed to get out of the cave, and losing the excess weight and bulk helped immensely. All night we climbed at what seemed a snail's pace, but we were conscious of our exhaustion and were determined not to take any risks that could result in an accident. The last few hours were painful, knowing that the sun would be rising shortly, and we were beginning to make small mistakes. We began to snap at one another, as communication narrowed to only the essentials.

Among the last few pitches, I accidentally tossed an ascender into a pool far below the trail, and realized I had been asleep while climbing. We made it out as the sun was rising over the camp.

Philippe and Melanie had gotten out during the night and had gotten some sleep while we were climbing out. The camp was just beginning to wake up, so we grabbed coffee and some real food before giving a debriefing on our trip. The next day we enjoyed sleeping late and stayed out in the sunshine. It had been raining for all of the time we had been underground, and the camp had been soggy. Many of the people on the surface we had left four days before had departed for their own corners of the world. Those cavers remaining were ready to get back underground.

We drove out of camp with a truckload of cavers for a meal in Concepción Pálapo, the village we had driven through coming up into the mountains. The simple food served in a rustic setting was appreciated as much as if we had stumbled upon a three-star restaurant. Well . . . , maybe not. But we enjoyed it immensely. In the village we were supposed to pick up a container of diesel fuel Bill had ordered some days before. Through some

miscommunication, the local police had picked up the container and had driven away with it just as we were beginning to inquire about it. We had to chase the police truck all over the side of the mountain to get the fuel back, and it was a good thing for them we did, because their truck ran on gasoline, not diesel.

Back at Llano Cheve, we had one more day of caving before we needed to pack up and head home. I spent it on a trip back in to recover my lost ascender. At the pool where it had landed, I elected to strip off my clothes and swim naked, rather than risk being too chilled in wet clothes by the brisk breezes blowing against me on the way out.

The next day, the last exploration crew left the surface for a complex set of tasks down below Camp 3. Paula Grgich and I packed up to leave, since she had an appointment and I had to get back to work. Melanie and Philippe decided to take their time going back, spending a day in Ciudad Oaxaca and then taking a bus back to the border and onward to San Antonio. Paula and I would take the bulk of their equipment and deliver it to Melanie's mother's house there. We made our appointments Monday morning on time and adjusted back to life after the Cheve Expedition.

### Notas de Cheve

El autor participó por dos semanas en la expedición 2003 al Sistema Cheve en Oaxaca. Describe el viaje al Campamento 3 en la cueva.

# CAVES ON THE JALPAN QUADRANGLE, QUERÉTARO

Gerald Moni

In December 2002, Gerald Moni and Preston and Shari Forsythe searched for caves west of Puerto de Huilota and around Pinal de Amoles, Querétaro. From Puerto de Hilotla they took dirt roads southwest to Puerto Escanelilla and Derramadero de Juárez. They stopped just east of La Yerbabuena. They found nine pits and one cave west of Puerto de Huilota and three caves near Pinal de Amoles. Lengths in the descriptions are horizontal lengths, not total survey. Most of the caves are named for local guides. All caves are on the Jalpan topographic map (F14C48).

Sótano de Agoaz, 21°12'15"N 99°37'24"W, length 24 meters, depth 43 meters. The pit entrance, 0.6 kilometers east-northeast of La Yerbabuena, is 6 meters long and 3 wide. The entrance drop is 14 meters, and the bottom slopes down, 20 meters long by 12 meters wide, to two pits, one 10 meters deep and the other not checked but estimated to be 25 meters deep.

Sótano del Apalonio, 21°12'27"N 99°36'30"W, length 50 meters, depth 65 meters. Located 1.2 kilometers southeast of Derramadero de Juárez on the north-northwest slope of a ridge, 6 meters north-northwest of a major trail. The pit entrance is 15 meters long, 12 meters wide, and 34 meters deep. The floor is 15 meters in diameter and slopes down at 40 degrees for 15 vertical meters to a second pit, 5 meters deep. From the bottom of the second pit, another slope for 15 vertical meters leads to a room 8 meters in diameter, the end of the

cave.

Sótano La Charca, 21°12'27"N 99°35'58"W, length 7 meters, depth 19 meters. Located 2.0 kilometers southeast of Derramadero de Juárez, 15 meters above the floor of a ravine on the southwest side. The entrance is 3 meters below a major trail, 100 meters up the trail from where it crosses the ravine. The pit entrance is 1 meter by 1 meter and 5 meters deep. The floor slopes 2 meters to a second pit, which is 13 meters deep. The bottom is 6 meters long and 3 meters wide, the end of the cave.

Cueva de Leona, 21°11'26"N 99°38'53"W, length 50 meters, depth 8 meters. Located 0.5 kilometers southeast of Agua Enterrada, 300 meters northeast of the next to last house on the dirt road. The cave is 150 meters southwest of Cueva de Zuniga, at the base of a 6-meter-high bluff and 12 meters below the top of the ridge. There are two entrances. E1 is 4 meters long by 3 meters wide. E2 is 1.5 meters high by 6 meters wide. Both join the main passage just inside at a skylight. The passage is 50 meters long, 4 meters wide, and 7 meters high. It ends at a clay fill.

Sótano de Maximo, 21°12'04"N 99°37'26"W, length 107 meters, depth 40 meters. Located 0.5 kilometers east of La Yerbabuena, the pit is in a patch of trees in a pasture 260 meters east of the school in Yerbabuena, on the northeast side of a hill. The pit entrance is 15 meters long by 3 meters wide. The floor of the 8-meter pit slopes downward at 40 degrees to a room 23 meters long, 20 meters wide, and

15 meters high. A passage 6 meters square goes 110 meters to an unexplored crawl.

Sótano La Mesita, 21°12'38"N 99°35'52"W, length 21 meters, depth 26 meters. Located 1.9 kilometers east-southeast of Derramadero de Juárez in Ejido Puerto de Alejardria. The pit entrance is 6 meters above a barbed-wire fence, 8 meters long, 5 meters wide, and 26 meters deep on the low side. Halfway down, it is 15 meters long by 5 meters wide, and there are no leads at the bottom, which is 6 by 20 meters.

Sótano de Noe, 21°11'32"N 99°38'52"W, length 25 meters, depth 25 meters. Located 0.5 kilometers southeast of Agua Enterrada, 350 meters northeast of the next to last house on the dirt road. The pit entrance is on the hillside on the southeast side of an arroyo. It is 100 meters north of Cueva de Zuniga. The pit is 6 meters square at the top and slopes downward 30 meters to a depth of 25 meters. The bottom is 12 by 6 meters. A short passage on the bottom goes 6 meters.

Sótano El Pandito, 21°12'40"N 99°36'00"W, length 21 meters, depth 20 meters. Located 1.7 kilometers east-southeast of Derramadero de Juárez, 8 meters above a major trail. The entrance is 1 by 2 meters and 18 meters deep to a bottom 2.5 by 6 meters. A walking passage 5 meters high and 1 meter wide slopes downward for 15 meters to a room 2 meters deeper than the bottom of the pit. The room is 3 by 6 meters.

Sótano de Sixto, 21°13'02"N

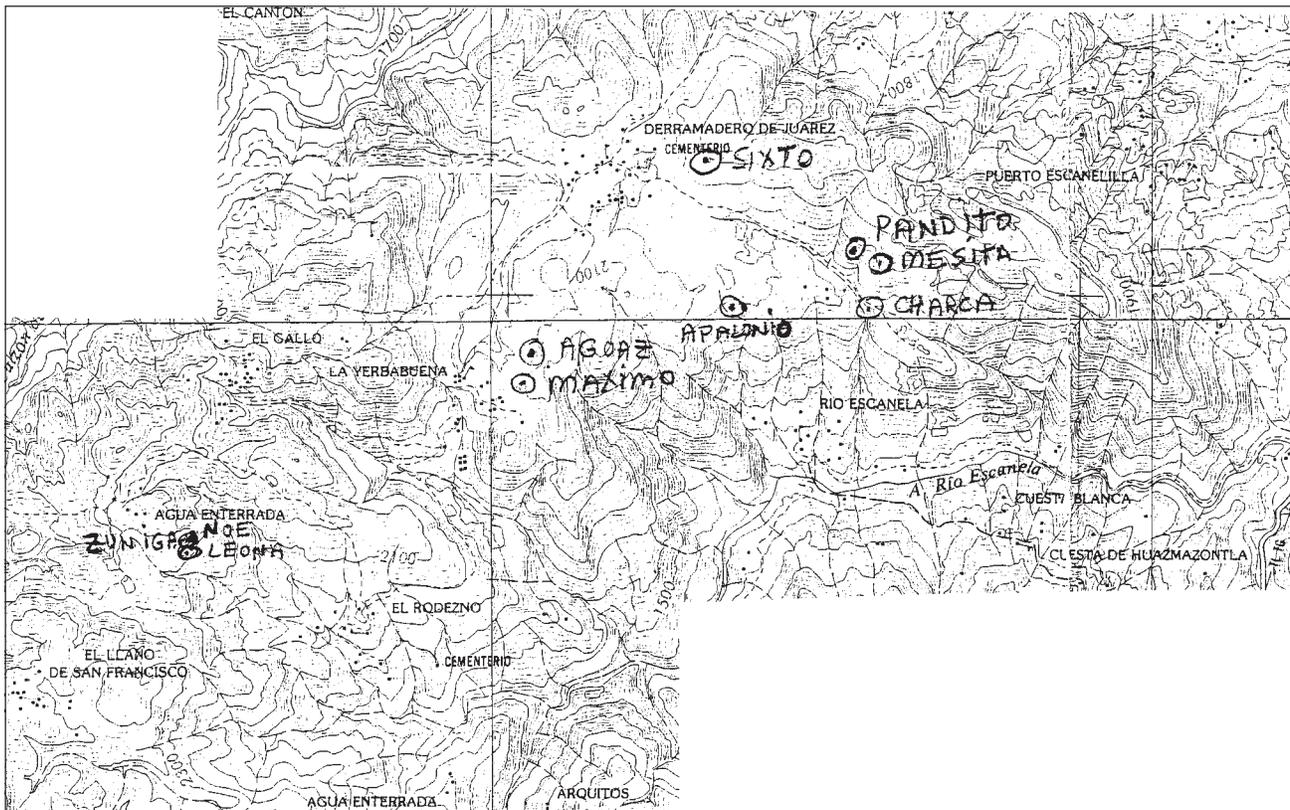


slope downward through a large room leads to a canyon passage 1 meter wide and up to 10 meters high that goes 125 meters. A tight crawl goes to a 5-meter climbable pit. Passage at the bottom with air-flow was not explored. Two side passages to the left from the canyon go to climbs up that are flowing streams in wet weather.

Cueva del Judío. 21°07'18"N 99°37'42"W, length 100 meters, depth 20 meters. The pit entrance (E2) is 10 meters north of the climbdown entrance (E1), 1.6 kilometers south of Pinal de Amoles in a national forest. From the forest gate, follow road 1.2 kilometers to a dirt road upward to the left. At the top of that road, go down a trail 75 vertical meters, then left downhill 25 meters to another trail. Go left on that trail 200 meters. Entrance is downhill to the right 15 vertical meters. E1 is a 6-meter climbdown 8 meters in diameter to a sloping passage. E2 is a 3-by-8-meter pit that is a skylight approximately 12 meters above the floor of the sloping passage that ends at a large room 25 meters wide and 15 meters high. A nice, large cave.

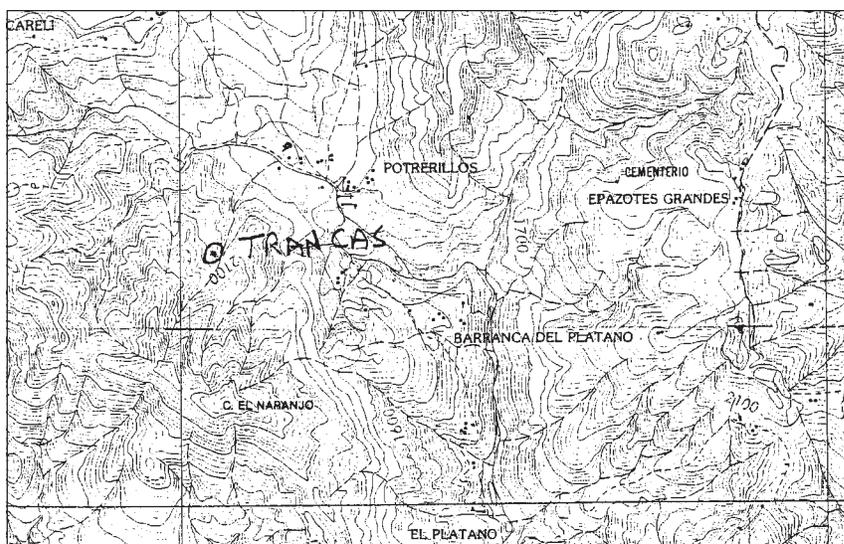
99°36'38"W, length 12 meters, depth 38 meters. On the northeast side of a ridge 0.5 kilometers east of Derramadero. The pit entrance is 5 meters in diameter and 30 meters deep to a slope that goes 8 meters vertically lower. There are no leads. Cueva de Zuniga. 21°11'30"N 99°38'54"W, length 200 meters,

depth 30 meters. Located 0.5 kilometers southeast of Agua Enterrada in a sink in a pasture 300 meters northeast of the next to last house on the dirt road. The cave is 100 meters south of Sótano de Noe and 150 meters northeast of Cueva de Leona. The entrance is 8 meters wide and 2 meters high. A 50-meter



Gruta Ojo de Agua de Pinal de Amoles.  $21^{\circ}07'59''\text{N}$   $99^{\circ}37'34''\text{W}$ , length 50 meters, depth 5 meters. In the south side of the town of Pinal de Amoles, the entrance is 50 meters southeast of the spring and 5 meters above the valley. The cave is 250 meters southwest of the main church in the middle of town. The spring is the source of water for the town. The entrance is 0.7 by 0.7 meters. A downward-sloping crawl goes 2 meters to a junction. To the right is a narrow crawl. At the bottom of the slope is a room 1.8 meters high, where a low crawlway continues. Not explored, but locals say the cave goes 50 meters as crawlways with small rooms.

Cueva de las Trancas.  $21^{\circ}05'18''\text{N}$   $99^{\circ}37'23''\text{W}$ , length 40 meters, depth 8 meters. One kilometer southwest of Potrerillos on the southwest side of Arroyo El Plátano. The entrance is 150 meters west of a bridge in an orange-colored bluff 40 vertical meters higher than the bridge. The entrance is A-shaped, 8 meters high and wide, with four large columns. A large walking passage goes 30 meters and ends at a crawl to the left. The crawl starts as a belly crawl that leads to 10 meters of hands and knees crawl.



### Cuevas del Cuadrángulo de Jalpan, Querétaro

Ubicaciones y descripciones de trece pequeñas cuevas en el cuadrángulo topográfico de Jalpan, Querétaro.

## OX BEL HA, SPRING 2003

Bil Phillips

The Steven Douglas Corey Memorial Expedition 2003 to Sistema Ox Bel Ha, Quintana Roo, took place in February. It was an Explorers Club Flag Expedition. The first phase was conducted from Cenote Ak Al Ché (Mayan for Swamp Water). This unattractive entrance was the closest one to a possible underground route into the Sian Kaan Biosphere Reserve from Ox Bel Ha. This part of the Yucatan jungle is virgin territory both above and below ground.

Using closed-circuit rebreathers and diver propulsion vehicles, explorers Steve Bogaerts and Bil Phillips pushed beyond known passages in search of a new cenote that would aid in future explorations. The ends of the existing lines lay about 2200 meters from the entrance. The first dive resulted in the discovery of 899 meters of new cave passage beyond the end of the old line. The cave ran south, heading directly toward the reserve, but no new cenote entrance could be found. With a new penetration distance of 3 kilometers from the nearest entrance and dive times of six hours, the challenge of further investigation was great.

Nevertheless, a second attempt was made. This time additional open-circuit bailout tanks were staged along the route in the cave for more safety in case of a catastrophic CCR failure. Each diver also used two DPVs, towing one while riding the other. The use of the DPVs allowed more time to push on beyond known cave, while minimizing bottom time. This effort

was a success. Beyond 473 meters of new passage, an opening to the surface was discovered and named Cenote So'sook, Mayan for *tangled*, because of the vegetation in the collapse zone and surrounding jungle. A GPS reading was taken to pin down the position of the new entrance. Steve and Bil's three-hour return journey through the cave was long but satisfying, because they had found a new entrance from which future pushes could be conducted.

The following day Bogaerts conducted a last dive from Ak Al Ché to recover stage tanks and make a final check for leads. Less than a mile in, he noticed an opening that had been previously overlooked. Steve ran a line to the southeast in it, and soon a large tunnel opened up before him. "I have never seen cave so big," he exclaimed upon surfacing. This section was named Middle Earth and will be the object of future investigations.

The second phase of the expedition was conducted from a cenote discovered in April 2002. Cenote Ix Tikia Kax Tik (Difficult Find) lies between Ox Bel Ha and Sistema Naranjal, which was at one time the longest underwater cave in the world and has about 21 kilometers of passage. Previous attempts to connect the caves had been made from both ends, but from either end penetrations had reached over 2 kilometers, mostly in passages where DPVs could not be used and where divers must pass through small, side-mount restrictions. No attempts to

connect had been made for several years, but the discovery of Ix Tikia Kax Tik and reconnaissance dives there that verified its potential led to new hopes.

The first day, Sam Meacham entered the water for a single-stage, side-mount, open-circuit dive to attempt to connect the new cenote with Ox Bel Ha, an estimated 300 meters away. This goal was realized after he unwound 485 meters of line through low bedding planes and passage with deep brown silt. Simultaneously, Bogaerts and Phillips, using CCRs and carrying double 80-cubic-foot open-circuit bailout tanks, headed southeast toward the distant Orion line in another part of Ox Bel Ha, some 1200 meters away as the crow flies. They were soon discouraged when a huge breakdown section confronted them. A steep, muddy embankment led up through a hydrogen sulfide layer to a small surface opening. This opening was seen to be unsuitable as a practical entrance, but did offer an emergency bailout point should the need arise, so Cenote Spidge was recorded and a surfacing line installed. Continued attempts to get around the breakdown led the divers through small, unstable passages, where the bulky CCRs and the extra tanks were a hindrance. Backtracking through zero visibility from stirred-up silt suggested that it was time to abort the dive, but another lead, below the halocline, was also pushed; it ended after a hundred meters or so. The line was being surveyed on the way out when a



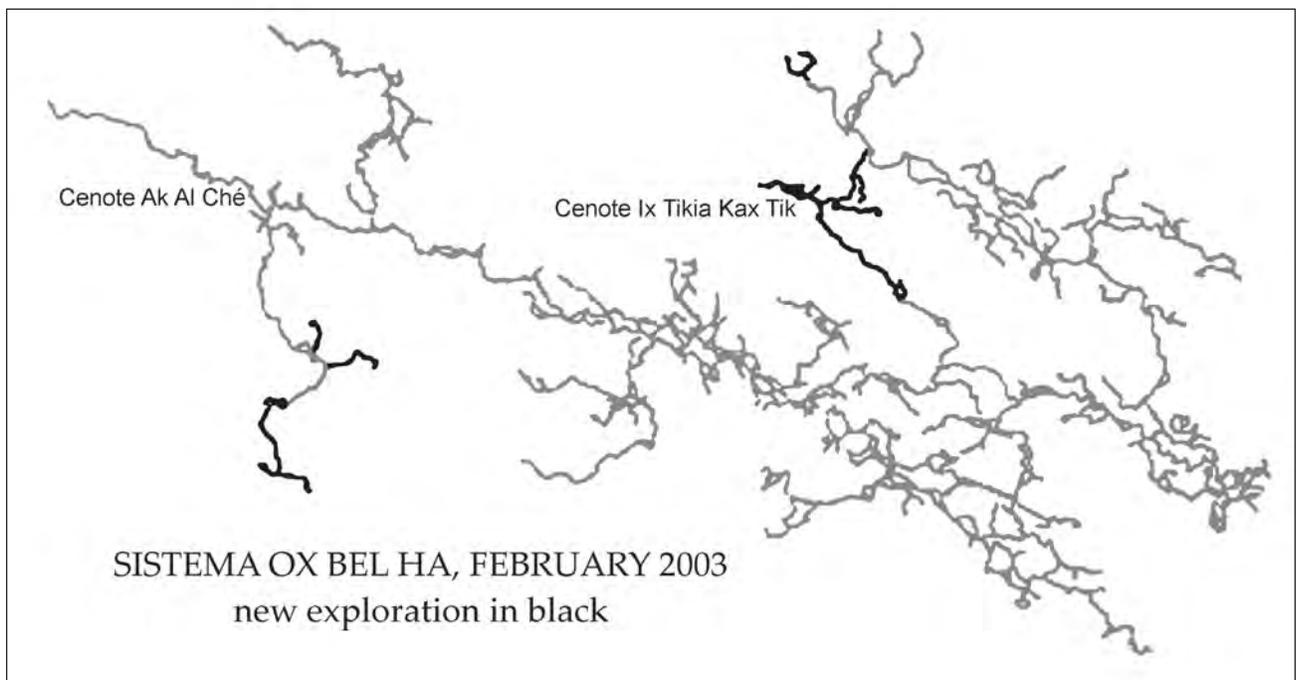
Bil Phillips (left) and Steve Bogaerts prepare for a rebreather dive in Cenote Ak Al Che. *Santos Mejia, Jr.*

low side passage was noted. This was a change in fortune, and Bogaerts and Phillips wound their way southeast with the flow of water until the first exploration reel was empty, then the second. Finally, on their third reel, they were led directly to the end of the Orion line in Ox Bel Ha. A short underwater celebration at the connection was followed by a return along the new line, recording distance, direction, and depth between line tie-offs, while monitoring the CCRs and other conditions for safety.

The new Watermelon Connection Line that was explored and surveyed during that six-hour dive has a maximum depth of 15 meters and a length of 1582 meters, which may be a new record for the most new underwater passage discovered on a single dive. Dives like this come once in a lifetime, as one has to have been lucky in choosing the right sort of gear for unknown passage, the dive has to be free from equipment failures or mistakes that terminate it prematurely, and, of course, the cave has to be there.

On the second day, Meacham's new connection line of the day before, the Orient Express, made it easy for rebreather divers to reach the ends of the lines in Ox Bel Ha nearest Naranjal, about 600 meters away. Bogaerts and Phillips set out, each with a CCR, two open-circuit bailout tanks, and a DPV. Sam's new line was nicely placed and allowed the diver to mostly move quickly through the low, silty passages. The halocline, where fresh and salt water meet, was right in the middle of the conduit, causing blurring that reduced visibility in the wake of the propellers. Any delay in the restrictions resulted in total visibility loss from silt, and the divers had to stop and feel their way along the guideline until the visibility improved enough for faster progress.

Within an hour and a half they were at the end of the existing exploration line toward Naranjal that had been installed by Bogaerts more than a year earlier. Tying off and feeding new line from their reels went smoothly. Finding a path while swimming against the current made pathfinding much easier



Team members: Standing, left to right, Santos Mejia, Jr., Sam Meacham, Steve Bogaerts, Santos Mejia, Sr., Olegario Hau Hau, Demetrio Herera Cano. Below, Jose Mejia, Bil Phillips.  
*Bil Phillips.*



than it had been going downstream with the silt the past few days. Forays into tunnels that ended caused only short delays, and finally the going passage was found. Eventually, 924 meters of line was installed and surveyed in big saltwater tunnels heading directly toward Naranjal, getting within about 300 meters before closing down where fresh water was flowing in through impenetrable cracks in the ceiling. Three hundred minutes on the rebreathers at an average depth of 18 meters gave the divers 100 percent of their daily oxygen-exposure limit, but resulted in only a few minutes of decompression requirement. Once again the CCRs proved their worth.

The last day of the project was dedicated to exploring and surveying going passage close to the Ix Tikia Kax Tik entrance. Before breaking camp later in the day, Meacham, Bogaerts, and Phillips collectively got another 1337 meters of new cave, the new lines giving a clearer picture of the area and pro-

viding information needed for future pushes.

Altogether, the project was extremely successful and met many of its objectives. The connection to Naranjal remains elusive, but much has been learned. A total of 6.6 kilometers of new underwater passage was explored and two new cenote entrances were found, in eight dives with a total bottom time of forty-three hours. Average depth of the passages was 17 meters, with a maximum of 21. The new length of Sistema Ox Bel Ha at

the end of the project was approximately 350,000 feet or 106 kilometers.

The divers' support team was Olegario Hau Hau, Demetrio Herera Cano, Santos Mejia, Sr., Santos Mejia, Jr., and Jose Mejia. Thanks for permission and support to Ejido Tulum, Commissario Abran Camara Pech, and landowner Victor Balam. Also special thanks to Buddy Quattlebaum and Hidden Worlds Cenote Park for gas mixing and tank filling. The expedition was made possible by the Steven Douglas Corey Memorial Fund.

