AMCS
ACTIVITIES NEWSLETTER

Number 26 June 2003

AMCS

ACTIVITIES NEWSLETTER

Number 26 June 2003

AMCS
ACTIVITIES NEWSLETTER

Number 26 June 2003

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

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

This issue was edited by Bill Mixon, with help from Katie Arens, Yvonne Droms, Ramón Espinasa, Rodolfo "Fofo" González, Orion Knox, Mark Minton, Nancy Weaver, and John "Solo" White.

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

ASSOCIATION FOR
MEXICAN CAVE STUDIES
BOX 7672
AUSTIN, TEXAS 78713
www.amcs-pubs.org

Front cover

Carol Westmoreland at the Veiled Statue in Gruta del Palmito, Bustamante, Nuevo León. See article on page 25. *1966 photograph by Orion Knox.*

Back cover

Linda Palit in Actun Kaua, Yucatán. Top, the Ruta Maya; bottom, the South Maze. See article on page 65. *Photos by Orion Knox.*

CONTENTS

AUTHORS IN THIS ISSUE

Guillermo de Anda Alaniz
Avenida García de la Torre #41 P.B.
Cancún, Quintana Roo
Mexico

Fred Devos
PO Box 14
Puerto Aventuras, Quintana Roo 77750
Mexico
fred@aquaexploration.com

Ernie Garza
473 Limestone Lane
Driftwood, Texas 78791
txworks@texas.net

Ed Goff
737 Bizerte Avenue
Dallas, Texas 75224
egoff@rice.edu

Pat Kambesis
Hoffman Envirornmental Research Institute
Western Kentucky University
Bowling Green, Kentucky 42101
kambesis@bigfoot.com

Oliver Knab
Im Tiergarten 50
CH-8055 Zürich
Switzerland
oliverknab@freesurf.ch

Jean Krejca
4806 Savorey Lane
Austin, Texas 78744
creature@mail.utexas.edu

Chris Lloyd
Teotehuacan 1661
Pinar de la Calma
Zapopan, Jalisco 54080
Mexico
cjlloyd@igu.net.mx

Randy Macan
400 Franklin Street
Fort Collins, Colorado 80521
randy@muchomail.com

Mark Minton
Department of Natural Sciences
New Mexico Highlands University
P. O. Box 9000
Las Vegas, NM 87701
mminton@nmhu.edu

Gerald Moni
2330 Rader Ridge Road
Antioch, Tennessee 37013
moni7597@aol.com

Dominique Rissolo
Department of Anthropology
San Diego State University
5500 Campanile Drive
San Diego, California 92182
rissolo@yahoo.com

David Roemer
Carlsbad Caverns National Park
3225 National Park Highway
Carlsbad, New Mexico 88220
Dave_Roemer@nps.gov

Bev Shade
8427 Old Lockhart Road
Muldoon, Texas 78949
bev@purificacion.org

Susan Souby
4707 Valley Oak Drive
Austin, Texas 78731
ssouby@austin.rr.com

Peter Sprouse
PO Box 8424
Austin, Texas 78713
peter@purificacion.org

George Veni
11304 Candle Park
San Antonio, Texas 78249
gveni@satx.rr.com

MEXICO NEWS

Compiled by Bill Mixon

CHIAPAS

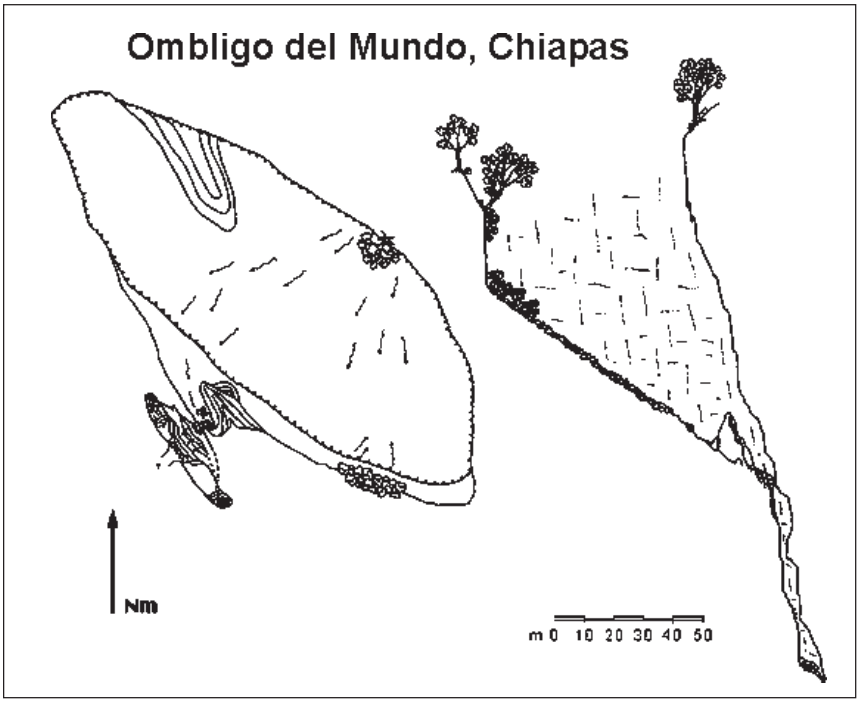
The **Ombligo del Mundo,** the Umbilicus of the World, was first reached by Italian cavers of the Río La Venta Project, after a couple of unsuccessful attempts at making a trail, by a rappel from a helicopter. Finally in 1998, twenty men in twenty days managed to make a trail to the pit. The pit is located in Tierra Colorada, 16°59′32″N, 93°40′28″W, at an elevation of 650 meters. *Source:* CD-ROM included in *Rio La Venta: Treasure of Chiapas.*

COAHUILA

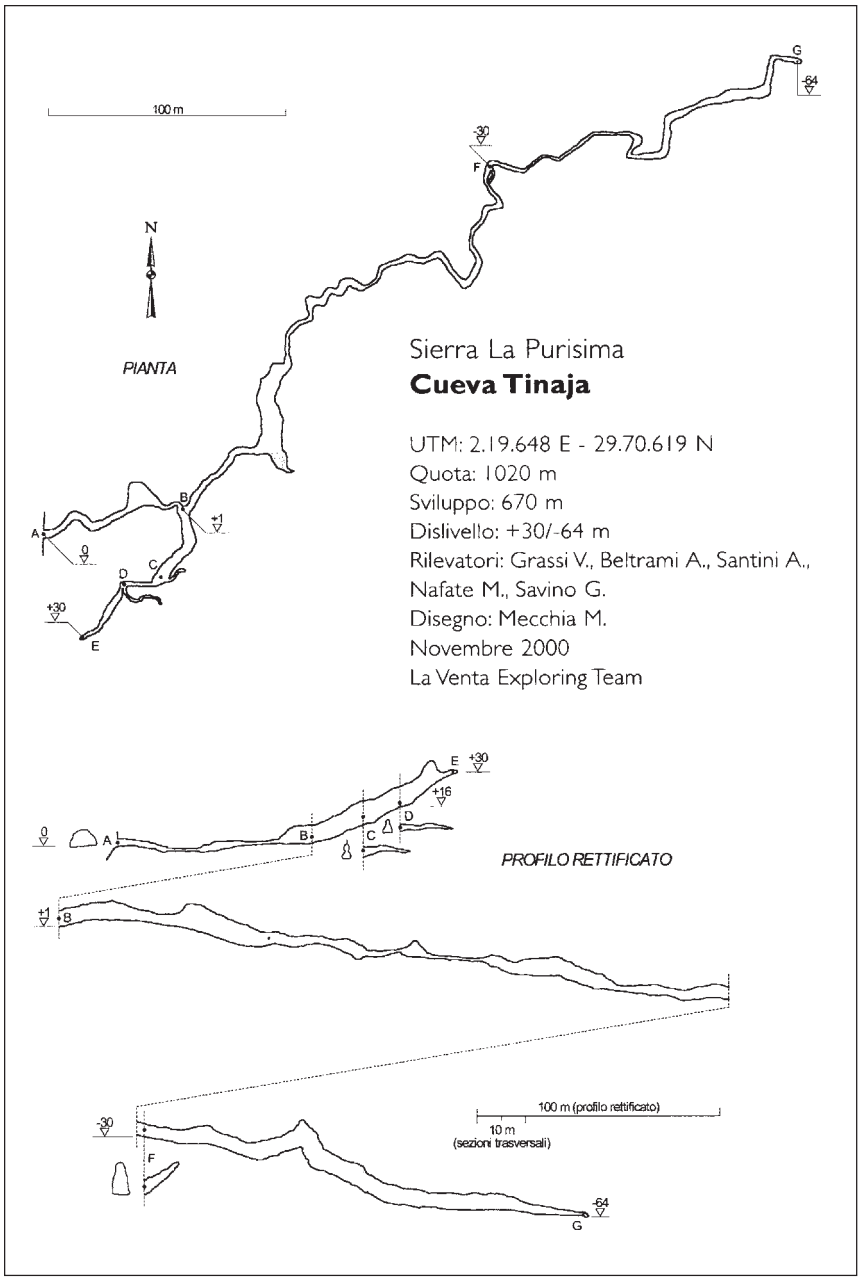
The story that a miner who was trying to steal some of the giant crystals from **Cueva de los Cristales** (see *AMCS Activities Newsletter* 25, page 72) died in the attempt has been confirmed by someone who helped recover the body, which had been baked in the room and "smelled like pork." Apparently the man, described as a local "wrongdoer," had been pinned under a crystal that he had broken off and was overcome by the heat before he could free himself. The body was removed by soldiers and mine workers.

The June 2002 issue of *Speleologia* (number 46) contains an article by Tullio Bernabei, Italo Giulivo, Marco Mecchia, and Leonardo Piccini of the Associazione La Venta on the group's **Cuatro Ciénegas** 2000 Project. Their investigation of the springs in the desert and the surrounding dry limestone mountains, with terrain like Cañón Pedregoso in the Sierra La Purísima, has so far located more than sixty caves with over 8000 meters of total passage. Two of the cave maps from the article are reprinted here.

Over Thanksgiving 2002, Texas cavers visited some very large sinks on a karst plateau in the **Sierra la Concordia,** just south of Saltillo. The sinks had been spotted by Peter Sprouse on a topo map many years before. After some difficulties getting access to the area through locked gates, the sinks were reached. Three caves were found that appear to drain an enormous sink. Two of the entrances were unpleasantly smelly. The caves were not pushed, but appear to have considerable potential. *Source:* Travis Scott,



Cañón Pedregoso, Sierra La Purísima, Coahuila. From *Speleologia* 46.

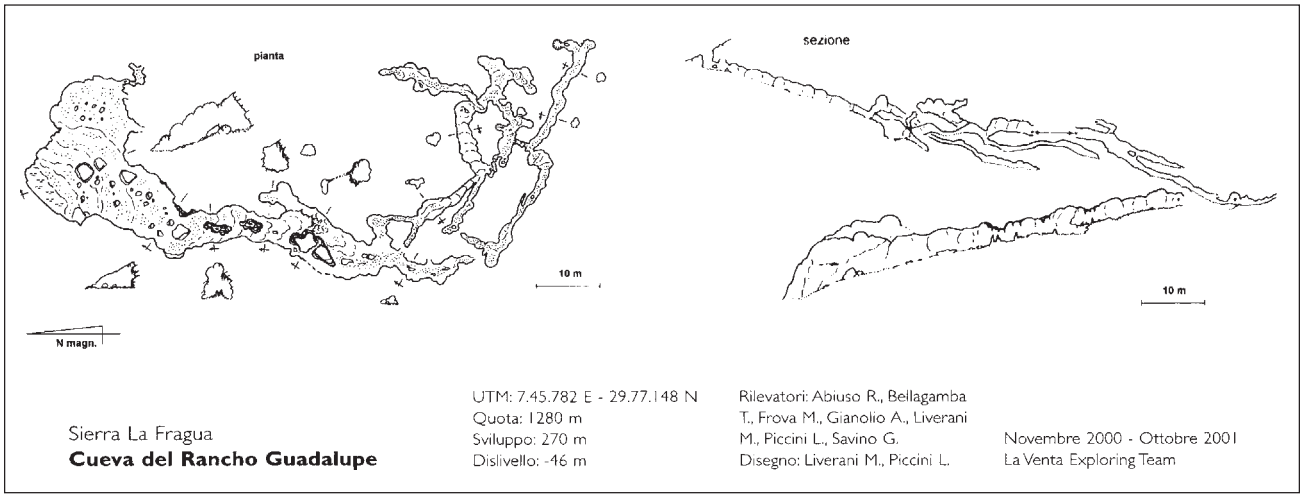


www20.brinkster.com/travii99/concordia1.html.

GUERRERO

The fourth Mexpeleo, co-sponsored by the Association for Mexican Cave Studies and the Sociedad Mexicana de Exploraciones Subterráneas, was held 26–30 December 2002 at Posada de la Paz near the town of Acahuizotla, Guerrero, which is about an hour southeast of the state capital of Chilpancingo de los Bravos. Ninety-one cavers registered. Many cavers did the newly reopened through-trip in featured cave **Resumidero de Acahuizotla,** which requires a free dive through a short sump. Another popular cave was **Cueva de la Mano** (see *AMCS Activities Newsletter* 25, page 150). About a dozen cavers went into **Resumidero Xocomanetlán.** The first two cavers out, Gerald Moni and Preston Forsythe, found that one of the two Alonzo brothers, who had offered to guide cavers to the Grutas de Acatatlaca, had been shot. So they loaded him into their truck to take him to the hospital, passing truckloads of police heading for the village. When the other cavers got out of the cave, they were confronted by twenty-five armed local men, whom the cavers convinced that they had not had anything to do with the shooting. Cavers avoided that cave for the rest of the week.

Numerous slide presentations about caving projects in Mexico were given during the evenings. Principal organizers of the event



were Ramón Espinasa of the SMES and Peter Sprouse of the AMCS. See also an article in this issue about the caves mapped during Mexpeleo. *Sources: Xol,* newsletter of the Mexpeleo; Bev Shade.

At about 11 in the morning on Sunday, 9 March 2003, a visitor to **Gruta del Río Chontalcoatlán** was hit by a rock dislodged by another person while she was climbing down into the canyon at the upper entrance. The rock caused her to fall to her death. Her body was removed from the canyon by members of Unión de Rescate e Investigación en Oquedades Naturales (URION), Socorro Alpino de México, and Cruz Roja Mexicana of Taxco and Coyoacán, assisted and coordinated by the management of the Cacahuamilpa show cave. This is reportedly the second fatality among several accidents in the Dos Bocas caves during the early part of the year. The other was a drowning. The caves are very popular excursions, and untrained local guides take ill-equipped tourists though them. *Source:* Mexican caving email list Iztaxochitla; David Locklear.

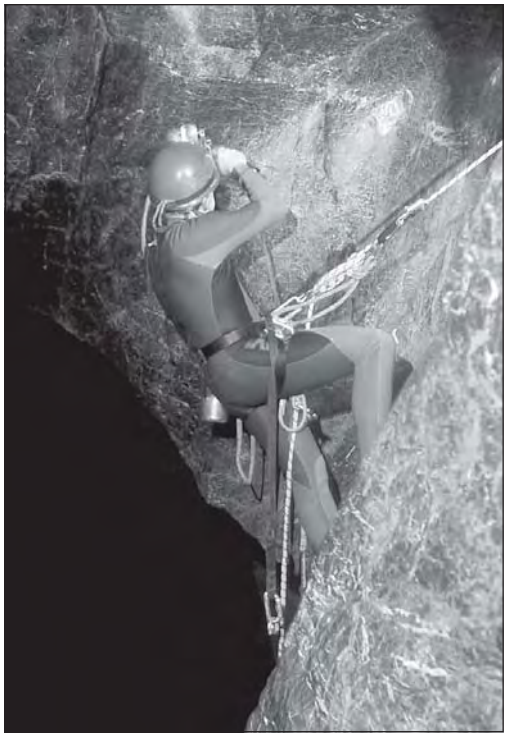
NUEVO LEÓN

In August 2002, a ranch employee at **Minas Viejas** offered to show the cavers a newly discovered pit. On the last day of their trip, he drove them to a parking lot being carved out of the mountainside for some future cabins. There they met a sprightly 78-year-old German-American-Mexican bulldozer driver named Clemente, who had, a few days before, been minding his own business with a front-end loader when the washing-machine-size boulder he was pushing suddenly disappeared. **Pozo Clemente** is a blind pit 30 meters deep, with a ring of boulders around the entrance to keep cars out. *Source:* Ed Goff.

In late August 2002, sixteen cavers from the United States, Canada, and Mexico explored caves south of El Viejo, focusing on the Hoya del Muerto and Cerro Chupaderos, where they mapped ten new caves. The group also looked at some gypsum sinkhole leads near Zaragoza. *Source:* Bev Shade; see also *Death Coral Caver* 12 (2002), pages 17–21.

The "bottle sump" in Resumidero de Acahuizotla, Guerrero. *Peter Sprouse.*

Placing a bolt during the rigging of Resumidero de Acahuizotla for Mexpeleo. *Peter Sprouse.*

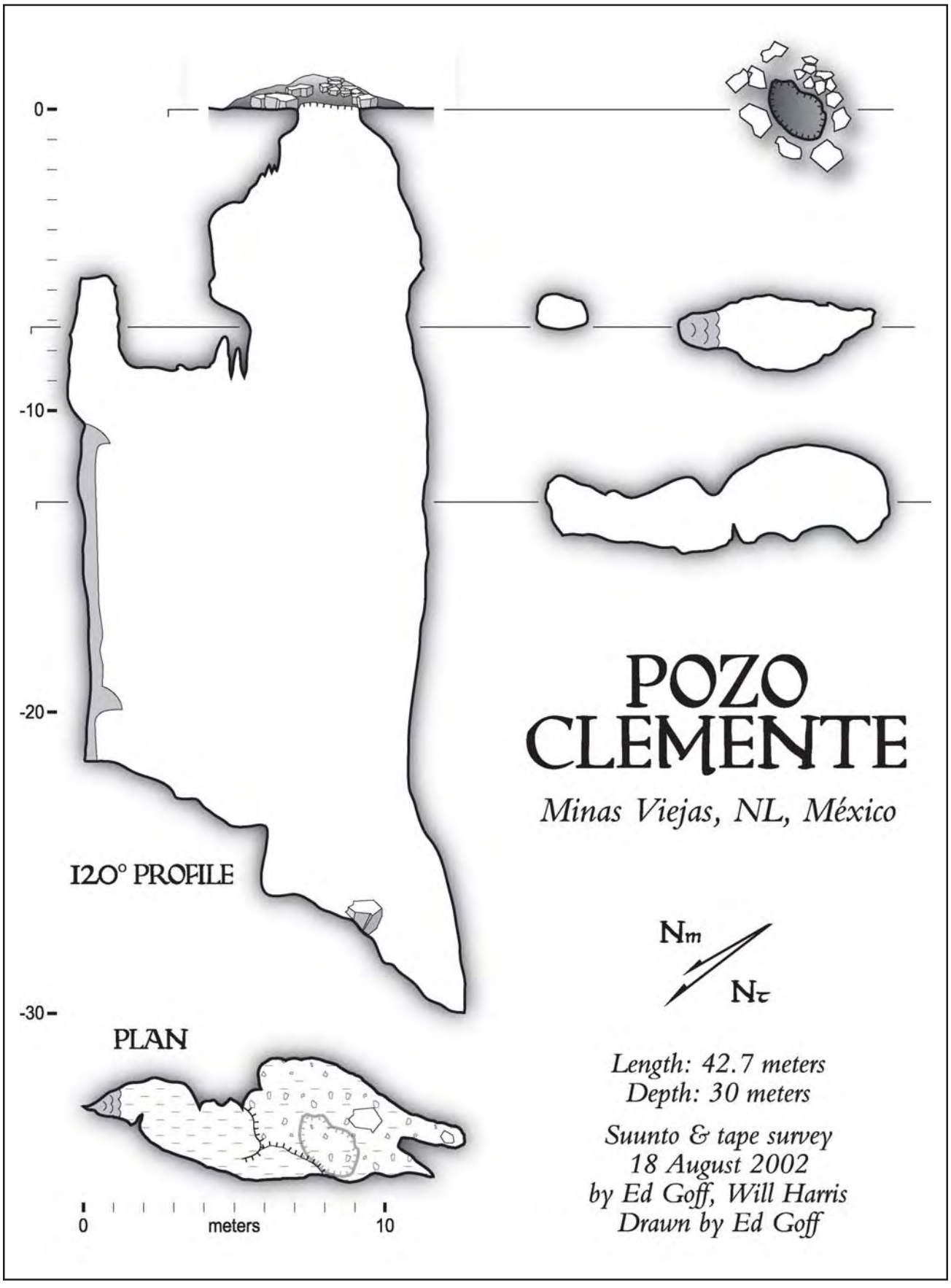


The show cave **Grutas de Villa de García** was closed in June 2002 for some renovations. The tramway to the entrance is being replaced by a cable car. They hoped to be open again by Christmas. *Source:* Rodolfo "Fofo" González.

OAXACA

From February 21 to May 5, 2003, an effort was made to extend the limits of **Sistema Cheve,** Oaxaca. The team was composed of forty-six individuals from eight countries: England five, Poland five, Mexico five, Netherlands three, Germany two, Switzerland one, France one, and USA twenty-four. Included were strong contingents of both cave divers and lead climbers. Previous efforts in Cheve throughout the 1990s were directed mainly at finding a route through the massive breakdown that blocks the end of the A.S. Borehole, just beyond Camp 3. The last exploration in the area, in 1997, netted the discovery of Harbinger Hall, a large collapse chamber some 120 meters vertically above the main A.S. Borehole, but no continuation of the high-level fossil borehole that exists elsewhere in Cheve was found. Earlier, in 1991, the sump at –1364 meters at the end of the Wet Dreams canyon was dived by John Schweyen to a distance of 80 meters penetration and a depth of 22 meters. Schweyen reported that the tunnel ends at an impassable restriction, but there was considerable subsequent speculation that a bypass might have been overlooked.

On March 26, following twelve days of rigging and seven days underground, a second exploratory dive in the Cheve sump was conducted by Rick Stanton and Jason


0
-10
-20
-30
120° PROFILE
PLAN
0
meters
10
POZO CLEMENTE
Minas Viejas, NL, México
Nm
Nt
Length: 42.7 meters
Depth: 30 meters
Suunto & tape survey
18 August 2002
by Ed Goff, Will Harris
Drawn by Ed Goff

Mallinson, using closed-circuit rebreathers. They immediately discovered a parallel, higher-level underwater tunnel to the east of the one explored by Schweyen. Within fifteen minutes they passed the sump, 140 meters long and 12 meters maximum depth. They went on to explore, still in their diving drysuits, 800 meters of steeply descending, narrow stream canyon before encountering a widening in the passage and a second sump. The team returned in early April, with Bill Stone and Richie Hudson joining the other two divers, and on April 6 and 7 a nineteen-hour push was made beyond Sump 1. Equipment was transported from Sump 1 to Sump 2 for Stanton and Mallinson to make a recon dive there while Hudson and Stone began a fourteen-hour survey back toward Sump 1. The two divers found Sump 2 to be wide and shallow, 280 meters long and 12.5 meters deep. It surfaced into a 15-meter-wide tunnel floored with large stream-washed boulders. They were able to follow this for 50 meters to where a boulder choke blocked the tunnel. Three hours were spent attempting to find a route through the collapse, without success. The deepest known point in Cheve is thus currently the point of maximum descent in the middle of Sump 2.