### Ox Bel Ha, primavera del 2003

En febrero del 2003 buzos exploraron en Ox Bel Ha, la cueva más larga en México y la cueva subacuática más larga del mundo, desde dos cenotes de entrada, Ak Al Ché y Ix Tikia Kax Tik. En una sola inmersión encontraron 1582 metros de pasaje nuevo. Un total de 6.6 kilómetros de pasajes nuevos fueron encontrados, con dos nuevas entradas, pero los exploradores no tuvieron éxito en conectar con el Sistema Naranjal, al norte, o con la Reserva de la Biósfera Sian Kaan al suroeste. Después de la expedición, la longitud de Ox Bel Ha fue de alrededor de 106 kilómetros.

# MAYA CAVE SHRINES ALONG THE CENTRAL COAST OF QUINTANA ROO

Dominique Rissolo

In July 2003, my search for Late Postclassic (AD 1200–1500) masonry cave shrines along the central coast of Quintana Roo took a fortuitous route through the bush when I was invited to accompany Fred Devos to a rather large cavern just north of a popular show cave known as Aktun Chen. I was eager to also view and record the cave's petroglyphs, rock art being among my abiding interests within the growing sub-field of Maya cave archaeology. I was not disappointed. This cave contained an unusually extensive corpus of carved images, as well as two masonry structures built around stalagmites.

Since 1995, my archaeological investigations of Maya cave use on the Yucatan Peninsula have largely focused on the inland region of northernmost Quintana Roo (Rissolo 2003). Recently, I have turned my attention toward the Caribbean coast, where cave sites provide, among other things, a unique glimpse into Maya ritual practice and notions of sacred space on the eve of the Spanish conquest. Architecture, like iconography, offers a palpable link between the constructed ceremonial precincts of surface sites and the intensively used and often physically transformed subterranean realms. These forays during my short summer field season constituted a first step toward compiling an archaeological and architectural inventory of masonry cave shrines in Quintana Roo that will hopefully lead to a reassessment of this fascinating Late Postclassic cave-use tradition. I should mention that my research into coastal cave shrines has been

facilitated in the field by Fred Devos and Sam Meacham, with valuable input from Jim Coke and Bil Phillips. Brief, rather informal investigations of coastal cave sites have so far been accomplished at the discretion of local landowners and *ejidatarios* and under the supervision of the Instituto Nacional de Antropología e Historia (INAH). Access to the Aktun Chen area was graciously granted by Lorenzo Acona Díaz de León.

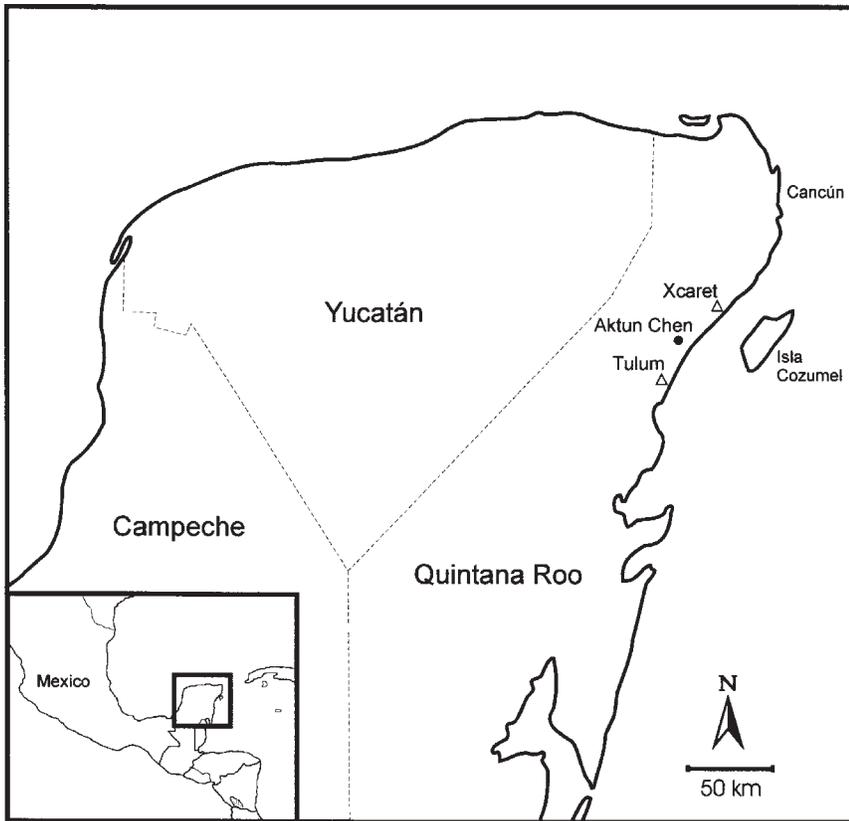
Before I provide a more detailed description of the cave near Aktun Chen, as well as an overview of other cave shrine sites along the central coast, it is perhaps useful to consider the fundamental characteristics of Late Postclassic east-coast architecture. The Caribbean coast of Mexico is famous for its enigmatic, almost quixotic temples and shrines; it is within this architectural canon that cave shrines appear to exclusively reside. Late Postclassic buildings in Quintana Roo are typically crude affairs, coated with multiple layers of stucco plaster and typically painted blue-green and red. The high, corbelled vaults of the Classic Period are absent; instead, buildings are capped by low, simple vaults (e.g., beehive vaults) or beam-and-mortar roofs. Interiors are sometimes graced with spectacular murals executed in the so-called Mixteca-Puebla style. Temple facades are typically encircled by characteristic moldings and often support high-relief stucco sculptures.

Shrines can be, in essence, miniature temples, since they contain some of the interior and exterior architectural details of temples, but

executed on a smaller, cruder scale. Only five examples of such structures have been reported in caves along the Quintana Roo coast. Another category of shrine can be described as a more open structure or masonry feature that may closely resemble the masonry altars or "thrones" found within temples at surface sites, such as Tulum or Xcaret. It is this type of shrine that was constructed in the cave near Aktun Chen.

This cave is located exactly 5 kilometers due west of the coastal resort community of Akumal, not far from the show cave of Aktun Chen. I hesitate to attach a specific name to the cave since it currently enjoys at least three monikers. This task is perhaps better left to both the landowner and the original surveyors. A preliminary survey of the cave was conducted in 2003 by Fred Devos, José Mis, James Reddell, and Marcelino Reyes, and the cave was provisionally named Gruta Las Caritas. Prior to their efforts, the cave was extensively explored by Lorenzo Acona Díaz de León and visited by INAH archeologist Luis Leira. The description that follows is based on my preliminary investigation of the cave's archaeological remains during my first trip with Fred and two subsequent trips with Sam Meacham.

The archaeological features in the cave are primarily located within the expansive, beautifully decorated twilight chamber at the cave's southern entrance. This broad, horizontal, south-facing opening lies at the bottom of a pronounced depression and measures 18 meters in width and a maximum of 13 meters



in height. Along the 246.5 meters of surveyed passage to the north are two additional entrances, which can be described as large skylights above massive debris cones. Shallow pools are found in the main entrance chamber, in its associated passage-ways, and throughout the cave.

The well-preserved wall of a masonry feature is immediately noticeable upon entering the cave. This structure was designated Shrine 1. Most striking is not the construction itself, but rather the fact that it was positioned around a stalagmite. Speleothems are closely associated with rain and fertility by the Maya. In their landmark paper, Brady et al. (1997) deftly and convincingly articulated the symbolic function and meaning of speleothem use.

Shrine 1, which forms a U-shaped enclosure around the stalagmite, is 2.33 meters long, 1.11 meters wide, and roughly 0.70 meters high. The northeastern half of the southeast-facing shrine appears to have collapsed at some point in the past and

Shrine 1, near the entrance of  
Gruta Las Caritas.  
*Dominique Rissolo.*

to have been crudely rebuilt by simply stacking stones atop one another. The intact walls of the southwestern half of the shrine were coated with a thick layer of stucco plaster and appear to have been painted blue-green. The stalagmite measures 2.1 meters in circumference at its base and 0.95 meters in height. The shrine's stucco floor once surrounded the stalagmite, but has since been destroyed, possibly by looters. This unfortunate excavation

exposed what appears to be an artificially carved niche at the base of the stalagmite, which may have originally housed a sub-floor votive offering.

Near the shrine we identified fragments of a modeled ceramic effigy incense-burner in the form of Chac, the Maya rain god. (This Late Postclassic ceramic type is known as Chen Mul, after the famous cenote at Mayapán.) This is vaguely reminiscent of Balankanche Cave, where effigy censers of Tlaloc, the Aztec rain god, were placed around a prominent column (see Andrews IV 1970). We also found a conch shell nearby that was probably part of an offering. One of the cave's six panels or groupings of rock art lies just behind Shrine 1. On the smooth ceiling above a flowstone mound, we counted at least twelve red, positive handprints. Such imagery can be found on the interiors of temple walls at various sites along coast and on Cozumel. A simple face was etched into the flowstone, one of at least a dozen found in the cave.

Shrine 2 is located along the eastern wall of the main entrance chamber, on the edge of a shallow pool. This U-shaped shrine was also constructed around a stalagmite. Unlike those of Shrine 1, the flanking walls of Shrine 2 are stepped back and closely resemble the "terraced wings" of the altar in Structure 1 at the site of Xelha (Lothrop 1924: fig. 136). Shrine 2 is in a remarkably good state of preservation. It appears as if efforts to produce





smooth plaster surfaces focused on the interior walls of the shrine, leaving the crude masonry of the exterior exposed. The north and east walls of the roughly west-facing shrine were built into a sloping portion of the low cave ceiling. The thick, elevated plaster floor of the shrine is largely intact, but it is clear that someone attempted to excavate around the base of the stalagmite. The stalagmite itself is 1.84 meters in circumference and 0.62 meters high. Interestingly, there is an abstract U-shaped element carved into the stalagmite. Also noteworthy is the base of a broken stalagmite, located directly in front of the shrine, that was carved into the shape of a cylindrical column.

In 2003, in addition to visits to the Aktun Chen area, I attempted to relocate four cave shrines in the vicinity of Xcaret that were originally reported by Andrews IV and Andrews (1975). Three of the cave shrines reported by Andrews IV and Andrews could be described as miniature temples. I was successful in relocating the shrine in Group Y Cave and hope to return in the near future. During my search, I had the good fortune of briefly visiting a previously unreported cave shrine near Xcaret that strongly resembles Shrine 2 in the cave near Aktun Chen. In this case, however, the shrine was built around a “throne,” rather than a stalagmite. Many thrones in or atop shrines throughout Quintana Roo now sit empty,

because the idols that once occupied them have since been spirited away or smashed; the fragments of these doomed sculptures sometimes litter the shrine’s floor.

Outside of the site of Xcaret, only two other shrines have been reported in caves along the central coast: Cueva de Satachannah, southwest of Xcaret (Martos López 2002: 222–225), and Aktun Na Kan, south of Xcaret (Leira Guillermo and Terrones González 1986). I strongly suspect that there are many more cave shrines than those reported in the archaeological literature. There is both great potential for discovery and a hope on the part of archaeologists that locals will share their knowledge of such sites.

A systematic program of detailed mapping and archaeological recording in the impressive cave near Aktun Chen is certainly warranted. Only then can we more closely examine the cave’s rock art, artifacts, and architectural features in their broader archaeological and speleological context.

Shrine 2, on the far side of the entrance pool in Gruta Las Caritas. *Dominique Rissolo.*

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### Altars Mayas en cuevas

Una cueva cerca de Aktun Chen, 5 kilómetros al oeste de Akumal, Quintana Roo, contiene dos altares mayas. Ambos son paredes construídas alrededor de estalagmitas. La cueva también contiene arte rupestre, incluyendo impresiones de manos y caras grabadas en calcita.

# SPECIATION IN AQUATIC TROGLOXENES IN CENOTES

Adriana Barona and Luis Espinasa

The Yucatan Peninsula is a large limestone platform with a vast expanse of karst topography. One of the Yucatan's most striking features is the complete absence of any significant surface fluvial system. Essentially all water flows underground through long cave systems. Access to the water networks can be gained in places where the roofs of these underground rivers or aquifers have dissolved or broken down. These karst windows are known as cenotes.

The direction of the water flow and communication among these drainage systems has important implications for the biological communities, as well as for the inhabitants of the Yucatan Peninsula, but, unfortunately, very little is known about these cave systems. Pollution of hydrologically connected cenotes is a constant threat. We were interested in studying the degree of relatedness among fish populations inhabiting different cenotes and, potentially, indirectly establishing the extent of interconnectedness of the caves by

This article is a summary of a BA thesis written by AB. Authors are affiliated with CEAMISH, Universidad Autónoma del Estado de Morelos, and/or Shenandoah University. Correspondence should be addressed to LE, Biology Department, Shenandoah University, 1460 University Drive, Winchester, Virginia 22601, [espinasl@yahoo.com](mailto:espinasl@yahoo.com). Eduardo Granados and Gerardo Obispo gave help and support during the field studies.

determining how much migration or gene flow there is among the cenote populations. Our results did not resolve questions about the level of connectedness, but as it often happens in science, the unexpected results proved to be more remarkable than what we originally had planned to investigate.

In non-karstic parts of the world, aquatic organisms freely disperse by following upstream or downstream water networks. Their dispersal is mainly restricted when they encounter geographical barriers, such as waterfalls or rapids, or when the organism is not adapted to different physical conditions, such as temperature or pH, encountered along the course of the stream. Since most aquatic animals cannot disperse over dry land, species tend to be restricted to hydrological systems, and as long as they encounter no significant barriers, members of a particular species can be found along long stretches within these systems (Chen and Borowsky, 2004).

Dispersal opportunities within the Yucatan hydrological network are different. Despite an almost complete absence of waterfalls or rapids (the Yucatan Peninsula is largely flat), the contrasting conditions in illuminated cenotes and the dark passages connecting them can be insurmountable barriers for some species. Water pressure can also be a significant barrier. Underwater galleries or cenotes can go to depths of hundreds of meters. If organisms are to disperse from one open cenote to another, they have

to be able to cope with the continuous darkness, the different sources of food, and often the high water pressure found in some of these galleries.

Since the Yucatan's hydrological network can be characterized as an essentially underground system with a scattering of karst windows (cenotes), one might predict that aquatic troglobites are able to disperse with relative ease, and, consequently, members of these species will be widespread and found in multiple localities. The biogeography of several organisms supports this idea (Reddell, 1977); two aquatic shrimps, *Typhlatya pearsei* and *Creaseria morleyi*, are highly adapted troglobites with a broad range throughout the peninsula. The latter has been found in at least thirty different localities. Most troglobitic fish studied behave similarly. One of the more distinctive members of the Yucatan cave fauna is the blind eel, *Ophisternon infernale*, and its range encompasses the north coastal plain from east to west. Another troglobitic fish, *Typhliasina pearsei*, shares a similar range.

Is the situation drastically different for aquatic trogloxenes that live in open cenotes? These organisms may not be able to survive long in the underground passages, and one could postulate that their dispersal is restricted to events sporadic in nature, such as flooding of the surface land or having their eggs get stuck to the legs of waterfowl, who then fly to nearby cenotes. Since the subterranean hydrologic connections that presumably exist between

neighboring cenotes are an unlikely option for their dispersal, aquatic troglonenes living in open cenotes may be as isolated as land animals on islands in the middle of the ocean. Only species that are able to survive the overland journey will be able to disperse regularly. For aquatic troglonenes, the open cenotes of the Yucatan may not be a continuous network of streams and rivers, but instead are akin to isolated islands in an archipelago.

In order to characterize the level of isolation for an aquatic troglonene living in open cenotes, we estimated the number of migrants by measuring gene flow among four populations of *Gambusia yucatanana* with two molecular biology techniques, RAPDs (DNA fingerprinting) and isoenzymes. *Gambusia yucatanana* is a small (less than 4 centimeters) colorful fish in the same family as the guppy, Poeciliidae. It schools at the edge of streams, where it feeds on algae and insect larvae. *Gambusia* clusters near the surface, seldom swimming below

20 centimeters from the surface. They have internal fertilization and give birth to live fish. *Gambusia yucatanana* is abundant in the Yucatan and can be found in open cenotes that are well illuminated and have algae. They are clearly troglonenes, and show no adaptation to the cave environment.

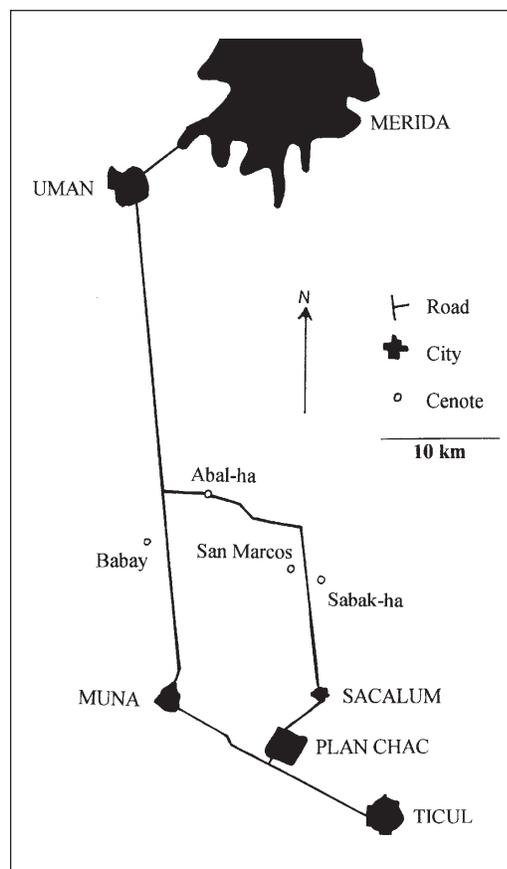
Live fish were collected from four open cenotes 30 kilometers south of Mérida: Babay (20°36.490'N 89°43.849'W), Abal-haa (20°38.620'N 89°41.115'W), San Marcos (20°35.040'N 89°36.850'W) and Sabak-ha (20°34.792'N 89°35.299'W). The shortest distance among them was between San Marcos and Sabak-ha (2.73 km) and the longest was between Babay and Sabak-ha (15.19 km). Fresh muscle tissue was used for the isoenzyme analysis, and DNA was extracted from fin clips for RAPDs analysis in the laboratory. Nine loci for the EST (2 loci), IDH, AAT (2 loci), 6-PGD, MDH (2 loci), and APH enzymes were studied in thirty-five individuals from each population. Five loci were polymorphic and therefore informative (EST-2, IDH, 6-PGD, MDH-1, and MDH). Heterozygosity was low; 0.04 instead of the expected average of 0.09. (Low heterozygosity happens in small populations that do not migrate to other neighboring populations, thus promoting endogamy). Average  $F_{st}$  (an estimate of gene flow) among the four populations was 0.52. This indicates very great genetic differentiation and extremely low migration ( $Nm = 0.22$ ). This number translates into approximately one single individual in the population migrating every four generations. To give some perspective, humans have much higher gene flow estimates among populations living on different continents ( $Nm$  close to 5.1), and animals have an  $Nm$  close to 1.2 on average.

We also obtained a phylogenetic tree (UPGMA

method) with data from DNA fingerprints (seventy-three bands scored, 42.4 percent of which were polymorphic) from five individuals from each of the four populations. The phylogenetic tree was also consistent with low levels of migration among populations. All four populations were monophyletic, and every single individual was more closely related to members of its own cenote than to any individual from any one of the other populations. Genetic distances from both the isoenzyme and RAPDs data showed the same two population clusters: Babay and Abal-haa populations were the most closely related, and then San Marcos and Sabak-ha populations.

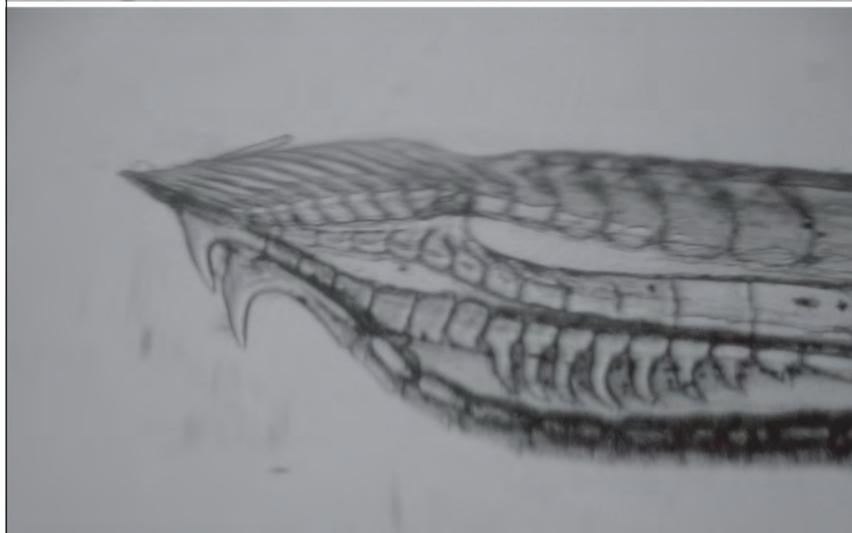
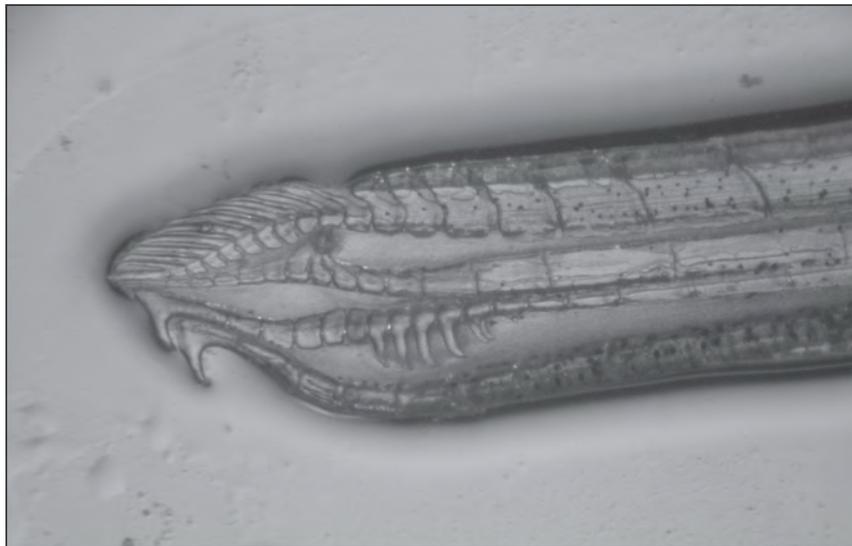
One theory of evolutionary biology postulates that if two populations are isolated from each other and do not exchange genes, they eventually splinter, each following its own evolutionary course as changes in genes accumulate. As time progresses, they will increasingly diverge, both genetically and morphologically, until they become separate species (Mayr, 1963). This process is known as allopatric speciation. Our results demonstrate that for the *Gambusia* living in what is for them geographically isolated cenotes, gene flow has been low, and they have already experienced much genetic differentiation. This prompted us to study the *Gambusia*'s morphology to, in a sense, see speciation in progress.

We took twelve different body measurements from seventy-five fish from Babay, fifty-nine from Abal-haa, seventy-one from San Marcos, and forty-seven from Sabak-ha, and divided them further into males and females. We then performed a statistical analysis known as "principal components" and established that the four populations were each clearly morphologically distinguishable from one another. Overall, individuals from Abal-haa and San Marcos were the least distinct, while those from Babay were the most, although each population had its own distinguishing set of factors. For example, San Marcos fish are characterized by a pointed face and a curved body,



while those from Babay are flat-headed with parallel-sided body. A most significant distinguishing feature was the gonopodium. The gonopodium is the anal fin, which in males is modified and appears as a semi-penis to help them with the internal fertilization. The tip has a set of spines, which are used by taxonomists to differentiate between poeciliid species. So diagnostic is this character that the number and position of the spines is used in biological keys as the main character to differentiate species. In the case of the four populations we studied, Babay males had an average of  $5.60 \pm 0.51$  (standard deviation) spines in the gonopodium, Abal-haa  $6.57 \pm 0.49$ , Sabak-ha  $4.73 \pm 0.49$ , and San Marcos  $5.65 \pm 0.41$  spines. The individuals from Abal-haa and the ones from Sabak-ha did not even overlap in the number of spines. Abal-haa fish had six or more, while all the Sabak-ha individuals measured had fewer than six spines. If it was not for the fact that these two cenotes are only 12 kilometers apart, some taxonomists would have no problem considering this character enough to assign the two populations to two different subspecies or even different species.

**C**ONCLUSION. *Gambusia yucatana* is a troglone fish that lives near the surface of the open, illuminated cenotes in the Yucatan Peninsula. Since the fish almost never descend more than 20 centimeters beneath the surface, they are essentially unable to disperse by swimming from one cenote to another through the underground passages. Dispersion among cenotes is also restricted for this species because, unlike most fish, *Gambusia yucatana* give birth to live fish and do not lay



Above: Morphological difference between two typical females from cenotes San Marcos (top) and Babay.  
 Below: Male gonopodium, tip of anal fin. Top specimen is from Babay, bottom specimen is from Abal-haa.

eggs. Therefore they cannot use the traditional egg over-land transporting devices such as sticky eggs adhering to the legs of waterfowl or simply being blown to a different locality. The result of these behavioral and ecological characteristics means that cenote populations of *Gambusia* are extremely isolated from one another. Geographic isolation restricts gene flow among populations, and a low level of gene flow allows for genetic differentiation, which then may be reflected in their distinct morphologies. All of these factors are present in *Gambusia yucatana*, and all of these are the basis for speciation.

We have demonstrated that four arbitrarily selected cenote populations of *Gambusia yucatana* within an 8-kilometer radius have enough

genetic and morphological differentiation to be classified as different subspecies or even species, depending on the criteria being used. Such divergence in non-karstic rivers would typically be expected only if populations are much farther apart or even in different hydrologic systems.

Why is this relevant? There are hundreds if not thousands of open cenotes in the Yucatan Peninsula. If each cenote has its own subspecies or species, we may need to consider the Yucatan Peninsula as one of the biggest "hot spots" of speciation for fish. It even opens an interesting door for conservationists: Typically governments do not protect one locality unless it houses some unique organisms. If the validity of our results can be extended over the

whole peninsula, perhaps each cenote has its own unique and endemic *Gambusia*. This might be an ichthyologist's dream, but for the taxonomist who has to catalogue them all, it is his worst nightmare.

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### Especiación de troglóxenos acuáticos en cenotes

Investigadores intentaron estudiar las conexiones subacuáticas entre cenotes en Yucatán midiendo las similitudes entre los peces superficiales en los cenotes. Estudios de ADN y morfología demostraron de hecho que las poblaciones de *Gambusia yucatana* en los cuatro cenotes eran bastante distintas, indicando que no viajan de uno a otro para reproducirse. Si los biólogos estimaran estas diferencias como suficientes para definir nuevas especies, habrían cientos de especies similares en los cenotes de Yucatán.

# CAVING IN CUETZALAN

Chris Lloyd

Cuetzalan, Puebla, has to be one of the best weekend caving areas in the world. Where else can a Mexican caver drive for a long weekend (or even a regular weekend if he lives in Mexico City) to over one hundred kilometers of explored, mainly large stream passages, with loads of potential for new stuff? You don't even have to camp out, unless you like camping in the rain. The hotels, food, and, most importantly, drink are all still very cheap. There is the small matter of its caves' reputation for floods, but I think that is a bit overdone. We went. We didn't get caught in a flood. It must be overdone.

My trip began in Guadalajara with two friends, Victor Hugo and Alberto Cortés, on a Thursday afternoon in February 2003. We stopped in Mexico City for the night at the house of Ramón Espinasa. The next morning, with Ramón joining us, we continued on toward Cuetzalan, thinking we could make good time, since it was a holiday and cross-town traffic was unusually light. Our good fortune did not last, of course, as we got stuck for over an hour in stop-and-go traffic just to pay the toll to get out of town, confirming that the biggest hassle in caving in Cuetzalan is the traffic in Mexico City (although the police in Toluca do their best to grab the top spot). Unless you travel through or out of Mexico City between midnight and 6 AM, you are almost sure to get stuck in traffic for at least an hour. Caving in Cuetzalan, once you get there, is the easy part of the trip.

Once out of Mexico City, after a few hours on the road crossing the high, volcanic plateau of central Mexico, one begins to drop off the edge into steep, heavily dissected terrain with an almost permanent cloud bank. Along the winding road, the karst of the Cuetzalan area slowly becomes apparent through the clouds and light drizzle known as *chipi chipi*.

The area we had chosen to explore is actually to the west of Cuetzalan and above it, centered roughly around the smaller town of Jonotla. This area was also explored by the Americans, with some Canadians, Brits, and Mexicans as well, in the 1970s and early '80s, but even less was published about it than about the main Cuetzalan area. As a result, Ramón has been poking away for the last ten years or so at properly mapping the known caves in this area. Our trip was to add to that, as well as do a top-to-bottom through-trip in Sistema Huayateno, which we figured had never been done before. The whole of the system is about 6.5 kilometers long, with many leads still to push, while the main through-trip traverses about 3.5 kilometers of passage.

Due to the traffic problem, we weren't in the Jonotla area until 3 PM, so we decided to just have a look at a cave Ramón knew to be just under the highway, with only a five-minute approach hike. It resurges about 500 meters downhill on the other side of the highway. Starting the survey at the drip line, we headed downstream over clean-washed cobbles set between sandbanks. Two side passages right by

the entrance were left for later in hopes of a quick through-trip. But the cave had other things in mind. About 150 meters in, still within sight of daylight, the stream headed under a wall into ugly-looking stuff that we had no intention of pushing, since the main passage seemed to head off to the left, where, fortunately, it continues in ample size, 20 by 15 meters, until a corner presented us with a large pile of tree trunks that must have been washed in by the last hurricane, about five years ago. We continued along the left wall over a pile of rotting wood and then over big breakdown blocks into much smaller passage. Some narrow bits and small chambers quickly took us to a dead end, where there is a small water inlet and an even smaller outlet, but no way on for us. Hmmm. We must have missed something somewhere. Backtracking, we checked out the right side of the wood pile and found a couple of ways on into smaller passage with the sound of flowing water. This would be the way to check sometime when we had more time. We needed now to get over to Cuetzalan to find a hotel room for the holiday weekend. (This cave is Sumidero de Agueyaco, described by Randy Spahl in the *Canadian Caver*, volume 15, number 2, 1983, but whose map has never been published.)

Once in Cuetzalan, we quickly noticed that the streets were full of SUVs, many sporting bikes in racks, not a good sign. Sure enough, our usual hotel, the Hotel Vicky, was completely full, but as

the owners know Ramón, they let us use for a couple of nights a house they are converting into a small hotel. Thus settled, we were able to get ready for our big through-trip the next day.

Ramón had not been to the top entrance in ten years, and we did not know how long the traverse would take. We figured six to eight hours plus the hikes to and from the entrances. We parked at the same house, Don Tobias's, as the day before and set out in rare sunshine on the one-hour hike to the upper entrance. As we hiked, Ramón pointed out various other entrances, as well as the house that Mike Boon and Randy Spahl had used as a base while exploring this area some twenty years ago (see the same article in the *Canadian Caver*).

The upper entrance we used is actually a fossil entrance in a small headwall about 50 meters from the active entrance, where the stream flows underground, and some 100 meters away from where the same stream emerges from the lower end of Sima Estefan, another through-trip cave, 1 kilometer long. Our first obstacle was a climb right in the entrance that looked a bit tricky, but turned out to be quite easy once we were on it. From the base of the climb, in passage 3 meters wide by 4 meters high, a passage is seen going both uphill and downhill, with

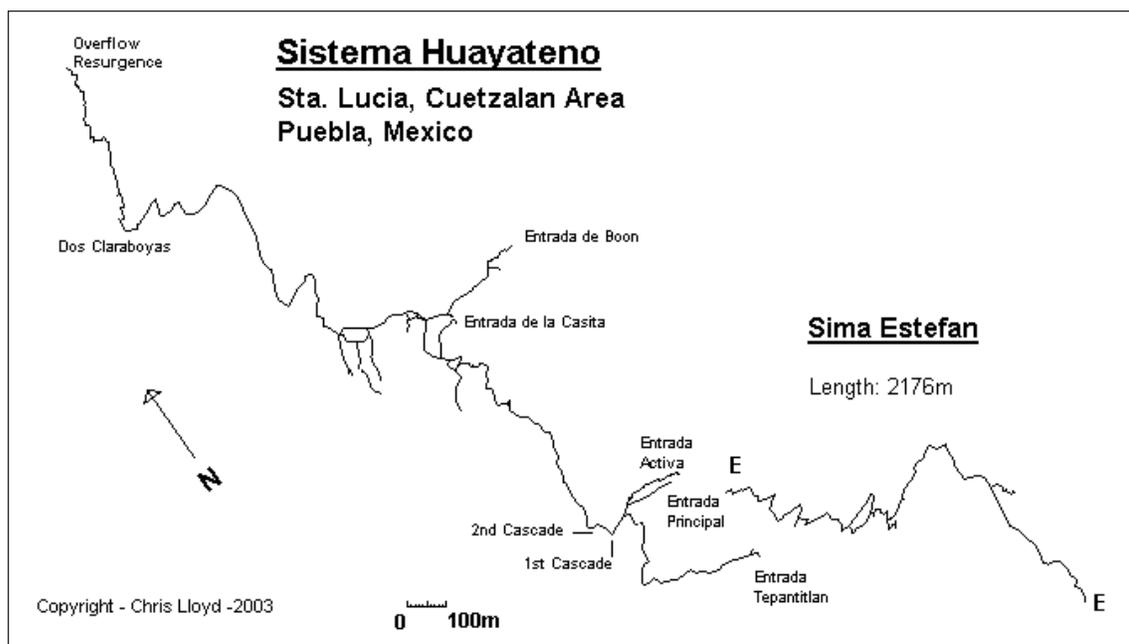
a small inlet coming in across from the base of the climb. The uphill direction was not checked, while I had a quick look into the active inlet, scooping about 40 meters of walking passage that has not been mapped. But we were there for a sport trip and headed on down into the known cave.

About 40 meters in, the stream comes in on the right from a walking-size passage that quickly gets smaller. It is possible to follow the water in from the wet entrance, but that entails crawling in the flowing water, so we had taken the easy route. After another 40 meters in ever-larger passage, one passes under an 8-meter-diameter skylight before coming to a junction where a large passage comes in from the left. This is the Tepantitlan section, which I had helped explore in 2000 from its surface entrance down three pitches to the top of a fourth. This trip we strolled upstream in it 50 meters to see the 7-meter-high waterfall that had stopped us then.

Continuing down the main route, we soon came to the next obstacle, a 7-meter cascade. We had brought a rope just in case, but finding nothing to rig to, we just used it to lower our packs, and we down-climbed on one side of the water. The climb looked quite tricky, but handholds appeared just as they were needed, and nobody was washed into the

crashing water. Below the cascade is a large breakdown chamber with a couple of possible routes onward. The right way is down through the blocks, which pops one out into a lower level that continues in solid rock, leaving the breakdown behind. Shortly, another junction is reached, where the left side goes to another climb and cascade, both of which can be bypassed by going to the right through some hands-and-knees crawlways. As crawlways go, these are not too bad, though most of the floor is cobbles in conglomerate, which makes it uncomfortable on the knees. Before long, we popped out high up in the wall of the main drain. Now this was more like it, 10 meters wide by 15 meters high, with an exposed but easy downclimb to get into it. Once down, we walked back upstream to check out the waterfall pouring into a 25-meter-wide chamber, where we decided that the crawlway bypass had been worthwhile.

The main drain continues on in fine style, with a clear flowing stream quietly sliding by gravel banks or between large blocks in passage 10 to 20 meters wide. Such easy going never lasts, though, and before long we were back up on top of big blocks and could see another waterfall on the right, which marks the inlet from the La Casita Entrance. One hundred meters farther,



we climbed up out of the main route to pass through the Claraboya (Sky-light) Entrance. Here we stopped for lunch and enjoyed the lush greenness of the damp vegetation at the bottom of the 30-meter-deep and 20-meter-wide pit. Off to one side, another high inlet came in from a passage that led up to the house that Boon had used. Opposite that was a 10-by-8-meter opening leading down into the rest of the cave.

The next section of the cave has the biggest passage, with some of the breakdown blocks here wider than any of the passage seen previously. Some places reach 40 meters in width and some 30 meters high, with the stream somewhere under the blocks. Also in this section is the only notable formation in the cave, a large flowstone bulge along one wall, with a nice stalactite and drapery above it. Beyond that formation, the size of the passage decreases to 5 to 10 meters wide again, and before long we came to yet another entrance, the *Entrada de Dos Claraboyas*. This one is particularly important, as it allows you to check the weather outside before committing yourself to the last 500 meters of the cave. So far, moving along with occasional stops for photos, we had spent only five hours underground, but five in the afternoon put us in the prime time of day for rain. Fortunately, a look outside suggested that we were unlikely to get a shower, so we plunged on into the most sporting part of the trip.

*Plunge* may not be quite the right word, as the first pool, which used to be a swim, is now only a wade, due to the last hurricane bringing in a lot of sand and gravel. This had been noticed throughout the cave, actually, as nowhere did we need to make the swims that Ramón remembered, though we did get wet up to the armpits in a few places. After the wade, the passage narrows down into a tall canyon. We followed narrow ledges near the roof, while the stream rushed along 3 to 5 meters below us. Most of the time, the passage is narrow enough for comfortable bridging, but a few wide spots made us stretch to reach the other side. Where boulders

block forward progress, we had to drop down to water level again, before being forced back up by a section too narrow to pass. Then the height of the passage drops to just a few meters, and we were in the water and trying to avoid plunge pools. Following a few cascades, we rounded a corner to be confronted by a boulder blocking the passage. Ramón says he squeezed by the last time he was here, but, ten kilograms heavier, he had no such luck this time. Time to look for the supposed bypass.

Backtracking upstream, we failed to find anything that we could squeeze through, so we decided to see if the skinny guys could get past the boulders and maybe help the heavyweights from the other side. Fortunately, before we did that, Victor took a look at the floor of the passage and thought that he could lie in the water and get past the boulder that way. Sure enough, it was not tight at all, and it did not even require full immersion.

So now, with the tightest bits behind us, we cruised through more bridging rift over the stream and a few deep pools before popping out the lower fossil entrance, having lost the water under boulders a couple of turns back. I found this entrance a bit disappointing, as it was only a couple of meters in diameter, nothing like some of the huge entrances in the area or like much of the rest of the cave, for that matter. But we were out in six hours, did not get flooded out, and still had daylight to hike back up to the car. Quite a good day on one of the classic through-trips in Mexico: 3.5 kilometers of everything you could want in a cave. Now if we could just get rid of a couple of things we didn't want, like those crawls in the upper bit. . . .

After being delayed somewhat Sunday morning by the local market, we set off to see if we could complete the through-trip in *Sumidero de Agueyaco* that we had started on Friday. It took quite a bit of willpower and no shortage of whining to put back on wet clothes in the light drizzle now falling, but eventually we made it back down

into that cave. This time we took the first side passage to see what it did and quickly knocked off 150 meters of survey in walking passage, following a trickle of water and a breeze. This took us into a boulder pile, though, that some of us weren't too keen to push. But finally the young lads got to show their keenness by pushing on ahead. Victor took a tight, stooping stream passage, while Alberto headed up into the boulders, managing to get above the pile and into big passage again. Unfortunately, Victor's streamway drops to a crawl after 30 meters, and the big stuff up above didn't seem to go very far. Considering the good breeze in the start of that section, it is definitely worth a good push trip to find the way on. We had come for the through-trip, though, so we headed back into the main part of the cave, passing four frogs along the way, prompting the name *Pasaje de las Arañas*.

Back at the woodpile, we headed in on the right side and passed a narrow part, before the passage opened up again to 2 to 5 meters wide. That didn't last long before we had to drop down into a small section with a flowing stream. Following the stream briefly, we tried to stay with the air and the bigger passages in what appears to be a rectilinear maze. Leaving behind a number of side passages, we pushed on, with Victor probing the route ahead into a modest-sized chamber. Continuing on through boulders at the right end of that room, we popped out into a very large room, 50 meters wide, 20 meters high, and about 30 meters across, with the stream flowing across rounded cobbles. This was more like it; this stomping passage had to be the main way on. But once again the cave had other ideas.

Leaving small leads in the corners of the room, we headed downstream, where the size quickly closes down again to normal walking size. We surveyed around a pillar to avoid a dunking, and then the passage split again, one taking the stream to the right, while the main air seemed to be going left. But now we were out of time and had to call a halt in favor of starting our

thirteen-hour drive home (oh, joy). But a quick scoop ahead by the young lads confirmed that we still had lots to come back for. So far we had about 500 meters of survey in what was supposed to be a trip between entrances 500 meters apart, but we had in fact only advanced half of that straight-line distance. Who knows how much more awaits us?

### Cueveando ed Cuetzalan

El artículo describe una travesía en el Sistema Huayateno, Puebla, y el comienzo de la topografía del Sumideron de Agueyaco, en la misma área.

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## BOOK REVIEW

*The Devil's Book of Culture: History, Mushrooms, and Caves in Southern Mexico.* Benjamin Feinberg. University of Texas Press, Austin; 2003. 6 by 9 inches, 272 pages. Softbound ISBN 0-292-70190-x \$23.95, hardbound ISBN 0-292-70550-6 \$55.00.

Feinberg is an anthropologist writing about the Sierra Mazateca and primarily about the long history of Huautla, Oaxaca. Up until about fifty years ago, the Sierra Mazateca was a little-known, isolated area with few, if any, roads into it. This all changed in 1957, when George Wasson, a mycologist, wrote an article for *Life* magazine. He revealed the existence of a culture in which shamans used the mind-altering abilities of psychedelic mushrooms in curing ceremonies. By the mid-1960s, a rough, unpaved road had reached Huautla, and hordes of hippies started to descend on the area seeking the magic mushrooms. To add to the mix, cavers went there to check out the many sinkholes indicated on topo maps. Not long afterward,

regular caving expeditions began to Sótano de San Agustín and other caves near the village of San Agustín.

There was a local backlash against the hippies, and they were ordered out or prevented from going into the mountains. Since cavers at the time appeared no different, cave exploration in the area became much more difficult. A six-year hiatus in caving ensued, until trips resumed in the late 1970s. It is with this background that Feinberg's book can be read with particular interest in his take on the role the caves play among the Mazatec. Most of the book deals with political, commercial, and cultural history, making it read like a specialized anthropological journal. But within it are scattered many tidbits of interest to cavers, including a long chapter on caves. In everyday language, he includes amusing stories about his truck and the adventures he had during his many trips to Huautla.

The cavers, ecstatic at having found world-class caves, at first

gave little notice to the importance the indigenous people placed on the caves, which they had used for hundreds of years for ceremonial events and burials for the nobility. Feinberg tells of legends of buried treasure and myths of El Chato, a half-beast, half-human that inhabits the caves. This devil-like creature will provide wealth in return for sexual favors to anyone who ventures underground.

It is small wonder that cavers met with such ire from the traditional Mazatecs. Despite his efforts at public-relations, some still think that Stone's expeditions are taking things of value out of the caves. After almost forty years of caving in the Sierra Mazateca, the issue of the cavers is still not clearly resolved among the local people. From Feinberg's book one can at least get an idea about why relations between the Mazatecs and cavers have been so contentious. Perhaps a better idea will emerge of the Mazatecs, custodians of some of the most spectacular caves on earth.

—Ernie Garza

## HISTORY

# FIRST SPELEOLOGICAL SURVEY OF MEXICO TRIP

T. R. Evans

Here is a letter written by T. R. Evans and addressed to Orion Knox. Both were cavers from Austin, Texas. The letter is dated October 30, 1962, and is on Speleological Survey of Mexico letterhead, which lists TR as editor and James Reddell and William Russell as associates. Reddell and Russell are still active in what is now called the Association for Mexican Cave Studies. The letter is printed here with TR's per-

mission.

The first cave mentioned is Sótano de El Crucero, Veracruz. As far as I can tell, no map of this cave has been published. The second cave is Sótano de Oztoatlicholaa, Veracruz. A map of it appears in *AMCS Activities Newsletter* 22, on page 55. The cave in the Xilitla area is Sótano de Huitzmolotitla; a map exists but has not been published.

TR wrote a longer article on the

trip for the *Texas Caver*, volume 7, number 12 (December 1962), pages 135ff., and it was reprinted in the tenth anniversary issue of the *Association for Mexican Cave Studies Newsletter*, volume 4, number 1 (January 1973), pp. 23–26, under the title "First Speleological Survey of Mexico Trip." The article says that the trip began on November 11, 1962, so either the date on the letter or the date in the article is wrong.—Editor.

The trip to Mexico was far out, and we turned out some far out spelunking. The first stop was the area that I found this summer near Orizaba, which was even further out than I had anticipated. The first sotano we went in (Terry and I went in the deep ones while Reddell and Bill Russell watched the top and located others) was a spastic 364-foot drop in one clean shot. It is a large dome-pit filled at the bottom, with no passages. The second one, at Tequila, is the most impressive cave sight that I have even seen. You drop down a 15-foot-in-diameter hole for about 100 feet, and at this point the ceiling cuts back and goes out to the sides, so you are in a room 100 feet long and about equally as wide, with the floor some 250 feet below and out of sight—a true abyss. At the bottom of the first 350 is another 100, and shortly after another 100, through a little waterfall that soaks you and the rope. Here the 600-foot rope ran out, and we were looking down a 50-foot or so. Air was moving out and water going in. The passage was a fissure some 8 to 10 feet wide and 75 to 100 feet high. Probably goes for miles. We found numerous others in this area (at least fifteen over 200 feet) that we didn't have time to bottom. One you drop a rock in and hear the last bounce after 10 seconds—after that it

fades from audibility. The 364-foot took 6.5 seconds for a rock to hit, glancing off the vertical walls.

After this area, we bounced to Xilitla to see what we could do with the "6 Second Sink" that Glen Merrill and crew took 1000 feet of rope to and spent 10 hours going down only the first 350. (They took safety precautions that we didn't; after Tequila, we were used to tossing the rope over and blasting down without fanfare.) We got to the top of the 350 at 2:30 one afternoon, and Terry and I were on the bottom at 3:00. Drove a bolt and went down the second drop (175 feet) using the same rope (the 600). We retied it to the expansion bolt. We explored over a mile of passage and were on the surface 6 hours later, at 8:30 P.M.—a record of sorts. The last 175 is through a little waterfall, and the mile of passage is a water passage. The water is from ankle to neck deep, and the passage all walking. No end in sight where we stopped. Will also add that many swallows inhabit the cave, so at night prusiking out you have at times eight or ten birds clinging to you and the rope. One knocked Terry's carbide lamp off, and he lost it. We both prusiked at the same time with no trouble. May go back Christmas.

# CHIROPTERPHOBIA

Chris Lloyd

Some cavers are so afraid of bats that at the slightest contact with or even the sight of a bat they feel compelled to run from the cave. This would have to be considered a true phobia, and it is obviously not a good thing for a serious caver to be afflicted with. So if you have it, how can you get rid of it? Well, the National Geographic Society is going to show you how.

Recently I had the opportunity to work for a film company that was producing a series of shows on animal fears for the National Geographic TV channel, and I got to help with the one on bats. Quite a convoluted route led NG to me and my local cave, and the process that actually cured someone's bat phobia was amazing. It all started, for me at least, with an e-mail out of the blue. A neighbor, John Pint, contacted me from Saudi Arabia, where he was working, in response to a request he had received regarding a quest for a bat-filled cave in Mexico. The film company that had won the contract from NG to do the bat program had seen Louise Hose in another NG film about caves and had contacted her. It turned out that Louise was one of the few serious cavers afflicted with a real bat phobia, and since she already had "acting" experience, she became their star. Then they needed a cave full of bats where they could film Louise being cured of her phobia. So Louise contacted my friend, who

normally resides in Mexico, in search of a foreign cave to give a bit of exotic appearance to the film. But Pint was overseas, so he suggested to me a cave close to my home in Guadalajara. I tried to suggest some larger and more bat-infested caves, but they all tended to be in places not as safe and convenient for a film crew, so they decided to go with the cave near Guadalajara and use me as their "fixer." The deal was that I would provide the cave and set things up so that they could fly in, shoot their film, and fly out again with minimal fuss. They didn't mention that they wanted to use me in the film, but I guess I should have figured out that I would be the most likely candidate to guide Louise into the cave. If the bats did not perform as promised, I would be right on hand to explain the problem. Fortunately, the bats did perform, though not the ones I was planning on.