Meanwhile, work by the climbing teams, mainly Tomek Fiedorowicz, Pawel Skoworodko, and Marcin Gala, during the first and second pushes from Camp 3 revealed the presence of some 700 meters of upper-level galleries at an elevation of 50 meters above the Wet Dreams canyon. One of these tunnels, Mazunte Beach, actually led out over top of Sump 1 to a point nearly above the downstream end of the dives. However, this tunnel was ultimately blocked by breakdown. A final climbing team of Robbie Warke, Bart Hogan, Marcus Preissner, John Kerr, and Bill Stone spent ten days near the end of April in Camp 3 bolting up further domes in the Wet Dreams area, with similar results. One of these domes, near the Mazunte Beach climb, led to a point nearly 70 meters above Wet Dreams and appeared to be heading east, but it too was blocked by breakdown. During the derig of the cave, Preissner led an exposed climb up the main waterfall dome in the Black Borehole, halfway between Camps 2 and 3, with the hope of drilling upward into a new fossil borehole. It connected, surprisingly, with a little-known extension of the Hall of Restless Giants.

A total of 1.9 kilometers of new tunnels was mapped in 2003, with Cheve reaching a depth of 1484 meters, narrowly regaining its status as the deepest cave in Mexico. Members of the team spent thirty-three days operating from underground camps. A lot of heavy gear was hauled on this project. To all those who helped move it into and out of the cave, Thanks! *Source:* Bill Stone.

A group of dedicated cavers met for one last time in March 2003 at **Cueva Charco,** near San Miguel Santa Flor in the mountains of Oaxaca. After coordinating schedules and getting psyched, the first group of three went into the cave for a seven-day camp. The upper section of the cave is tight and sinuous and requires serious contortions. Carrying a pack makes it even more hideous. The rest of the cave doesn't get much better. The group spent one night at Camp I, then proceeded on to set up a second camp at over 900 meters deep. They found a place that was adequate for three hammocks, with a flat spot for cooking. In two long push trips, they surveyed over a kilometer of passage and finally came to a sump. About 300 meters before the sump, the nature of the cave changes. Most of Charco follows a stream, and the general trend of the cave is a straight line. While most caves tend to get bigger as they get deeper, the passage in Charco remains narrow, best described as a cheese grater, with tight squeezes even below –1000 meters. Just before the sump, the stream passage intersects a borehole. The upstream section of the borehole is blocked by flowstone, and the downstream section leads to the sump.

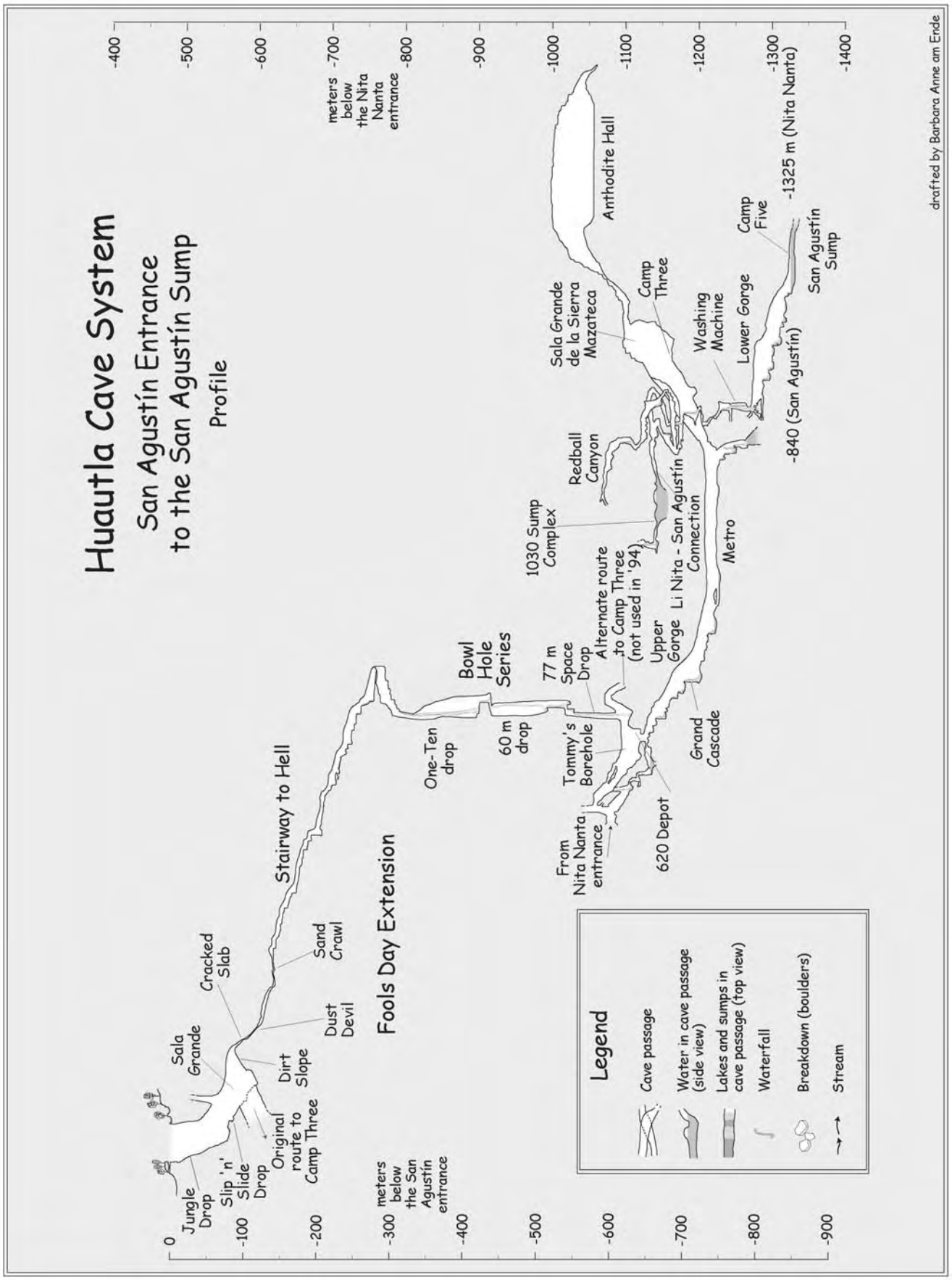
A second group of three met the first group as they were leaving the cave. The second group spent five nights underground and thoroughly checked the sump and possible bypasses, but could not find any way to continue. They packed up the camps and made the long and tortuous trip out of the cave for the last time.

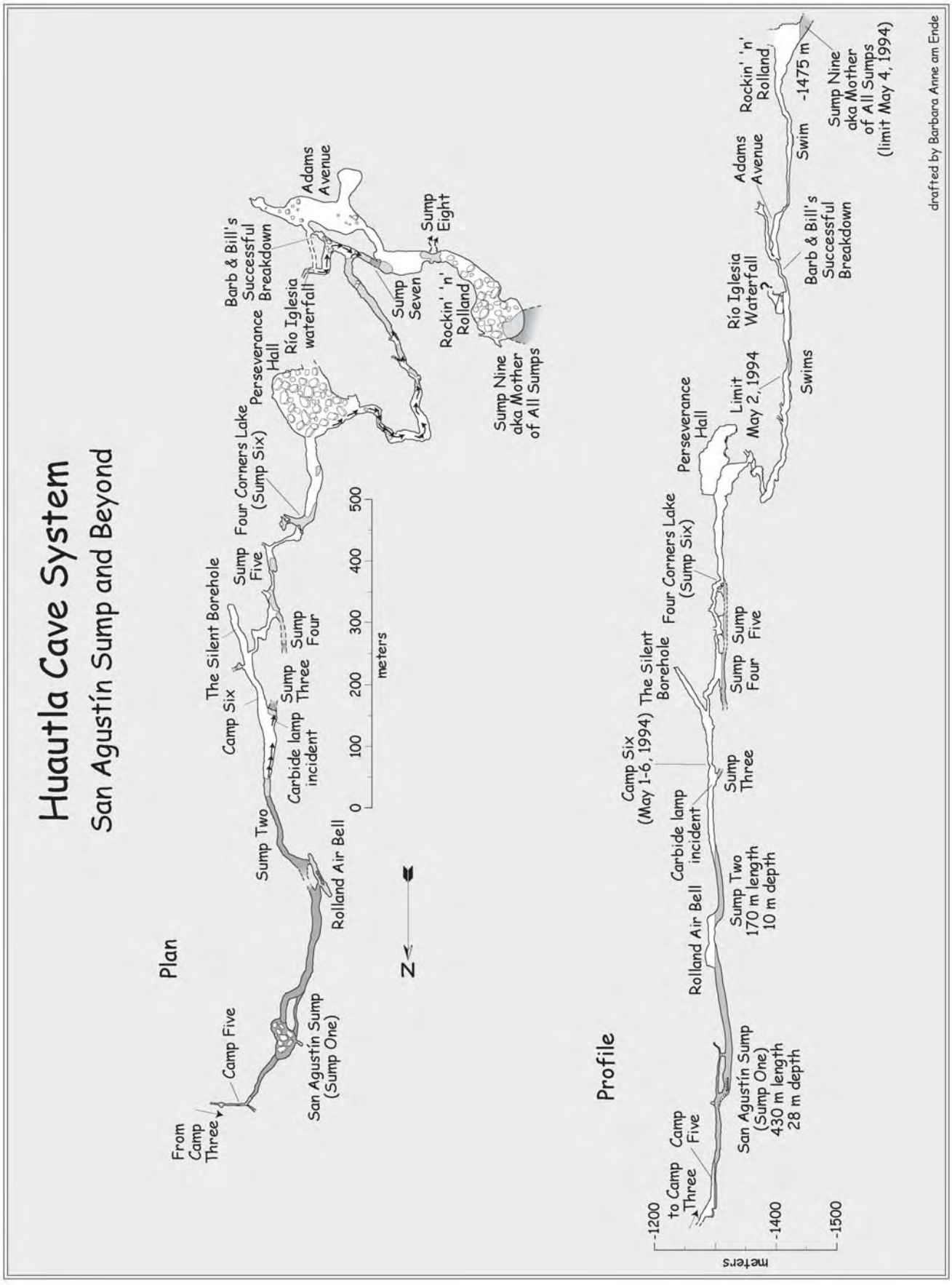
Meanwhile, four cavers spent two nights at Camp I to check a significant lead at an infeeder, appropriately called the Showerhead. The passage varied between tight belly crawls and fair-sized rooms, always following the water upward. The passage kept going, so another team went in to the Showerhead on a very long day-trip. They followed the stream until they came to a place where the water poured out of too-tight holes. They took photos of some of the very pretty formations in the stream passage and in a short, dead-end side lead.

With all the data tallied, Cueva Charco is 1278 meters deep and 6.71 kilometers long. According to the latest information we have, this makes Charco the third deepest cave in Mexico, behind Sistema Cheve and Sistema Huautla. Charco is arguably the most difficult deep cave in Mexico.

While crews were working deep in Charco, groups on the surface were searching for other cave entrances. Several pits were found, the deepest being 65 meters, but they all ended. **Cueva Palomora** was pushed. After squeezing through a very narrow crack, the cavers followed a slightly wider passage for a short distance, but then it pinched back down and became too tight. The final depth of Palomora is 142 meters, and the length is 262 meters.

We want to thank our sponsors for supporting us in this endeavor: Cancord Inc, who generously made us nylon rope specifically for the trip, Richmond Area Speleological Society, Dogwood City Grotto, National Speleological Society, Gonzo Guano Gear, and the Huntsville Grotto. We would also like to thank the cavers involved for not getting injured in the cave, as any kind of serious rescue beyond the first kilometer would be impossible. *Source:* Nancy Pistole.


Huautla Cave System
San Agustín Entrance
to the San Agustín Sump
Profile
meters below the San Agustín entrance
meters below the Nita Nanta entrance
Jungle Drop
Slip 'n' Slide Drop
Original route to Camp Three
Dirt Slope
Sala Grande
Cracked Slab
Dust Devil
Sand Crawl
Stairway to Hell
Fools Day Extension
One-Ten drop
Bowl Hole Series
60 m drop
77 m Space Drop
Tommy's Borehole
From Nita Nanta entrance
Alternate route to Camp Three (not used in '94)
1030 Sump Complex
Redball Canyon
Upper Gorge
Li Nita - San Agustín Connection
620 Depot
Grand Cascade
Metro
Sala Grande de la Sierra Mazateca
Anthodite Hall
Camp Three
Washing Machine
Lower Gorge
Camp Five
-840 (San Agustín)
-1325 m (Nita Nanta)
San Agustín Sump
Legend
Cave passage
Water in cave passage (side view)
Lakes and sumps in cave passage (top view)
Waterfall
Breakdown (boulders)
Stream
drafted by Barbara Anne am Ende


Huautla Cave System
San Agustín Sump and Beyond
Plan
From Camp Three
Camp Five
San Agustín Sump (Sump One)
Rolland Air Bell
Sump Two
Carbide lamp incident
Camp Six
The Silent Borehole
Sump Three
Sump Four
Sump Five
Four Corners Lake (Sump Six)
Perseverance Hall
Rio Iglesia waterfall
Barb & Bill's Successful Breakdown
Adams Avenue
Sump Seven
Sump Eight
Rockin' 'n' Rolland
Sump Nine aka Mother of All Sumps
0
100
200
300
400
500
meters
N
Profile
Camp Six (May 1-6, 1994)
The Silent Borehole
Four Corners Lake (Sump Six)
Perseverance Hall
Limit May 2, 1994
Swims
Rio Iglesia Waterfall
Adams Avenue
Rockin' 'n' Rolland
Swim
-1475 m
Sump Nine aka Mother of All Sumps (limit May 4, 1994)
Barb & Bill's Successful Breakdown
Sump Four
Sump Five
Carbide lamp incident
Rolland Air Bell
Sump Two 170 m length 10 m depth
Sump Three
San Agustín Sump (Sump One) 430 m length 28 m depth
Camp Five
to Camp Three
-1200
-1400
-1500
meters
drafted by Barbara Anne am Ende

On hearing that Charco had finally been pushed to an end, James Wells provided this report on its early exploration:

This was an incredibly stout push, although if you were stout, you would be out. In 1993 I was (semi-)fortunate to begin this survey, from the surface to about 250 or 300 meters down. I had shown up for the 1993 Cheve expedition, ready to push the deepest cave of them all, I thought, but in fact I was woefully unready for the deep stuff. They had a good test for a newbie, which was to go re-rig Palomitas for the season. This little bit of exercise, conducted at about 2500 meters elevation, pretty much decided things. It was the middle karst for me.

This area was a bit farther down the hill, and was where we hoped to find a back door to Cheve. A half-dozen of us moved on down there and found a good camp, then started ridgewalking. Our only limitation was that one person had to stay behind in camp, reading either *Walden* or *Sex Lives of Rich and Famous People,* to defend the camp against marauding pigs, the actual snuffling kind with four legs and flat noses. There were small farmhouses dotted all around, and a few villages. Don Coons worked magic, always finding us a meal and a friendly reception, including in places where on other occasions the *yanqui* cavers had been pelted with stones. We walked through all manner of terrain that was a hard-to-explain cross between jungle and desert, finding nothing more than a 30-meter pit filled with vampire bats, until Peter Bosted relocated Charco.

The cave had been reported previously by another person of some repute and described as ending in a sump after two drops. We went down to look at the sump, and found that although it sure looked like a sump, that was an illusion. "It's nothing but a puddle," said Carol Vesely, and the exploration of **Cueva Charco** (Puddle Cave) was underway.

Every meter was real work, in a twisting, angling, 45-degree rift. Of that first steep series, only about 60 meters was rope drops, and the other 200-plus meters was downclimbs. I recall seeing Ed Sevcik inserting himself upside down into one squeeze, so his knees would bend the right way in the middle of it. Our end for the season was where Pat Kambesis disappeared into an impossible, no, merely utterly improbable, sand-sump squeeze with a few inches of air and sand that settled around her as she pushed through. I was too scared to try it. It still went, she said, but we were done, in more ways than one, for that year. Getting to that point, perhaps 20 percent of the way to the new end point reported above by Nancy, is something I recall as one of the harder trips I had ever done.

Issue 59, for 2002, of the *Canadian Caver* contains an article by Mark Crapelle on the first phase of the InnerSpace Odyssey Expedition of 2001 to **Huautla** and vicinity. A long report on the whole expedition appeared in *AMCS Activities Newsletter* 25.

The maps of the Huautla Cave System were prepared by Barbara am Ende for the book *Beyond the Deep*, where they appeared on the endpapers. They show the part of the system on the route to the previously terminal San Agustín sump and the 1994 discoveries beyond the sump, as described in the book by Bill Stone and Barbara am Ende, with Monte Poulsen. Thanks to Barb for letting us print them here. See also the article on the 1994 expedition by Bill and Barb in *AMCS Activities Newsletter* 21.

The La Venta Exploring Team from Italy visited the **Juquila Canyon** during a ten-day expedition. One team descended the canyon to join up with a second team that had established a base camp 35 kilometers downstream from which they explored caves and resurgences in the area. *Source:* www.laventa.it/en/oaxaca-news.html.

PUEBLA

The 2002 expedition of the Groupe Spéléo Alpin Belge to Puebla explored about 8 kilometers of new passage. Depths were less than they were used to achieving in Mexico: only ten caves exceeded one hundred meters in depth. Three of them reached or exceeded two hundred meters, the deepest being TZ48, **Cueva del Hueso Dos,** a long-suspected cave that was not entered until this expedition and which reached –242 meters. The team turned around in a strong air current at the top of a pit about 30 meters deep. Logically, this cave should connect at around –400 meters into a side-passage of **Coyolatl.** This would give direct and fast access to the upstream area in this 20-kilometer-long resurgence cave, where there remains great potential for discovery.

The other finds worth mentioning from the expedition are TZ40-41, **Cueva de los Sueños,** a vast and splendid cave just over 2500 meters long and 118 meters deep; TZ25, **Sótano de los Colibris,** a friendly cave 593 meters long and 198 meters deep; two deep pits, Croz 1 or **Sótano del Dolmen,** made up of a single drop of 150 meters, and **Croz 2,** a 180-meter dead-end pit; and finally TZ50, **Cueva sin Nombre,** 1600 meters long and 166 meters deep. *Source:* Richard Grebeude in *Regards* 45, 2002, translated from French by Yvonne Droms.

QUERÉTARO

El Sótano de El Barro, with its 410-meter drop, is currently closed to all caving except for very specific purposes, mainly scientific, for which you need a permit from SEMARNAT (the Environment and Natural Resources Ministry). *Source:* Rodolfo "Fofo" González.

QUINTANA ROO

Exploration in **Sistema Naranjal,** 21096 meters in length, continues in the Muknal Remote Siphon region. This area was originally discovered in 1991 to uncover the farthest downstream drainage pattern that has been explored in Naranjal.

A small fault-controlled dissolution passage, conjoined with associated offset sinks, connects this region to the upstream cave. Beyond the Fenceline Cenote, a well-defined trunk passage leads to a final

offset sink, the Jailhouse Cenote. Two in-feeding tunnels and two of the deepest areas of Sistema Naranjal intersect this trunk passage. A nearly complete human skeleton was discovered in this portion of the cave. ^{14}C dating by the Center for Applied Isotope Studies at the University of Georgia indicate that the demise of this early cave explorer was 8060 ± 130 years BP.

Although exploration in the Muknal Siphon region continues, important cave developments are found beyond the Jailhouse Cenote. The most recent discovery has been the Snakeman's Escape area. Numerous restrictions requiring sidemount techniques, zero visibility events, and strong siphoning current conditions all demand prudent exploration. Over 1450 meters of underwater cave passage have been surveyed in this area. The Snakeman's Escape area holds the greatest possibilities for further extensions to the system. Exploration efforts continue. *Source:* Jim Coke.

In April 2003, the Quintana Roo Speleological Survey had recorded 427.7 kilometers of underwater cave passage in the state. All of the longest caves in Quintana Roo are water-filled; topping the list are:

Sistema Ox Bel Ha	107,118 m
Nohoch Na Chich	61,142
Sistema Dos Ojos	56,671
Sistema Sac Actun	23,977
Sistema Naranjal	21,096
Sistema Ponderosa	15,019
Sistema Nohoch Kiin	13,888

Ox Bel Ha is the longest cave in Mexico. It has 60 cenote entrances. There are thirty-four more caves with more than one kilometer of underwater passage. The greatest water depths remain The Pit in **Dos Ojos** at 119.1 meters (see *AMCS Activities Newsletter* 24, page 84) and the Blue Abyss in **Nohoch Na Chich** at 71.6 meters (see number 20, page 86). *Source:* the QRSS web site www.caves.org/project/qrss.

Underwater skeleton in the Muknal Siphon section of Sistema Naranjal. *Jim Coke.*

The Cave Diving Section of the National Speleological Society held an Instructor Institute in Cozumel in September 2002. The meeting was organized by German Yañez, with staff Matt Matthes, Steve Ormeroid, and Denny Willis. Six candidate cave-diving instructors received certification during the meeting, following evaluations in cenotes **Aerolita** and **Quebrada.** Steve Bogaerts was appointed the CDS safety officer for the area. *Sources:* Matt Matthes and Denny Willis, *Underwater Speleology,* December 2002.

Cenote el Balneario, a small cave north of Playa del Carmen originally called Xibalba, is being remapped. All lines in the system have been resurveyed. Principal explorers of the underwater cave are Sam Meacham and Bil Phillips, and Matt Matthes and visiting French cave divers have also added line in the system. *Source: ProTec Newsletter* 3, May 2002.

During February 2002, a Russian filming expedition took place in Quintana Roo and Yucatán, making a video for Russian Channel 1 TV. Cave diving in Quintana Roo was shot in **Grande Cenote, Dos Ojos,** and **Nohoch Na Chich.** Ocean diving was shot at the Los Tortugas deep reef at Xcaret. Cave diving in Yucatán was shot at cenotes **Sabak Ha** and **Dzonot Ila.** *Source: ProTec Newsletter* 3, May 2002.

The cave-diving community in Quintana Roo is beginning a program of installing line arrows with distance markers in caves in the Riviera Maya area. The plan is to install markers on the lines every 75 meters, pointing to the nearest exit. As a pilot project, markers were installed on September 18, 2002, on 600 meters of line in **Cenote Taj Mahal.** If acceptance of these markers is good, then divers will go ahead and install distance line markers in all the popular underwater caves. *Source:* Andreas "Matt" Matthes in *Underwater Speleology,* December 2002.

During the tenth French cave-diving expedition to Quintana Roo, more than 11,000 meters (8,500 of which are underwater) of virgin passage was mapped in February 2002 by a group composed of P. Brunet, G. Carmine, O. Champart Curie, C. Depin, A. Dutheillet, A. Germain, B. Glon, G. Larie, C. Thomas, and L. and M. Rotzinger. This brought the total length of French discoveries under the Yucatán Peninsula to 100 kilometers, most of it underwater.

The partially dry caves of **Aluxes**, previously 2.5 kilometers long, was explored to a length of 5 kilometers, following a large fracture parallel to the shoreline. Exploration stopped

in a vast underwater maze that was not dived due to lack of time. [See also article on Aluxes in this issue.]

The flooded **Cave of Pitch** has now reached a length of 8183 meters and a maximum depth of 24 meters. Despite much effort, the entrance fissure leading downstream could not be penetrated. Upstream, the cave was extended by Philippe Brunet to a distance, continuously underwater, of 3410 meters from the entrance, which added 1700 meters of virgin passage to this river this year. Various constrictions preclude the use of diver-propulsion vehicles, so the only way to make progress is by finning, during which the solo diver must carry all of the necessary tanks for a 6-hour, 45-minute trip.

The small, flooded system of **Palomita**, located between Pitch and Xunaan-Ha, grew from 500 meters to 950 meters of often low passages, mazy and cluttered with stalactites.