Our bat cave was Cueva del Chapuzón, which is located only forty-five minutes away from Guadalajara and a very short walk from the road. It has a good ten thousand or so bats, apparently of some seven species, in passages that are somewhat narrow, forcing you into close proximity with the bats—perfect conditions for the film. They would interview Louise in Los Angeles to get the background on her phobia and then have her talk to a psychologist who was supposedly going to cure her. Then they would bring her down to the bat-filled cave to show that the cure really worked. After many e-mails, we

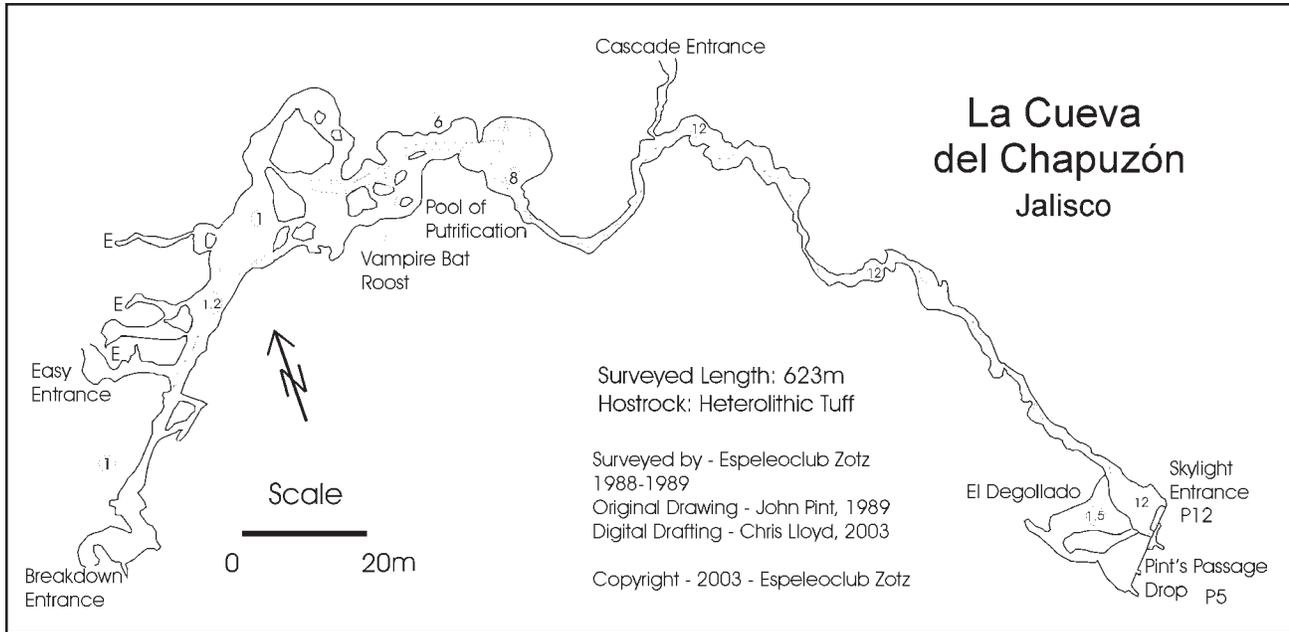
agreed on the first week in June 2002, at the start of the rainy season. I warned them that I might have to leave to do my real job of looking for gold, but I figured it was unlikely, as things were so slow in the gold business that I had been twiddling my thumbs for many months. But a jump in the price of gold changed that, and not long after we'd gotten everything sorted out, I was sent on a trip to Honduras. Fortunately we were able to delay the filming a week, until I got back, and we were able to do the shoot in three action-packed days.

I was a little shocked, needless to say, to see Louise hobbling on crutches and limping in her foot casts when I met them all at the airport in Guadalajara. How was the star of the show going to get through the cave in that condition? It turned out that both of her feet had been operated on about ten weeks earlier and were just getting to the point where she was allowed to walk. It also turned out that she did just fine in the cave.

During our first meeting, over dinner, I got to meet the team. The producer was a young lady who grew up in Hong Kong and is the only person I have seen adjust to Mexican driving without fuss. She brought with her a cameraman who was a producer when he could get the work and a soundman who was a cameraman when he could get the work. Of the three, only the soundman had been in a cave before, and he seemed to have enjoyed crawling around, so I didn't expect any problems from him. The other two

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This article appeared in slightly different form in the *Canadian Caver*, number 60, 2003.



I was not so sure about. But they all seemed keen, so I tried to get them prepared for crawling around in bat guano and a possible swim in the lower entrance. Also at that dinner was a group of local Mexican bat biologists whom the producer had somehow tracked down and asked to check the cave to make sure the bats were actually at home. I had presumed they would be, as I knew they had young ones in September, although I didn't really know when they were born. The biologists had been out to the cave the day before and found that at least two of the species had babies with them, and so we were asked not to disturb that maternity colony. This put a bit of a crimp on our plans, because the idea had been to get shots of Louise in a passage with lots of bats flying around her. A bit of a panicky planning session ensued to figure out what we could do to salvage the shoot. After a good bit of translating back and forth between the crew and the Mexican biologists, we learned that there was a colony of vampire bats in the main passage, while the main maternity colony was in a side branch. Disturbing the vampires was not considered a problem. So instead of having a mass assault by bats, Louise was now going to have to confront her bat phobia by getting friendly with a group of vampire bats. Not quite

what the producer had planned, but we would have to make it work. Louise did not seem overly thrilled by the change in the script, but was willing to give it a go.

Driving out to the cave, Louise picked up right away the fact that there did not seem to be any limestone outcrops anywhere. It had not occurred to me to mention it, as I was used to the fact that everything in the area is volcanic, seeing as my house sits on the north rim of a large caldera that is still smoking. The cave is located just to the south of that caldera, in volcanic rocks. So while the film crew was running around checking out filming angles and so on, Louise and I sat down to look at the rocks. While I knew the cave was developed in a volcanic flow of some kind, I had never bothered to look at it closely. Now, with another geologist to make up stories with, I took a critical look.

It turns out that the big rock fragments I had noticed before were part of a large eruption cloud that had collapsed and flowed away from its source to be deposited here. To clarify the terminology a bit: Volcanologists sometimes describe things flying through the air as flowing. Sometimes an eruption produces mainly small particles, like grains of sand or smaller. Think of the typical nuclear-bomb mushroom cloud and you have an idea

of what a volcanic eruption looks like—not the cap-like nature of it, necessarily, but the big-cloud-going-up part. Those grains of sand fall out of the cloud after gravity takes over, and that leaves a downwind surface covered in ash and sand grains. You have probably seen the photos. This is called an air-fall deposit and is *not* what happened at Cueva del Chapuzón.

The rock unit at Cueva del Chapuzón is a heterolithic tuff, with rock pieces making up over 50 percent by volume, the fragments being anywhere from 0.5 to 20 centimeters across. Those rock fragments were ripped out of the wall of a big magma chamber and sent about 3 kilometers or more up into the sky in one of those large mushroom clouds. Eventually the energy that had sent them up there ran out, and gravity took over. A portion of that cloud collapsed, and the particles began their return trip to earth. As those rock fragments built up speed downward, they entrained the same hot gas that had sent them up. The combination of rock and gas travels like a fluid; it flows. That fluid, at least 200 degrees C, flows back down the edge of the rising cloud and spreads out over the surrounding countryside, burning and burying everything in its path. If you are thinking Mt. St. Helens, that is way too small, and it was a

horizontally oriented blast eruption, a somewhat different beast. If you have seen footage of Mt. Pinatubo in the Philippines, you are on the right track, but again way too small. Eruptions from volcanoes tend to be small affairs, with a very big one, like Krakatoa, erupting up to 100 cubic kilometers of magma. Caldera eruptions, on the other hand, start at about 100 cubic kilometers and go up from there, way up. A big caldera eruption can have over 2000 cubic kilometers of magma going up the pipe.

Were the rocks that host Cueva del Chapuzón produced by the Primavera Caldera my house is located on, or another one? A little research in my files at home unearthed an article on the Acatlán Caldera, which is located about 40 kilometers southwest of Guadalajara and about 15 kilometers southeast of the cave. The article describes a lithic-rich tuff unit that sounds very similar to the one we saw at Cueva del Chapuzón, and the limits of distribution of the tuff shown in the map in the paper would cover the cave. As the Primavera eruptions did not tend to be lithic-rich, it is most likely that the cave is in the lithic tuff of the Acatlán eruption. That eruption has not been well dated, but it is thought to have happened about one million years ago and been about 140 cubic kilometers in size. While not large by caldera standards, it was enough to cover well over 200 square kilometers with over 30 meters of semi-molten rock that settled and cooled to become the rock we see today. Not a good day to have been out looking for caves.

Once we had studied the rocks, we had to get down to some real, in the eyes of the producer, work. I figured I had better first take the film crew in to let them see what they were getting themselves into and give them a chance to pick some shooting spots. A quick trip without gear would make it easier for them later. So in we went. The main upper entrance to Chapuzón is located under a big fig tree whose roots spread out over the rocks, almost hiding the small opening we

had to crawl into. After a short stoopway, the cave opens up to walking passage, where one enters a small streamway that has cut down into the soft volcanic rock. Right away there are a couple of downclimbs that land in water-filled pools. Crossing over them dry requires a bit of tricky bridging that wouldn't be an option for Louise, as she could not risk a fall. All the better, said the film crew. Shots of Louise getting wet would be fine. After the short bit of big stuff, the next section is mainly stooping passage or hands-and-knees crawl. I had originally planned to take them up the other branch, where the passage is at least 15 meters high, but with the baby bats there we were stuck with this lower section. After about 100 meters of that, the film crew called a rout, saying that they had gotten the idea just fine, thank you.

So now it was time for lights, camera, action, which in reality translates into putting people into staged positions and waiting while the cameraman gets set up, the sound guy does his level checks, the producer tells everybody what she wants done, and then the camera runs for ten or twenty seconds. If it worked (in this case they had a digital camera and could actually check right away whether it worked), we would then advance to the next place they wanted filmed. So we did the going-into-the-cave shot, and then the looking-out-the-entrance-as-we-entered (again) shot, and so on farther into the cave. I got to alternate between being the guy holding the diffusing reflector for the light and being the cave guide taking Louise into the cave. Three people were to appear in the cave in the film, Louise as the star, me as the guide, and Yunuhen Rodríguez as a bat biologist, which she really is.

We set up shots everywhere the producer thought might look good. Fortunately the speaking parts were limited, so it did not take too much time. My first lines were to exclaim over the first pile of vampire guano we happened upon. I, of course, had been alerted to its presence well before seeing it, as it smells so bad,

but I had to make it look good for the camera—my exclamation, that is, as nothing can make vampire guano look good. About lunch time, we finally hit the chamber with the vampires. A lunch break was called to get some food down before being overcome by the noxious guano smell.

While the others were heading out, Louise and I took the time to look at the cave walls to get a better understanding of how the cave had formed. Up to that point we had seen what mainly looked like bedding-plane development that had been downcut by the stream in places to form a small canyon, as well as some almost-round phreatic development with nice scallops on the walls. The only problem is that volcanic rocks are not noted for their bedding planes. But that is not to say they can't have any, and when we looked closely it was quite clear there was in fact a bedding plane controlling the development of the cave. Looking more closely, we could see that the bedding plane was filled with about 1 centimeter of clay. It therefore appears that water must have reached the bedding plane by fractures in the overlying rocks and then started to flow along it, eroding out the soft clay. Then little by little it just enlarged that opening, eroding away the volcanic tuff, mainly along the bedding plane. Uplift was obviously going on at the same time, and before long the passage started to be downcut into a canyon. None of these features were well developed up to that point, but I knew from previous visits that good examples of each lay ahead. The vampire-bat chamber is actually the best-developed horizontal area in the cave, with a room about 10 meters across and only 1 meter high. Right beyond it, a sizable canyon has been cut, making a passage about 8 meters high that grows to 15 meters high farther downstream. Quite an interesting cave.

But we weren't there to marvel at the cave, so after lunch we had to get down to the real business at hand, demonstrating how Louise could now happily hang out with

bats, even if they were vampires. Back in Los Angeles, Louise had talked with a psychologist about her phobia, but not before she was interviewed by the film people, who had a script of questions from the psychologist. The psychologist studied that tape, and by noting her unconscious physical reactions (pauses, looking away, things like that) to the questions was able to get a good idea of the nature of her phobia. Then when they met in person, the psychologist asked Louise to close one eye and describe the first encounter with bats that came to mind. With her left eye closed, she described a big chamber with a bunch of bats flying around in the distance. When asked, she said she was agitated by the vision, but not panicked. With her right eye closed, the first image that came to her was one of being in a confined space with lots of bats flying around. She was visibly panicked and almost ready to run out of the room. These responses were much as the psychologist expected, having to do with the different responses of the two sides of the brain to the same stimulus. Once that had been identified, the psychologist was able to talk Louise through her different feelings and try to get her to replace the panicky image she saw with her right eye closed with the manageable image she saw when her left eye was closed. In that manner, basically, Louise was almost cured of her phobia. They had then taken her to a barn that had a large colony of Mexican freetail bats and filmed her sitting in the corner testing out her

new awareness. Little by little she got over the feeling of panic and got used to the bats flying around. Now they wanted to test her out in confined spaces with vampires.

Part of the vampire chamber in Cueva del Chapuzón is just big enough to stand up in, though that puts your head in contact with the bats walking around on the ceiling. Then there is the pool of liquid vampire guano on the floor that you have to straddle. In all my previous visits to this cave, I had always rushed by this spot, as the smell is horrific, but this time we had to hang out while the bats rushed around and the film crew got their footage. We had Yunuhen capture a bat, and we got more footage of us petting it and exclaiming how cute it looked. All in all, Louise took it very well and stayed put through the whole experience. I was probably more anxious to leave than she was, as I had lots of previous experience seeing vampires up close and had no incentive to stay and put up with the smell. We didn't get the hundreds of bats swarming around that we had hoped for originally, but vampires did keep flying through the little room and bouncing off Louise or one of the others, so the result was deemed a suitable test of her cure.

On the second day, we went back and repeated some of the shots and filled in with some more, as well as getting a staged shot of Louise rappelling over the 20-meter-high cliff by the lower entrance, right through the waterfall. While one does not need to rappel the cliff to

get to the cave, it did look quite impressive on film. The neatest part, though, was when they took in an infrared camera to try filming the bats with it. I still have no idea how it works, but that thing can really see in the dark. We could point it at the cave wall with all our light out and see the wall in the viewer. Then we swung it around until we picked up some vampires. Playing around a bit more, we happened to spot a cluster of twelve or so young vampires hiding in a crevice. We were able to watch them on the monitor without disturbing them with our lights. While it was only a grayscale image, it was quite impressive to watch them cleaning themselves, looking around, and then finally one or two taking off to fly. Hopefully some of that footage will make it into the film.

The person who actually spotted the bats hiding in the crevice was the girlfriend of the director of the nearby Primavera Forest Park, who stopped by for a visit to see how we were doing. She had never been in a cave before and decided to pop in in her street clothes for a look. As I described earlier, much of the cave is stooping or hand-and-knees in water, and there she went in her nice leather shoes, white blouse, and the works. Back on the surface, I was flabbergasted to see not a speck of dirt on her clothes, just partly muddy hands and a big smile on her face. The most natural caver I have ever seen. And no phobia about bats, either.

### Quiropterofobia

Espeleólogos visitaron la Cueva del Chapuzón, en Jalisco, con un equipo que grabó un programa para National Geographic sobre el temor a los murciélagos de una espeleóloga y cómo fue curada de él. La cueva tiene varios tipos de murciélagos, inclusive vampiros. La fotografía subterránea fue en una bóveda con vampiros. La cueva está formada en rocas ígneas, aparentemente siguiendo un estrato formado por una capa de arcilla.



**I. P. N.**

## GRUTA DE SAN SEBASTIÁN

Ricardo Arias Fernández

This report presents the results of a visit in December 1999 by members of the Sección de Espeleología of the Asociación de Excursionismo y Montañismo at the Instituto Politécnico Nacional to the Gruta de San Sebastián, Oaxaca. To reach this cave, go 15 kilometers south from Oaxaca city to a junction with road 131, which leads to Puerto Escondido. At about 58 kilometers, after the town of Lachila, in a place known as El Vado, you will find a turn toward San Sebastián. This road follows a small, clear stream about 10 kilometers to the center of town. About 3 kilometers beyond the center, you will find cabins and parking for the cave. The Gruta de San Sebastián is inside an ambitious ecotourism development by SEMARNAP, CIIDIR, and the community. The plan is to offer visitors comfortable air-conditioned cabins with kitchenettes, full-size and bunk beds, and a bath with hot water for 50 pesos a person. Due to an earthquake that recently ravaged the area, the cabins are damaged and not in service (winter 1999–2000). Repairs should be completed within four months. These cabins offer comfort and convenience for speleological explorations in the region. The Juquilita dining room, which is near the cabins, is good and economical. Don't leave the area without trying the famous local

Adapted by the editor from a January 2000 report by the author. Thanks to Elizabeth Hernandez for translating the original for the AMCS.

mescal, Tobala. On February 2, the Day of the Candalaria, a colorful festival is held, and they open a small floodgate in the sinkhole to begin irrigating the land for the spring planting.

The Sierra Madre del Sur, where San Sebastián de las Grutas is located, is where the deepest caves in Mexico, except those found in the Sierras Orientales de Oaxaca (Huautla, Chilcholta, Concepción Papalo, etc.), are located. The karst of the range has been little studied, except for the Cerro Grande area in Colima and Jalisco (Carlos Lazcano's 1988 publication, now available as AMCS Reprint 4). In general, the karst is developed in a warm, subhumid climate and folded mountains. There are plains at the highest elevations where sinkholes are common, separated by wide valleys of non-karst rocks. The isolated limestones are Cretaceous in age. Gruta de San Sebastián is in the Teposcolula Formation of Albian-Cenomanian age.

An early visit by cavers to the cave is recorded in a trip report by Bill Russell (*Association for Mexican Cave Studies Newsletter* 3(4)70–71, 1972). In the summer of 1994, cavers from Cruz Roja in Oaxaca, together with two Americans, supposedly surveyed about 1300 meters of the cave, but the water passage was not surveyed because of the rainy season, and the map was never completed or published (note by Louise Hose, "Mexico News," *AMCS Activities Newsletter* 21, p. 4, 1995). A mining geologist in the state of Oaxaca named Manuel Aragón

supposedly also surveyed the cave sometime in the past, but that map was also apparently never published.

The Gruta de San Sebastián is located in the Sierra de Miahuatlán, a part of the Sierra Madre del Sur, just at the edge of the Valles Centrales, where small valleys lie in the folds of the mountains. The entrance is in the side of the Cerro de La Gruta, 150 meters from the cabins at a west-northwest azimuth of 292 degrees. A footpath leads to the entrance in a rocky bluff 4 meters high. The artificial entrance, made with explosives around 1970, has a metal gate and will lead you directly by a smooth slope to a room 5 meters in diameter named La Columnita. A passage to the right contains the formation and is 10 meters long. An apparent passage to the left ends after a few meters. The natural entrance is 5 meters above, where one previously entered with a rope to begin a journey through the cave. The continuing passage, 5 to 8 meters high, shows various dissolution forms and passes through the Salón de la Costilla de Res (Cow's Rib) and past the curious formation named El Elefante. From here on, the passage has the classic keyhole shape, from initial formation full of water and then down-cutting as the stream sought the lower levels where it now runs. In a stretch of 70 meters, the guide points out imaginatively named figures Señora Viendo Hacia la Pared, Mujer con Pelo Mojado Peinandose, La Cobra, El

Dinosaurio, and El Buho. In front of and to the left of The Owl is breakdown in conglomerate, where the ceiling height increases to 12 meters. Immediately ahead are formations, including Perro de Mickey, in the Salón de Pluto and the prettiest room in the cave, the Salón de las Columnas, which is 14 meters high. Then the passage widens to the right and the ceiling gets even higher at the Salón de la Cascada, with live flowstone on the wall. Just beyond this, on the left, is an irregular opening about 5 meters in diameter and 5 meters deep that leads to the river passage.

The main passage begins to display a pronounced upward slope, with some concrete steps, and passes by formations or areas called Agua de la Esperanza, Pareja de Enamorados, Fuente Monumental, and Salón del Rey Mago. In the Room of the Wise King, you can observe the collapse of the ceiling into a great pile of breakdown. From here the Vampire Passage begins. Then the ceiling of the main route descends abruptly, and the room becomes a small passage 1.5 meters high, where a strong air current can be felt, that takes you to the Salón de la Cruz and the Gran Salón del Colapso, a giant collapsed room 70 meters in diameter with abundant breakdown and a steep slope with concrete steps to the exit from the cave. The tourist route is 397 meters long and rises 10 meters.

For convenience, we rigged the 5-meter drop from the main passage into the Ramal del Río Subterráneo with a rope. Beyond the drop, a mud ramp 50 meters long with an average slope of 30 degrees leads to a room that is 50 meters long, at the bottom of which runs the river. In view of the mud on the walls, it can be seen that the river rises considerably during rainy periods, so you should not visit this part of the cave during those months. Following the river downstream will lead after 26 meters to a place where the roof lowers to 40 centimeters high, making it impossible to follow the water, which flows off on an azimuth of 100 degrees. Upstream, the river flows through an ample passage. After

100 meters, a tributary on the right ascends between the rocks with a beautiful display of sparkling water, jumping between smooth limestone veined in black and white. This passage, which you can go up without difficulty for 60 meters to the source of the water, is without a doubt the most beautiful section of the whole cave. Past the inlet is the Salón de Independencia, which contains a beautiful column also named Independencia, as well as other formations that divide the room. The stream passage ends in huge breakdown blocks from which part of the flow of the river comes. The length of the Subterranean River Passage is 291 meters, and its depth below the tourist passage is 13.9 meters.

The Ramal de los Vampiros descends from the Salón del Rey Mago at an angle of 30 degrees between blocks of breakdown. This leads to a room with a sandy floor and conspicuous horizontal bedding. Ahead, the passage changes to irregular, muddy terrain with an abundance of huge debris over which one climbs and descends for about 80 horizontal meters, to where the floor becomes more level. After 12 more meters, there are two pools on the right of guano from the vampire bats that inhabit ceiling domes above them and give the passage its name. After another 65 meters, climbing over another breakdown pile, one reaches a room 11 meters wide and 10 meters high, the Salón México. Finally, the passage flows into another large room, where great stalagmites in the shape of long tapered candles under a ceiling 14 meters above give the name Salón de los Cirios. Staying low for 30 meters, we found marvelous white calcite flowstone, which narrows the route down to a small, abundantly decorated room, the Sala Fantástica. If instead one goes up the 20-meter ramp to the left beyond the candles, he reaches a high room with a low ceiling and abundant sodastraws above small stalagmites. A short ramp and an exposed ledge, where a rope was necessary, lead to the Sala Colgada, where we were disappointed to find no continuation. The total

length of the Vampires Passage is 389 meters, and its depth below the Room of the Wise King is 22.6 meters. The total length of the whole cave is 1078 meters.

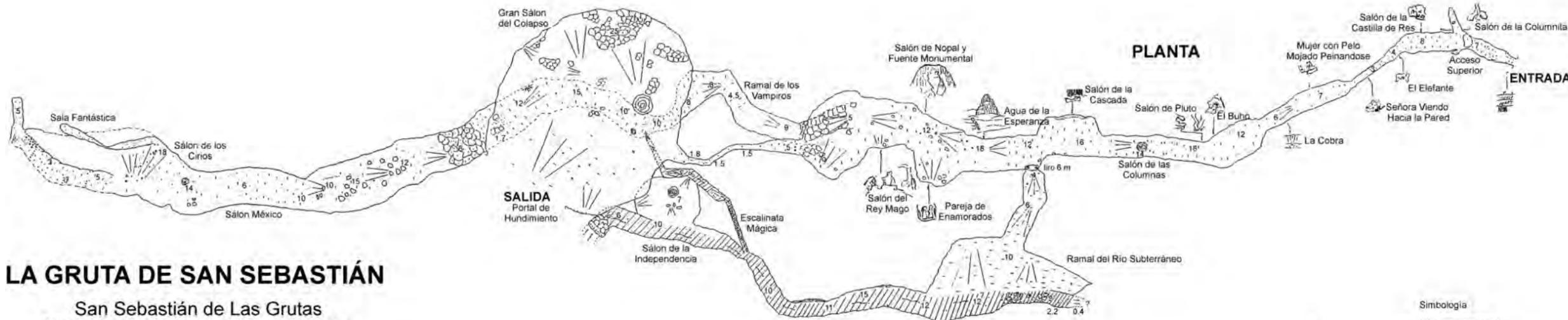
The stream in the cave flows on through Cueva de la Ventana, described below, and surfaces at the spring that is the source of the Río Las Grutas, a tributary to the Río Atoyac. The Atoyac is a branch of the Río Verde, which flows into the Pacific Ocean at the Bay of Chachahua. There is a small cave 25 meters down the hill from Ventana in which flowing water can be heard. This functions as an overflow spring in wet weather.