In the flooded system of **Xunaan-Ha**, 1150 meters of virgin passage brought the total length to 6751 meters, with a maximum depth of 18 meters. Upstream, two passages split at 90 degrees from each other, reaching 250 and 275 meters, at 2125 and 2153 meters from the entrance. That brings them to a distance of 150 meters from Palomita, and 600 meters downstream from Pitch. C. Depin also reached an isolated, 30-meter-deep pit at 1730 meters from the entrance.

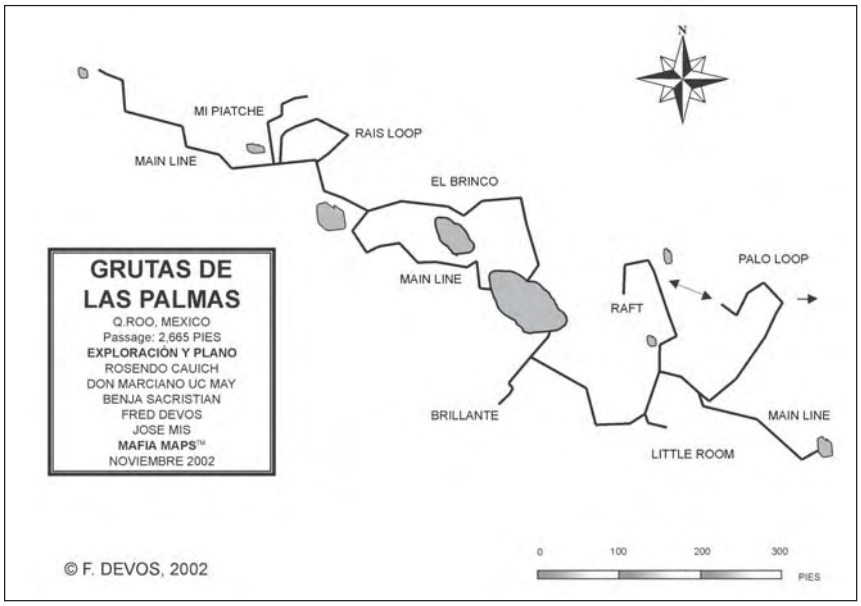
The assumed resurgence of this system, **X-Cacelito**, has a flow rate of 600 liters per second, and it was penetrated to 80 meters. A very strong current and low ceiling heights in the horizontal entrance fissure made progress difficult.

The flooded system of **Ta-Tich**, discovered in 2001, which requires a 3000-meter-long portage in order to access it (on top of 9 kilometers of trail) was lengthened to 5300 meters, with a maximum depth of 11 meters, with 2800 meters of new passage. Other cenotes, upstream and downstream of the system, were noted. This cave, which lies 600 meters away from **Nohoch Aktun**, 8100 meters long, promises to become an important system.

One kilometer to the north, the team discovered and dove 270 meters of passage in a cave named **Chiqleiro**. It ended in breakdown.

The flooded cave of **Altar Maya** grew by 2280 meters to a length of 6280 meters. The cave is developed parallel to the coast and has strong currents. Its map closely resembles the flooded passages of Aluxes Cave.

Other minor caves were found and explored. The detailed account of the explorations, the maps, the photos, the water analyses, and the system summaries will, as always, be condensed into an expedition report, which will be made available next year. *Source:* Christian Thomas in *Regards* 43, 2002, translated from French by Yvonne Droms.



A connection has been made between the downstream region of **Sistema Sac Actun** and **Sistema Nohoch Ha** through a 1540-meter passage that bypasses the **Naval Cenote** on the south. Sac Actun is now the fourth longest underwater cave in Quintana Roo. Also, **Sistema Ich Tunich** and **Cenote Bomba,** both recently discovered, have been connected. New caves **Sistema Chico, Lizette's Labyrinth, Cenote Rudy Sánchez, and Cenote Nohoch Balaam** are being explored near Sistema Crustacea. *Source:* www .caves.org/project/qrss/new.htm.

Benja Sacristan was the first to document **Grutas de Las Palmas,** located in Ejido de Playa del Carmen. On two subsequent visits, he, José Mis, and Fred Devos mapped 812 meters of passage in this cave, which is dry for Quintana Roo, although most of the passage is wet by dry-cave standards, with many areas requiring swimming and the occasional dunking. *Source:* Fred Devos in www.aquaexploration.com.

The following two abstracts of papers presented at the fourteenth British Cave Research Association Science Symposium at the University of Bristol in March 2003 are reprinted from *Cave and Karst Science,* volume 29, number 2 (2002) with permission from the first authors.

"Decoupled Density Stratified Groundwater Circulation on the Caribbean Coast of the Yucatan Peninsula, Mexico," by Patricia A. Beddows,[1] Peter L. Smart,[1] Fiona F. Whitaker,[2] and Samantha L. Smith[2] ([1]School of Geographical Sciences and [2]Department of Earth Sciences, University of Bristol).

Coastal carbonate aquifers are density-stratified with a thin freshwater lens that floats on top of higher-density saline water. The conventional Dupuit-Ghyben-Herzberg model indicates that coastward discharge of fresh water entrains the underlying saline water, thus inducing a deep saline return flow from the ocean into the

aquifer. Regional observations of saline groundwater temperature on the Caribbean coast of the Yucatan Peninsula suggest that warm ocean water derived from the Caribbean Sea circulates to more than 9 kilometers inland prior to thermal equilibrium. Incorporation of saline groundwater in the overlying fresh water occurs progressively seaward at a relatively slow rate, but within 1 kilometer of the coast there is a much more rapid incorporation within the discharging fresh waters. These observations may be interpreted to accord well with the conventional DGH circulation model for density-stratified coastal aquifers. However, detailed in situ monitoring of groundwater velocities and dye tracing strongly suggest an alternative model, in which at least some of the saline groundwater is recharging via inland flow immediately beneath the saline-fresh-water interface in the caves. This occurs during periods of rising net ocean level, with saline discharge occurring when ocean levels fall. Fresh groundwater discharges at all times, the fresh and saline flows being decoupled, rather than the fresh water simply entraining saline groundwater flow. Sustained inland flow of saline water can occur, with subsequent mixing leading to potential contamination of the fresh-water lens, coastal outlets, and the barrier reef systems, all of which are essential resources for the rapidly expanding local population and tourism industry on the Caribbean Yucatan coast.

"Active Dolomitization by Saline Groundwaters in the Yucatan Peninsula, Mexico," by Samantha L. Smith,[1] Fiona F. Whitaker,[1] R. John Parkes,[1] Peter L. Smart,[2] Patricia A. Beddows,[2] and Simon H. Bottrell[3] ([1]Department of Earth Sciences and [2]School of Geographical Sciences, University of Bristol, and [3]School of Earth Sciences, University of Leeds).

The Yucatan Peninsula is a 300-kilometer-wide carbonate platform that hosts a salinity-stratified aquifer where a thin meteoric lens is separated from the underlying saline water by a well-defined mixing zone. An extensive network of flooded caves along the eastern coast permits direct access to the saline groundwaters. Water and wall-rock samples were collected from sites up to 40 kilometers inland and 105 meters depth below the water table. Saline groundwaters are depleted of magnesium (–7.7 to –0.1 mM, mean = –3.6 mM) and enriched in calcium (–0.1 mM to +10.4 mM, mean = +2.3 mM) relative to local sea water, suggesting that these waters have formed replacement dolomites. The pCO_2 of saline groundwaters is approximately 11.5 times greater than the local Caribbean sea water, and they are undersaturated with respect to aragonite ($SI_A = -0.47 \pm 0.12$) and calcite ($SI_C = -0.34 \pm 0.08$). However, the waters are marginally supersaturated with respect to ordered dolomite ($SI_D = +0.18 \pm 0.22$), providing the potential for dolomitization.

Some caves host a marked H_2S layer. Bacterial sulfate reduction is evidenced by an increase in $\delta^{34}S\text{-}SO_4$ relative to the surrounding saline groundwater and is supported by the successful enrichment of viable sulfate-reducing bacteria. Also, compared with surrounding saline groundwaters, the water within the H_2S layer is depleted of Ca^{2+} (by –3.2 mM), as well as Mg^{2+} (by –4.5 mM), suggesting that sulfate reduction may stimulate primary dolomite precipitation. These findings support previous laboratory simulations that suggest the sulfate-reducing bacteria decrease the kinetic barriers to dolomite nucleation. In addition, viable thiosulfate-oxidizing bacteria, enriched from the waters, actively re-oxidize the reduced sulfur species produced by sulfur-oxidizing bacteria, generating acidity and consequently enhancing the dissolution of carbonate rock. Thus, both sulfate-reducing and thiosulfate-oxidizing bacteria play a role in dolomitization and carbonate dissolution.

Wall-rock samples from the zone of saline groundwater are partially dolomitized (up to 80 percent), with both fabric-preserving dolomitizaton of grains and dolomite cements lining inter- and intra-granular pores. Preliminary analysis indicates that these dolomites are characteristically non-stoichiometric (~41 mol% Mg), and Sr/Ca ratios indicate a sea-water origin. No dolomites were found outside the saline zone, and dolomite content increases with depth, due to slow incremental dolomitization over time or dissolution at shallow depths. Dolomitization is more prevalent within a centimeter of the sediment-water interface and also where there is interconnected porosity. This confirms the importance of the active circulation of Mg^{2+}-rich fluids or the significant mediation of diagenesis by bacteria, which are one to two orders of magnitude more abundant at sediment-water interfaces, compared with the numbers found in the surrounding groundwater.

The year 2002 marked the first Quintana Roo Speleological Survey convention, which was held in Playa del Carmen on the evenings of 6 and 7 September. This was the second cave-diving convention held in Quintana Roo; Parker Turner had organized the first convention on Cozumel in 1987. The convention provided the local community and local cave divers with two evenings of presentations on the status and progress of various cave investigations in Quintana Roo. The event was free to the public to underline our commitment to education and constructive dialog among the speakers and attendees. Nearly three hundred people attended the event over the two evenings. Presentation titles and speakers are listed below.

"The Importance of Exploration in the Riviera Maya Region; Sistema Ox Bel Ha as a Prime Example," Sam Meacham. "Sistemas Subterráneos de Cozumel," German Yañez. "Physical Hydrology of Quintana Roo," Luis E. Martin. "Sistema Sac Actun," Daniel Riordan. "Underwater Caves as a Significant Visual Art," Jill and Paul Heinerth. "INAH and Arqueología Subacuática en Cenotes," Octavio del Río. "Summary of the First Evening," Bil Phillips. "The Geochemistry and Geomicrobiology of Saline Groundwaters in the Yucatan

Peninsula, Mexico," Samantha Smith. "Sistema Aak Kimin," Greg Brown. "The Dos Ojos Pit," Steve Bogaerts. "Endangered Caves and Cave Animals of the Yucatan Peninsula," Tom Iliffe. "Puerto Aventuras Dry Caves," Fred Devos. "Summary of the Second Evening," Andreas W. Matthes. *Source:* Jim Coke in *Underwater Speleology,* December 2002, and *NSS News,* December 2002.

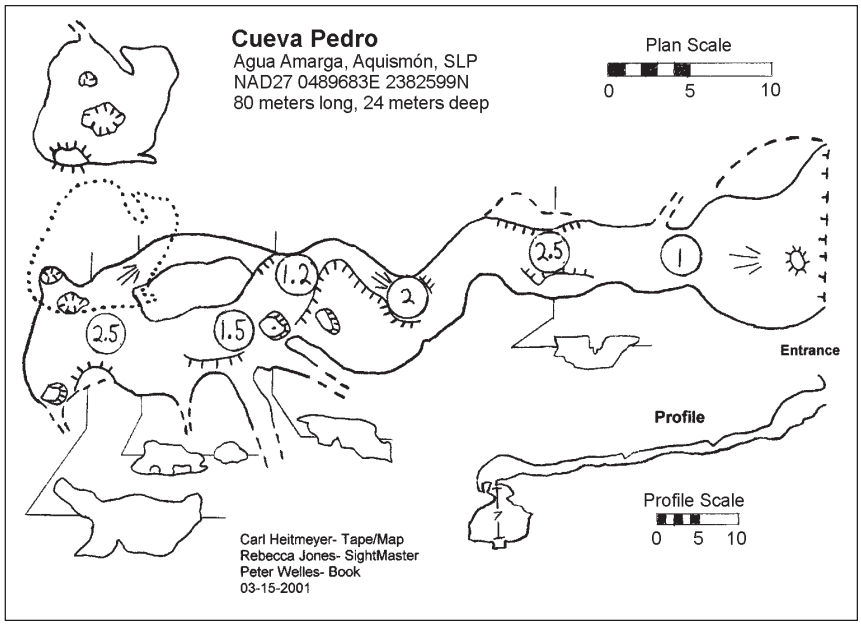
The 2003 Quintana Roo Speleological Survey Convention will be held in Playa del Carmen on September 5 and 6. See www.caves.org /project/qrss/ for details.

SAN LUIS POTOSÍ

Sotanito de las Golondrinas is much smaller than the more famous Sótano de las Golondrinas. The drop is much shorter, but the entrance is about the same size. It was named for the many swifts flying about. The cave entrance is located beneath a cliff face visible almost 1 kilometer from the road. The cave is 190 meters long and 65 meters deep. To the northeast, about a half-kilometer away, is a pit about 120 meters deep that was dropped by Peter Welles and Carl Heitmeyer, but not surveyed.

Cueva Pedro is near the lowest part of the dolina on the west side of the road just to the south of Rancho Agua Amarga. It is a small cave that ends in a room at the bottom of a 7-meter pit. There is slight air movement through the terminal breakdown. Not shown on the map is a smaller entrance that leads to the main passage via a very low crawl. The cave is named for Peter Wells. Both of these caves were explored and mapped in March 2001; local names for them are unknown. *Source:* Carl Heitmeyer.

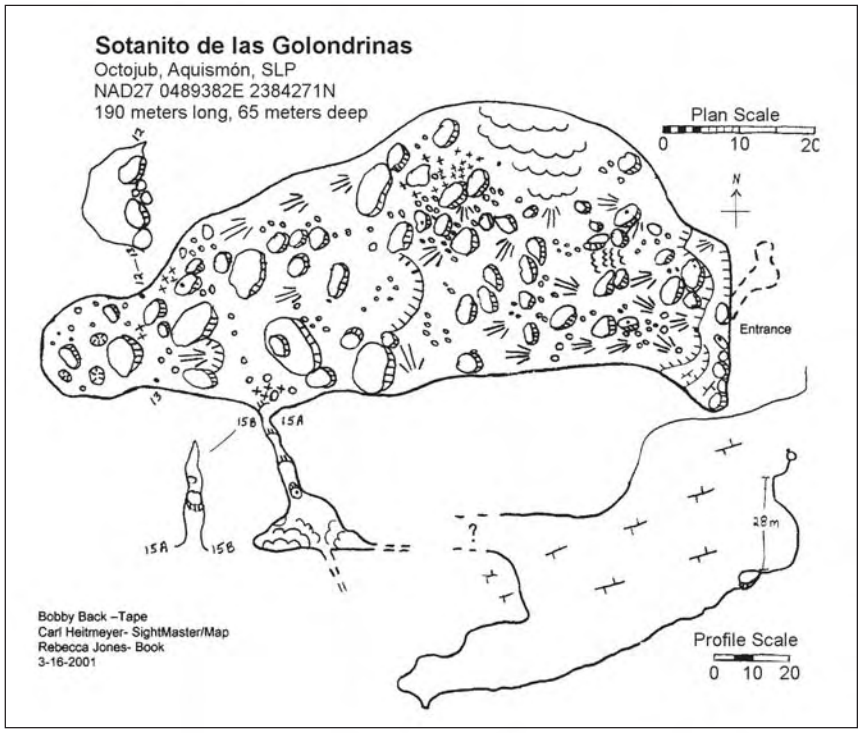
In May 2002, Mike Walsh, Jerry Fant, and Christopher Ross visited the Aquismón area. The new AMCS Bulletin 10, *Caves of the Golondrinas Area,* by Peter Sprouse and Jerry Fant, describes most of the caves they checked. **Cueva Linda** was extended significantly and is now the subject of a mapping project led by Jerry Fant. *Source:* Jerry Fant.



TAMAULIPAS

In March 2002, eight cavers from the United States and France pushed **Sótano del Caracol** to a depth of 301 meters and a length of 1044 meters, from the previous numbers of 282 and 677. A short camp was established near the bottom of the cave, in the B+ Room. The cave ends in a sump. One fissure with airflow continues, but it is too tight. Most exploration was from the camp. Three small caves near Caracol were explored: **Cueva del Papamoscas, Pozo de Gnat King Hole,** and **Pozo de Cojin de Alfiler.** *Source:* Bev Shade, *Death Coral Caver* 12 (2002), pages 8–12.

In November 2002, eight cavers had a four-day camp in **Sistema Purificación.** The camp was in the World Beyond, from which they pushed exploration of the Batwing Boulevard section of the cave.



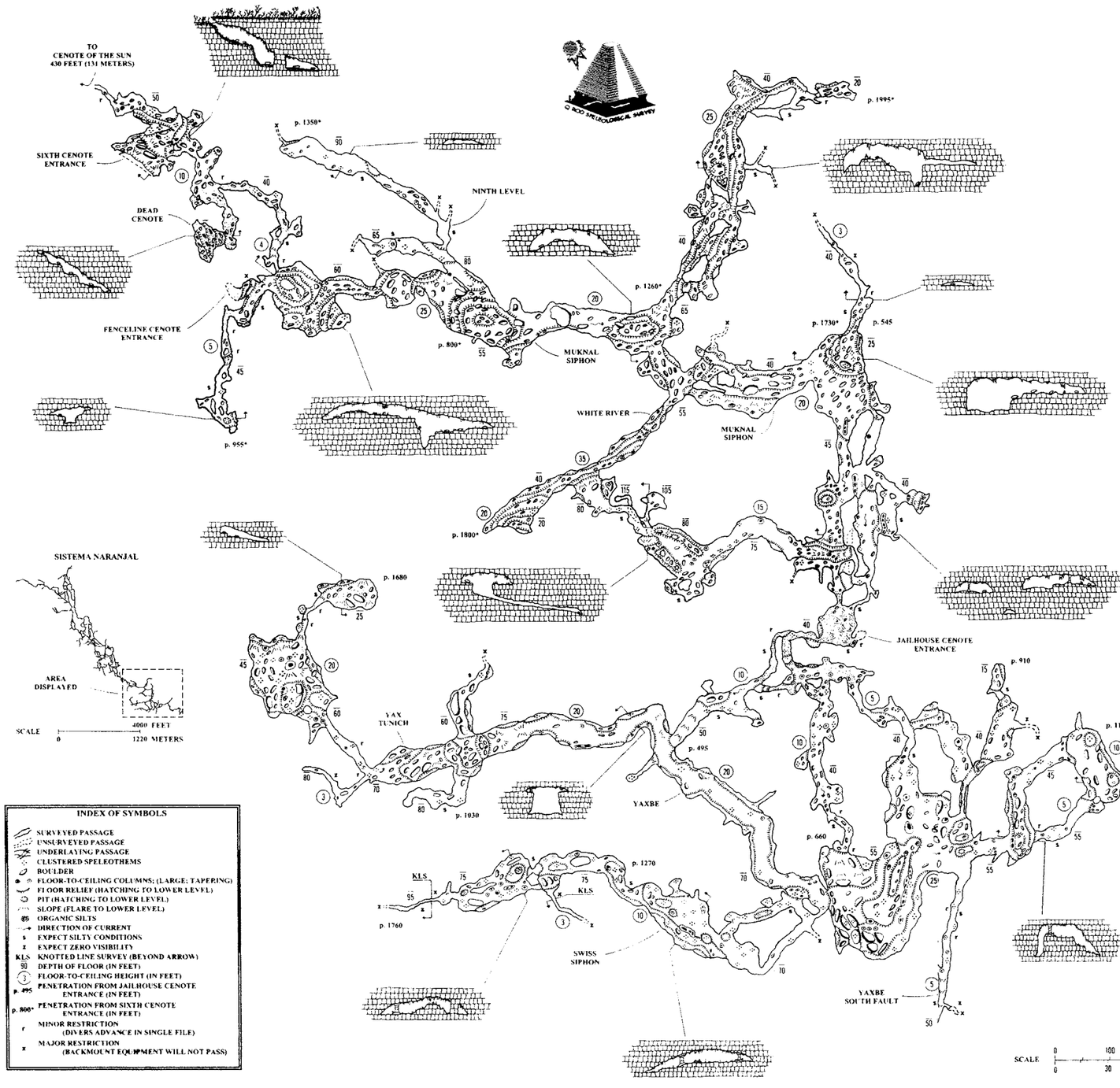
MUKNAL REMOTE SIPHON

SISTEMA NARANJAL

TULUM, QUINTANA ROO

MEXICO

N20.18832° LATITUDE
W087.48985° LONGITUDE
WGS 84 DATUM



PRINCIPAL EXPLORERS

J. Coke	C. Sutton
L. Conlin	C. Weber
B. Phillips	T. Young

AN UNDERWATER CAVE SURVEY OF THE
MUKNAL REMOTE SIPHON SECTION
OF SISTEMA NARANJAL
SURVEYED
JANUARY 1991 TO APRIL 1994
BY
JAMES G. COKE IV
LORIE CONLIN
CARL SUTTON
THOMAS M. YOUNG
MARCH 2000 TO DECEMBER 2000
BY
JAMES G. COKE IV
BIL PHILLIPS

DRAFTED BY JAMES G. COKE IV

Plan Length:	16,408 Feet	(5001 Meters)
Plan Depth:	- 115 Feet	(- 35 Meters)

INDEX OF SYMBOLS

- SURVEYED PASSAGE
- UNSURVEYED PASSAGE
- UNDERLAYING PASSAGE
- CLUSTERED SPELEOTHEMS
- BOULDER
- FLOOR-TO-CEILING COLUMNS; (LARGE; TAPERING)
- FLOOR RELIEF (HATCHING TO LOWER LEVEL)
- PIT (HATCHING TO LOWER LEVEL)
- SLOPE (FLARE TO LOWER LEVEL)
- ORGANIC SILTS
- DIRECTION OF CURRENT
- s EXPECT SILTY CONDITIONS
- z EXPECT ZERO VISIBILITY
- KLS KNOTTED LINE SURVEY (BEYOND ARROW)
- 90 DEPTH OF FLOOR (IN FEET)
- (3) FLOOR-TO-CEILING HEIGHT (IN FEET)
- p. 495 PENETRATION FROM JAILHOUSE CENOTE ENTRANCE (IN FEET)
- p. 800* PENETRATION FROM SIXTH CENOTE ENTRANCE (IN FEET)
- r MINOR RESTRICTION (DIVERS ADVANCE IN SINGLE FILE)
- x MAJOR RESTRICTION (BACKMOUNT EQUIPMENT WILL NOT PASS)

NOTES

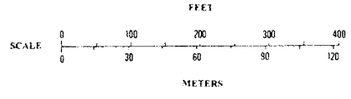
In the present geological era, this anchialine limestone cave is completely flooded by fresh and salt waters. Located four kilometers from the coast of the Mexican Caribbean, this remote section of Sistema Naranjal supports an important freshwater drainage system that originates from the North and West. Three offset cave entrances permit immediate access into this siphon cave, which is characterized by fracture and joint controlled passages. Explorations that depart from the main siphon passage should anticipate disorienting flow reversals within offshoot cave passages. A halocline is normally encountered at a depth of 52 feet (15.8 meters). Typical environmental conditions include cream colored silt floors with dark chestnut colored walls and ceilings.

A Suunto compass and digital depth gauge (± 1 foot accuracy) were used to confirm all azimuths and depths within the cave. A fiberglass tape was used to measure all distances, unless noted as KLS. A knotted line survey was incorporated beyond the KLS symbol appearing on the map plan. All distances have been corrected for the plan view.