The entrance to Cueva de la Ventana is located 65 meters downhill from the entrance to San Sebastián, at an azimuth of 305 degrees from the cabins. The entrance is 90 centimeters high and 3 meters long, at the edge of a drop 6 meters to a slope of dirt and boulders. This passage, which is 3 meters high, slopes down to the river. Up-river and to the right, the water becomes over 2 meters deep, and we were unable to continue, although the passage continues with the same dimensions. The left branch of the entrance room extends 20 meters, with an abundance of mud on the walls. It ends at a small passage 1.5 meters wide, containing water 1.6 meters deep, that closes down after 8 meters. The total surveyed length is 95.4 meters. The stream is about 5 meters below where it is seen in San Sebastián and 9 meters above the elevation of the spring.

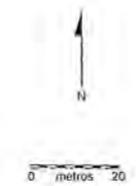
The entrance to Cueva de la Maternidad is somewhat hidden in a bamboo thicket. It is a crevice 3.1 meters long and 60 centimeters wide, 211 meters approximately north from the spring. An easy chimney down 3 meters leads directly to the stream in the cave, which consists mainly of one room 38 meters long, 4 to 6.5 meters wide, and from 2 to 6 meters high. Thirty meters in are some solution domes in the ceiling. The temperature was very warm in comparison to the other caves discussed here. This river rises from a small and beautiful lake of turquoise-blue water,

# LA GRUTA DE SAN SEBASTIÁN

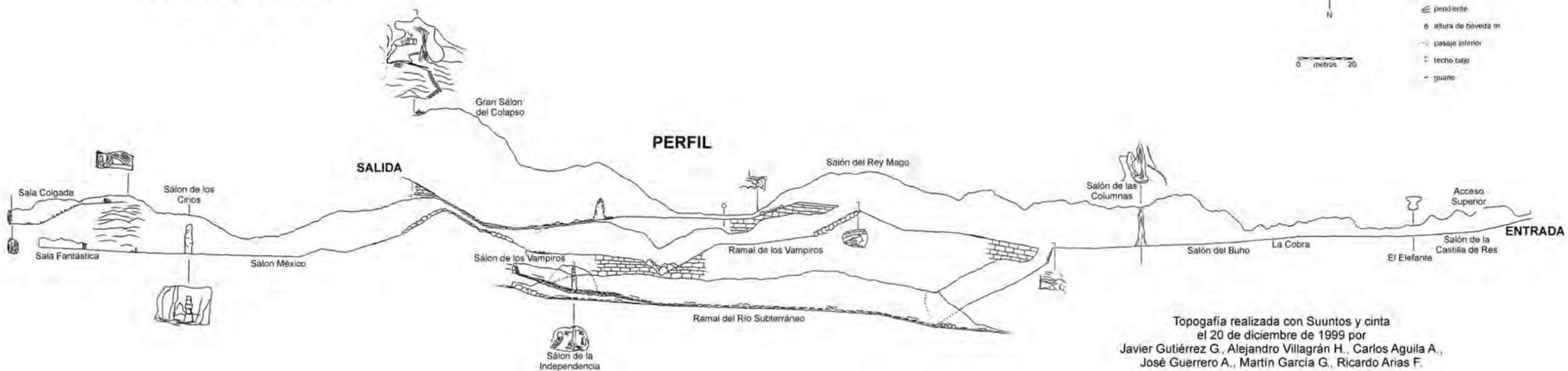
San Sebastián de Las Grutas  
Mpio. Sola de Vega, Oaxaca, México  
Longitud 1078 metros



- Simbología
- - - lodo, barro consolidado
  - arena
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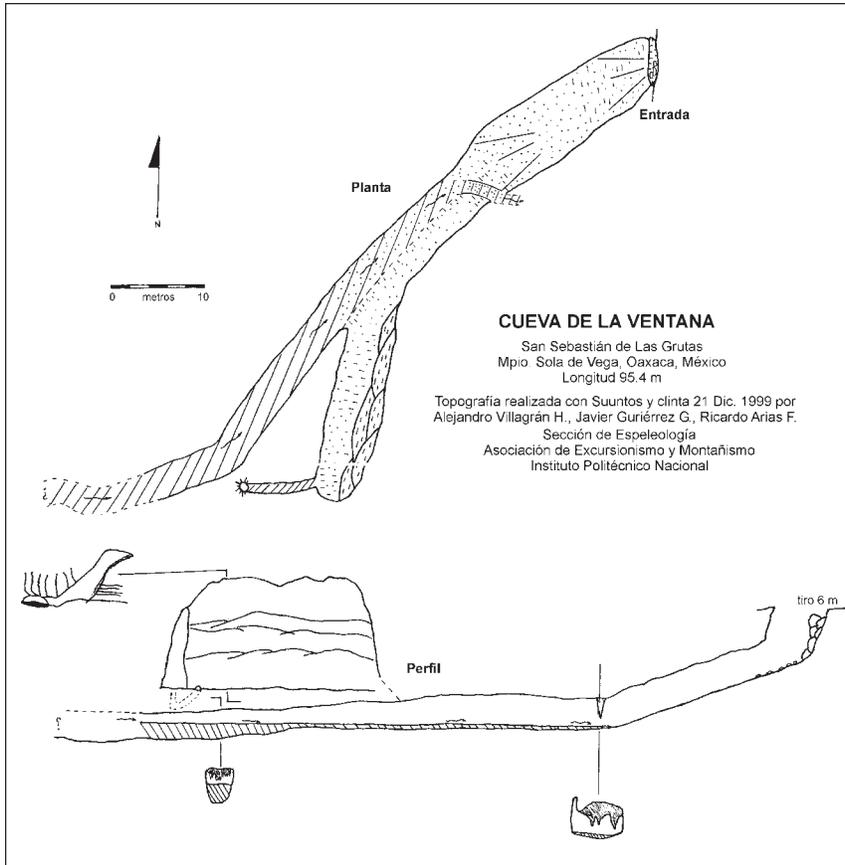


## PERFIL



Topografía realizada con Suuntos y cinta  
el 20 de diciembre de 1999 por  
Javier Gutiérrez G., Alejandro Villagrán H., Carlos Aguila A.,  
José Guerrero A., Martín García G., Ricardo Arias F.  
Dibujado por Javier Gutiérrez G., Ricardo Arias F.  
Sección de Espeleología, Asociación de Excursionismo y Montañismo  
Instituto Politécnico Nacional



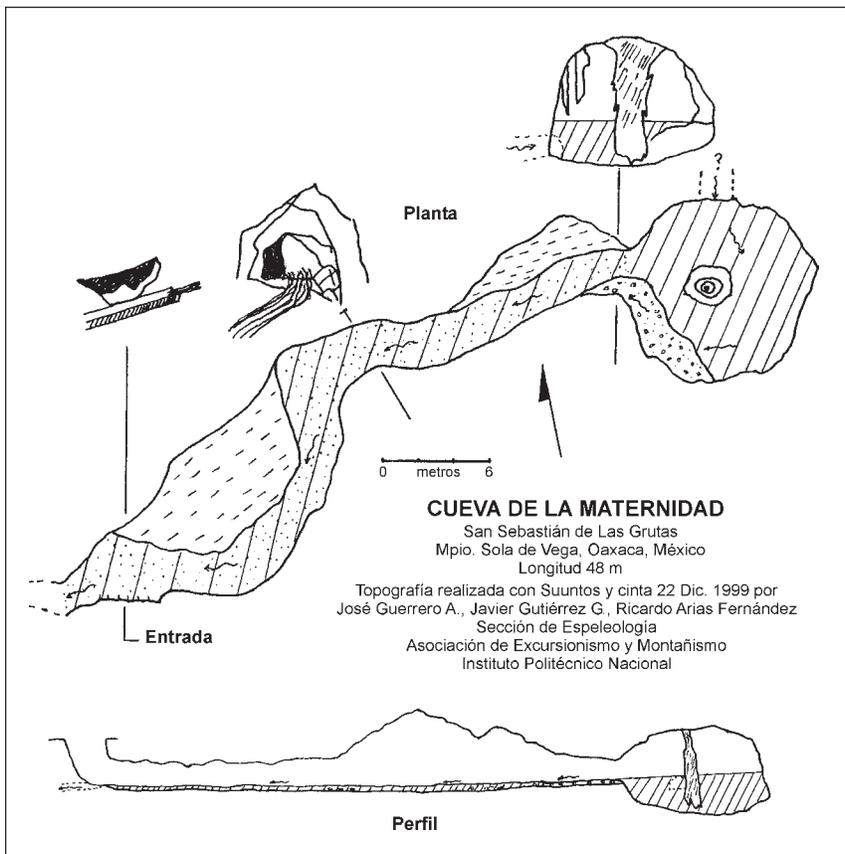


where a huge stalactite disappears into the water. The underwater conduit that feeds the lake is on the left side and appears large enough for scuba exploration.

Cueva de Llano Grande is 5 kilometers from San Sebastián de Las Grutas on the road from Las Grutas to San Vicente, near concrete electricity pole number 073, in the hill to the left. From a bushy tree, we walked straight ahead to the base of the hill, then 80 meters to the entrance, which is at an azimuth of 218 degrees from the tree. It has a small, circular entrance 1.25 meters in diameter at the foot of an oak tree. A slope of 8 meters leads to a decorated room, from the end of which another sloping path leads to the lower part of the room, where there is a lot of breakdown. Sliding down the breakdown, we found a small passage and a drop of 3 meters that leads to a lower passage with two branches. These lead to a final room that is beautifully decorated with a white column and live sodastraws. We also noted vandalism and graffiti, as well as broken bits of clay pots, chicken bones, and egg shells that local people leave behind as thanks for health, rain, or good crops or even as a supplication for bad luck to an enemy.

Along the same road and 10 meters to the left of pole 045, Resumidero del Paso Ancho is a sinkhole that captures an enormous amount of water from two streams during the wet season. Sliding down 3 meters will take you to a narrow passage that leads 18 meters to the edge of a drop of unknown depth.

Finally, our companion in this project from CIIDIR, Ing. Alberto, says that in the town of San Pedro Totomaxapa, 15 kilometers from Cueva de Llano Grande on the road to San Vicente, there is a cave with cave paintings of historical or cultural value that should be studied.



Thanks for support and collaboration to our companions from the Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional (CIIDIR) Oaxaca: biologist Olga Herrera Arenas, director of the ecotourism project at the Grutas de

San Sebastián; Ing. Manual Rubio Espinosa, chief of the Departamento de Vinculación; and Ing. Alberto Floreán Cruz, fellow mountaineer and enthusiastic promoter of the natural splendors of the state. Also companions in the exploration and survey José B. Guerrero Alegría, Carlos A. Aguila Aznar, Alejandro Vallagrán Hernández, and Javier Guitérrez Gracia. And Antonio García Pérez "Luis," cavern guide, Martín García García, good friend, and León Pérez López, *comisariado*. Finally, the federal and municipal authorities, particularly of San Sebastián de las Grutas, for their interest in promoting the ecotourism projects of CIIDIR, which further the development of Oaxaca and contribute to the knowledge of the subterranean world of Mexico.

### Gruta de San Sebastián

En diciembre de 1999, miembros de la Sección de Espeleología de la Asociación de Excursionismo y Montañismo del Instituto Politécnico Nacional exploraron y topografiaron esta cueva turística en Oaxaca, además de dos cuevas cercanas más pequeñas. La ruta turística en la cueva principal entra por un túnel artificial y deja la cueva a través de una entrada natural bastante grande. Los niveles inferiores en la cueva se inundan durante la estación de lluvias. La longitud topografiada de la Gruta de San Sebastián es de 1078 metros.

# GRUTAS DE BALANCANCHE

Bruce Rogers

This rather breezy look at Grutas de Balancanche is the result of numerous visits to the cave over the past twenty-two years. It is adapted from an informal guidebook I've written for traveling companions that I have taken along on my Yucatecan junkets. The cave is located near the world-class archaeological site of Chichén Itzá. The cave is commercialized and has tours from about 8 AM to 4 PM. Costs vary year to year depending on the budget of the INAH, the Mexican park service, but entry is usually about 20 pesos—about two dollars in 2003. Every Sunday is free entry at all national parks in the Yucatan. In the recent past, English-spoken tours departed at varying hours, usually staggered with tours in Spanish, or when enough people gathered to merit a tour. As of early 2003, however, all tours departed hourly and were in Spanish only. Normally the guides try to hurry the cave visitors through the tour, which is about 500 meters round-trip, in a half hour or so. However, if people show up with their own lights and are decidedly not willing to be rushed, they often can drag their collective feet and extend their tour to fill the allotted full hour between tours. Some guides also dislike visitors using their own lights, but most are accommodating enough if the lights are used tactfully.

The cave's Mayan name, Balancanche, also spelled Balaamcanche, Balaancanche, Balankanche or Balancanchén, means Throne of the Jaguar Priest. This refers to a local

elite, not some ragtag big cat scuffling around in the bush. The cave has been known to the Maya since well back before the Preclassic, probably at least three thousand years ago. The cave was used as a source of water, as well as venerated for its connection with Chac, the Maya rain god. Chac was the same entity as the Teotihuacano god Tlaloc. Sometimes the Teotihuacanos merged Tlaloc with their spring god, Xipe Totec. Much of this Teotihuacano mythology meshed with the Maya in the area of Balancanche, since pottery vessels dedicated to both entities are found in the cave. Broken ceramics found on the ground surface surrounding the cave date from the Preclassic (300 BC) to just before the Spanish invasion (ca. AD 1250–1400), with the most intensive use during the Terminal Classic to Early Postclassic (AD 900–1200). The cave was first studied in 1932 for its biological content.

Balancanche Cave, just as all caves in the Maya region, has been venerated as a portal to the Other World, the world of spirits and ancestors. In mid-1959, a cave guide discovered that the pile of breakdown sealing the back end of the cave was actually a stuccoed stone wall. After being alerted to this discovery, archaeologists working at adjacent Chichén Itzá descended on the cave and carefully removed the wall. The back part of the cave had been blocked at about the end of the Terminal Classic, between AD 830 and 1000. The stucco coating had been officially sealed with glyphs

and shamanic signatures. As the archaeologists excavated the wall and recorded the wealth of artifacts inside the newly unsealed back part of the cave, the local Maya became worried that these actions would offend Chac and that he would withhold the much-needed winter rain. As a result, famed Mayanist archaeologist E. Willys Andrews IV had the local shamans conduct a ceremony to pacify the gods. This ceremony had apparently never before been conducted in the presence of non-Maya folks. Unprepared for the magnitude of this undertaking, the archaeologists found themselves participating in a ritual that ran for nineteen hours nonstop, both in and out of the cave. The archaeologists reported that the ceremonies were exhausting, with the oxygen level steadily dropping in the cave, resulting in nearly everyone ending up with a splitting headache. Apparently the ceremony worked, however, for the cave still holds water, no one has become lost in its depths, and the local villages still have bountiful harvests.

The cave is located just north of Highway 180 about 3 kilometers east of Chichén Itzá. A small botanical garden surrounds the cave entrance, with plants labeled in English, Spanish, and Mayan. In the center of the garden is a modest-sized sinkhole that leads south into the cave, which is T-shaped in plan. The first part of the cave is roomy, wet, and modestly decorated with white sodastraw stalactites and flowstone. The cave is hot



and humid, despite the three 18-inch-diameter ventilation holes bored in 1992. The initial cave passage is elliptical in cross-section, with an artificially leveled clay and sand floor. Large, shallow scallops have been dissolved into the walls of the passage, indicating it had been slowly dissolved under the local water table.

To their credit, the government has left most of the cave undeveloped, except for the tourist trail itself; indirect lighting enhances the cave experience. To the east are a

series of low, muddy stream passages. Initially phreatic tubes, they have been invaded and modified by vadose streams as they flowed to the east to several shallow pools. Seasonal streams still course down the sinkhole entrance and follow several routes to these pools. After covering nearly 75 meters of passage averaging 8 meters wide and 5 meters high, the visitor enters the large Tiger Room. This "Throne of the Jaguar Priest" room has an El Tigre in vermiculations high on the east wall. Adjacent to El Tigre is La

Cabeza, a large breakdown block resembling a skull; a bit of the local anise-and-honey liquor Xtabentun assists this impression. Straight ahead is a dead-end passage, paralleling the one the cave visitor has just come through, and just beyond the room another low passage snakes off to the east for nearly 50 meters to another small pool.

Ahead on the main route, about another 40 meters to the south, is a choke point in the cave. This is where guide José Humberto Gómez discovered that the end of the cave was really a stuccoed wall. As outlined above, the recognition and removal of the wall was a major archaeological event in the cave's modern history. The cave constricts here, then immediately opens up into the Column Pots Room. Here are large numbers of ceramic incensers and water-collecting pots, some firmly cemented to the floor by large amounts of calcite flowstone. The decorations are attractive, but it's the artifacts that catch one's eye. Several squat, round, lipped pots have been placed to collect virgin water for rituals conducted in and around the cave. Virgin water is water that hasn't touched the profane surface of the earth. Rain water and underground

Incensers in the Column Pots Room, just inside the old Maya wall. *Bruce Rogers.*



# GRUTAS DE BALANCANCHE

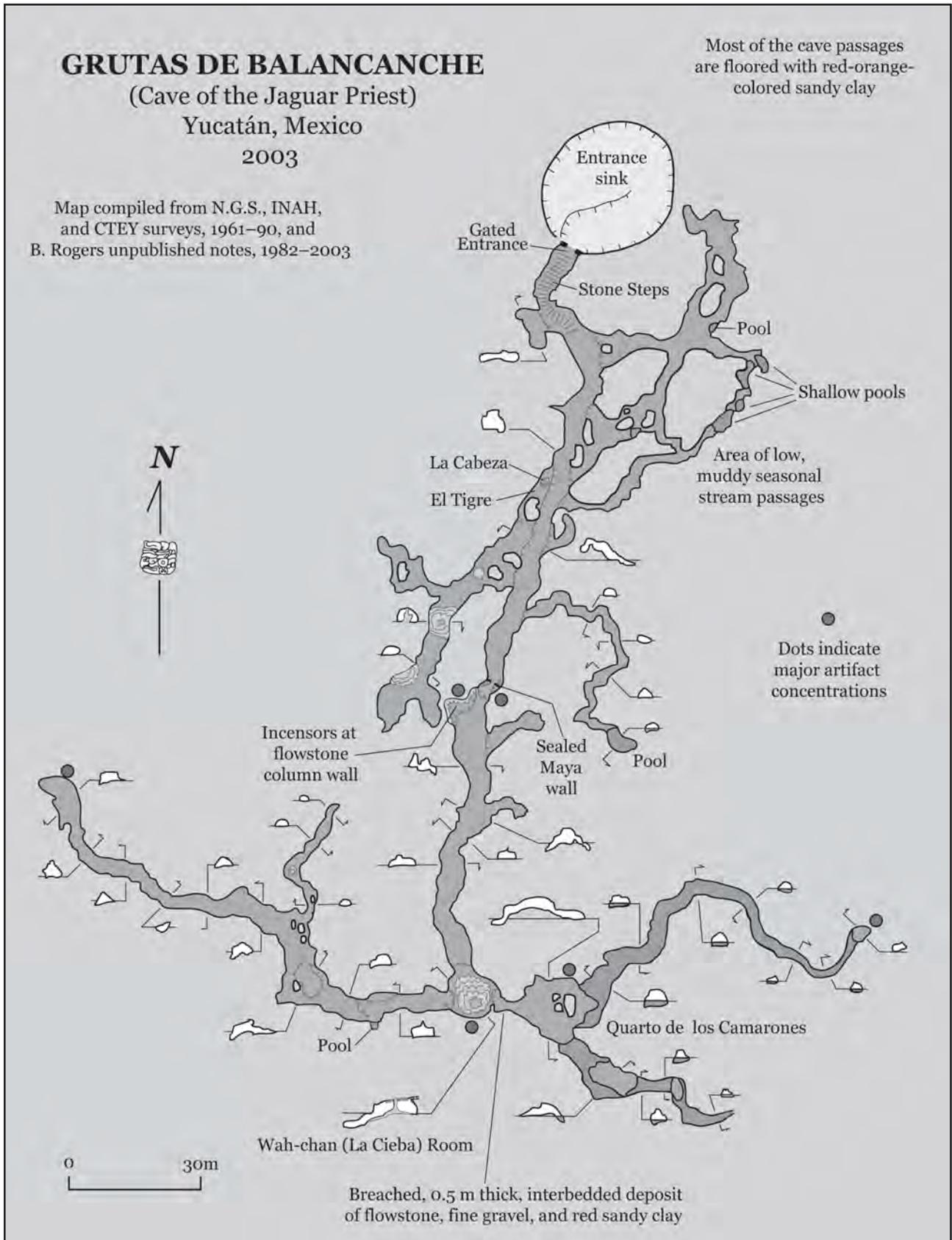
(Cave of the Jaguar Priest)

Yucatán, Mexico

2003

Map compiled from N.G.S., INAH,  
and CTEY surveys, 1961–90, and  
B. Rogers unpublished notes, 1982–2003

Most of the cave passages  
are floored with red-orange-  
colored sandy clay



drips qualify. At least two of these pots have become cemented to the floor by sheets of white calcite flowstone. Several “pots” nearly 0.3 meters in diameter and height among the water collectors are really incense burners well over a thousand years old. The image of Chac or Tlaloc decorates some of them.

After another 60 meters or so, one climbs up a very narrow fissure into the rounded Wah-chan or La Cieba Room. Several of the large combination drapery-stalactites you pass through or under to reach this room appear to have been mined by the ancient Maya for calcite for pottery tempering. This room is also called the Throne (Room) of Balaam. Over the eons, a small crawlway entering the ceiling from the southeast has brought water to deposit a circular umbrella of golden-colored stalactites. The dripping water has also formed a thick column, which dominates the room, resting on a massive flowstone dome that carpets the room. Scores of ceramic pots are scattered over the flowstone apron supporting the Sky of the World Tree. The Mayan name for this edifice is Wah-chan, also interpreted as Raised-up Sky. At some time in the past, Maya shamans left bright red handprints on this column, sort of a professional-shaman calling card to the god Chac.

The pots are of two types. The most obvious pots are to collect virgin water. The other pots are really wastebasket-sized receptacles in which the Maya burned copal, rubber, and other incense. During cave rituals, the cave atmosphere must have, as noted by the archaeologists, become somewhat poor in oxygen, high in carbon dioxide, and heavy with incense. This oxygen deprivation may have assisted the shamans and elite Maya in their efforts to see Chac-Tlaloc and speak with the gods. In any case, this room is worth a little contemplation time.

The cave passage tees at this room. The right branch is nominally

The column and artifacts on the flowstone mound in the Wah-chan Room. *Bruce Rogers.*

closed, since it is low and “dangerous” to the average tourist. At its end is a small offering of metates, manos, incensers, pots, and conch and jade beads. This is one of the off-route areas we have had no success at all in visiting. The main tour route goes to the left (east), dropping down through a narrow trench dug into bedded silt, sand, and flowstone of amazingly varied colors. About 20 meters farther is the end of the cave route. A fairly roomy breakdown room, Quarto de los Camarones (Shrimp), intersects the water table here. A pair of roomy passages half filled with water snake off into the distance. The northeast-trending passage is the most obvious. When first entered by archaeologists, a Terminal Classic-period carved stone head was found perched on a breakdown pile. It sat in regal splendor in the partly flooded passage and was quite striking. This passage itself extends for nearly 80 meters to a tiny dry room whose floor is littered with more offerings. A few years ago, INAH officials removed the head from the cave and transported it to the National Museum in Mexico City. Local Maya were very upset with this act and are still demanding either its return or at least a copy of the sculpture to re-install in the cave. Such sculptures or artifacts are considered representatives of the site’s soul, and removing them is tantamount to killing

the site.

A second, shorter passage opens down to the southeast behind the breakdown in the Quarto de los Camarones. This low, partly flooded passage winds on to the southeast for about 40 meters, past several dry areas to another siphon.

The Shrimp Room has a large collection of metates, manos, pottery, and other artifacts, mostly gathered from other parts of the cave; in 1959, archaeologists collected tripod dishes and other artifacts and put them on display here for the visitor. In the partly flooded part of the room, lucky explorers can sometimes see white, eyeless, troglobitic shrimp. There are even unverified reports of white, eyeless cave fish having swum into sight for the lucky visitor. The visit to this room completes the cave tour. The visitor then waves gaily to the blind shrimp and fish, winds his way back out of this sauna-like cave, and dries off outside.

Once back outside, the traveler can take a little time to inspect the park grounds. The low limestone-rubble wall surrounding the entrance sinkhole is of recent building. Four totally ruined platforms with what appear to have been small temples surround the cave’s entrance farther out from the sinkhole. The ticket office has a small museum with a collection of black-and-white photographs, among



Artifacts displayed in the  
Quarto de los Camarones.

*Bruce Rogers.*

which are photos taken during the 1959 nineteen-hour Chac blessing. Formerly, a small gift shop and snack bar were operated for the visitor, but these were closed during our February 2003 visit. Clean restrooms are available, however, and are usually well stocked with *papel higiénico*.

It is highly recommended that one stay at the nearby Hotel Dolores Alba. A recent enlargement has expanded the hotel to about thirty-five clean and modestly decorated rooms set in the lush rainforest. More importantly, the new swimming pool is unique in the Yucatan. The hotel owners merely excavated the thin terra rossa soil out of the karst and then sealed the karst. Within the pool are four short "cave dives" through solution tubes in karst pinnacles. The Cenote Momota (Turquoise-browed Motmot Bird Cenote) across the highway is now open for visitors, and they arrive by the busload from both Cancún and Mérida. Occasionally it is open for swimming. In 1993, before tourism took such a stranglehold in the area, we were rudely run out of the place at shotgun point and told never to return—my how things have changed. This finishes your vicarious tour of the not quite world-famous Grutas de Balancanche. We now return control of your day-dreaming to you.



Gruta de Balancanche

Balancanche es una cueva turística arqueológica cerca de Chichén Itzá en Yucatán. La mitad posterior de la cueva fue descubierta en 1959, cuando se descubrió que el final de la cueva era en realidad una pared construida por los mayas entre los años 850 y 1000 de nuestra era. El recorrido sigue el pasaje principal hasta el Cuarto de los Camarones. Están en exhibición muchos metates, ollas e incensarios.

# DIVING THE CHEVE SUMPS

Rick Stanton

During March and April 2003, the U.S. Deep Caving Team, led by Bill Stone, planned an assault on the terminal sump of the 1386-meter-deep Sistema Cheve in the Sierra Juárez highlands of Oaxaca. Jason Mallinson and Rick Stanton from the Cave Diving Group of Great Britain were to be the lead divers on the project, and grants were kindly provided from Sports Council funding and the David Hood Fund to enable participation in this venture. Other group members present were Richie Hudson and Robbie Warke, who were to act, along with Bill Stone, as diving sherpas should the need arise. Because of the remote location of the sump, we decided that all exploratory diving attempts would be made with our own homemade lightweight, chest-mounted rebreathers, in preference to the larger CisLunar units that were also available. To this end, each unit had been reworked and improved for the task ahead to increase both reliability and ruggedness.

The Cheve cave system holds great potential for a world depth record. The main entrance is located at an elevation of 2800 meters, and the sump is situated at 1464 meters above sea level. The much lower resurgence cave and its fossil resurgence, Cueva de la Mano, had been previously visited and pushed to a conclusion by Stanton and

Mallinson in 1997 and 2001 (see *Cave Diving Group Newsletter* 124 and 142 and *AMCS Activities Newsletter* 25). The total depth potential of the system is 2547 meters, which implies that the terminal sump in Cheve is perched 1160 meters above resurgence level, an exciting prospect for exploration. Dye-tracing experiments have shown a flow-through time of eight days from sump to resurgence. With a straight-line distance of 12 kilometers, this fast flow suggests that much of the missing cave passage consists of open streamway. The cave's morphology also suggests this, with an entrance shaft system dropping dramatically to -500 meters, from which the stream heads down-dip with a gradient of approximately 1:10. This gradient can be projected beyond the sump to match up with the resurgence in the Río Santo Domingo canyon.

The cave length from entrance to sump is 8 kilometers. The sump had been previously dived by American sump-diver John Schweyen in 1991, helped by a large team of the original explorers. He progressed, using open-circuit scuba of limited duration, for 100 meters at 20 meters depth to a point where he reported the cave closing down into many small passages. He was unable to complete a follow-up dive due to the death of a caver in an SRT accident.

Stanton, Hudson, and Mallinson arrived at base camp, located just outside the cave entrance, on March 13, 2003; others had been there for a week. Debilitating effects of the

elevation are noticed when walking around the entrance area before becoming acclimatized. (After a week at the bottom of the cave, this acclimatization is lost, to turn what should be an easy exit into a real plod.) The U.K. contingent expected to be in the field for a period of at least five weeks, so enough freeze-dried food had been brought in to cover the duration, to be supplemented with local supplies from the nearest village, about 7 kilometers away. On our first day there, a rescue situation developed, and all personnel assisted in the evacuation of a caver with a dislocated knee from about 250 meters down in the entrance series. This was the only accident of the whole trip.

Before our arrival, much of the base-camp infrastructure had been set up, and some of the equipment had been carried in from the vehicles that had been used to transport it down from the States. These four-by-fours were able to reach a point within 2 kilometers of camp. Rigging teams had begun the task of taking in the 1.8 kilometers of rope that was eventually used throughout the cave. Initially, Mallinson and Stanton gathered and prepared the items of dive gear that were to be taken down and started carrying them to a depot at -500 meters. Eventually, after eight days, enough rigging and dive equipment and supplies of food and camping gear were in place at sufficient depth to allow Mallinson and Stanton, with a team of about

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This originally appeared in somewhat different form as a dive report in the *Cave Diving Group Newsletter* 150, January 2004.

ten other people, to enter the cave on the start of the diving trip. This turned out to be a six-day stay underground. It took thirteen hours to reach Camp 3 with the large bags. This was the divers' camp and was located an hour's caving from the sump. (Initial plans to camp at the actual sump were dismissed as unsuitable.) The next few days were spent ferrying equipment along to the camp and then rigging the final section of cave, which was reminiscent of a Yorkshire pot, down to the terminal sump pool, followed by moving gear to the pool and setting it up for the dive. Most of the cave is large, but there are two notable breakdown sections that contain squeezes. These require tackle bags to be unpacked, and this was extremely time-consuming. Observations at the sump showed a possible route that went back on itself, rather than the main route straight ahead that Schweyen had followed.

The dive was made on the fifth day underground, March 26. Twin 10-liter composite cylinders were used, in addition to the ventral rebreathers. Water temperature was 12 degrees C, so drysuits were worn over the top of Fourth Element undergarments that had been kindly donated. The thin drysuits were lighter to carry than full wetsuits, and they would allow more comfortable long dives if necessary. Stanton led and acted as route-finder, while Mallinson managed the line and reel. The route opposite the one Schweyen had taken quickly turned back around to continue in the general direction of the system. An air-bell was met after 25 meters, and then the passage continued along, at 12 meters maximum depth, passing over a shaft at 60 meters. After 110 meters, there was a hole in the right-hand wall beyond which the floor, which consisted of white shingle at this point, was observed to rise up. Recognizing the significance of this feature, both divers ignored the main-looking route ahead, darted through the hole, and surfaced 10 meters later to the sound of a cascading river.

The gear was stashed immediately beyond the sump, the only

suitable area in the next few hundred meters. The cave consists of a narrow, highly eroded canyon passage 1 meter wide carrying the full flow of the Cheve stream cascading down a steep gradient. Two tricky waterfalls were down-climbed, beyond which the passage starts leveling off and becoming larger. Sitting down on a rock for a rest and a bite to eat, the divers discussed the origin of various unusual shingle deposits, not knowing that they were only 20 meters from a second, very spacious sump pool. When this sump, which clearly backs up in high flow, was found, it was an unexpected setback, and the divers returned to Sump 1, having estimated the distance covered as about 500 meters, with a drop of 50 meters. This passage was not going to be an easy portage for taking gear down to the second sump.

On the return dive through Sump 1, the passage continuing beyond the hole in the wall was examined. This led to a series of very low, descending shingled beddings from which the water flows. The shaft at the mid-point of the sump was then descended, to meet up with Schweyen's line from 1991. Stanton followed this downstream at 20 meters depth to its end, which is clearly at the base of the same low, shingled bedding, no more than 15 meters from where they had seen it from the top end. Both divers left the sump along the old line in the main tunnel, much to the surprise of the waiting sherpas, who expected the divers to come out the same way they'd gone in. Time away had been six hours, of which 4.5 hours were spent exploring the dry cave.

After some discussion on how to proceed, it was decided to make for the surface the next day, have some rest time, and then return with enough gear to enable two more divers to pass through Sump 1 to help carry equipment to Sump 2 and complete a high-grade survey of the new passage. Traveling light, it was possible to gain the surface from Camp 3 in ten hours. Most people then took a few days off at a beach resort, a twenty-hour journey in itself.

Having regrouped after four days away, we gathered equipment, and another, similar assault was begun, with about half of the cavers replaced by new arrivals. This was to be another six-day stay underground, the first few of which were taken up with the transport of the extra dive gear. On April 5, Stanton and Mallinson made a staging dive, transporting two composite tanks and some lead to Sump 2. Ropes were installed on the pitches, and an equipment tyrolean was set up on one of them in readiness for a push on Sump 2 the following day, when Stanton and Mallinson dove through on the closed-circuit rebreathers, followed by Hudson and Stone on open circuit. Once at Sump 2, Stanton and Mallinson dove on, while the other two commenced the survey back toward Sump 1. This time around, Mallinson did the route-finding and belay-spotting, while Stanton operated the reel. A straightforward dive in an elliptical passage 5 meters high, 3 meters wide, and 12 meters deep led to air after 290 meters. At first glance, this appeared to be a chamber of boulders with no way out of the water, which certainly explained why the whole sump had been noted to back up. After de-kitting, they found a route up through the boulders that led to a passage and some climbs down to a static pool. A further passage led off there through solidly bonded boulders to an area of squeezes where no further progress could be made. The sound of flowing water could be heard coming from some point ahead, but it could not be reached. The whole area showed signs of being completely scoured by a strong current; there was no loose material present, not even one stray pebble. Back above the sump pool, another climb through boulders led to a strange, circular, funnel-shaped surge chamber that was blind. They left the sump after four hours, which had mainly been spent squeezing through boulders in a concerted attempt to find a way through. Some considerable drysuit wear and tear had been sustained from this.

As there was no sign of Hudson

and Stone, the divers carried a load up to the pitches, then, as they still hadn't met up with the surveyors, returned for another load. When they met up with the survey team at Sump 1, they were told that the distance between sumps that they had estimated at 500 meters is in fact just under 800 meters, and the depth gained is around 100 meters. All went back to the pitches for one last load. The dive out was complicated by the fact that some lead and two cylinders were left at Sump 2 for posterity. As there was then not enough gear for all four to dive out through Sump 1 in one go, Jason made a return dive to relay back equipment after he and Rich had dove out. During Stanton's trip out,

he completed the survey of Sump 1. All arrived back at Camp 3 very tired after nineteen hours away.

It was clear that, unfortunately, no more diving progress could be made, so the next day all gear was pulled back from the sump, then most people left for the surface the following day, carrying heavy loads. Many camped overnight at Camp 2 to break the journey. Hudson, Mallinson, and Stanton returned to the U.K. a few days after gaining the surface, having spent five weeks on the expedition.

The divers would like to express their thanks to all those who assisted with the transport of equipment during the whole mammoth

project, with special mention of the Polish contingent. In conclusion, the diving efforts added 1260 meters to the length of the cave. Other teams stayed on to complete some climbing leads in an effort to bypass the sump, but were unsuccessful in achieving this. In total, an additional 1.9 kilometers of passage was mapped at the bottom of Cheve, which brought its length to 26,194 meters and its depth to 1484 meters, making it the deepest cave in the Western Hemisphere and the ninth deepest in the world. At 9.3 kilometers from the nearest entrance, the breakdown collapse beyond Sump 2 apparently represents the most remote point inside the earth reached by humans.

### Buceando los sifones del Sistema Cheve

Buzos británicos reportan sobre las inmersiones en los sifones 1 y 2 al fondo del Sistema Cheve, Oaxaca. Durante el primer campamento subterráneo de la expedición Cheve 2003 bucearon el sifón 1, determinando una longitud de 120 metros. Condujo a alrededor de 500 metros de pasaje seco que aumentó la profundidad de la cueva en aproximadamente 50 metros. El sifón 2 fue buceado durante un segundo campamento en la cueva. Era un tubo de 5 metros de alto y 3 metros de ancho, con una profundidad máxima del agua de 12 metros y longitud de 290 metros. El corto pasaje seco después del sifón está bloqueado por derrumbes. El punto más bajo en Cheve es ahora el fondo del sifón 2, aumentando la profundidad total a 1484 metros, el más profundo del hemisferio occidental.



I. P. N.

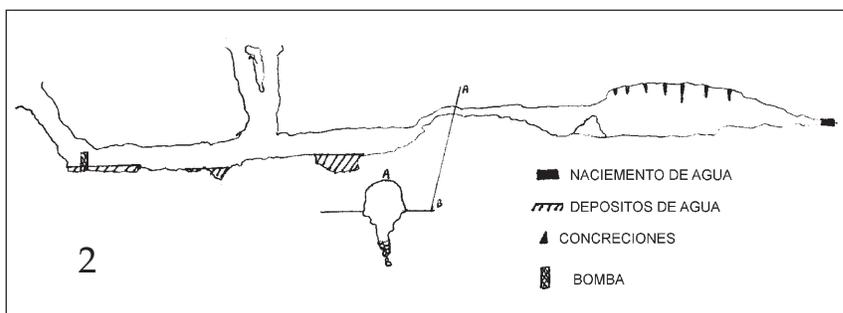
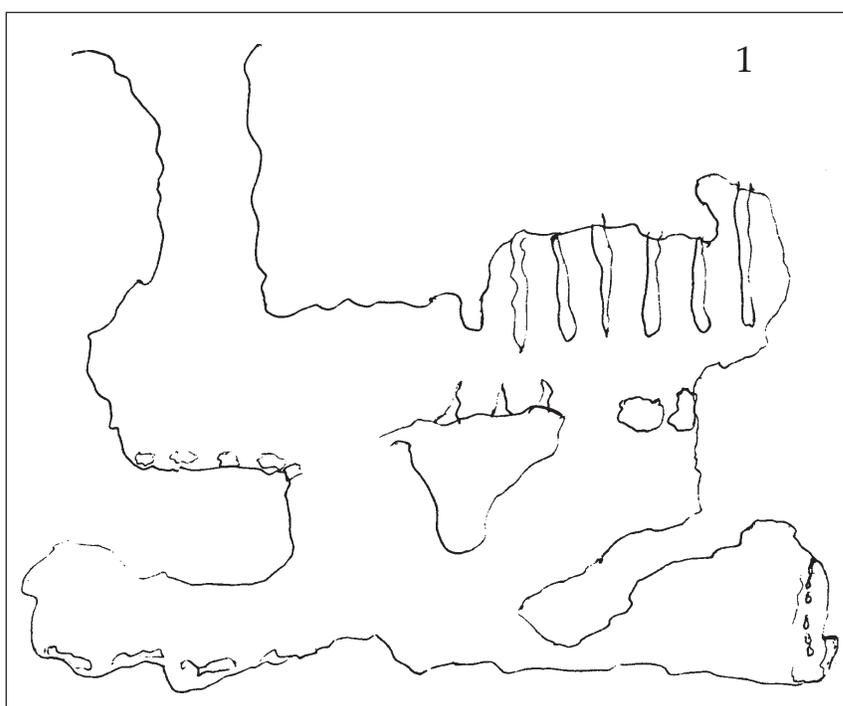
## CAVES OF ATOYAC, VERACRUZ

Ricardo Arias Fernández

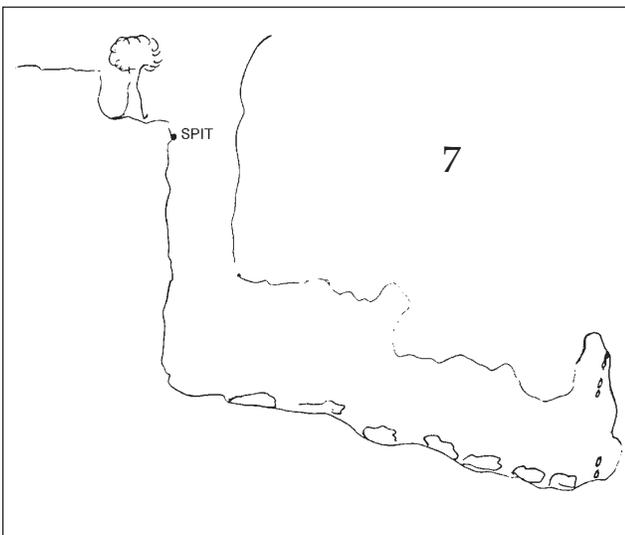
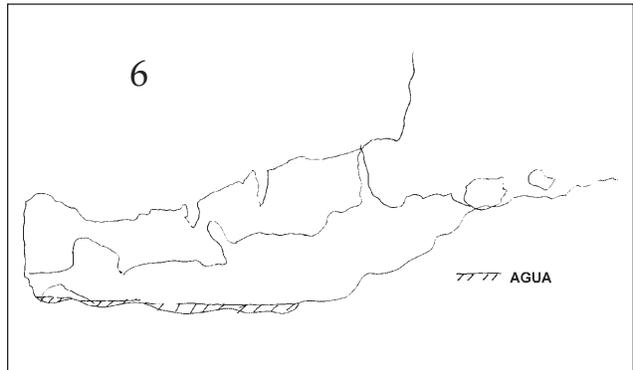
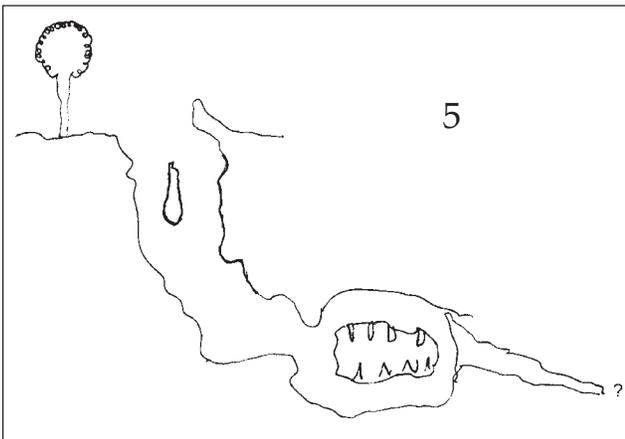
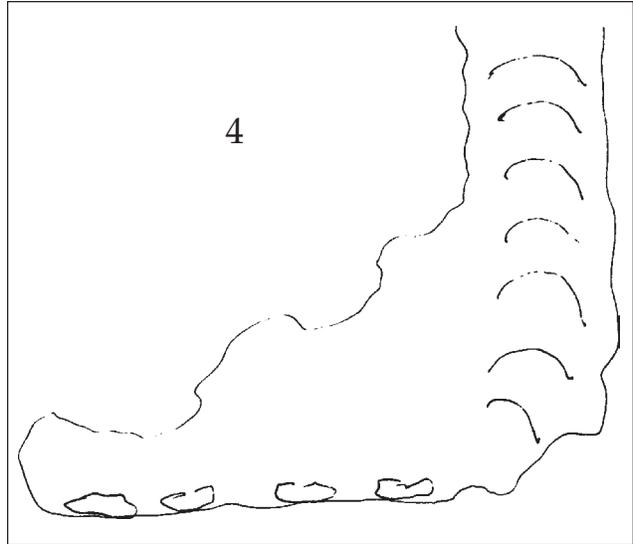
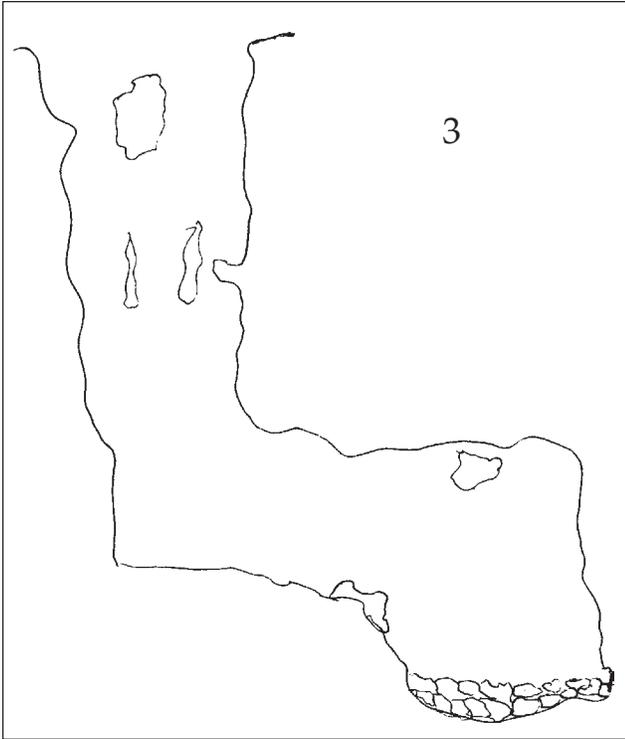
The *municipio* of Atoyac is located in the Sierra de Atoyac, central Veracruz. Atoyac is on INEGI topographic map E14 B57, at 18°54'32"N, 02°21'47"E (relative to Mexico City), elevation 461 meters. There are many small communities in the area, which is warm, with an average annual temperature of 26°C, and dry, except during the wet season. Heavy rains occur in June and September, with total annual rainfall 3.2 meters. Soils in the area are clayey, acidic, and poor in nutrients. Because water for the communities is distant and expensive to transport, especially during the dry season, *presidente* Lic. Fernando Pimentel Ugarte asked the Sección de Espeleología of the Asociación de Excursionismo y Montañismo at the Instituto Politécnico Nacional to investigate caves in the area to see if a deep, permanent source of potable water could be found.

During two months of expeditions to the area in 1999 led by Carlos Aguila Aznar, thirty caves were found and explored. Unfortunately, none of the caves was deep enough to reach a water table, and only seasonal water sources were found.

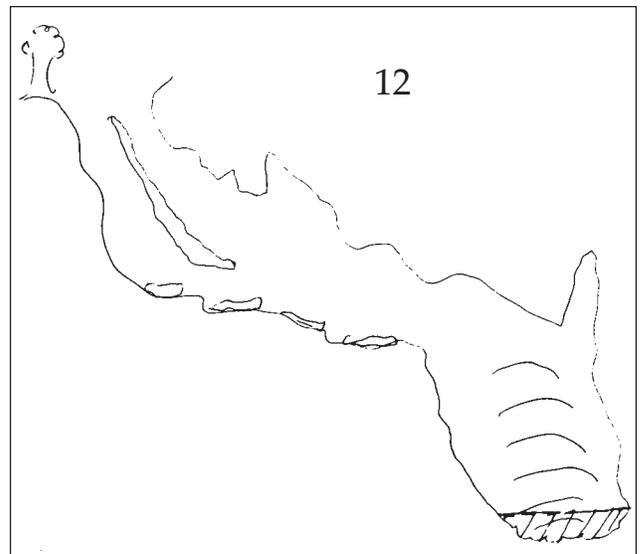
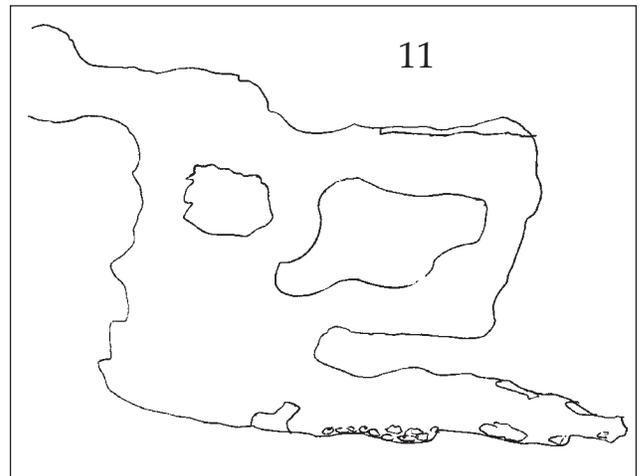
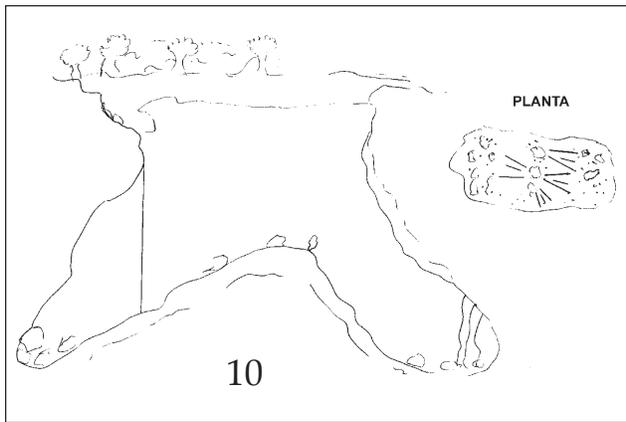
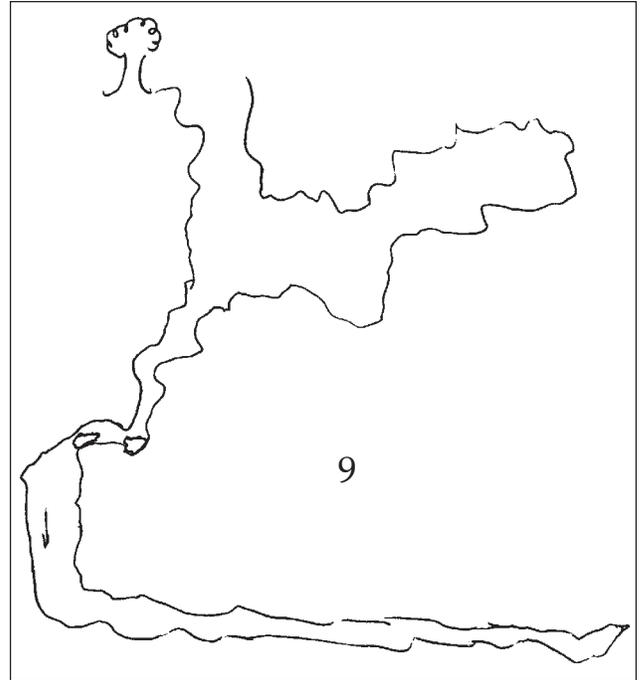
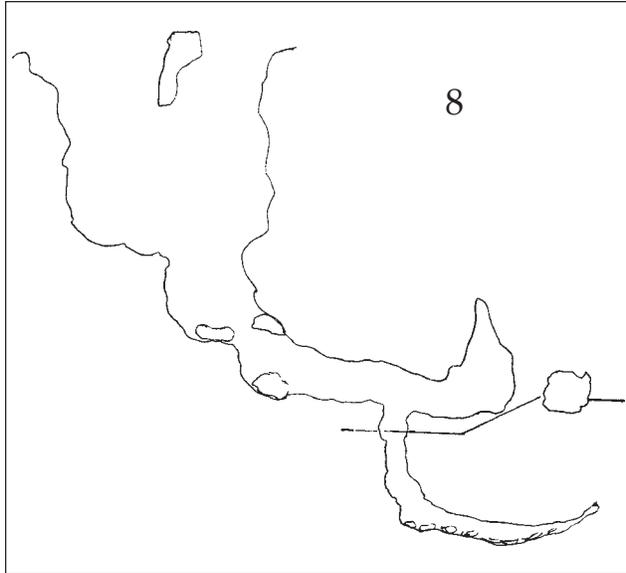
Adapted from a report by the caving group at IPN. Thanks to Oscar Berrones for translating the report for the AMCS.