Cross section and profile representations are enlarged by twice the plan scale; directional arrows associated with these illustrations indicate view. This survey depicts the major features of the cave passage. Only trained individuals using proper equipment and expert technique should enter this fragile cave system.

SNAKEMAN'S ESCAPE

Accessible only by sidemount equipment techniques. Expect numerous passage restrictions, strong siphon conditions, and frequent zero visibility events.



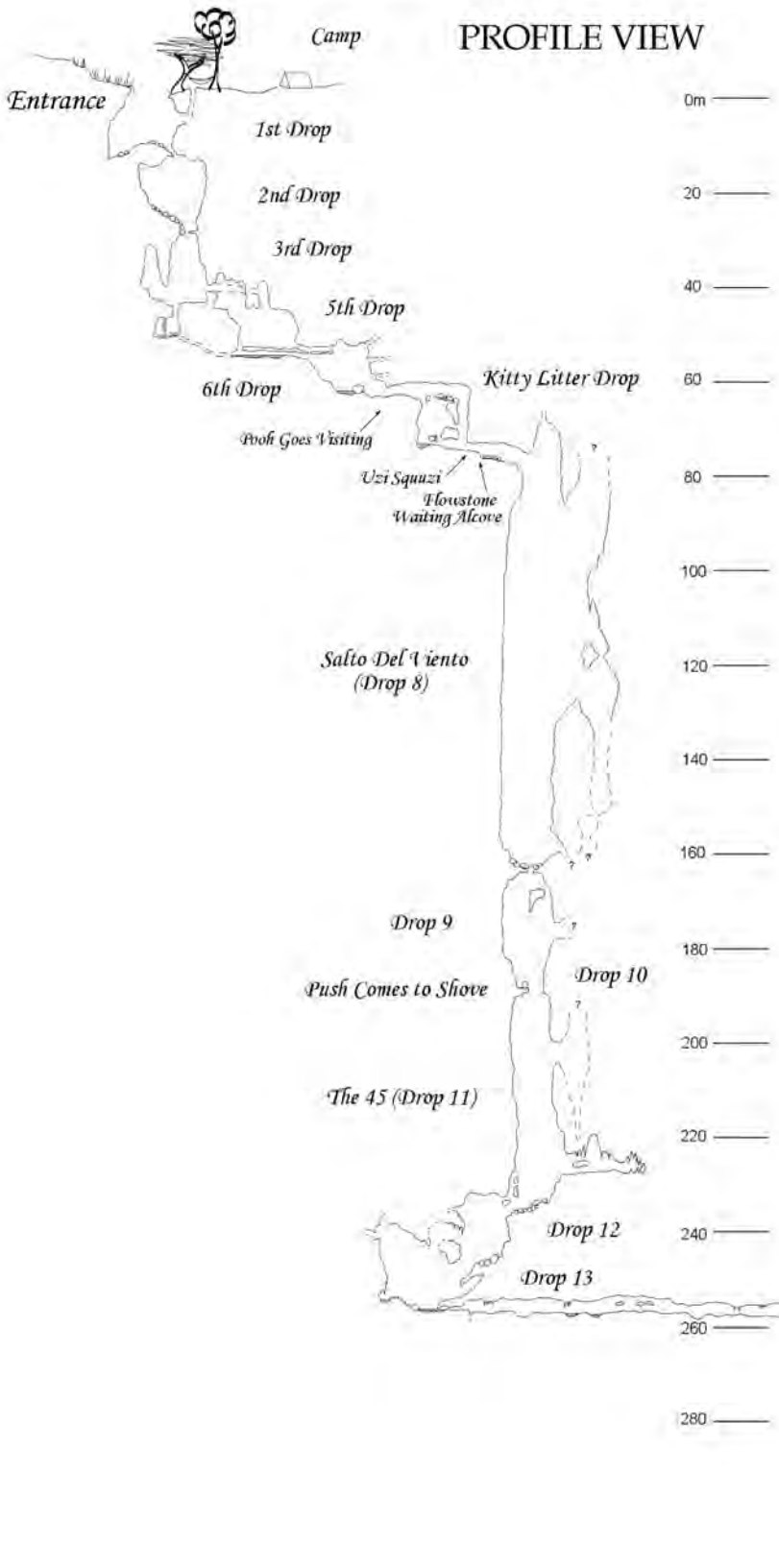
Sótano de Caracol

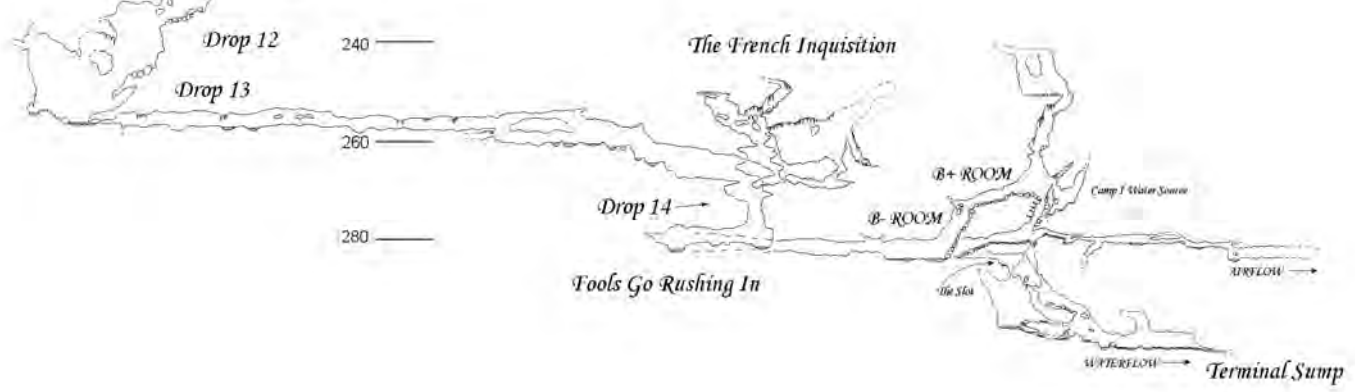
Ejido de Revilla
Tamaulipas, México

Suunto & Tape survey by
Melanie Alspaugh, Wayne Bockleman, Yvonne Droms, Bart Hogan, Joe Meppelink, Mark Minton, Terry Raines, Bev Shade, Tom Shope, Jose Antonio Soriano, Philipe Senecal, Bill Stone, and Nancy Weaver
1986-2002

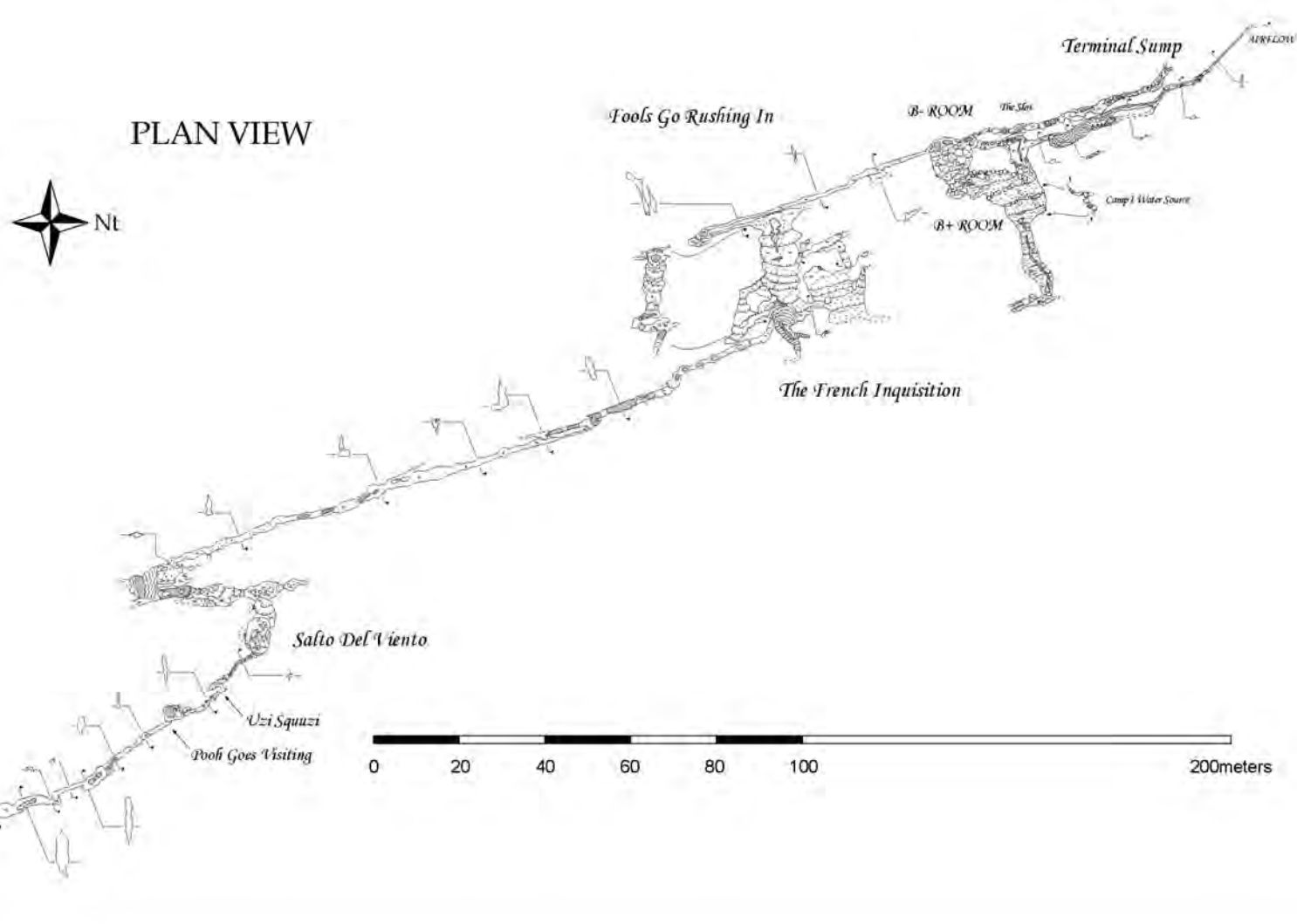
Drafted by Bev Shade, June 2002
PEP Standard Symbols
Projected profile 270°
Traverse Length: 1044 Meters Depth: 301 Meters

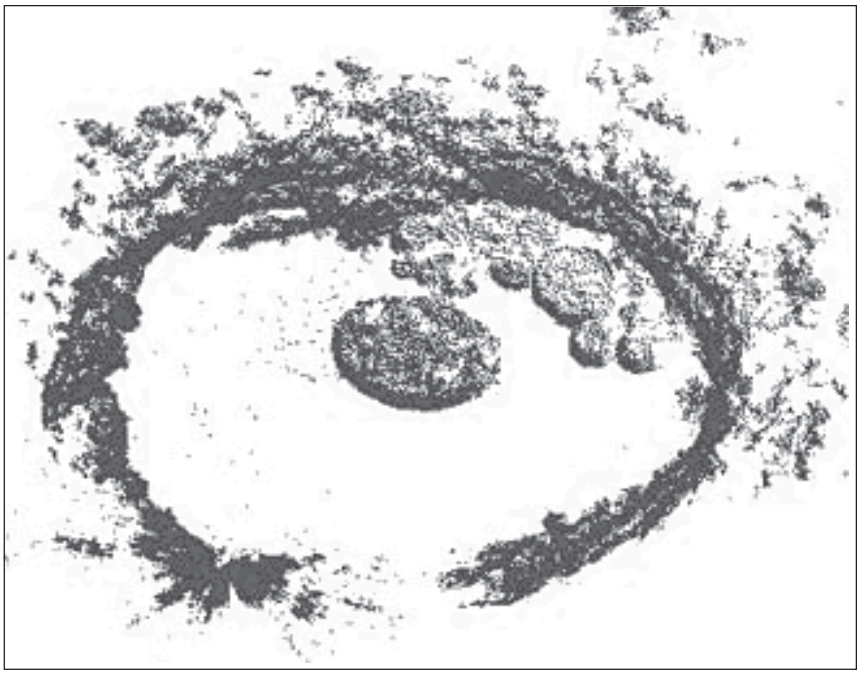
PROFILE VIEW





PLAN VIEW





This aerial perspective view of the Zacatón cenote at Rancho La Azufrosa, Tamaulipas, was synthesized from LADAR data taken from the rim of the cenote. See *AMCS Activities Newsletter* 25, page 122. The resolution is limited because it is a screen-capture from a window on a computer display. *Source:* www.geo.utexas.edu/zacaton.

They finished a lead climb left from November 2000 and explored up another short climb that led into impassable breakdown. The tantalizing airflow that characterizes this section of the cave issues from this breakdown, as does a small stream. The cavers surveyed 40 meters, gaining approximately 18 meters in elevation. *Source:* Bev Shade.

On March 6–13, 2003, twenty-three cavers from Canada, the United States, and Mexico pushed **Cueva del Tecolote** from a camp at Camp I. With 3913 meters surveyed during the trip, the surveyed length of the cave is 40.5 kilometers. New discoveries were made in the Chihue Freeway and close to the Extreme Borehole, and the Southpark maze was connected to the 7 of 9 Borehole in several places. *Source:* Bev Shade.

VERACRUZ

Two separate carloads of cavers from Mexico City heading for Sumidero El Popoca, near Zongolica, were robbed at gunpoint, bound, and gagged. No one was seriously hurt. They report that they got little help from the police. *Source:* David Locklear.

YUCATÁN

Between March 12 and April 8, 2002, a large project was conducted at the "ring of cenotes" in northern Yucatán. The project was organized by the Instituto Nacional de Antropología e Historia, Karst Productions, and the National Geographic Society. There were surveys, excavations, and documentation on a few selected cenotes by a team of twenty-three people from the Mexico City–based Subdirección de Arqueología Subacuática, INAH. Tom Iliffe studied cave life. Emory Christof had a couple of ROVs with him and helped with the exploration of new cenotes and baiting for cave creatures in extreme environments, below the H_2S layer in deep sinkholes and caves. There was a film team of nineteen people. Many well-known cave divers were part of the overall project. *Source: ProTec Newsletter* 3, May 2002.

INTERNATIONAL CONGRESS

Six papers at the thirteenth International Congress of Speleology, held in Brazil in 2001, dealt with Mexican caves. The abstracts below are from the proceedings of the congress, so far distributed only on a CD. The first two abstracts are included with full papers; the other four are abstracts of unpublished talks. The abstracts have been lightly edited for publication here.

"El mio de la serpiente de las grutas," by Carlos Augusto Evia Cervantes: In the state of Yucatán, Mexico, people who live in rural communities near caves recount a mythical story of a gigantic snake called Tsukán. According to some testimonies, this strange being lives in, takes care of, and is the owner of the cave it occupies. Legend has it that it is so big that its body is as wide as the trunk of a tree and its head is like that of a horse. This myth apparently originated in the Mesoamerican cultural area and has therefore come to us from pre-Hispanic times. Analyzing this myth has led us to find out about similar stories in other parts of the world, stories that exhibit common symbolic factors: the water, the cave, and, of course, the snake. [Translated from Spanish for the AMCS by Yvonne Droms.]

"Pre-Hispanic Ritual Use of Caves in the Río La Venta Region, Chiapas, Mexico," by Davide Domenici (Dipartimento de Paleografia e Medievistica, Università degli di Bologna, and Associazione La Venta): The knowledge of archaeological remains in natural

caves of the **Río La Venta** area, Chiapas, has notably increased since 1993, when La Venta Exploring Team began its long-term speleological exploration. The Río La Venta Archaeological Project, originating from the speleological one in 1997, is currently drawing up a catalog of archaeological caves of the area, once inhabited by Zoque Indians. Analysis of excavations of ritual activity areas (offerings, burials, child sacrifice, etc.) is showing their wide distribution and their chronological variations, always related to the cult of water deities respected by Indian groups living in a highly karstified area extremely poor in surface waters. The article summarizes the results of our work and deals with the main lines of ongoing research.

"Ixtacxochitla, Sierra Negra, México," by Javier Vargas G., Juan A Montaño-Hirose, et al. (Grupo Espeleológico Universitario, Asociación de Montañismo y Exploración de la Universidad Nacional Autónoma de México): In 1989, our group started prospecting and exploring the region of **Ixtacxochitla** ("land of the white flowers") in the Sierra Negra, Mexico. Exploration was suspended in 1995 because of local conflicts, and it was not until 2000 that we took it up again. As a result of the work carried out by numerous cavers, to date nearly 300 hectares have been prospected, in which we have found ninety-one cave entrances. All entrances have been located on a chart, and most of the caves have been fully explored. The caves explored vary in depth from a few meters up to 500 meters. The most important systems include **Iztaxochitla** (six entrances, 171 meters deep, 1834 meters long), **Platanitos** (two entrances, 218.5 meters deep, 789 meters long), **El Encanto** (five entrances, 371 meters deep, 2719 meters long, unfinished), and **Tlaloc** (three entrances, 250 meters deep). Other important caves are **El Andrajo** (315 meters deep, 360 meters long, with abrasive concretions), **Los Idolos** (2 meters high, 37 meters long, with archaeological findings), and **El Alquimista,** with beautiful formations.

"Cave Fauna from 'Las Sardinas,' a Mexican Mixed Energetic Subterranean System," by José G. Palacios Vargas, Daniel A. Estrada, Mariano Fuentes, and Jésus Monterrubio (Laboratorio de Ecología y Sistemática de Microartrópodos, Departmento de Biología, Facultad de Ciencias, Universidad Nacional Autónoma de México): Las Sardinas Cave, or **Cueva de Villa Luz,** is located in Tabasco 3.5 kilometers south of Tapijulapa. Elevation at the area is about 100 meters. There are very few records of the animals living in this interesting cave, which is a very special environment, as it has mixed resources of energy in bat guano, vegetal debris, and autotrophic bacterial colonies.

This cave is rather small, about 300 meters long. The main chambers are not higher than 15 meters, and the routes between them are very narrow passages, but there are several entrances that allow litter and soil to fall inside different parts of the cave.

Some chambers are inhabited by huge populations of bats. We have seen five species of the Mormoopidae family. In the guano of those bats there are very complex communities of arthropods.

Specimens were hand collected or extracted from soil, litter, and detritus in Berlese-Tullgren funnels. We have observed many arachnids, four families of spiders, and specimens of Pseudoscorpionida, Amblypygi, and Opilionida.

Among the mites, most abundant are the Cryptostigmata (Malaconothridae: *Malaconothurus;* Haplozetidae: *Rostrozetes*), which are usually very common in soil and litter. Members of Astigmata mites (Acaridae and Guanolichidae) have been collected in several places in the cave, including where "snottites" (chemotrophic bacteria colonies) are growing. Most frequent predators are Mesostigmata and Prostigmata (Cunaxidae), the microphages belong to the Uropodidae family, and the ticks Argasidae are associated with bats, being very often found on the guano.

Springtails are also very abundant. We have recorded the following genera: *Willemia, Schaefferia, Cryptopygus, Pseudosinella,* and *Americanura*. Specimens of Chilipoda, Diplopoda, and Symphyla were also collected. The most abundant insects are the flies *Tendipes fulvipilus* (Diptera: Tendipedidae), which develop on the bat guano. The aquatic arthropods include water crabs of the family Potamonidae and hemipteran insects of the families Gerridae and Belostomatidae. Other terrestrial insects are Psocoptera, Orthoptera, Coleoptera, and Hymenoptera, which are under study.

We have found that this environment is very special, with a high diversity of species well adapted to its conditions, and it needs to be preserved because it is unique in America. Ecological studies need to be done before the system is modified.

"Exploration Techniques in a Hydrogen Sulfide–Rich Cave," by Louise D. Hose and David J. Lester (Department of Environmental and Chemical Sciences, Chapman University; National Speleological Society): The unusually toxic environment in **Cueva de Villa Luz** (a.k.a. Cueva de las Sardinas), Tabasco, Mexico, presents unique challenges. The H_2S concentration in the cave atmosphere typically ranges from 4 to 200 parts per million. The O_2 level is only 9.6 percent. The recorded CO_2 level has reached 3.2 percent. Moreover, formaldehyde may be released from some water inlets. Monitors also indicate frequent bursts of carbon monoxide. Gypsum deposits, microbial colonies, and water drips range from pH 0 to 3 and have caused chemical burns to the skin and eyes of cavers. One passage contains an unidentified substance that irritates the skin and causes an itchy rash for several days after contact. Precautions used by researchers include carrying a four-gas continuous monitor, using gas mask filters rated for acid gases and organic vapors, carrying belt-size scuba tanks for emergency evacuations, and wearing Tyvek exposure suits under some conditions.

"Speleogenesis in a Hydrogen Sulfide–Rich Cave," by Louise D. Hose, Arthur N. Palmer, and Margaret V.

Palmer (Department of Environmental and Chemical Sciences, Chapman University; Department of Earth Sciences, State University of New York, Oneonta): **Cueva de Villa Luz** (a.k.a. Cueva de las Sardinas), a hypogenic cave in Tabasco, Mexico, displays remarkably rapid speleogenetic processes apparently facilitated by chemotrophic microbial interactions with a mostly micritic limestone bedrock. At least twenty-six water inlets feed the 290-liters-per-second cave stream. The inlets release hydrogen sulfide, carbon dioxide, and other biologically active chemicals into the cave atmosphere. Microbial activity enhances three speleogenic processes: Sulfuric acid converts subaerial limestone surfaces to gypsum, which the stream readily removes as blocks fall from the ceiling and walls. Drops of strongly acidic water dissolve the limestone floor. Occasional increases in surface water infiltration, accompanied by increased presence of acidic microbial colonies, accelerate acid production and may cause the stream to become aggressive with respect to calcite. [See *AMCS Activities Newsletter 24* for an article on and map of Cueva de Villa Luz.]

MAPS

Here is a great web site with free online maps of Mexico. There are no topos, unfortunately, but there are good, detailed road maps, much better than MapQuest, for example, which only has rudimentary info on Mexico. Check out http:/www .maps-of-mexico.com. Where there are more or less real public roads, the coverage is pretty good. For example, the Huautla area is at the above, followed by /oaxaca-state-mexico/oaxaca-state-mexico-map-b0.shtml. Where access is by logging or mine roads only, coverage is poor. For example, the Purificación area is at /tamaulipas-state-mexico/tamaulipas-state-mexico-map-a2.shtml and the same with *b2* replacing *a2*. All the hyphens in the URLs above are actually part of the URL; none have been added as line breaks.

The site also sells maps and guidebooks and offers Mexican weather forecasts. *Source:* Mark Minton.

CAVE RESCUE IN MEXICO

The need for organized cave rescue in Mexico has been noted for years. If there are misunderstandings and misperceptions about the specifics of cave rescue in the United States, imagine the situation in Mexico. But not until recently, about three years ago, were definite efforts to improve the situation made.

Different cave-rescue groups were evaluated, and finally the French were chosen because of the techniques used in Mexican caving and the type of caves usually involved in accidents here. A group of instructors from Spéléo Secours Français (www.speleo-secours-francais.com) was brought to Mexico and taught our first cave-rescue course [see article in *AMCS Activities Newsletter* 25], giving birth to Espeleo Rescate México. So far we have had three of these courses, all by the SSF instructors, and there are ERM personnel almost everywhere in Mexico, with regional coordinators and a good organization. I'm part of it, so it's not fair for me to say this, but the level of the group is very good, and it has already had the chance to prove it two times in the real world, as well as in staged exercises.