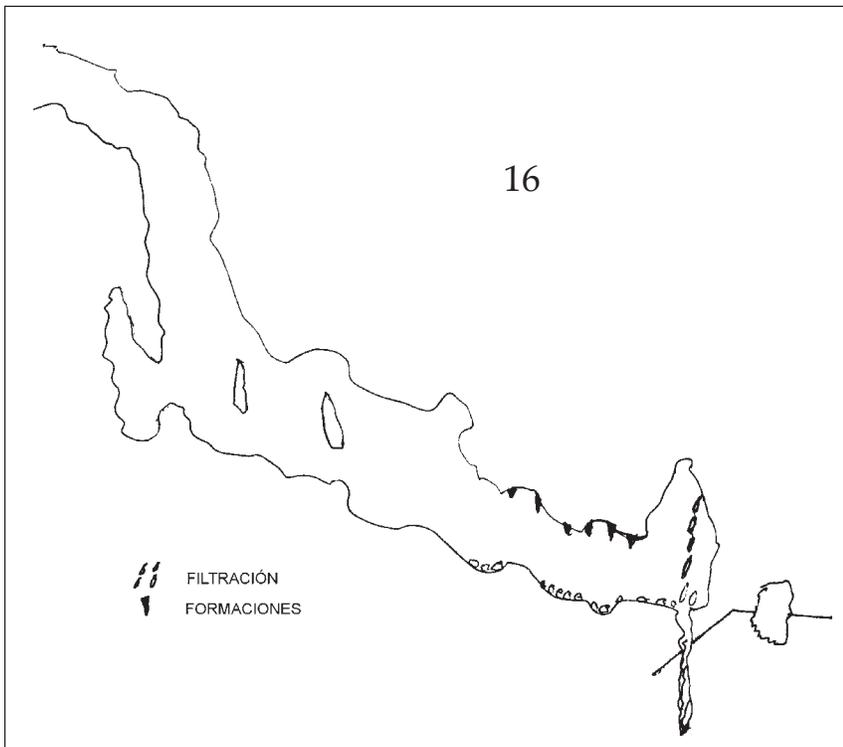
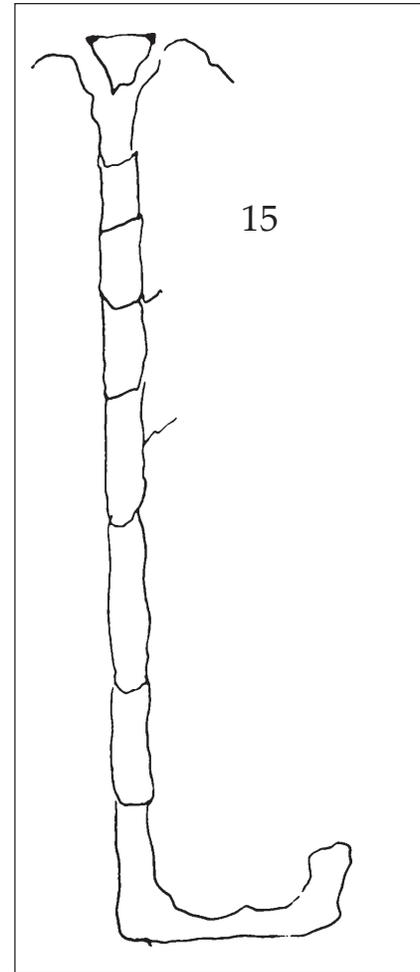
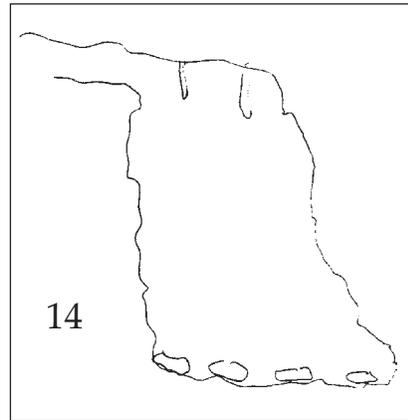
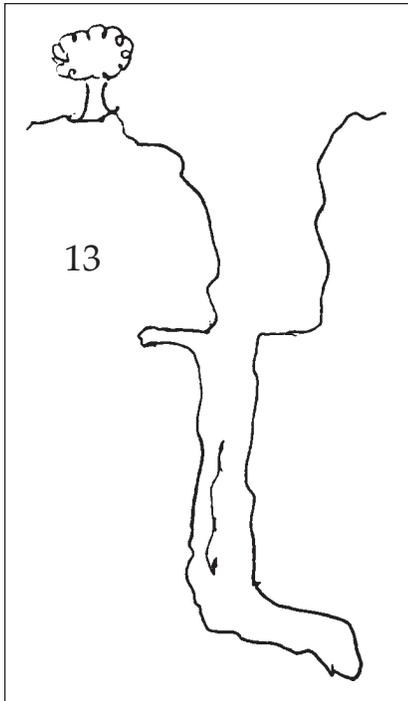
1. Sótano del Potrero, property of Sr. Erastos Hernández, located near the village of Progreso, *municipio* of Atoyac, Veracruz. Depth 35 meters, drop of 15 meters. 2. Cueva del Aguaje, La Aurora, *municipio* of Atoyac, Veracruz. Length 300 meters, depth 30 meters. Water is pumped from this cave to supply the community of La Aurora.



3. Cueva de la Calavera 2, property of Sr. Fernando Morillo, village of Progreso, *municipio* of Atoyac, Veracruz. Depth 40 meters. 4. Sótano sin Nombre, property of Sr. Clemente Blanco, 25 minutes before reaching Progreso. Vertical drop of 40 meters. 5. Sótano del Gordo, property of Julio Escamilla, village of Progreso, *municipio* Atoyac, Veracruz. Vertical drop of 25 meters, total depth 48 meters. 6. Sala de Agua, located at the village of Zapotal, *municipio* of Atoyac, Veracruz. 7. Sótano del Agua, property of Sr. Abundio, Progreso, Veracruz. Total depth 55 meters.



**8.** Sótano de la Tina, property of Sr. Silvino Cruz. Total depth 34 meters. **9.** Sótano del Diablo, Tlacorrancho, Veracruz. Total depth 57 meters. **10.** Sótano Magico, ejido of Tlacorrancho. Total depth 45 meters. One of the most beautiful caves in the area, a classic collapse pit worth the trouble of a visit. **11.** Cueva del Encanto, property of Sr. Bartolo González, 35 minutes from village of Progreso, *municipio* Atoyac, Veracruz. Depth 23 meters. **12.** Cueva de Nogales, village of Progreso. Total depth 30 meters, pool depth 1.5 meters.

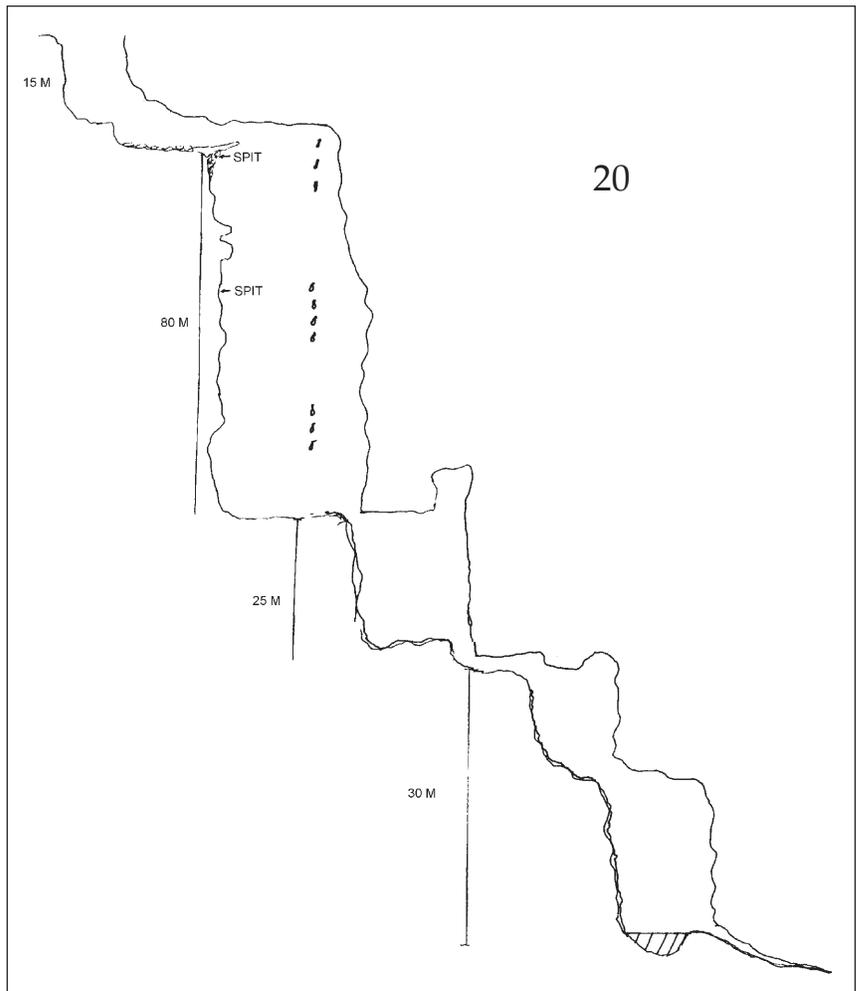
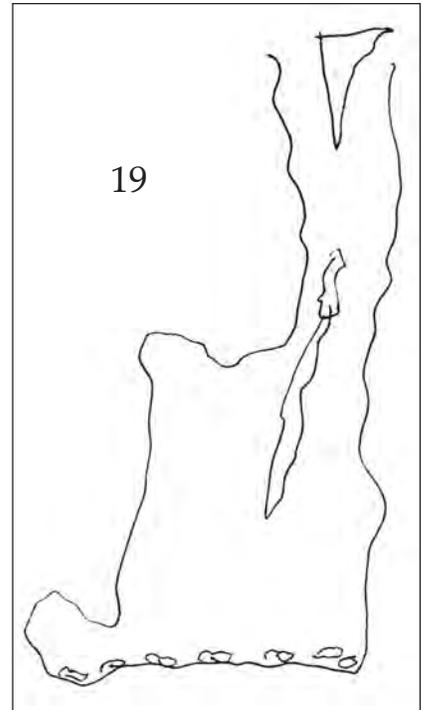
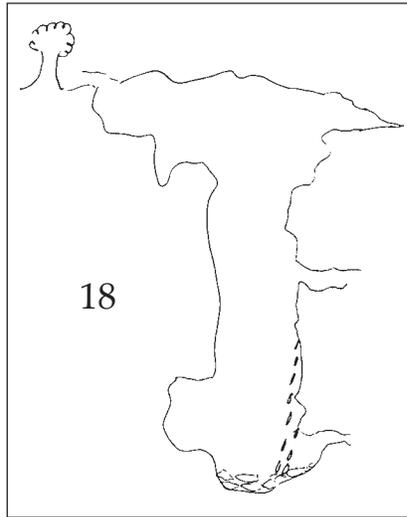
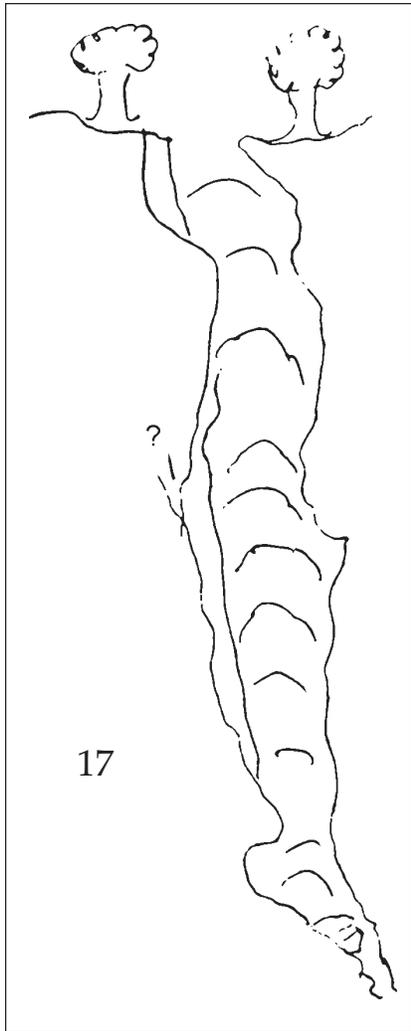


**13.** Cueva de la Reata, community of Zapote. Vertical drop of 10 meters, cave very tight.

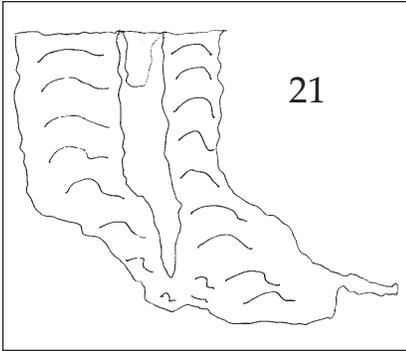
**14.** Sótano del Encanto 2, property of Sr. Bartolo González Hernández, Progreso.

Drop of 15 meters. **15.** Sótano del Horno del Sr. Clemente Blanco, village of La Charca, *municipio* Atoyac, Veracruz. Total depth 45 meters.

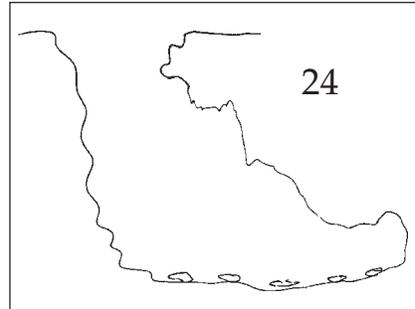
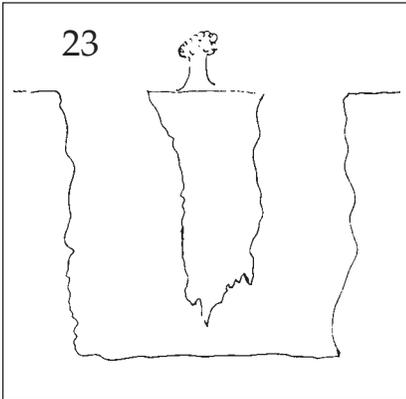
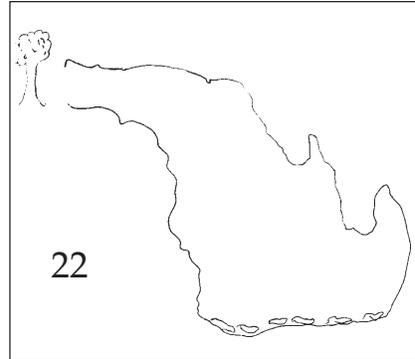
**16.** Sótano del Sr. Jacinto Palma, located 15 minutes from village of Progreso, *municipio* Atoyac, Veracruz. Total depth 60 meters.



**17.** Unnamed, property of Sr. Artemio Morales Martínez, *ejido* Tlacorrancho, Zapotal, Veracruz. Depth 70 meters. **18.** Unnamed, property of Sr. Aurelio Hernández, village of Progreso. Total drop 30 meters. **19.** Sótano de Horno, property of Sr. Evaristo Moreno, Tlacorrancho, Veracruz. Drop of 56 meters. **20.** La Cueva del Pozo, located in the village of Charca. Total depth 150 meters, technically very difficult because of loose rocks in the shafts.



**21.** Cueva de la Calavera 1, property of Sr. Fernando Murillo, Progreso. Total depth 38 meters. **22.** Sótano de la Señora Tila Mesa. Total depth 23 meters. **23.** Sótano del Gemelo del Panteón. Property of Sr. Abundio Marquez, Progreso, Veracruz. Depth 8 meters. **24.** Sótano del Solitario, property of Sr. Clemente Blanco, *municipio* Atoyac, Veracruz. Total depth 20 meters.



### Cuevas de Atoyac, Veracruz

Miembros de la AEMIPN exploraron cuevas alrededor de Atoyac, en la parte central de Veracruz, buscando fuentes de agua permanentes para los poblados de la zona. Hallaron varias cuevas pequeñas, pero ninguna lo suficientemente profunda para llegar al nivel freático.



## GEOGRAPHY OF CAVES IN QUINTANA ROO

Jim Coke

Cave explorations in the Yucatan Peninsula well before the first European incursions into the New World are documented by paleontological evidence.  $^{14}\text{C}$  radioisotope dating of charcoal and bones confirms that a small number of primitive inhabitants investigated dry caves on the peninsula, with tragic results, prior to 7000 BC. Archaeological evidence indicates that both Maya and Toltec civilizations utilized numerous dry caves in the region. Even today, modern explorers continue to stumble upon forgotten caves in the jungle where petroglyphs, paintings, stone walls, burial sites, and intricate ruins wait to be catalogued into the archives of history. There is a measure of speculation concerning the intentions of these early explorers. Why would ancient people explore or even bother with these dark and forbidding geological marvels? Current analyses of ancient population centers and cave inscriptions suggest their explorations were a quest for a reliable supply of fresh drinking water for a growing population of thirsty inhabitants. Geological circumstances have always limited surface freshwater drainage systems in the northern regions of the peninsula. Only a scattering of cenotes and dry caves allow regular access to the area's shallow freshwater aquifer.

Cave explorers are rediscovering many of the karst features in the state of Quintana Roo that were of prime importance to earlier cultures. Present studies, however, are stimulated by cave science, sport

exploration, and, on occasion, by profits collected from ecotourism. Whatever their incentive, most present-day explorers are mapping their discoveries and submitting raw cave-survey data to the Quintana Roo Speleological Survey for archiving. At this date, the QRSS archives data for over 500 kilometers of passage in more than 110 underwater caves, together with more than 4 kilometers of surveyed passage in numerous dry caves. This information is geo-referenced through the Global Positioning System to reveal details of frequency, distribution, and hydrological environment of regional karst features. It is a rather new development, as modern cave exploration in Quintana Roo is still in an emerging phase.

Advanced cave explorations commenced on mainland Quintana Roo during the late 1970s, primarily at two coastal sites near the fishing village of Playa del Carmen. By 1985, only four surveyed caves were known, with less than 5 kilometers of combined survey. A number of obstacles limited modern karst investigations in the region until the early 1980s. One concern is the complexity of access to interior jungles. Few roads and known trails penetrate this dense tropical forest. It is also partitioned into an enigmatic concoction of unmarked private, communal, and federal holdings. It is not uncommon for a naive trespasser to face a tense reception by suspicious *ejido* or private landowners. Local inhabitants have always figured prominently in karst

studies, but early explorers did not have occasion to befriend local inhabitants who were cognizant of inland property boundaries and cave locations. This situation limited investigations to the immediate shoreline of Quintana Roo, primarily at freshwater discharge points on the Caribbean, known locally as *lagunas*, *caletas*, or *ojos de agua*.

Coastal caves may be considered immature in a geological sense. They negotiate relatively unconsolidated limestone deposits, submerged in a saltwater intrusion that is infused with freshwater flow from interior drainage patterns. Fault-oriented and bedding-plane conduits containing large, unstable breakdown boulders and powdery white silt typify their passages. Initial reports of unstable tunnels, poor visibility, and undersized maze caves likely inhibited further probes into the Quintana Roo karst. Finally, the technical character of local caving generally requires competence with specialized life-support equipment for cave diving. Proper equipment for cave diving was not available in the Yucatan, unless brought by a pioneering visitor. These problems would serve to defer effective inland ventures until 1984.

The potential for inland cave exploration materialized over a few short years. By 1988 over three dozen caves within 12 kilometers of the coast were under active exploration. Over 70 kilometers of road and trail surveys linked many of the cave plots into a regional portrayal, exposing an elaborate northwest-

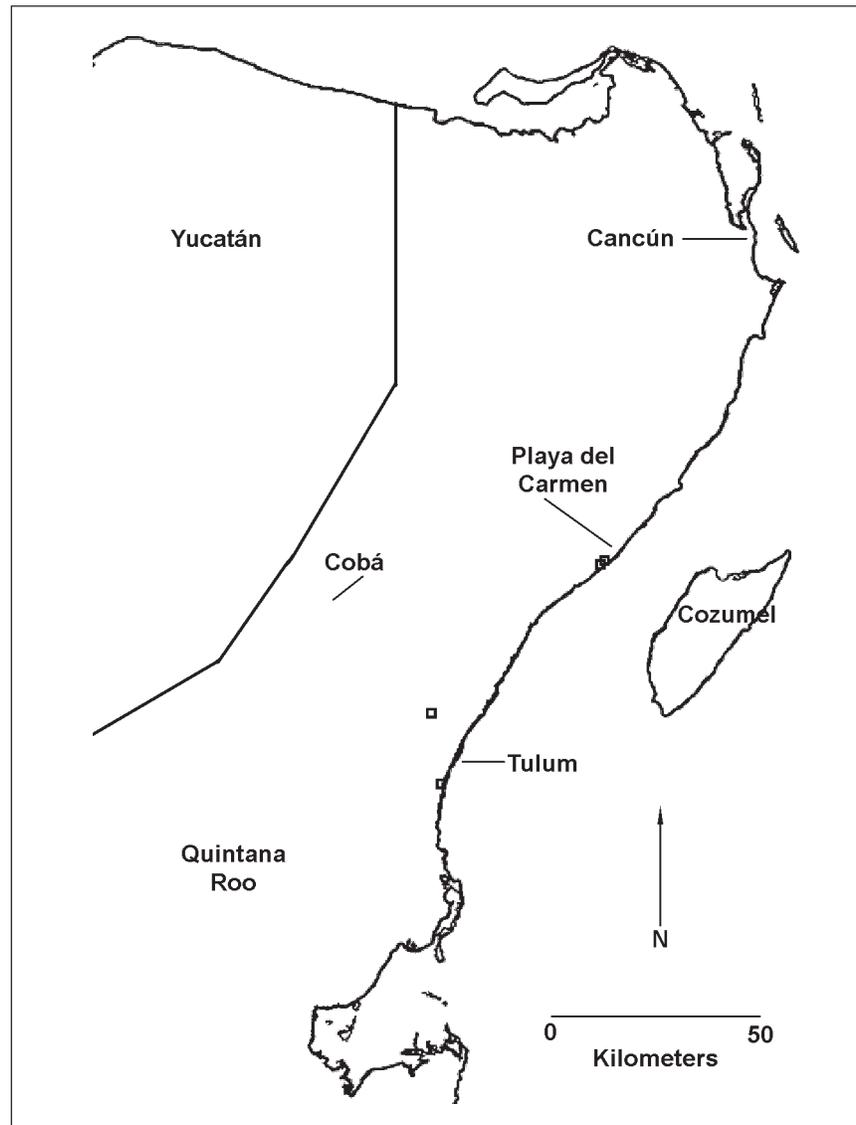
to-southeast configuration of passage evolution. The majority of these tunnels are situated within 16 meters of the surface, channeling freshwater drainage through isolated karst windows toward coastal discharge exits. The basic framework used to assemble this analysis of emerging karst patterns was, however, inherently flawed. Overland surveys were too time-consuming and consequently unable to keep pace with new discoveries. Problems with cumulative survey error over long distances and identifying indistinct survey stations for future tie-ins were also symptoms of an ailing system in need of change. GPS appeared to be a logical alternative for obtaining location data for widely dispersed caves, although initial attempts to harness this promising technology were disappointing. Selective-availability errors and an old four-channel GPS receiver meant that our skills at bungling geography far surpassed our abilities as cutting-edge explorers. However, results have since improved. SA is turned off, and new computer software and civilian twelve-channel GPS receivers are far superior in accuracy. Waypoints and track records are now collected in WGS84 datum using Garmin 2+, V, and eTrex receivers. Both Garmin 2+ and V models are capable of using a Tri-M Mighty Mouse 2 external active antenna. The active antenna amplifies satellite signals that are weak due to a dense jungle canopy or poor satellite locations and can be raised 5 meters above the ground to improve signal detection. Under optimal conditions, estimated position errors with this antenna range from 3 to 9 meters. Field data are transferred from the receiver to a computer through a cable interface.