If you happen to have an incident while caving in Mexico and need to call for cave help, please keep these numbers in mind:

Antonio Aguirre (president ERM)
(444) 820-6960 (Cruz Roja, San Luis Potosí)

Rodolfo González Luna (NE region coordinator)
mobile (818) 665-8688
office (818) 158-2559
email: gonza142@msu.edu

Sergio Santana (operations coordinator)
home (55) 5753-9436
mobile (55) 2550-7541

Juan A. Montaño
home (555) 671-6468
office (555) 622-5900
mobile (558) 534-4007
other (555) 927-2082

All these are Mexican numbers. In Mexico, dial 01 followed by these numbers; in the United States, precede them with 011-52. Do call the NCRC in the United States too, if it gives you peace of mind. *Source:* Rodolfo "Fofo" González.

DEEP CAVES OF MEXICO

Mark Minton
May 2003
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	Nita Cho	Oaxaca	894
13	Sistema Tepepa (Ehécatl+Niebla)	Puebla	880
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	Cuaubtempa Superior	Puebla	640
31	Sistema Atlalaquía	Veracruz	623
31	Cueva de Diamante	Tamaulipas	621
33	R'ja Man Kijao	Oaxaca	613
34	Nita He	Oaxaca	594
35	Meandro Que Cruce (H54)	Puebla	588
36	Sistema del Encanto	Puebla	584
37	Yometa	Puebla	582
38	Sótano de las Coyotas	Guanajuato	581
39	Sótano Arriba Suyo	San Luis Potosí	563
40	Sistema Tepetlaxtli	Puebla	535
41	Sótano del Río Iglesia	Oaxaca	531
42	Sótano de Nogal	Querétaro	529
43	Resumidero de la Piedra Agujerada	San Luis Potosí	521
44	Grutas de Rancho Nuevo	Chiapas	520
45	Sótano de Ahuihuitzcapa	Veracruz	515
46	Sistema Soconusco	Chiapas	513
47	Sótano de las Golondrinas	San Luis Potosí	512
48	Hoya de las Conchas	Querétaro	508
49	Sótano de Los Hernandez	Querétaro	507
50	Sótano del Buque	Querétaro	506

Updates and corrections:

Mark Minton
Department of Natural Sciences
New Mexico Highlands University
P. O. Box 9000
Las Vegas, NM 87701
mminton@nmhu.edu

Mark Minton
May 2003
Length in meters

LONG CAVES OF MEXICO

1	Sistema Ox Bel Ha	Quintana Roo	107118
2	Sistema Purificación	Tamaulipas	93755
3	Nohoch Nah Chich	Quintana Roo	61142
4	Sistema Dos Ojos	Quintana Roo	56671
5	Sistema Huautla	Oaxaca	55953
6	Cueva del Tecolote	Tamaulipas	40475
7	Sistema Cuetzalan	Puebla	37676
8	Kihaje Xontjoa	Oaxaca	31373
9	Sistema Cheve	Oaxaca	26194
10	Sistema Tepepa (Ehécatl+Niebla)	Puebla	24000
11	Sistema Sac Actun	Quintana Roo	23977
12	Sistema Soconusco	Chiapas	21733
13	Sistema Naranjal (Najarón-Maya Blue)	Quintana Roo	21096
14	Coyalatl	Puebla	20000
15	Sistema Aerolito	Quintana Roo	18000
16	Sistema PonDeRosa (Pondazul, Eden)	Quintana Roo	15019
17	Sistema Nohoch Kiin	Quintana Roo	13888
18	Cueva del Alpazat	Puebla	13678
19	Cueva del Río La Venta	Chiapas	13000
20	Atlixicaya	Puebla	12200
21	Sistema San Andrés	Puebla	10988
22	Actun Káua	Yucatán	10360
23	Grutas de Rancho Nuevo (San Cristóbal)	Chiapas	10218
24	Cueva del Arroyo Grande	Chiapas	10207
25	Cueva del Mano	Oaxaca	9790
26	Sistema Abejas	Quintana Roo	9743
27	El Chorro Grande	Chiapas	9650
28	Sistema Tepetlaxtli	Puebla	9600
29	Cenote Chac Mol - Mojarra	Quintana Roo	9193
30	Cueva Quebrada	Quintana Roo	9000
31	Sótano de Las Calenturas	Tamaulipas	8308
31	Gruta del Tigre	Quintana Roo	8300
33	Cueva Pitch	Quintana Roo	8183
34	Nohoch Actun	Quintana Roo	8100
35	Sumidero Santa Elena	Puebla	7884
36	Cueva Yohualapa	Puebla	7820
37	Cueva de la Peña Colorada	Oaxaca	7793
38	Cueva de Comalapa	Veracruz	7750
39	Sótano del Arroyo	San Luis Potosí	7200
40	Sistema Perrito	Oaxaca	7148
41	Cueva de la Puente	San Luis Potosí	6978
42	Sistema Xunaan-Ha (María Isabella)	Quintana Roo	6751
43	Cueva Charco	Oaxaca	6710
44	Sistema Zoquiapan	Puebla	6597
45	Xongo Dwi Ñi	Oaxaca	6500
46	Cueva Vinata	Michoacán	6460
47	Sumidero de Jonotla (Teponahuas)	Puebla	6381
48	Cueva Altar Maya	Quintana Roo	6280
49	Cueva del Ferrocarríl	Morelos	6100
50	Sistema Cretacico (Suchomimus)	Nuevo León	6065

DEEP PITS OF MEXICO

Mark Minton
May 2003
Depth in meters

1	El Sótano (de El Barro)	Entrance drop	Querétaro	410
2	Sótano de las Golondrinas	Entrance drop	San Luis Potosí	376
3	Sótano de Tomasa Kiahua	Entrance drop	Veracruz	330
4	Sótano de Alhuastle	P'tit Quebec	Puebla	329
5	Zacatón	Entrance drop	Tamaulipas	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	Sima Dos Puentes	La Ventana	Chiapas	250
12	Hálito de Oztotl	Entrance Drop	Oaxaca	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 los Planos	Puits Tannant	Puebla	220
18	Sótano de Eladio Martínez	Entrance drop	Veracruz	220
19	Sótano de Coatimundi	Entrance drop	San Luis Potosí	219
20	Sima de la Pedrada	Entrance drop	Chiapas	217
21	Sótano de Sendero	Entrance drop	San Luis Potosí	217
22	Resumidero el Borbollón	Tiro Grande	San Luis Potosí	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	Sistema Soconusco	Darwin	Chiapas	180
38	Sima de Veinte Casas	Entrance drop	Chiapas	180
39	Croz 2	Entrance drop	Puebla	180
40	Ahuihuitzcapa	Entrance drop	Veracruz	180
41	Hoya de la Luz	Entrance drop	San Luis Potosí	180
42	Sima del Cedro	Entrance drop	Chiapas	175
43	Sótano de la Cuesta	Entrance drop	San Luis Potosí	174
44	Sima Dos Puentes	Entrance drop	Chiapas	172
45	Sótano de los Monos	Entrance drop	San Luis Potosí	171
46	Sótano de Otates	Third drop	Tamaulipas	171
47	El Socavón	Entrance drop	Querétaro	171
48	Nita Diplodicus	Entrance drop	Oaxaca	170
49	Sótano de Tepetlaxtli no. 2	Entrance drop	Puebla	170
50	Sótano de los Ladrones	Entrance drop	Oaxaca	170

AMIGOS DE LA GRUTA

SIX YEARS OF THE BUSTAMANTE LABOR DAY PROJECT

Susan Souby

Since its discovery in 1906, the Gruta del Palmito has attracted national and international visitors. It has been a favorite destination of Texas cavers since the early 1960s and has been an excellent training cave and a great way to introduce new cavers to caving and to Mexico. Generally open access to cavers and non-cavers alike has taken its toll on the cave in the form of graffiti, trash, vandalism, and the impact of thousands of footsteps. Since 1997, volunteers for the annual Bustamante Projects over Labor Day, sponsored by the Texas Speleological Association, have been making progress in restoration, conservation, and development of the cave, with attendant advantages in public relations and community spirit. The projects are increasingly popular, attracting more than one hundred volunteers from Texas, Mexico, and as far away as Colorado, Illinois, Kentucky, Alabama, and Florida.

Orion Knox and Bob "Rune" Burnett are well suited as project coordinators. Orion, after discovering Natural Bridge Caverns, took a year off from college to assist in developing that cave. Orion's thesis in architecture used Gruta del Palmito as the central point of a regional park, complete with a visitor center, a cable car to move people up the mountain to the entrance, and trails through the cave and out a tunnel exit at the south end. Renowned for their fine surveying and mapping skills, Orion and his wife Jan were chosen to map Kartchner Caverns in Arizona. Rune's duties as an archaeologist and natural-resource manager at the Texas Parks and Wildlife Department included management of all the caves on state park lands. He was loaned to the state of Arizona to head the development of Kartchner Caverns, a cutting-edge example of show-cave development in the world. The expertise and dedication of the project coordinators, as well as the talented volunteers, make this a unique project.

Preservation of the original natural beauty of the cave has required limiting access and better-defined trails. Installation of educational and conservation signs has exposed visitors to the conservation ethic necessary to protect the cave. Trash pickup and graffiti removal were undertaken to remove the damage that had been done to the once-pristine environment and restore the cave to its original condition to the extent possible. Development projects to improve access, increase safety, and enhance visibility will reduce the impact of the many visitors. The conservation, restoration, and development work has received wide-ranging support and appreciation from the caving community in the United States and Mexico, from local officials and citizens of Bustamante and Nuevo León, and from international visitors to the cave. The project has inspired a phenomenal number of cavers and friends to work hard to restore a very beautiful place. The Amigos de la Gruta includes veteran cavers, super-cavers, old-timers, newbies, armchair cavers, party cavers, non-caving friends and family, child cavers and children of cavers. Some venture only into the entrance room, some never enter the cave, and some work diligently on some aspect of the project at home and never go to Bustamante.

Gruta del Palmito is located in the Sierra de Gomas above the town of Bustamante, Nuevo León. The story of the discovery has been related by Cayetano Gómez Durán, the son of the discoverer. Orion and Jan Knox sought out Cayetano and arranged for the interview. Charlie Loving videotaped and recorded the interview, Jeannie Loving conducted the interview and interpreted, and later Philip Russell translated the dialog into English. According to Cayetano, his father, Juan Gómez Cázares, while gathering palm fronds for thatched roofs in the mountains above Bustamante, felt cool air blowing on his foot as he walked by a small hole on a new trail he had hacked out with a machete. Investigating the source of the air, he opened a manhole-size entrance to a vertical drop into the cave. He made torches out of palm fronds he had gathered and went in. He was awed by the beauty of the cave and headed back to town to tell his tale at the *presidencia.* Soon after the discovery, the town of Bustamante, realizing the draw of such a natural wonder, undertook a major project to enlarge the entrance and make the cave more

---

Written in collaboration with Orion Knox, Jan Knox, and Bob "Rune" Burnett.

accessible. Tours started immediately. According to Cayetano, people came from all over Mexico and the United States by train and were taken up to the cave by burro. Three generations of the Gómez family were guides in the cave. The discoverer became a guide. His son learned the trade from his father, started guiding at the age of thirteen, and continued until he was physically unable to make the climb from the base of the mountain at 623 meters elevation to the cave entrance at 970 meters. Ramiro Gómez, grandson of the discoverer, was the guide during the first years of the Labor Day projects.

An early map of the cave, by Orion Knox and Terry Raines, was published in 1967 by the Association for Mexican Cave Studies in its bulletin 1, *Caves of the Inter-American Highway.* In 1973, Orion and his wife Jan began an extraordinarily detailed map of Gruta del Palmito. They continued the survey in 1974, and then, after a hiatus of twenty years, took up the survey again in 1994. From 1994 until the last year of serious survey in 1999, they enlisted the help of many fellow cavers to complete the map of the entrance room and most of the main room of the cave. Orion has made good use of his map during the project to designate sections for trash removal, to mark the concentrations of graffiti, and, with Rune, to design a loop trail in the entrance room, complete with plans for bridges, viewing platforms, and a lighting system.

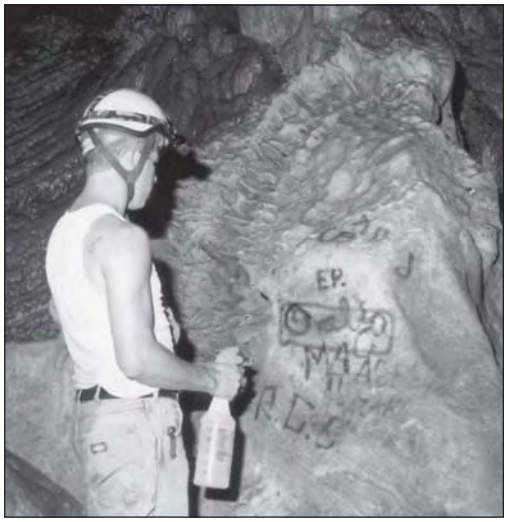
The town of Bustamante, which manages and controls access to the cave, has been actively involved in the project since its inception. Orion and Rune have met each year prior to the project with the mayor or the city administrator to explain the goals for the year and to seek approval and support for the project. The project has endured through three mayors, Prof. Artemio Hernández Solís (1994–1997), Jorge Santos Gutierrez (1997–2000), and his wife and current mayor, Norma Robles (2000–2003). Mayoral terms run for three years, beginning on November 1. Each major has been interested in and supportive of the project. The city officials have made arrangements for materials and local labor for various aspects of the project and have waived camping fees in Bustamante Canyon for the volunteers.

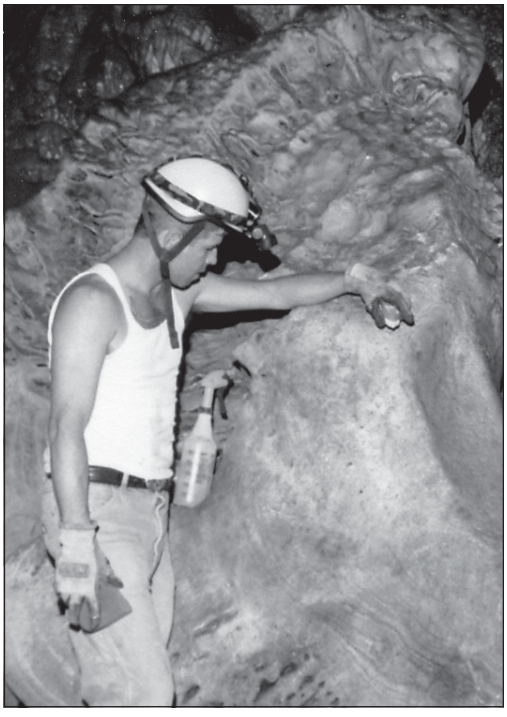
Each year the Hernández family, our gracious hosts and the proprietors of the Hotel Ancira, has catered the banquet held on Sunday night. The regionally famous restaurant at the Ancira has put on a diverse and delicious buffet. In 1997 and 2001, the city provided the municipal park as the banquet site, and other years it was held at the hotel. Each year, amid whooping and hollering, the volunteers are thanked with the many door prizes.

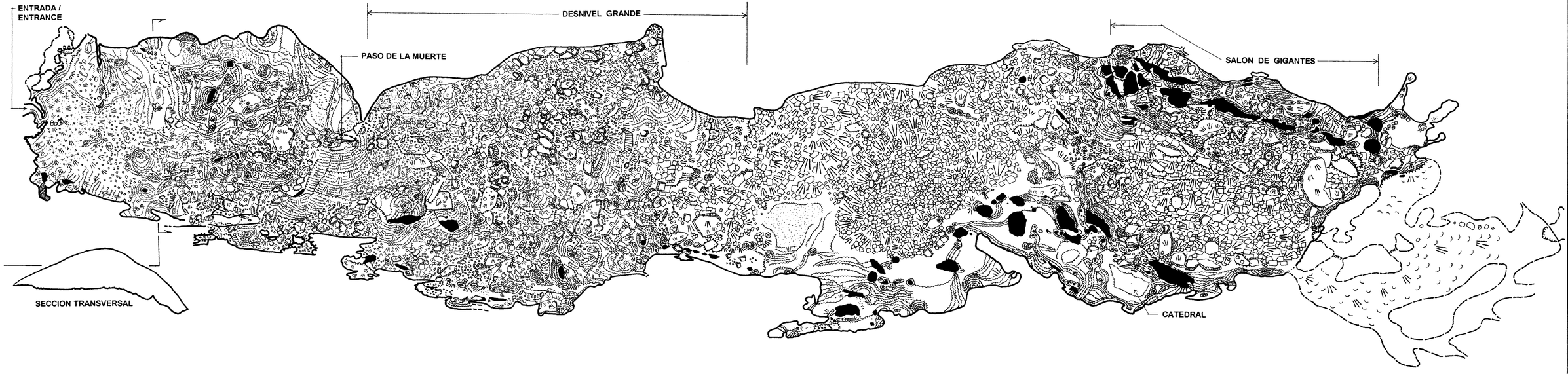
In 1998, Omar Mohamed Tamez, Director Estatal de Turismo for the state of Nuevo León, and Gerardo Peña, an engineer and project director with his department, visited the project. They descended into the entrance room to observe the graffiti removal and the installation of the steps. In 2001, Tamez again visited the project, accompanied by Bustamante officials Norma Robles, *presidente,* and Jóse Baldemar Gómez Rodriguez, *secretario.* They attended the banquet at the end of the project and presented each participant with a certificate of appreciation. Each certificate was personalized with the volunteer's name and carried the seals of the state of Nuevo León, the department of tourism, and the town of Bustamante. The banquet was underwritten by the Coca Cola Company, Carta Blanca, and the town. Also in 2001, a crew from the Monterrey TV station XHMNL filmed the banquet and work in the cave during the day. Plans to interview participants in the cave failed when the news anchor had an attack of acrophobia on the drive up to the cave and returned to the base of the mountain.

Special guests at the banquet in 2002 were again the *presidente,* her husband and former mayor, and the *secretario* and his wife, Nancy Castillo. The *presidente* expressed her appreciation to the group for all that had been accomplished in the cave. She was pleased to report that the government of Mexico had appropriated two million dollars for development of the cave and environs.

Before and after: Brittan Hussing removing graffiti in the Cathedral Room. *Danny Evans.*







GRUTAS DE BUSTAMANTE
(GRUTA DEL PALMITO)

BUSTAMANTE, NUEVO LEÓN
MÉXICO

(TOPOGRAFÍA EN PROCESO / SURVEY IN PROGRESS)
ABRIL DE 1997 / APRIL, 1997

ESCALA / SCALE

0 25 50
METROS / METERS

0 50 100 200
PIES / FEET

NM
N
DECLINACION MAGNETICA
7°30' (1997)

CARTÓGRAFO / CARTOGRAPHER:
ORION KNOX

TOPÓGRAFOS PRINCIPALES / PRINCIPAL SURVEYORS:
ORION KNOX & JAN KNOX

CON AYUDA DE CUEVEROS DE MÉXICO, ITALIA, FILIPINAS Y LOS ESTADOS UNIDOS / WITH HELP FROM CAVERS FROM MEXICO, ITALY, PHILIPPINES, AND THE UNITED STATES

INSTRUMENTOS DE TOPOGRAFÍA / SURVEY INSTRUMENTS:
TRÁNSITO, BRUNTON, SUNTOS Y CINTA DE MEDIR / TRANSIT, BRUNTON, SUNTOS AND FIBERGLASS TAPE

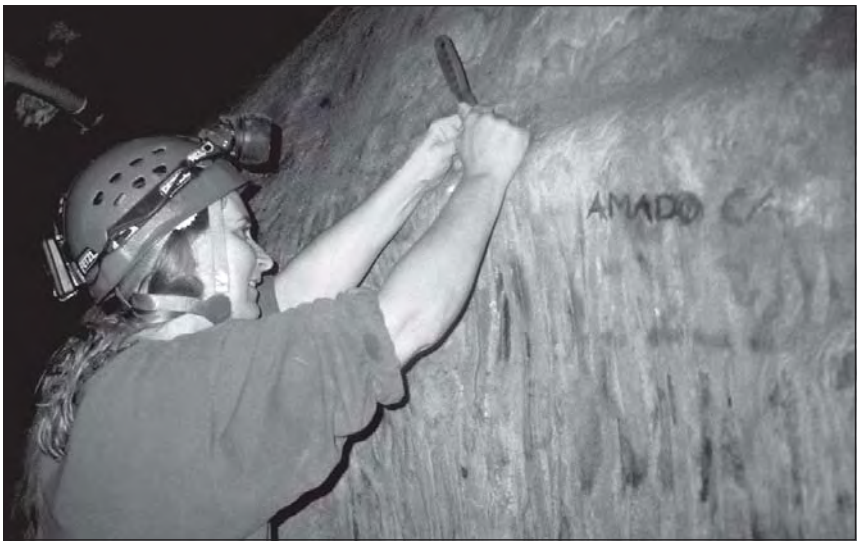
DATA REDUCTION BY "WALLS"
DEVELOPED BY DAVID McKENZIE

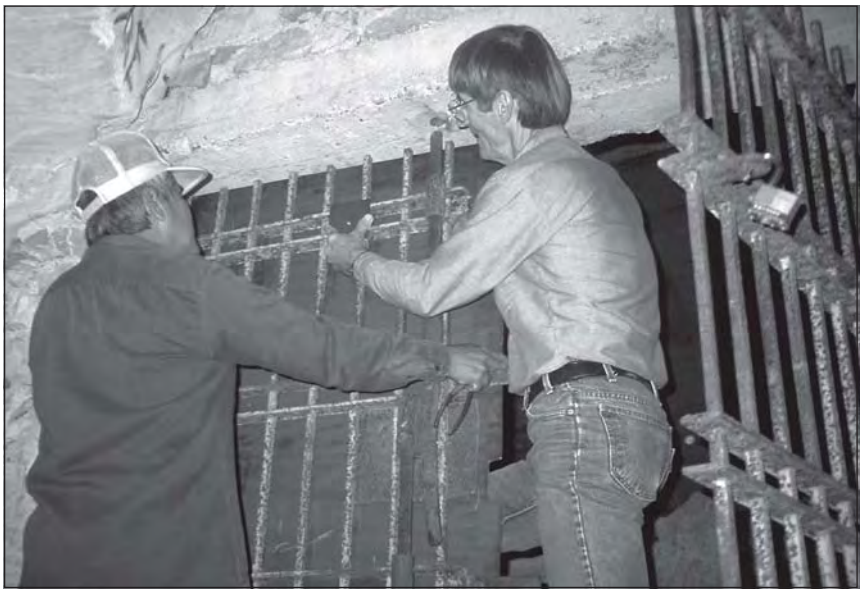
DESCUBRIMIENTO / DISCOVERY:
LAS GRUTAS DE BUSTAMANTE FUERON DESCUBIERTAS POR JUAN GÓMEZ CAZARES EN EL AÑO DE 1906, CUANDO SINTIÓ UN AIRE FRIO PROVENIENTE DE UNA FISURA UBICADA A UN LADO DE LA VEREDA EN LA SIERRA MIENTRAS ESTABA RECOGIENDO MATERIALES DE CONSTRUCCIÓN. / GRUTAS DE BUSTAMANTE WAS DISCOVERED BY JUAN GOMEZ CAZARES IN 1906 WHEN HE FELT COOL AIR COMING FROM A SMALL HOLE ALONG A MOUNTAIN TRAIL WHILE GATHERING CONSTRUCTION MATERIALS.

PRINTED BY:

SIMBOLOGIA / SYMBOLS

- COLUMNAS / COLUMNS
- ESTALAGMITAS GRANDES / LARGE STALAGMITES
- ESTALAGMITAS PEQUEÑAS / SMALL STALAGMITES
- COLUMNA CAÍDA / FALLEN COLUMN
- DEPÓSITO DE CALCITA / FLOWSTONE
- DIQUE TRAVERTINO / TRAVERTINE DAM
- CHARCO / POOL
- CAÍDA / DROP
- DECLIVE / SLOPE
- PIEDRA RODADA / LARGE BREAKDOWN BLOCK
- PIEDRAS GRANDES / MASSES OF BREAKDOWN
- TIERRA SUELTO / LOOSE SEDIMENTS





STEPS. The entrance room is the most accessible to the public and the most-visited room in the cave. In fact, the guided tour traverses only the entrance room. The trail from the gate descended about thirty meters in elevation down slippery mud-covered breakdown to the bedrock and travertine floor. One of the project's first development projects was the installation of prefabricated concrete steps to increase safety for visitors descending that slope. Rune designed and built forms for three sizes of steps, twenty-four, thirty, and thirty-six inches long by six inches wide and three and a half inches thick. The town had concrete steps cast, with rebar reinforcement, by a local block company. PVC pipes were cast into each step to provide two holes for anchoring the steps. Cavers who arrived the day before the project in 1997 loaded the steps into trucks in town and hauled them up the road to the upper parking lot. The town provided a burro and several city workers to help the cavers carry the steps from the upper parking lot, at 918 meters elevation, the 330 meters to the cave entrance at 970 meters. Placing the steps was very labor-intensive, requiring rock removal and rearrangement to provide a foundation for each step. The steps were secured by driving half-inch pieces of rebar through the PVC pipes. Some areas of the trail were solid rock and could not be modified for the preformed concrete steps. For those areas, workers mixed concrete to cast steps in place. A total of 130 steps were constructed, 123 of

Top: Wendy Bixby removing graffiti in the Cathedral Room. *Jan Knox.*
Middle: Orion Knox and cave guide Rogelio Rangel installing the steel plate on the entrance gate. *Jan Knox.*
Bottom: Don Broussard, Marshall Gee, Rune Burnett, and Mark Gee removing large rocks from the trail from the upper parking area to the cave. *Orion Knox.*

which have been installed, 71 in 1997, 30 in 1998, and 22 in 1999.

Immediately inside the cave, the visitor had to duck down low to avoid the ceiling. During the step installation, volunteers also lowered the floor of the trail there by jackhammering the very hard limestone.

GATE. Giovanni Pierantozzi G., a well-known lighting and acoustics engineer from Monterrey, has been involved in the cave since the 1970s. As a Boy Scout leader, Giovanni has brought scouts to help with the cleanup efforts each year. Concerned about the vandalism in the cave, Giovanni had the first gate installed. Giovanni has also designed a show-cave lighting system for the entrance room. The gate that Giovanni installed was successful in deterring vandalism in the cave, but it did not restrict the airflow that contributed to the drying out of the pools in the entrance room and formations throughout the cave. Orion covered the gate with 11-gauge sheet steel. This slowed down the loss of moisture, but it wasn't until 1999 that the project completed the sealing of the gate. They built a frame around the door and filled in the gaps with rock and concrete.

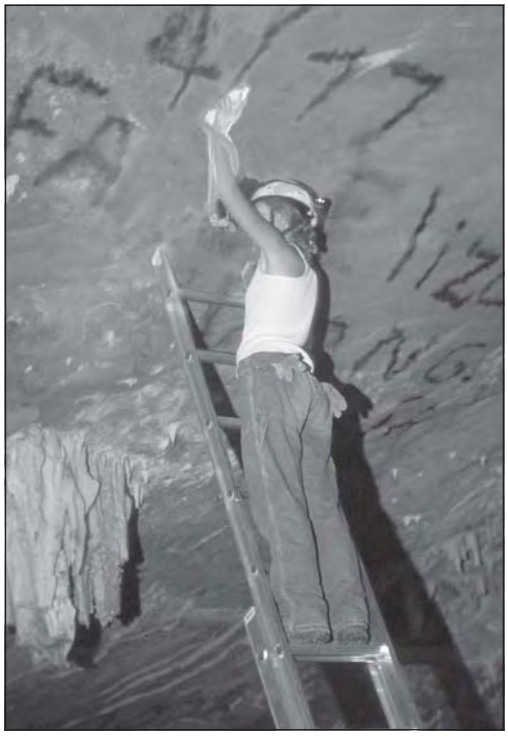
TRASH CLEANUP. The first year of the project, it took two big trucks from the town to haul away the huge pile of trash removed from the cave. In 1998 and 1999, more trash was removed, and by 1999 the entrance room looked pretty good, and more people proceeded to the main room, picking up lots of rusted wire, cans, and bottles on the breakdown slope. Cavers cleaned the Cathedral Room of broken glass and candle wax. In 2000, all discarded batteries were removed from the Cathedral Room. Every year, Giovanni has brought his hard-working Boy Scout troop, and they've picked up trash in the cave, as well as outside near the entrance. In 2001, Girl Scouts came too. Most of the trash has now been taken out of the cave, and very little has reappeared. In the last two years, trash removal outside the cave and in the parking area has taken only a short time.

GRAFFITI REMOVAL. After many years of uncontrolled access and heavy visitation, the main trails were decorated with many types of graffiti. It seems to have been a tradition of visitors to leave names, initials, and drawings everywhere, on formations, on flowstone, on breakdown, and on walls. The graffiti were especially dense and conspicuous on the ceiling in the entrance room, along the trail through the Paso de la Muerte, down the breakdown slope to the "lunch room," and on the trail to the Cathedral Room. About 120 meters in elevation below the entrance is the Cathedral Room, which, with its altar and candles, is the destination of a pilgrimage of local residents each Easter. It was especially hard hit with graffiti. The graffiti consists of an amazingly vast array of materials, including soot from candles and carbide, ink markers, pencil, chalk, various types of spray-paint, and some has been incised with a sharp tool. Likewise, an array of techniques has been used for its removal, always with a concern for preventing any further contamination of the cave. Aimee Beveridge, coordinator for graffiti removal since 2000, and her strike forces have developed a scheme of working with the least abrasive techniques first, such as plastic-bristle brushes and cave water. On spray-paint, stainless-steel brushes powered by cordless drills have worked on many surfaces. After six years of cleaning, the entrance room is almost finished, the Cathedral Room is vastly improved, and the teams are ready to move into more remote or harder to reach areas.

The project coordinators consulted with Mexican archaeologists to determine the date before which graffiti should be considered historical and left in place. In Mexico, pre-Columbian is the cut-off date. Since this was unrealistic for the interior of the cave, only opened in 1906, the Texas archaeologists

Pete Strickland installing concrete steps on the slope into the entrance room. *Jan Knox.*

Cleaning graffiti from the ceiling of the entrance room. *Orion Knox.*



CHRONOLOGICAL SUMMARY

1997—Attendance 157 cavers and 55 Boy Scouts from Monterrey. Trash pickup in cave (two truckloads), graffiti removal in entrance room, installation of seventy-one concrete steps, lowering of floor at entrance. Banquet at municipal park.

1998—Attendance 60 cavers, and Boy Scouts from Monterrey. Trash pickup in entrance room and beyond, graffiti removal in entrance room, installation of thirty concrete steps. Visit from director of tourism for Nuevo León. Banquet at Hotel Ancira.

1999—Attendance 90 cavers, and Boy Scouts from Monterrey. Trash pickup beyond entrance room, graffiti removal in entrance room, installation of twenty-two concrete steps, replacement of lighting supports with PVC pipe, frame and seal entrance gate. Banquet at Hotel Ancira.

2000—Attendance 109 cavers, and Boy Scouts from Monterrey. Seventy-eight people signed into the cave. Trash pickup outside the cave and in the Cathedral Room, graffiti removal in the Cathedral Room, around the entrance inside and outside, and on the road, formation washing in entrance room, installation of signs in entrance room, installation of light shields in entrance room. Banquet at Hotel Ancira.

2001—Attendance 116, plus Boy and Girl Scouts from Monterrey and the film crew from XHMNL; 88 into the cave. Trash pickup outside the cave, graffiti removal in Cathedral Room, around the entrance inside and outside, and on the road, installation of signs in entrance room and outside the cave, installation of more light shields. Banquet in municipal park, certificates presented by officials (see main article).

2002—Attendance 168 and Boy Scouts from Monterrey; 140 into the cave, including 30 members of the Espeleológia ITESM from Monterrey Tech. Trash pickup outside the cave, graffiti removal in the Cathedral Room, on the breakdown slope, outside the entrance, and on the road, installation of signs outside the cave, installation of light shields. Banquet at Hotel Ancira with official guests.

involved in the project decided to adopt the American standard of fifty years. Some of the oldest graffiti, dating from the original discovery, is found in the stoopway maze above the entrance area and will be preserved. Those leading the graffiti-removal efforts also decided to leave some of the most artistic of the graffiti.

In 1997, 1998, and 1999, initial efforts were made at graffiti removal in the entrance room using both wet and dry techniques on the ceiling, on breakdown, and on flowstone. Bill Elliott pioneered by scrubbing with water. Karen Perry next tried dry methods and chemicals. Some progress was made with both these techniques, depending on the type of surface and the amount of moisture.

Before the 2000 project, Orion Knox and Allan Cobb marked with colors on a copy of Orion's detailed map the locations and types of graffiti in the cave. The map was reduced and copied for the various groups entering the cave. The project purchased tools and furnished them to those who did not bring their own. Aimee Beveridge was enlisted to coordinate graffiti removal. Jan Knox, Susan Souby, and Allan Cobb took a group of sixteen to the Cathedral Room. While Boy Scouts from Monterrey worked on cleaning mud off of formations in the entrance room, George Veni and the Bexar Grotto made some good efforts at washing graffiti from the formations there. Bob West's team was very successful in dry-scrubbing carbide graffiti off the ceiling in the entrance room, using ladders and a telescoping pole with a brush attached to reach the highest areas.

In 2001, Aimee and crew targeted the Cathedral Room for a major push, figuring that this would show the most dramatic results. An amazing amount of graffiti was removed. Some difficult-to-reach areas were cleaned, especially above the altar. Work also continued in the entrance room just inside the gate.

In 2002, a record 140 volunteers entered the cave, and the majority worked to remove graffiti. The Cathedral Room was again the main focus, though due to the previous year's successes there, more people could fan out to other areas. The project again furnished brushes, sponges, and spray-bottles. Most workers used nylon brushes and spray-bottles with cave water to remove soot and clean muddy formations. On two thirds of the trail down the breakdown mountain, a team removed all non-historic painted graffiti. An extension ladder was carried to the Cathedral Room and used to reach the high walls. Cordless drills with stainless-steel brushes were used successfully on much of the painted graffiti on both flowstone and breakdown blocks. After the graffiti were removed, workers smoothed over the areas with dirt to give a more natural look. A new technique of using smooth stones to gently abrade scratched-in graffiti was developed to restore the surfaces. Three years of concentrated work in the Cathedral Room has resulted in a noticeable decrease in the amount of graffiti. Fortunately, no new graffiti are appearing inside the cave.

Outside the cave is a different story. The graffiti on the road up to the cave and around the entrance is sun-baked spray-paint, almost impossible to remove. Without the restrictions of protecting the cave environment, more forceful methods of paint removal have been used, but no completely successful method has been found.

LIGHTING. Bare electric lines supporting bare light bulbs had been strung years ago around the entrance room and along the main trails to the Cathedral Room and other most popularly visited areas. The lighting no longer worked in any area but the entrance room, and even there it was in disrepair and dangerous. In 1999, Ron Ralph led a project to replace the rotting timbers holding up the electric lines with PVC pipe. Out of 4-inch PVC sewer pipe, Orion constructed light shields with holes in the sides to direct the light. Orion and crew installed the shades and reattached the electric lines to their supports during the 2000, 2001, and 2002 projects. The shaded light bulbs now cast a nice warm glow, in contrast to the glare of bare bulbs.

Top: Banquet at the Hotel Ancira. *Orion Knox.*

Middle: Sunday tour of the Fábrica de Mezcal. *Orion Knox.*

Bottom: Terry Plemons's hard-working truck with Scouts from Monterrey; scout leader Giovanni Pierantozzi at right. *Charlie Loving.*

Orion and Rune also requested that the hundred-watt bulbs be replaced by sixty-watt bulbs for a softer light.

SIGNAGE. To encourage conservation of the cave, cultivate a conservation ethic among visitors, and promote the cave as a resource, the project leaders designed a series of signs. These include interpretive, conservation, and directional signs. All signs are in both Spanish and English. A donation from Natural Bridge Caverns in New Braunfels, Texas, paid for the fabrication of the signs.

For durability and moisture resistance, the signs within the cave are coated aluminum with stick-on letters covered with clear polycarbonate or are photo-Mylar sandwiched between coated aluminum and clear polycarbonate. The signs are caulked around the top and sides to prevent water from entering and open at the bottom to allow any water that does accumulate to drain. The interpretive signs are installed on galvanized metal pipes embedded in the cave floor. The outside signs are cutout letters in quarter-inch steel plate that has been hot-dip galvanized. These signs are anchored to rocks or cliff faces with bolts. Peter Strickland and crew began installing the signs in 2000 and continued in 2001 and 2002. With the gate locked and entry only when accompanied by a guide, the trash and graffiti problems are largely under control. Hopefully the signs have contributed to a conservation ethic.

TRAIL BUILDING. In 2002, Philip Russell headed a new project to improve the trail up the mountain to the Cabeza de León peak that overlooks the cave entrance. His crew flagged about one third of the trail and then cut brush and set trail markers.

In 2001, cavers with pry bars and Herculean effort cleared a path through the large rocks that were left over from the blasting of the road from El Cono to the upper parking area. (The lower parking lot originally had a cone-shaped *palapa,* before the present concrete-block building was constructed.) The boulders, weighing up to an estimated 200 kilograms, had obstructed

the beginning of the trail from the upper parking lot to the cave.

(During the projects, to avoid gridlock on that steep one-lane switchbacked road up from El Cono, Terry Plemons has coordinated transportation of volunteers up the road, providing his pickup and commandeering other suitable vehicles as needed. He makes seven or eight runs per day with about ten passengers each, coordinated by radio between volunteers at the upper lot and El Cono. The passengers enjoy the ride along the 3.9 kilometers of road rising 295 meters, which takes about twenty minutes and affords spectacular views of the valley, the canyon, and the town of Bustamante.)

Besides the nice free camping at the springs in Bustamante Canyon and the traditional Sunday night banquet, volunteers who have worked at the cave on Saturday have a choice of several Sunday excursions. The cave has been open to wild-cave tours led by experienced cavers. The Red Room and the Birthday Passage have been featured some years. Ron Ralph has led an early-morning tour to Chiquihuitillo, a rock-art site in the desert west of the Sierra de Gomas with geometric designs that may date to two thousand or more years ago. Shannon Breslin has led birding tours to the desert and along the stream in the canyon. Historic tours of Bustamante have included a visit to the home of Cayetano, the son of the discoverer, and a walking tour of the town led by Felipe Hernández, both with interpretation by Philip Russell. Terry Plemons, after intensive research and product testing, has led many tours of the Guadalupana Fábrica de Mezcal at the edge of town. The tour ends in the tasting room, making this one of the most popular tours. Cavers have visited Minas Viejas, the high mountain ranch nearby that the Elizaldi family is developing for ecotourism, restoring the historic mining buildings for cabins and a restaurant.

Future projects depend on the status of the development of the cave by the Mexican government. At this time, plans are to continue with graffiti removal in more remote areas of the cave, trash pickup outside the cave, graffiti removal along the road, near the cave, and in the lower parking lot, and improvements to the trails to the cave and to Cabeza de León. Planned changes to other available activities include adding a Sunday trip to Minas Golondrinas and moving the mescal-factory tour to Monday morning. Information can be found at http://cavetexas.org.

The church on the plaza in Bustamante, with the Cabeza de León peak in the distance. *Orion Knox.*

BIBLIOGRAPHY

Barksdale, Marcus. TSA Bustamante Clean-Up 1999. *Texas Caver,* September/October 1999, pp. 82–92.

Beveridge, Aimee. Conservation Activities at Palmito Cave. *Texas Caver,* December 2002, pp. 6–7.

González Luna, Rodolfo. No Banjercito Necessary. *Texas Caver,* December 2002, p. 7.

Burnett, John. Going Underground. *Texas Monthly,* September 2000, pp. 108–116.

Burnett, Rune, Orion Knox, and Melanie Alspaugh. Bustamante 2000. *Texas Caver,* July/August 2000, p. 96.

Ediger, Gill. The Bustamante Area, Comprising a Few Interesting Facts, Near Facts, ... 1993, 1998. http://www.caver.net/tsa/Carrizal1.htm.

Knox, Jan, and Aimee Beveridge. Palmito Cave Cleanup, Labor Day. *Texas Caver,* November/December 2000, pp. 145–150.

Knox, Orion. Bustamante 2001. *Texas Caver,* December 2001, p. 11.

Loving, Jeannie. Gruta del Palmito, Bustamante, Nuevo Leon. *Texas Caver,* May–December 1997, p. 82.

Plemons, Terry. Bustamante Fabrica de Mescal Tour. *Texas Caver,* December 2001, pp. 12–13.

Ralph, Ron. Chiquihuitillos. *Texas Caver,* December 2002, p. 8.

Souby, Susan. Los Amigos de la Gruta, Bustamante 2002. *Texas Caver,* December 2002, pp. 3–5.

http://www.cavetexas.org/bustatext.htm. (The 2001 project.)

Seis Años de Amigos de la Gruta, Bustamante

Durante el asueto anual del Día del Trabajo a principios de septiembre, la Asociación de Espeleología de Texas ha organizado los últimos seis años un proyecto para ayudar con la restauración y desarrollo de la Gruta del Palmito, en Bustamante, Nuevo León. El trabajo ha incluído remoción de grafiti, instalación de escalones en la bóveda inicial, colocación de letreros informativos y el sellado de la puerta de entrada para evitar el secado de las pozas en la primer bóveda.

AMIGOS DE LA GRUTA ACKNOWLEDGMENTS

Project Coordinators—Orion Knox and Rune Burnett

Project Treasurer—Ron Ralph

Registration—Ron Ralph, Walter and Rae Olenick, Aimee Beveridge, Christa McLeland Riddington, Jim "Crash" Kennedy

Publicity—Aimee Beveridge (U.S.), Peter Sprouse (Mexico)

Banquet Coordination—Terry Plemons and Charlie Loving

Door Prize Coordination—Susan Souby

Transportation—Terry Plemons, with help from Charlie Loving (until his transmission blew out), Gill Ediger (who carried a record seventeen people on and in his truck), and Bruce Anderson

Graffiti Removal (in cave) Coordinators—Aimee Beveridge, Karen Perry, Bill Elliott

Graffiti Removal (outside)—Rune Burnett

Step Installation—Rune Burnett and Pete Strickland

Lighting Improvement—Orion Knox

Signs—Financing, Natural Bridge Caverns; installation, Pete Strickland

Cabeza de León Trail—Philip Russell

Tools—Rune Burnett

First Aid—Tom Brown, with field kit provided by Jim Kennedy

Communication Radios—Elaine and Larry Reagan, with radios provided by James Strickland

Sunday Trips—Ron Ralph, Shannon Breslin, Felipe Hernández, Terry Plemons, Rune Burnett, Orion Knox, Don Broussard, Pete Strickland

Design—Vreeland Graphics (T-shirts and stickers, printing), Janet Learmonth (stickers, conservation signs, T-shirts), Charlie Loving (T-shirts)

Gruta del Palmito Guides—Ramiro Gómez, Rogelio Rangel

Door Prize Donors—Whole Earth Provision Company, Gonzo Guano Gear, the UT Grotto, Bat Conservation International, Patagonia, Eagle Creek, Vasque, Cascade Designs, Sweetwater, Metolius, Boreal, Leki, Smartwool, Petzl, Black Diamond, Princeton Tech, PMI, Bluewater, King Feed and Hardware (Wimberley, Texas). The Hotel Ancira contributed their locally crafted stools. Among the most sought-after door prizes were contributed by Orion and Jan Knox: computer-enhanced photos of cave formations in Palmito and the church on the Bustamante plaza and watercolor paintings of cave formations, respectively.

Chaco, maker of sandals, donated $1200 cash to the project as part of their funding of grass-roots conservation programs.

THE MEXICAN BLINDCAT

Jean Krejca

My dive buddy and I were beached on a muddy slope, tired and weighed down by somewhere around seventy pounds of dive gear. The plan was to wait until the first team came back with news of how long the unexplored sump was and what the passage was like on the other side. After some time had passed and they had not returned, it began to sink in that the sealed-off chamber we were waiting in, while fairly roomy at approximately 20 meters in diameter, was entirely full of bad air. We found ourselves panting with each little movement and developing increasingly severe headaches. After about an hour (or two or three), I crawled up onto the flat top of the mud slope and puked. At that point we finally put two and two together and decided to kit up for an exit. There would be no more searching for blindcats today, because it was time to recognize how close we were to a dangerous situation and get out of there. In hindsight, it is remarkable that it took us that long to make this decision.

The trip out involved putting the tanks and equipment back on and sliding into the now-murky water with a careful thumb and forefinger looped around the dive line. After a fairly steep descent to about 10 meters, my side-mounted tanks hit the smooth bedrock ceiling, and soon after that my stomach came to lie against the cobble floor and I began the body-length squirm through the tight spot. Once past that, the rest of Thanksgiving Sump is a fairly easy sloping ascent to another section of air-filled passage.

By then the clear air from the tanks had my headache subsiding, and we were ready for the 600-meter-long slog through ankle- to knee-deep mud to reach Catfish Parlour Sump, the final sump that separated us from a warm campfire beneath the stars. The water here was also murky from our dives, so no more blindcats were spotted, and we passed through its twists and turns uneventfully.

Researching a rare species that lives in remote places can be full of days like this. Many person-hours are spent gaining access into the rare portal that provides human passage into an elusive desert aquifer, and then it takes a combination of persistence and luck on top of that to actually encounter one of these species.

The Mexican blindcat, *Prietella phreatophila*,[1] dwells in the groundwater below the desert of northern Coahuila, Mexico. Groundwater is primarily a place we don't think of as fish habitat, since most of it is trapped in tiny pores in rocks or spaces between gravels. However, in karst areas, which are typified by subterranean drainage, including features such as sinkholes, caves, and springs, the groundwater takes on the characteristics of surface streams, but the travel is through underground passages rather than valleys on the surface. The trick is to find access points to these passages, which can come in the form of cave entrances, spring orifices, and wells. A recent article by Hendrickson et al.[2] summarizes work that our research team has done to find additional access points to the aquifer and therefore additional localities for this rare fish. Of over fifty caves, wells, and springs visited, only ten proved to be localities for the only two known species of this genus, *P. phreatophila* and *P. lundbergi*. The latter species is known from only two locations, and only five specimens have ever been seen.