GPS has proved to be an efficient means of linking cave surveys into a regional plot using Compass or SMAPS cave-mapping software. Yet coordinate information is equally useful in other geographic applications. Fugawi 3 mapping software

is designed to import scanned topographic maps or aerial photographs in any scale or datum. Following a short map-calibration procedure, waypoints and tracks are converted by the program for accurate position and display on the map or photograph. Not only are past navigation records available for study, but creating target waypoints for promising sites on a scanned map is a simple matter. Loaded with the coordinates of these potential sites, a GPS receiver can act as a guide to a promising jungle location that is, hopefully, not just a speck of dust on a dirty computer screen.

The recent field application of GPS is making valuable contributions to exploration and site evaluation in Quintana Roo. The majority

of underwater caves in the region have shallow, nearly horizontal profiles that encourage lengthy penetrations from an entrance. In favorable geological settings, analysis of the QRSS database suggests that it is reasonable to anticipate a karst window to the surface for roughly every 800 meters of horizontal cave traversed. Pinpointing these cenotes in the jungle is indispensable for extending a survey. The ability to move overland to another entrance greatly extends the range of gas supplies carried by a diver, two-thirds of which must be held in reserve for the exit from the cave. All too often, offshoot tunnels have been left unchecked for want of sufficient underwater time. A new entrance not only stimulates



Area map showing the four caves that had been surveyed by 1985.

deeper penetrations into virgin territory, but it also allows branches from older passages to be reassessed.

In the past, a diver would surface in a remote cenote at a prearranged time and summon a machete crew with blasts from a toy trumpet or whistle. Given large support groups and distances under 1.5 kilometers, the method proved to be better than locating the new cenotes by cave-survey data. Although a reliable azimuth and distance to an opening can be found from survey data, it is a challenge to hold a precise bearing in a dense and thorny jungle and gauge how far one has traveled. Locating a distant and obscure hole by azimuth is a gamble.

Integral to today's underwater cave kit is a compact GPS receiver housed in a waterproof container. Equipped with a GPS, a diver can surface at a new location and collect a waypoint in just minutes. There is no need to wait hours for a machete team while blowing a plastic horn; the waypoint is saved and underwater exploration continued. Today's longest underwater cave systems are explored in this manner, using GPS to later establish

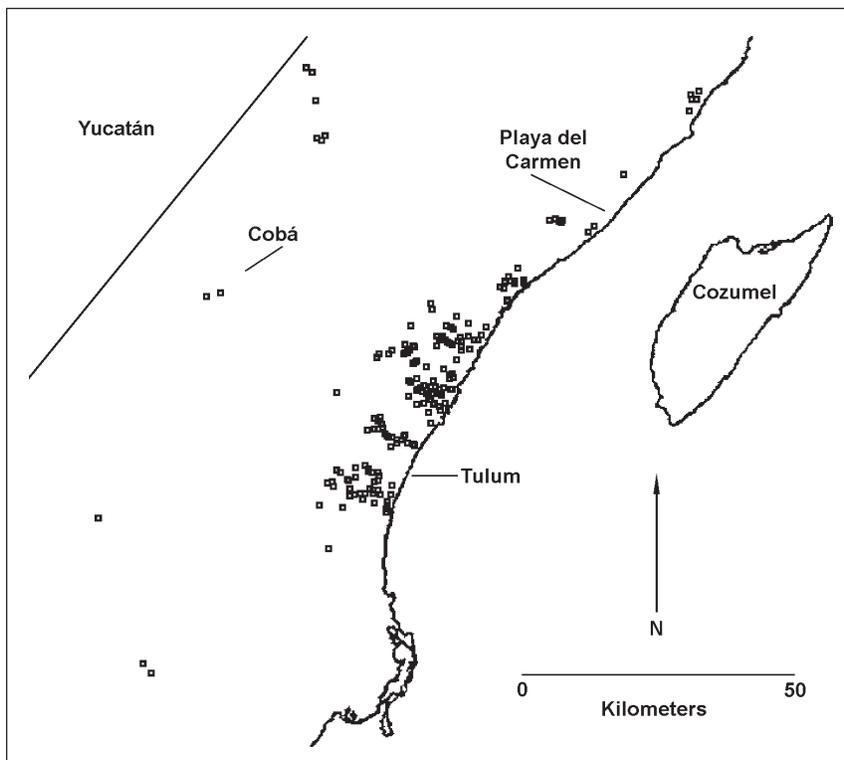
trails or place remote camps for expeditions.

While it is common to stumble on weathered remnants of Maya or *chiclero* cultures in the jungle or in shelter caves, finding a large structure or sophisticated rock art in a sizeable cave is a singular event. A team of divers exploring in a remote section of an underwater cave 4 kilometers from the ocean recently chanced upon what first appeared to be a sizeable air-bell. They surfaced for a quick look, to discover it was actually a large sump occupying nearly 75 percent of a large cavern entrance room. Dry caves of this size are unusual at this distance from the ocean, as land elevation averages 4 to 5 meters above sea level. Moreover, the cave has two 5-meter pits to the surface, rather than a walk-in entrance typical for the area. At the base of one pit they picked out a stone edifice with a clump of small trees whose trunks soared through the skylight to open jungle. They chose not to cut or flag a trail during the next visit, guided by a recorded waypoint, in order to protect what appeared to be an intact archaeological site. The waypoint proved

invaluable as they bushwhacked through the jungle. Both pits are undetectable beyond just a few meters. Two or three small rock structures surround the entrances at odd intervals, while low rock walls appear to intersect one or two structures at cardinal or astronomical angles and continue off into the jungle. The structure at the base of the pit is formed on a raised platform oriented to the cardinal points. Although tree roots have damaged the walls, a thin layer of lime stucco remains visible on the outside corners. Lending a bit more mystery to the ruin is an arrangement of flat stones that line the sump perimeter surrounding the ruin. It appears to be a paved incline for walking in or out of the sump. Its complexity and breadth, however, seem too extravagant for everyday use by humans. This ruin and ramp may be a quaint offering to the Aluxes, mythical forest elves held responsible for hunting mishaps or rich harvests on the *milpa*. At trail intersections in remote areas of Quintana Roo it is possible to find Alux gifts composed of short stone altars adorned with candles, bones, and small shells. Today cave entrances remain likely areas to encounter curious artifacts intended to appease these tiny spirits.

Petroglyphs are usually found in naturally illuminated areas of a cave; they rarely occur at any distance from the entrance. They normally take the form of a human face, characterized by three or four engraved features. The eyes, nose, and mouth are represented as simple holes or straight lines carved in the rock. The outline of the face is often represented by a limestone knob or bulge that acts as a three-dimensional rendering of the head. These faces serve to welcome or direct visitors to a nearby pool of fresh water. Detailed petroglyphs, such as the iguana emerging from a small rock hole in the photograph, are very rare. A second, unidentified glyph appears below and to the right of the lizard. The glyph set

Underwater and dry caves in the QRSS database in early 2004.



Small structure, perhaps an Aluxes house, below a pit entrance in a remote part of Sistema Sac Actun. *Jim Coke.*

was found near an extensive sump in a cave that contains a small Alux ruin complete with long, squat stone walls built to guide an Alux toward the sump pool in the back of the cave.

It is very difficult to determine the age of petroglyphs and ruins we find in these caves. A few may date from the Classic period (AD 600–900) when the city of Cobá reached its zenith. Others are much younger; a few pieces of rock art are no doubt inventions of bored *chicleros* riding out a hurricane in a damp cavern. Discoveries of any historical value are always reported to landowners as a courtesy. The QRSS also maintains open communications with the Instituto Nacional de Antropología e Historia as a matter of cooperation and respect for Mexican federal laws. Both ruins and rock art are considered central to Mexico’s history, and are therefore protected by law.

The QRSS database includes nearly three hundred GPS locations for underwater and dry caves. The resulting overview of entrance locations and actual cave maps suggests a few patterns of



cave speleogenesis in Quintana Roo. At this time the largest proportion, 76 percent, of mainland caves is confined to a zone between Playa del Carmen and a few kilometers south of Tulum. Caves within the zone appear to be controlled by the geology of the interior. Long horizontal underwater cave development in Quintana Roo declines approximately 12 kilometers from the coast. Beyond this boundary, elevations generally rise abruptly from 8 to 18 meters above sea level, which is sustained to the Yucatán state border about 50 kilometers inland. Known caves in the western

part of Quintana Roo are wet or dry pits; only two horizontal dry caves have lengths over 150 meters. A second, less evident pattern becomes discernible, especially in the vicinity of Tulum. Points between Playa del Carmen and Tulum tend to converge into groups aligned on a northwest-to-southeast configuration. Tight clusters symbolize one cave or a few closely related caves, while scattered clusters indicate many loosely associated caves. Each group of caves, whether loose or scattered, shares a common drainage path, according to cave survey. This could suggest a penchant for speleogenesis along preferred flow routes, rather than an amorphous “inland lake” drainage model suggested by a few researchers.

Quintana Roo has been a fertile area for cave exploration over the past twenty years. It continues to be a fruitful arena for a variety of scientific studies and new discoveries within the Playa del Carmen to Tulum zone. Many of the current explorations involve fringe caves located at the 12-kilometer perimeter, where pushes in their downstream sections, toward the coast, are more successful than bids for upstream growth. Investigations are also expanding south of Tulum and into the Cobá area, once considered



Iguana glyph in Cueva de las Ruinas. *Jim Coke.*

highly sensitive due to apprehensive or suspicious landowners. Residents in remote areas associate caving or technological equipment with land developers or governmental intrusions into their way of life. Establishing trusting landowner relations is paramount to our studies. With landowner approval, GPS proves to be an efficient means to document site exploration and assist navigation toward new entrances discovered by surface or underground searches.

### Geografía de cuevas de Quintana Roo

La Asociación de Espeleología de Quintana Roo tiene archivos de más de 500 kilómetros de cuevas subacuáticas, con más de 110 entradas. Hay además 4 kilómetros de pasaje topografiado en varias cuevas secas. Los mapas muestran el aumento de entradas conocidas desde 1985. La mayoría de las cuevas subacuáticas largas se desarrollan a menos de 12 kilómetros de la costa. Los buzos frecuentemente encuentran nuevas entradas a cenotes desde el interior de la cueva y portan un GPS en un recipiente hermético para poder registrar la ubicación de la nueva entrada. Las cuevas conocidas en la región occidental de Quintana Roo son en su mayoría pozos secos o húmedos. Sólo dos cuevas horizontales ahí tienen más de 150 metros. Algunos hallazgos arqueológicos se muestran en las fotografías.



Guillaume Pelletier at the top of a 14-meter pit in La Ciudad, Hoya Grande, Puebla, during Mexpé 2002.  
Photo by Gustavo Vela Turcott.

# A VAMPIRE ROOST IN A COLD CAVE

Gerardo Obispo Morgado, Luis Espinasa,  
and Monika Baker Alpheis

Encircling the northern portion of the warm valley of Cuernavaca in Morelos, Mexico, is a steep volcanic mountain chain known as the Sierra del Chichinautzin. The base of the Sierra del Chichinautzin lies at 1500 meters above sea level, and its peaks reach up to 3450 meters above sea level. Major sections of the mountain chain were formed from lava flows, and within them is one of the most extensive lava-tube systems in the world (Espinasa Pereña, 1999). During a systematic search for unexplored caves in the area, a cave known to the locals as Cueva Pelona was found. Cueva Pelona is located in the Municipio of Huitzilac, Morelos, at an elevation of 2205 meters (19°00'25.4"N, 99°11'51.8"W). It has a 30-meter-deep, 24-meter-wide bell-shaped entrance pit. From it, three passages 209.3, 24.6, and 25 meters long branch off. At the end of the last passage, in a chamber of 2 by 3 and 3.5 meters high, we made an unexpected discovery: a small vampire roost.

This article is a summary of a BA thesis written by GOM. Authors are affiliated with CEAMISH, Universidad Autónoma de Estado de Morelos and/or Shenandoah University. Correspondence should be addressed to LE, Biology Department, Shenandoah University, 1460 University Drive, Winchester, Virginia 22601, [espinasl@yahoo.com](mailto:espinasl@yahoo.com). Eduardo Gradados, Adriana Barona, Paulette Arellano, and Karla Pulido gave help and support during the field studies.

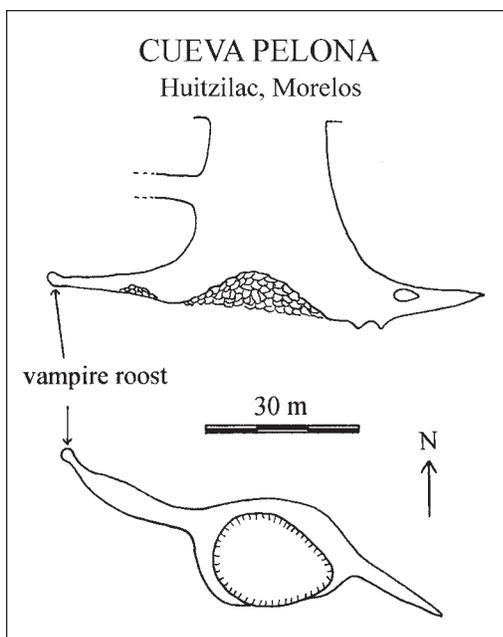
Why was this unexpected? Because the common vampire bat, *Desmodus rotundus*, typically lives at elevations below 2300 meters (Greenhall et al., 1983) in tropical and subtropical regions (McCracken, 1993). Vampire bats avoid roosting in caves or sites where temperatures drop below 15°C (Villa, 1966; Acha, 1968; Trajano, 1996), essentially limiting their distribution to geographical areas whose minimal isotherm for January is higher than 10°C (McNab, 1973). The area of Cueva Pelona has an average annual temperature of 12° to 18°C. At the nearby Huitzilac meteorological station, the minimum isotherm is 9.7°C. Perhaps most impressive, however, was the low temperature in the vampire chamber. The temperature ranged from 15°C to 13°C year-round, according to a min/max thermometer we installed in the vampire chamber, 2 meters from the vampires.

The restricted range of *Desmodus rotundus* is due to the metabolic cost of maintaining normal body temperature with energy input from a diet composed mainly of water (William, 1970; McNab, 1973). The maximum amount of blood obtained during a meal is limited by how much a mother vampire with a newborn can carry in her stomach and still fly. In very cold environments, this energy intake is simply not enough to maintain normal body temperature. Cueva Pelona is situated at a higher elevation and in a colder place than any other vampire roosting site recorded in Mexico. Before this study, the

highest reported vampire roost was in Ostoyohualco Cave (18°59'45.4"N, 99°03'37.6"W), also known as Cueva del Diablo, at an elevation of 1961 meters above sea level (In Villa's 1966 original description he miscalculated the elevation of Ostoyohualco, putting it at 2300). The inside temperature of Ostoyohualco, 20°C, is balmy in comparison to Cueva Pelona.

Four other caves in the same area were explored to determine if other *Desmodus* populations were nearby. Although *Artibeus*, *Glossophaga*, and an unidentified vespertilionid were found in those caves, no other *Desmodus* roost was found. The closest reported colony of vampires is in Naranjo Rojo cave, which lies 3450 meters to the south at an elevation of 1765 meters above sea level (18°58.77'N 99°10.94'W), near the base of the Sierra del Chichinautzin. We expected the colony of Cueva Pelona to migrate during the colder months of the year, but visits to the cave in winter showed it was still occupied by vampires. Therefore individuals are able to endure the extreme conditions. As this cave is clearly at the ecological distribution limits for the species, a demographic and behavioral study was conducted to better understand the factors that permit vampires to survive under sub-optimal conditions.

A total of twenty visits to the cave were made between April 1999 and March 2001. On eleven occasions the vampire gallery was entered without light with the help of a night-vision digital Sony Handycam,



and the colony was filmed. Recordings were done each time at about noon. By the end of the study, a total of 134 minutes of analyzable video tape was available. Since each scene monitors the activity of close to fifteen individuals, 2030 bat-minutes were on tape. In the laboratory, the tapes were analyzed, frame by frame when necessary, and the number of vampires, their relative positions, and the number and types of activities in which they engaged were noted. A total of 625 self-groomings, 137 sniffings, 46 attacks, 29 allogroomings, 1 copulation, 1 attempt at copulation, and 1 regurgitation were recorded. Hibernation or lethargy was not present during the winter. To the contrary, on average a bat engaged in some activity about once per minute in winter, while the frequency was about half that the rest of the year.

The colony was structured in the normal way for the species (Wilkinson, 1990): A main central group of females, juveniles, and some males, closely surrounded by "near satellites," which are mostly adult males, and "distant satellite" adults of both sexes scattered outside the core groups. The total number of individuals forming the colony varied little throughout the study, averaging 59. The lowest number was 52 in April 1999, and the highest

was 62 in July 2000. The central group averaged 37 adults or subadults and 2.5 infants. Near-satellites averaged 6 individuals, and distant-satellites averaged 13.

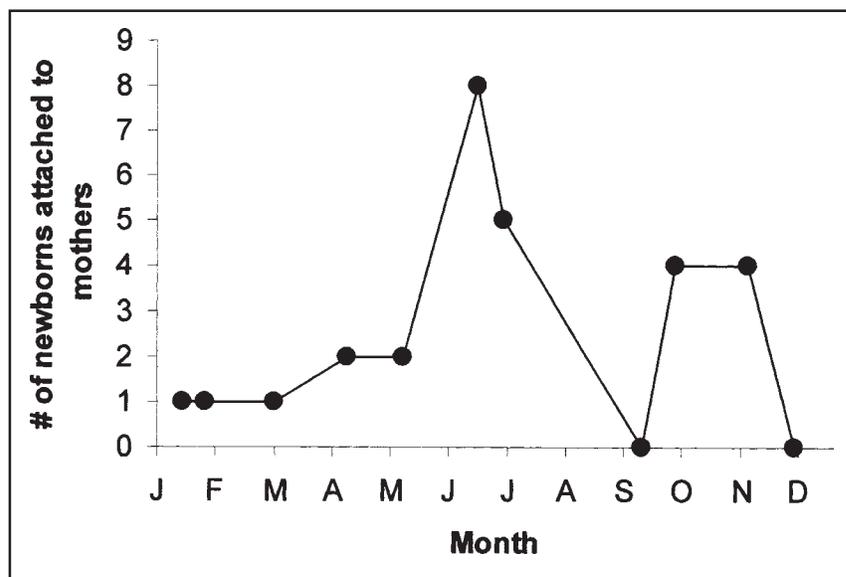
From September 1999 to April 2000, twelve males and six females were captured with a mist net at the entrance of the vampire passage. They were measured, tagged with an adjustable plastic neck band, and released. The bands had a black-and-white code easily seen on the video tapes. Of the twelve males tagged, five were not seen again. Of the six females, only one was never observed again. If we exclude the six individuals not seen again, tagged individuals were seen on average for 13 months. The longest time a tagged individual was observed was 18 months from tagging to the termination of the study. Not every tagged individual was spotted on all days of observation between the date it was tagged and the last time it was seen. For example, a female was tagged on November 19, 1999, and subsequently observed on July 12, 2000, February 4, 2001, and March 12, 2001, but could not be found inside the cave on June 29, 2000, December 14, 2000, January 23, 2001, and February 3, 2001. Note that even on the two consecutive

dates in February 2001, she was present one day and not the other. Based on the observations, we estimate that individuals occupy the Cueva Pelona roost only about 30 percent of the time.

Births occurred throughout the year, although two peaks of births were found, in June-July and October-November, as seen by the number of newborns attached to their mothers. There appeared to be fewer newborns in the coldest months of the year than during the rest of the year. The figure shows the number of newborns recorded over the two years of observation, condensed into a single year to visualize seasonal births.

Self-grooming was performed at similar rates in all parts of the colony, whereas allogrooming was performed mainly among near-satellite individuals, which, based on the sex distributions discussed above, consisted mainly of males. Of the twenty-nine allogroomings observed, only one was from a mother to her newborn. All others were from an adult directed to another adult. Our results corroborate the notion that allogrooming has a different function than that of self-grooming (Wilkinson, 1986). While self-grooming has a cleaning function and is performed by all adults with the same intensity, allogrooming apparently has a more social function, because it is performed mainly by the near-satellite

individuals were seen on average for 13 months. The longest time a tagged individual was observed was 18 months from tagging to the termination of the study. Not every tagged individual was spotted on all days of observation between the date it was tagged and the last time it was seen. For example, a female was tagged on November 19, 1999, and subsequently observed on July 12, 2000, February 4, 2001, and March 12, 2001, but could not be found inside the cave on June 29, 2000, December 14, 2000, January 23, 2001, and February 3, 2001. Note that even on the two consecutive



males that control access to the females in the central group.

Attacks and sniffings also appear to be performed mainly by males, according to the positions in which they were observed. Attacks were performed an order of magnitude more frequently by near-satellite individuals than by central or distant-satellite individuals. Near satellites also sniffed other individuals more often than those elsewhere in the colony. These activities could also be associated with male dominance interactions.

**CONCLUSIONS.** Not only did the Cueva Pelona vampire colony not migrate during the coldest months of the year, but it also remained nearly constant in size. Geographical factors may contribute to the ability of this population to endure the extreme conditions. This cave is only 4 kilometers away from the warm valley of Cuernavaca, clearly within the 5- to 8-kilometer flying range of vampires in search of food (Greenhall et al., 1983). Individuals could be descending to lower and warmer elevations in their search for food, as corroborated by ranchers' reports that vampire wounds are scarce on cattle at high elevations. Furthermore, although the colony size is stable, the individuals themselves do not spend every day in this particular cave, since it is estimated that both males and females are there only about 30 percent of the time. Since no other cave at this elevation appears to be occupied by vampires, but several caves in the Cuernavaca valley have large vampire colonies, individuals from Cueva Pelona may spend two-thirds of their time in warmer roosting sites.

If a vampire does not eat for three days, it dies. Food sharing by regurgitation among individuals is an efficient way to reduce this metabolic constraint (Denault and McFarlane, 1995). Although one might expect that in an energetically challenging environment, increased food-sharing could potentially increase survival rates, that is not a strategy particularly used by the Cueva Pelona colony. Food sharing by regurgitation was observed only once during the study.

Reducing reproductive rates in winter and using several roosting sites appear to be factors that enable individuals from Cueva Pelona to endure its extreme conditions. These tactics are not restricted to this population, but instead are part of the adaptive ensemble of the species. Nuñez and Viana (1997) showed that vampires in Trinidad, Brazil, and Costa Rica also have two birthing peaks at times other than winter, and Greenhall et al. (1983), Wilkerson (1990) and Trajano (1996) reported that individuals in populations inhabiting warmer areas also use several perching sites. It would then appear that no new strategies were developed by the members of the colony in Cueva Pelona to endure the extreme conditions there, but that they simply employ the adaptive characteristics typical of the species to their limits of effectiveness.

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### Un nido de vampiros en una cueva fría

Cueva Pelona, en la sierra del Chichinautzin, en Morelos, es la cueva a mayor elevación, 2205 metros, de que se tenga noticia con una colonia de murciélagos vampiros comunes, *Desmodus rotundus*. A pesar de las bajas temperaturas los murciélagos están presentes todo el año y no disminuye su actividad en invierno. La cueva está solamente a cuatro kilómetros del valle templado de Cuernavaca y los murciélagos probablemente acuden ahí en busca de alimento.