The most recent trip to study the Mexicanblindcat took place in November 2001 and was funded by a North American Native Fishes Association Conservation Research Grant. Trip participants were Chris

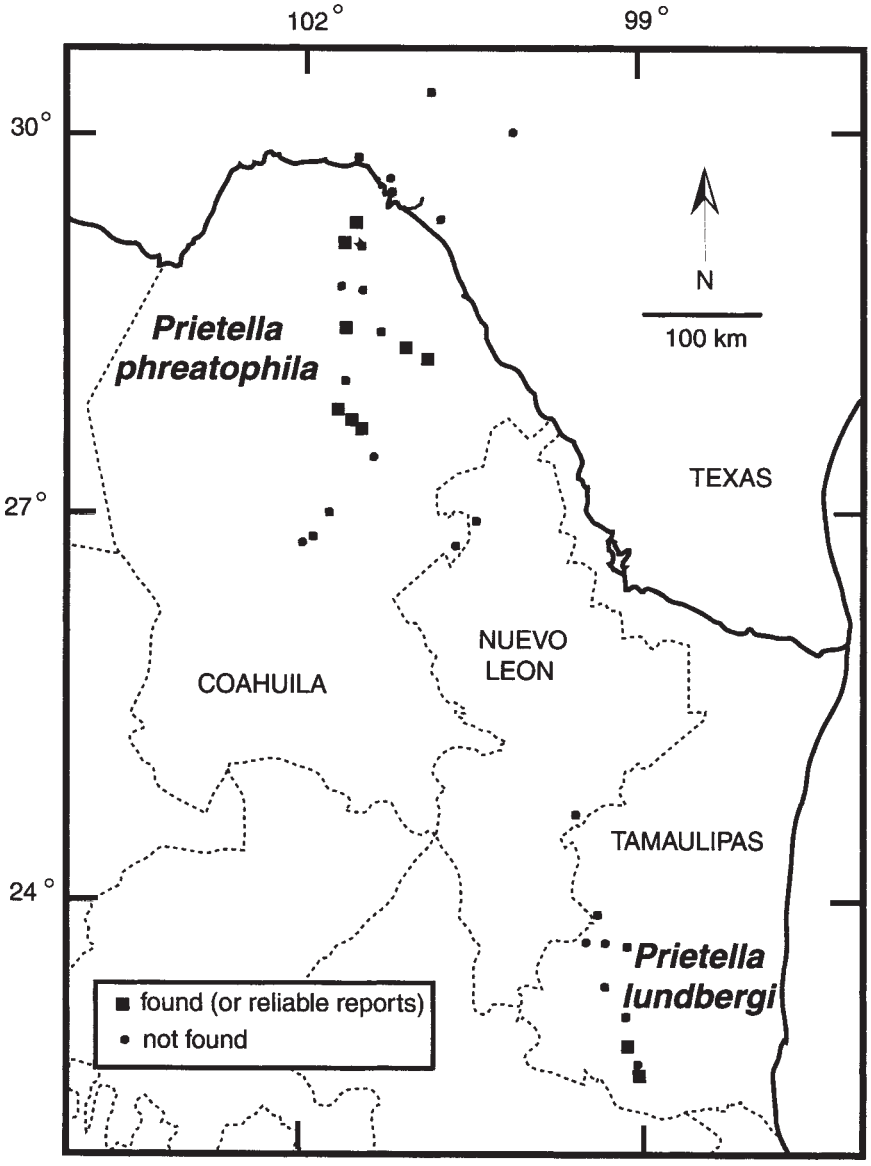
A Mexican blindcat. *Jean Krejca.*

This article is slightly revised from one that will appear in 2003 in *American Currents,* one of the publications of the North American Native Fishes Assocation.

Buntenbah, Allan Cobb, Gary Dunkley, Alan Goodman, Aldo Guevara, Chrissy Jett, Jean Krejca (a.k.a. Creature), Vivian Loftin, RD Milhollin, Jamie Moreno (a.k.a. James Brown), Jason Richards, Pete Shifflett, and Felicia and Erin Vreeland. The things that were done during this trip illustrate some of the ongoing research on this species.

On the November 2001 trip, we accomplished the first recapture of a marked fish in a different pool than where the fish was marked. Marked in June of 1998 at Catfish Parlour Sump, this fish was found on the other side of Sump Three in the passage that was newly discovered on this trip. After the exasperating day described above, the next day we returned to push through Sump Three and map the brand-new section of unexplored passage. During the survey, I noticed a blindcat and stopped to examine it. I was thrilled to note that it had a bright pink "tattoo" that had been placed there three years before.

Also on this trip about twelve more blindcats were marked, bringing the total to nearly forty marked fish, and several others from previous trips were recaptured. We are using an injectable tag consisting of fluorescent and brightly colored latex microbeads that are inserted at different places on the body to track individuals. The fish are first captured and anesthetized using clove oil, then measurements are taken, including length and volume, and then they are marked in one or two places and the marks are photographed. The goal of this is to make a population estimate for the various pools in the cave and also to track the fish's growth and movements through the cave system. In addition, we downloaded information from a data logger that sits in the first cave pool and tracks temperature fluctuations in their habitat.



Area map showing localities for *Prietella phreatophila* and *P. lundbergi*, adapted from reference 2.

Thanks to an experienced team of cave divers and vertical cavers, the frontiers of exploration in Sótano de Amezcua were pushed back by an exciting new discovery. In the upstream direction, the virgin Sump Three was penetrated to reveal a new, very large section of passage. This new passage doubled the length of the cave from 600 meters to its current length of over 1300 meters. The new passage is spectacular, with gravel-floored passages from 5 to 15 meters in diameter and full of large galleries. In the downstream direction, two dives were made, and approximately 150 meters of new underwater passage was explored, but not surveyed. On the cave map, all of the passage between Sump Three and Sump Four was entirely unknown and unexplored prior to this trip. An article by Krejca et al.[3] summarizes other cave discoveries and explorations made while searching for blindcats, and also shows the older map of Sótano de Amezcua before this new section was discovered. [See also *AMCS Activities Newsletter* 20, page 12.]

A cirolanid isopod, *Cirolanides texensis*, was also found in the new section of passage. These isopods, in addition to several other groups of isopods, including the asellid *Lirceolus cocytus*, and an amphipod are probably the food source for the blindcats. The isopods are also entirely adapted to the subterranean environment, sharing the characteristics of

Mexican blindcats, *Prietella phreatophila. Jean Krejca.*

eyelessness and lack of pigment that the fish have.

In addition to inventorying the species that co-occur with the blindcats, we are working on a broader-scale study testing the idea that genes of aquifer-adapted invertebrates can be used as an indicator of groundwater connections. The problem with studying groundwater flow in karst is that only very infrequently can a researcher actually travel far through the subterranean passages. So in order to learn where they go, remote-sensing techniques have to be used. Typically hydrologists use techniques such as dye-tracing and potentiometric-surface mapping to make inferences about subterranean flow paths. The idea that we are testing is that the genetic relatedness of these aquifer organisms will follow the hydrologic relationships of these sites, and therefore genetic studies can be an additional tool for hydrologists to answer connectivity questions in karst. Once the subterranean flow paths are better understood, anthropogenic impacts such as well drilling and contaminant spread can be better predicted in these environments. An extended abstract describing this work has been published by Krejca.[4]

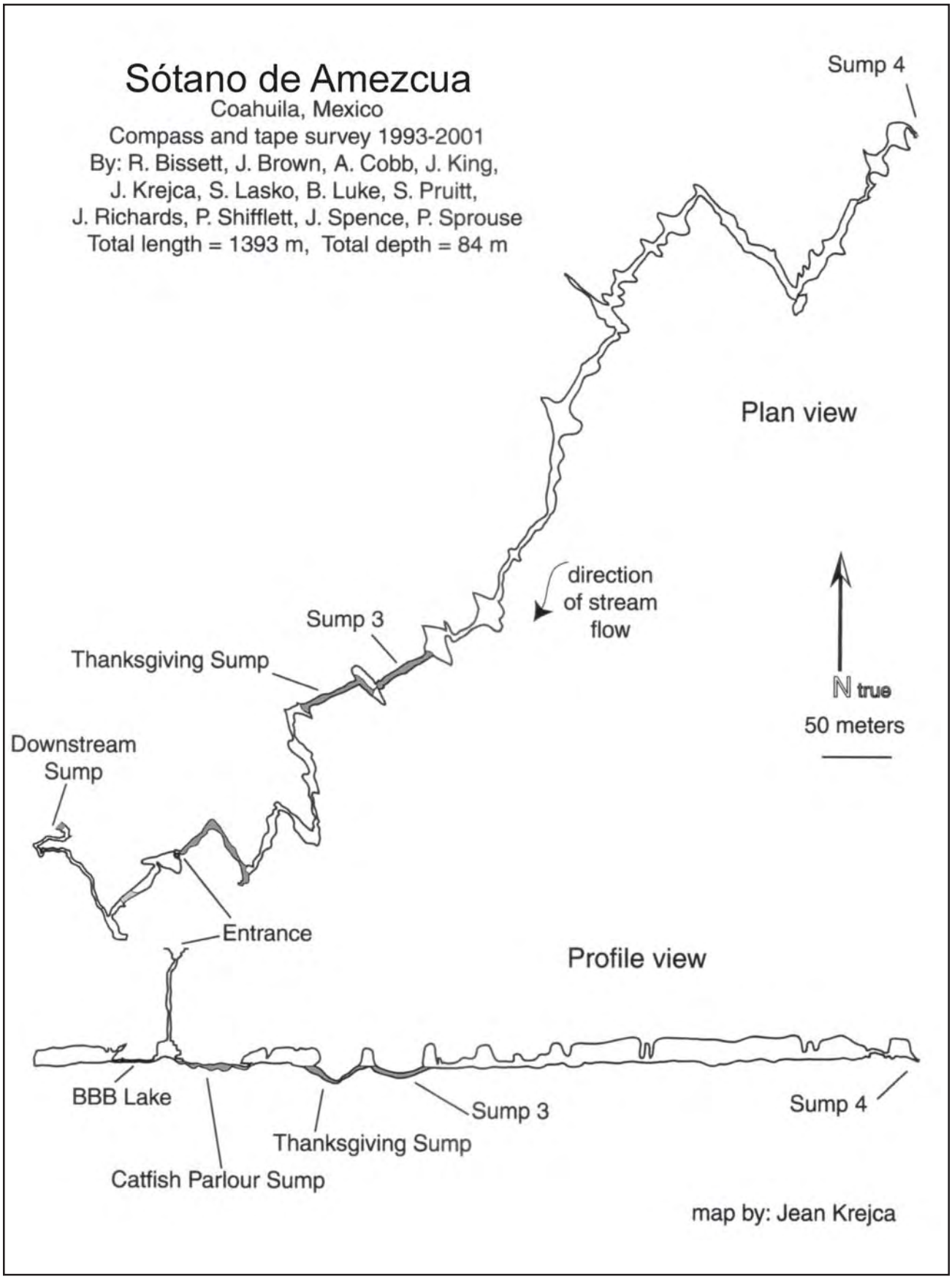
Since 1992, individuals of *P. phreatophila* have been maintained in captivity, and there many observations have been made.[2] Some of the more unusual behaviors they exhibit include periods of jaw-locking and inactivity. The jaw-locking always takes place soon after individuals are rearranged into different tanks, and involves two individuals, thought to be males, alternately biting each other's head and maintaining a grip for anywhere from a couple of minutes to over twelve hours. During most of this time they are relatively motionless, but occasionally one will pull the other individual around, and they may let go for a few seconds and change position. After the initial encounter, they do not seem to repeat the procedure.

Periods of inactivity appear to be a sort of torpor, where the opercular movements are drastically slowed and the individual may drift around with the current of the tank oriented in any direction. They are also commonly seen lying on their sides or backs on the bottom of the tank, seemingly dead. This behavior may be some indication of the lack of predators in their cave environment.

To date, there have been three spawning events where courtship behavior has been observed, and at least twice eggs have been seen. Unfortunately in both cases the eggs disappeared within twenty-four hours, presumably having been eaten by other fish in the tank. Efforts to have a successful breeding event by separating eggs and adults after spawning continue.

Laboratory studies on light sensitivity, sensory biology, starvation tolerance, and genetics (phylogenetic relationships and population genetic studies) of the fish are also under way.[2] In addition, we continue to look for new localities in Mexico and South Texas and to maintain access to known localities to study these species. To see more

Diver James Brown on the far side of Catfish Parlour Sump. The mud-covered walls and ceiling show that the passage is sometimes entirely submerged. *Jean Krejca.*


Sótano de Amezcua
Coahuila, Mexico
Compass and tape survey 1993-2001
By: R. Bissett, J. Brown, A. Cobb, J. King,
J. Krejca, S. Lasko, B. Luke, S. Pruitt,
J. Richards, P. Shifflett, J. Spence, P. Sprouse
Total length = 1393 m, Total depth = 84 m
Sump 4
Plan view
direction
of stream
flow
Sump 3
Thanksgiving Sump
N true
50 meters
Downstream
Sump
Entrance
Profile view
BBB Lake
Sump 3
Sump 4
Thanksgiving Sump
Catfish Parlour Sump
map by: Jean Krejca

Top: A Cirolanid isopod, *Cirolanides texensis,* from Sótano de Amezcua. The body length is approximately 8 millimeters. This species is known throughout Texas and northern Mexico. *Jean Krejca.* Bottom: An Asellid isopod, *Lirceolus cocytus,* from Sótano de Amezcua. Body length is approximately 4 millimeters. This species is known from only one other site, a water-filled cave in Reeves County, Texas. *Jean Krejca.*

images and learn more about what is going on, check the web at https://webspace.utexas.edu/deanhend/www/ and http://www.inhs.uiuc.edu/~sjtaylor/cave/mexico/mexico.html.

1. Carranza, J. 1954. Descripción del primer bagre anolftamo y depigmentado encontrado en aguas Mexicanas. *Ciencia* (México) 14: 129–136.
2. Hendrickson, D. A., Krejca, J. K., Martinez, J. M. R. 2001. Mexican Blindcats, genus *Prietella* (Siluriformes: Ictaluridae): an overview of recent explorations. *Environmental Biology of Fishes* 62: 315–337.
3. Krejca, J. K., Taylor, S. J., Hendrickson, D. A. 2000. The Mexican Blindcat Research Team. *NSS News* 58: 165–171.
4. Krejca, J. K. 2002. Genetic relatedness of aquifer organisms as a tool for determining aquifer connectedness. *In:* Martin, J. B., Wicks, C. M., Sasowsky, I. D. (Eds.) *Hydrogeology and Biology of Post-Paleozoic Carbonate Aquifers*. Proceedings of the symposium Karst Frontiers: Florida and Related Environments, March 6–10, 2002, Gainesville, Florida. Special Publication 7 of the Karst Waters Institute, Charlestown, West Virginia. 157–161.

Estudio del Pez Gato Ciego en el Sótano de Amezcua

El pez gato ciego *Prietella phreatophila* vive en las aguas subterraneas del desierto norteño de Coahuila. Una de las ubicaciones donde se ha encontrado y estudiado a este pez es el Sótano de Amezcua. Debajo del tiro de entrada hay un pasaje con flujo de agua donde han sido buceados varios sifones. La longitud topografiada de la cueva es de más de 1300 metros.

Book Review

Hydrogeology of the Sistema Huautla Karst Groundwater Basin. James H. Smith, Jr. Association for Mexican Cave Studies, Austin, Texas 78713; 2002. 8.5 by 11 inches, 154 pp, softbound. $25 plus $3 postage from AMCS, PO Box 7672, Austin, Texas 78713 or www.amcs-pubs.org. AMCS Bulletin 9.

This, the first AMCS Bulletin published in twenty years, is Jim Smith's 1994 masters thesis at Western Kentucky University. It has been reformatted from the original 338 pages, and some of the large plates have been redrafted for increased legibility and so that they could be bound in among the sixteen foldout maps. While some of the text is the not very exciting stuff that always appears in theses—reviews of the speleogenesis literature and the like—, Jim describes the history of exploration in the area, the numerous dye traces he did there, and his other studies of the local geology, including studies of the resurgences in the Santo Domingo Canyon. Despite the academic baggage, this book is the best summary of the caves of the area that includes the second (by only 9 meters) deepest cave in Mexico, Sistema Huautla, 1475 meters deep.—*Bill Mixon*

DRY CAVES OF PUERTO AVENTURAS

Fred Devos

I am a cave diver and don't wish to present myself as an authority on dry caves. My methods in dry caving are certainly rudimentary and tainted by my interest and experience in underwater caves. If you look at many dry cave maps, passages often end with a symbol for water and a question mark. Explorers have gone to the limits of the dry cave and were disappointed when the passages ended in a pool of water. Underwater cave explorers are similarly disappointed when they find a passage filled with air rather than water. But the fundamental forces driving people to explore dry and wet caves are the same: to discover and document a place previously unknown. So it is not surprising when a dry caver takes an interest in diving or a cave diver writes about dry caves.

In the years I have lived in Puerto Aventuras, Quintana Roo, I have entered many nearby cenotes and mapped out the underwater systems leading from them. Neighbors have also shown me many entrances with only a few inches of water covering the floor of a dry cave. Some of these entrances continued in spectacular passages, and what coaxed me in was the hope that this would lead me to deeper, water-filled sections requiring diving equipment. On my early excursions in dry caves, I carried a mask and scanned every puddle. The hope for diveable passage was soon overcome by the beauty of the rooms and tunnels we traveled through. Exploration and mapping of these caves has purposely included local neighbors, and several have taken a keen interest in learning more about and preserving the beauty of this environment.

Dry cave exploration in Puerto Aventuras is not reserved for an elite few who are technically trained. These caves do not require technical equipment or skills. There are few elevation changes, and we have found that a helmet with headlight, hiking books, and knee and elbow pads are sufficient equipment. Exploration in the dry caves can include people who do not have the means to become experienced cave divers, and this opens the door to building environmental awareness within the local community. This is not to say that dry caving is not physically demanding. It is much harder to climb and crawl through a thousand meters of rocks and mud than to float effortlessly during a cave dive. Gravity sucks.

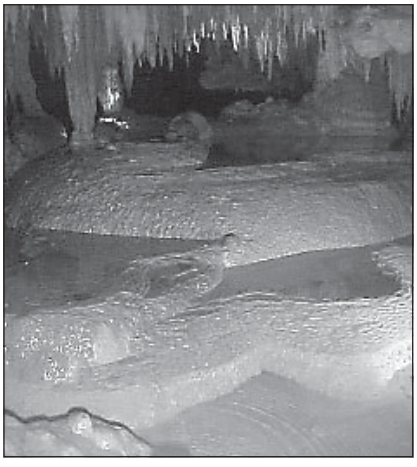
The Grutas de los Aluxes consist of four cave systems with eighteen entrances and a total of 3814 meters of known mapped passages. It is likely that some or all of these caves will be connected. To map the caves, the distances and compass bearings between stations were measured using a fiberglass tape and a hand-held Suunto compass. Depth or elevation changes were not recorded, as their minor changes would not greatly affect the big picture. Side-wall, floor, and ceiling distances were estimated.

Much of the passage has water on the floor. Its depth ranges from a few centimeters to more than 1 meter. Much of the passage is very active, with water dripping from the ceiling and running down the walls. Stalactites, stalagmites, and flowstone continue to grow. A spectacular series of rimstone pools is called the Wishing Well. A large column resembles the Leaning Tower of Pisa.

The name of the Grutas de los Aluxes comes from the first day of mapping, when Miguel Vasquez, Tomas Mendózo, José Mis, and I wiggled our way through 619 meters of tunnels and partly flooded rooms. We were a bit surprised to find a lone footprint of what appeared to be a barefoot young child. The Mayan legend of magical dwarfs, or *aluxes*, entered our minds. Later we learned of a visit by another explorer and a young child, but the name remained.

These caves butt up against civilization. Many of the entrances are on disputed land, with more than one party claiming ownership. A barbed-wire fence or a guard with a machete indicates delicate landowner

The Wishing Well. *Fred Devos.*



relations. The south cave runs under the federal highway, and trucks and cars rumble above. The ground wires for an electrical installation poke through the ceiling. If you are quiet, you can hear the noises of a family in their house above. Two of the wet entrances have pumps that supply water to many households, mine included. Fifty meters away, raw sewage can be seen dripping from the ceiling, which shows the need for proper sewage containment and treatment. Development plans would locate fifty thousand people above these caves. I hope publishing these maps will help protect this environment.

Cuevas Secas de Puerto Aventuras

La mayoría de las cuevas en los alrededores de Puerto Aventuras, Quintana Roo, están inundadas, sin embargo varias cuevas secas, las Grutas de los Aluxes, han sido exploradas. La longitud total de las cuatro cuevas es 3814 metros y es probable que algunas de ellas eventualmente se conecten. La población en el área directamente sobre las cuevas está creciendo rápidamente.

GRIETA DE LA PERDICIÓN, NUEVO LEÓN

Ed Goff

In 1999 and 2000, a small group of Texas cavers explored a mountain ridge east of Arteaga, Nuevo León. They found several caves, mostly blind pits and small horizontal caves. Relatives of the landowner there on a weekend outing showed them some entrances. Relations were established with the owner, who gave permission for the group to continue exploration and cave mapping on the ridge. The nicely decorated Cueva del Tarillal, also known as Cueva de la Familia, and Grieta de la Perdición, a 143-meter-deep tectonic fissure, along with some other small caves, were mapped in 1999. Exploration in the area has resumed in 2003.

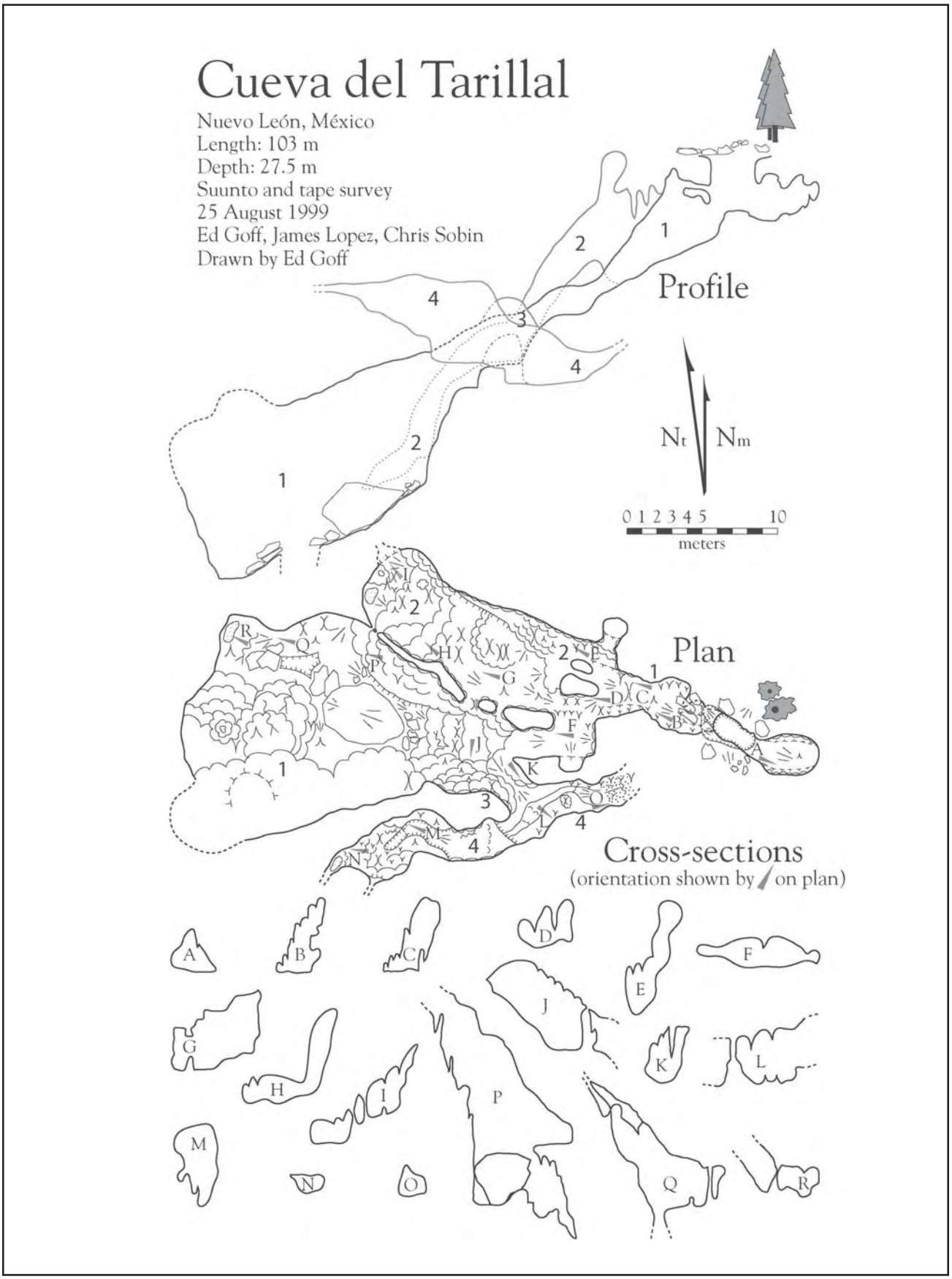
James Lopez at the entrance to a small pit near Cueva del Tarillal. *Ed Goff.*

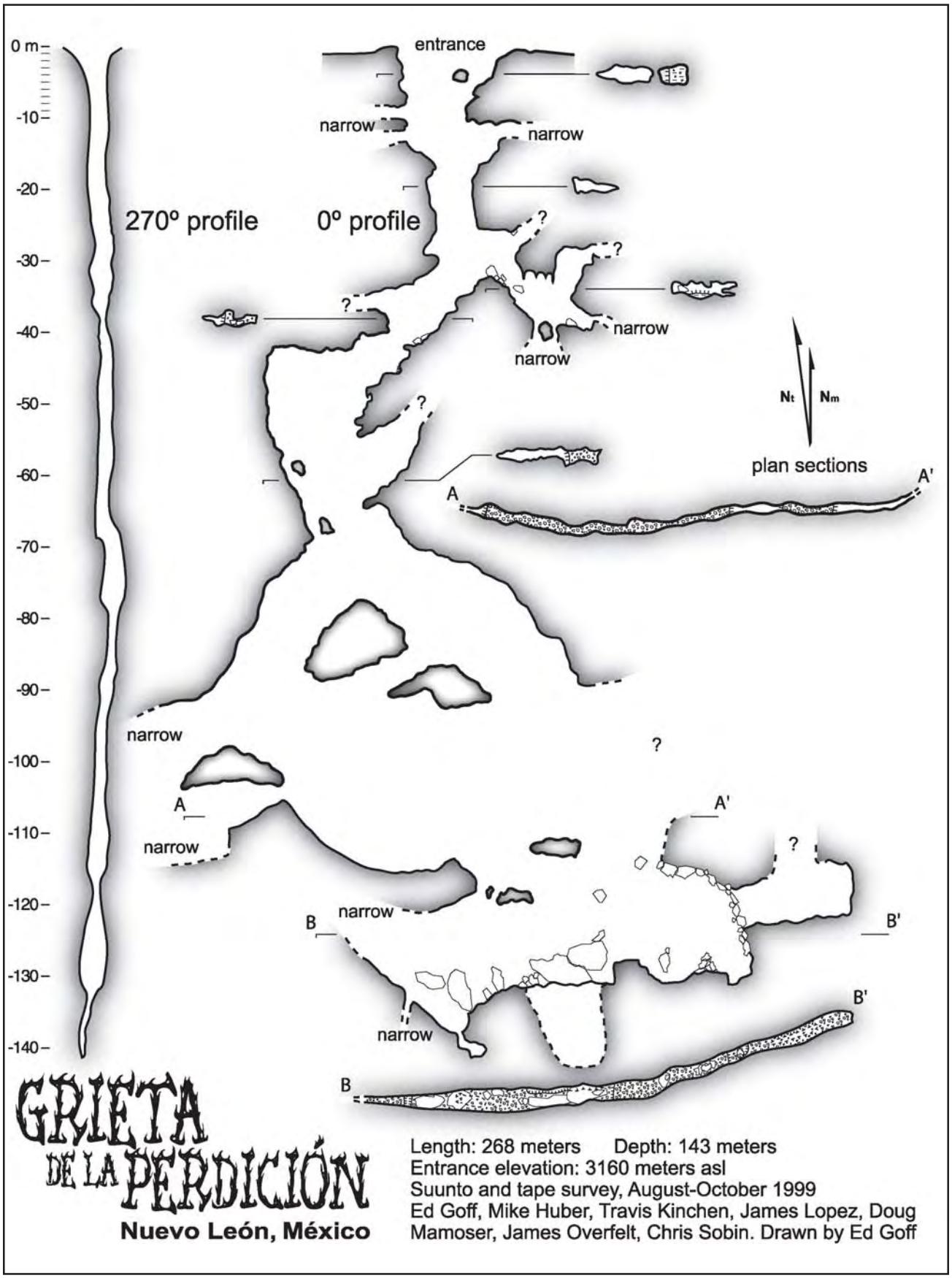
In July 1999, the landowner's relatives pointed out a pit atop a high point of a ridge, at 3160 meters elevation. They called it the Madre de Cuevas. The entrance is a funnel-like sink about 10 meters long by 2 to 3 meters wide. A 45-meter rope was rigged to the only handy anchor, a lightning-charred, dead tree near the sink. Rope's end revealed no floor, so plans were made to return. A few smaller caves were also found during this trip.

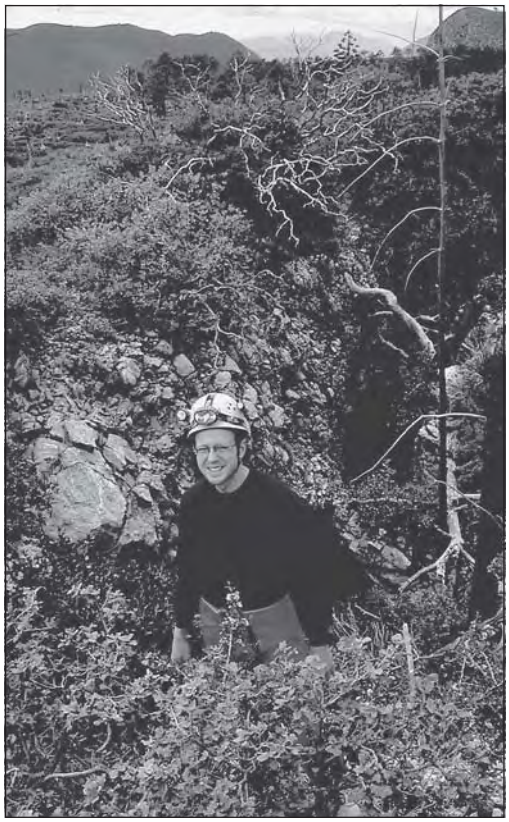
In August, a second trip was made to survey the pit. Shattered, rotten walls and a lip of stones loosely suspended in mud made rigging the first pitch tricky. At about –33 meters, a landing was reached where the cave enlarges somewhat and continues as a fissure down steep slopes in both directions. A large levitating boulder had to be dislodged, and it made a noisy, dusty descent. The cave turned out to continue only in the direction the boulder had taken, so two more short pitches were rigged down a steep, slippery flowstone chute and a narrow chimney to a flowstone ledge that rounded off into blackness. A good breeze was blowing out. By this point, it was apparent that the whole cave is formed along a single vertical crack, paralleling the east-west line of the ridge, where the vertically-dipping strata have separated along the crest of the ridge and the south side of the mountain has sagged toward the valley floor. This explained the profusion of broken rock. It appears, though, that dissolution has also contributed to shaping the crack. Flowstone coats the walls throughout. Innumerable loose rocks are everywhere. At the ledge, loose rocks are piled precariously. The walls there are completely covered with soft flowstone, which was judged unsuitable for the Petzl self-drive anchors that had been brought, and since natural anchors are lacking, it was decided to return another time with better anchors. A rock dropped from the ledge and timed with a watch could consistently be heard ricocheting as it fell for more than 20 seconds. The treacherous aspect of the cave revealed itself when the last person to ascend the entrance pitch was struck on the helmet by a substantial rock that had spontaneously detached itself from the lip. (Coincidentally, this happened the same day that Christy Quintana was killed by rockfall in Sótano del Aire.) On this trip, the cave was given its name, Grieta de la Perdición.

The rest of the weekend was spent removing a dead tree dangling over the entrance pitch and surveying a nearby cave.

Another trip to the area, in September, was devoted to exploring other caves, which all turned out to be blind. In October, a team returned properly equipped to push Perdición. Hilti epoxy bolts 3.5 inches long were used by the rigging team, while a survey team followed. The holes could be drilled in a couple of seconds in the soft, powdery flowstone, but the epoxy


Cueva del Tarillal
Nuevo León, México
Length: 103 m
Depth: 27.5 m
Suunto and tape survey
25 August 1999
Ed Goff, James Lopez, Chris Sobin
Drawn by Ed Goff
Profile
Nt
Nm
0 1 2 3 4 5 10
meters
Plan
Cross-sections
(orientation shown by / on plan)


0 m
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
entrance
narrow
narrow
270° profile
0° profile
?
?
?
narrow
narrow
?
Nt
Nm
plan sections
A
A'
narrow
?
A
A'
narrow
?
B
narrow
B'
B'
narrow
B
GRIETA
DE LA PERDICIÓN
Nuevo León, México
Length: 268 meters Depth: 143 meters
Entrance elevation: 3160 meters asl
Suunto and tape survey, August-October 1999
Ed Goff, Mike Huber, Travis Kinchen, James Lopez, Doug Mamoser, James Overfelt, Chris Sobin. Drawn by Ed Goff



Ed Goff at the entrance to Grieta de la Perdición. *James Lopez.*

required twenty minutes to cure, which slowed progress. From the ledge reached in August, the next pitch is about 33 meters. It begins as a 0.4-meter-wide vertical crack and widens to about 2.5 meters at the next landing, a bridge covered with a steep pile of loose gravel and rocks lying at the angle of repose. Here, just shy of –80 meters, the crack takes on a more monumental character, with soaring, pristine orange-brown flowstone walls. A traverse and short pitch were rigged to another gravel-covered ledge at –87 meters. When disturbed, the gravel floor on this ledge began pouring through gaps in underlying breakdown, opening a conical hole underfoot like a giant ant-lion trap. A short traverse down the gravel slope to the edge of the ledge led to a 25-meter pitch ending on something resembling a real floor. From the top of this pitch to the bottom of the cave, the flowstone that coats the north wall is heavily fractured. The flowstone on the south wall is intact and dry on the surface, but water seeps behind it. At the bottom of the pitch, the crack is about 2.5 meters wide. Small rocks rained down here, sounding like buzzing flies. To the west, the floor slopes steeply up to a point, then back down to a drop-off where the crack becomes too narrow. To the east, it leads to a squeeze, beyond which the crack widens at another drop.

Another floor is below this 18-meter pitch. Here the crack takes on somewhat the appearance of a horizontal cave passage. Westward it pinches after about 15 meters, but it continues east about 40 meters as a 2-to-4-meter-wide scramble over breakdown ranging in size from large boulders to pea-sized gravel. At the end of the passage, a 5-meter climb accessed 15 meters of horizontal passage ending in a breakdown wall. The lowest point found is a small breakdown alcove at –143 meters, under the bottom of the 18-meter pitch. At another spot near the bottom of this pitch it was possible to see down into a narrow crack along the north wall that appeared to be floored with gravel at the same depth as the alcove.

Grieta de la Perdición, Nuevo León

La Perdición es una fisura tectónica de 143 metros de profundidad, con algunas señales de modificación por solución y colada en las paredes. Tiene una gran cantidad de roca peligrosamente suelta. La Cueva del Tarillal está cerca, es una cueva pequeña y bien decorada.

Chris Sobin in Cueva del Tarillal. *Ed Goff.*

SÓTANO DE CAMINO DE LOS PINOS

Mark Minton

In the early days of our work at Sótano de Caracol and in the Tinajas Valley, in the eighties, William Russell had noted a series of three closed sinks shown on the Casas Reales topo map (F14A18) at 2700 meters elevation, south-southwest of the settlement of Leñadero. These remained an enticing lead for many years, until finally, over Thanksgiving 1997, Nancy Weaver and I decided to drive across the newly completed transsierra road from east to west, emerging at Zaragoza, the first caver traverse, as far as we know. We checked out Leñadero on the way. To our surprise and delight, the side road continued past Leñadero and climbed all the way to the top of the mountain, delivering us to a beautiful alpine meadow on the edge of the first sink. After a very cold night (19° F), we checked the area around the meadow briefly, finding a few small pits and the first sink to be flat-bottomed with no leads. A forest fire had apparently recently burned large areas of the mountaintop, and we surmised that the old road had been reopened in the course of fighting the fire. The area was uninhabited, but there was livestock, and we found the remains of two very old sawmills. Time constraints prevented further reconnaissance, but the area looked promising. Unbeknownst to us at the time, a couple of earlier recces had also been made around Leñadero, but nothing significant was found.

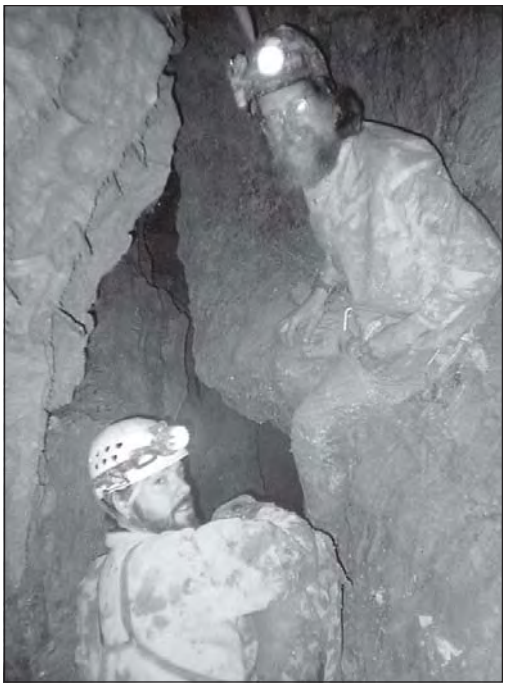
Reprinted from *Death Coral Caver* 12, October 2002.

Again the lead sat idle, until January 2002. After a week of relatively fruitless checking for caves north, east, and west of Infiernillo in hopes of bypassing the main sump, our group was ready for a change, especially with clouds rolling in and temperatures dropping. Mike Frazier, Randy Macan, R. D. Milhollin, Mark Minton (and his white shepherd Luz), Karen Olson, Monte Paulsen, Brian Pease, Pete Penczer, and Bill Stone and his son Rob composed the team. We drove all day through alternating thick fog and clear blue sky, depending on elevation. From Infiernillo camp around 1000 meters elevation we climbed to over 1850 meters above Caballos, then plunged down into Arroyo Luna, dropping back to 1400 meters. From then on it was all uphill, arriving back at 1850 meters at the turnoff to Leñadero. The side road seemed in much worse condition than it had five years earlier. Halfway up the final mountain we hit a literal log jam—forty *trozas* laid out across the road, apparently salvaged from the burned area higher up, but seemingly abandoned in the road for quite some time, based on the debris that had built up around them. Although it would've been easier to pitch them over the side, with considerable effort we carefully stood them on end, leaning against the uphill berm so they could be easily retrieved should the loggers return. By late afternoon, after a bit of route finding and clearing of fallen trees (love that chain saw), we arrived at the same spectacular campsite in a llano at over 2700 meters elevation, a mile higher than where we started. Again the temperatures fell way below freezing at night, but the days were beautiful. For several days we saw the lower elevations completely socked in, with only the top of El Viejo sticking up above the clouds, while we remained blissfully in the clear.

The group at Pinos in April. From left, Yvonne Droms, Bill Stone, Bart Hogan, and Mark Minton. *Yvonne Droms.*

We divided into three or more groups each day and fanned out across the area. The sinks were checked first, but all were filled and not cavey-looking. Monte and Karen followed the sinkhole valley for 3 kilometers down to where it began descending steeply, becoming the headwaters of Arroyo Luna, but again it wasn't very cavey. The eastern ridges yielded a few karst cracks and shallow pits, but nothing went far. Up-valley north and to the west looked better, with some large wooded sinks, but again only shallow pits were found. At the end of the first day Pete, RD, and I crested the highest ridge and made radio contact with the Stones, who were slightly to the south of us on the same ridge. We rendezvoused and began descending on a very old road in a remnant of pine forest that had been spared by the fire. Almost immediately RD spied an entrance just above the road, and we hurried over to drop rocks. It sounded deep, and looked like a real cave rather than just a crack. A 25-meter drop down a flowstone-covered wall led to a large, steeply sloping room with a narrow fissure at the bottom leading to a pool with stream gravel. This looked worth checking further, so we gladly left the ropes and hurried back to camp with the news.

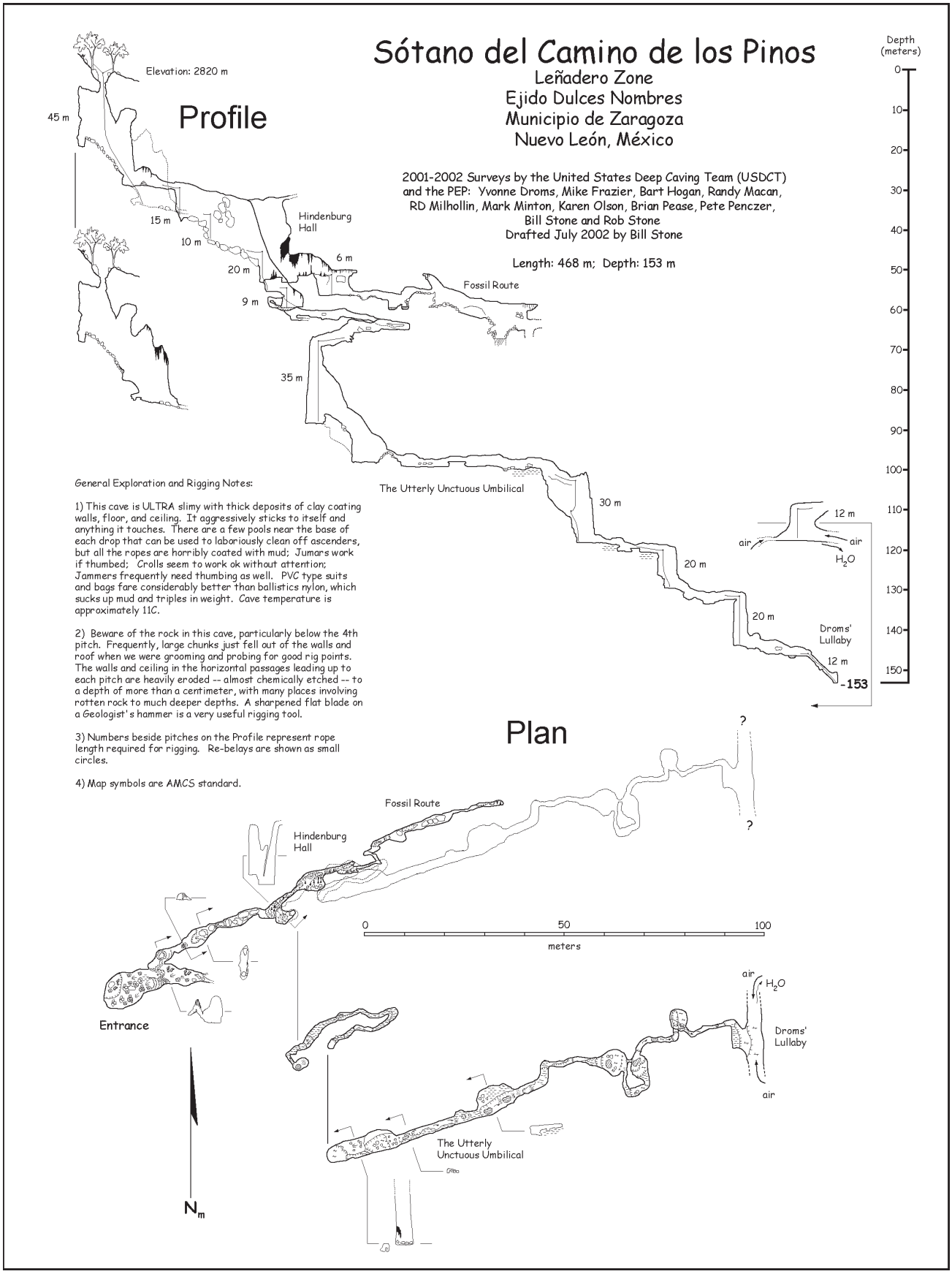
The next day four people checked the new cave, while others continued searching the hills. The Stones and I found by far the deepest pit in the area so far, a 70-meter blind drop we called Sótano del Madroño. The bottom contained a lot of organic matter and a rich fauna, including salamanders, crickets, spiders, amblypygids, isopods, flatworms, rhadine beetles, termites, flies, and mosquitoes. Nothing else significant was found. RD's cave, dubbed Sótano del Camino de los Pinos, at first appeared to pinch out at the bottom of the fissure off the entrance room, but upon backtracking up the slope, Brian discovered a side canyon with airflow hidden behind formations. It led down short drops and climbs to a larger, decorated area that looked more promising. Brian, Monte, Pete, and RD carried the survey down this route to a well-decorated room. Since some people had wanted to leave that camp to tour some of the larger known systems in the Purificación area, the team left the cave at 6 P.M. and called back to camp on their radio to see if the rest of the group might now favor staying. Upon hearing of going passage with air, most elected to stick around for the last couple of days, although, after another very cold and frosty night, Brian, Monte, and I had to leave early. It took us six hours to drive the 30 miles to the base of the mountains. That's pretty remote!



Brad and Mark getting muddy in Pinos. *Yvonne Droms.*

Meanwhile the seven remaining cavers formed two teams to push and survey in Pinos. Unfortunately, the cave ended in a flowstone choke only 10 meters beyond the previous end of exploration. Shades of Ghar Parau! Everyone scrambled high and low looking for a continuation. Bill Stone had his spent carbide stored in a waterproof PVC-coated pack, and when he opened it to get a high-powered flashlight, BOOM. The spectacular blast sent a shimmering blue light around the room and blew Bill's shirt to tatters, in addition to scorching his face. Pete gave Bill his water, then climbed down into a large pothole to get more. Brian had said this hole didn't go, but Pete saw a low, wet belly crawl and decided to check it out anyway. He felt responsible for extending their stay on the mountain, and really wanted to make it worthwhile. It immediately opened up into a very muddy descending crawl and stoopway. After 50 meters he came to a deep drop. The others were heading out with Bill and Karen, who had slipped and cut her arm, when Pete returned with his news and a huge grin. They derigged, leaving the usual last-day good lead.

Brown crystals at the beginning of the new exploration during the April trip. *Yvonne Droms.*

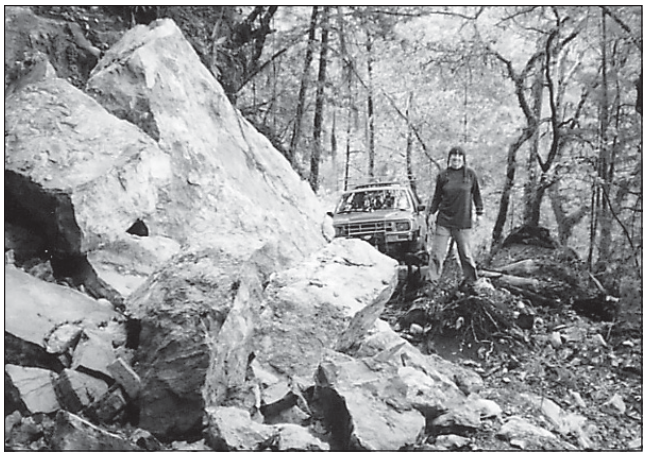

Sótano del Camino de los Pinos
Leñadero Zone
Ejido Dulces Nombres
Municipio de Zaragoza
Nuevo León, México
2001-2002 Surveys by the United States Deep Caving Team (USDCT)
and the PEP: Yvonne Droms, Mike Frazier, Bart Hogan, Randy Macan,
RD Milhollin, Mark Minton, Karen Olson, Brian Pease, Pete Penczer,
Bill Stone and Rob Stone
Drafted July 2002 by Bill Stone
Length: 468 m; Depth: 153 m
Profile
Elevation: 2820 m
45 m
15 m
10 m
20 m
9 m
Hindenburg Hall
6 m
Fossil Route
35 m
The Utterly Unctuous Umbilical
30 m
20 m
20 m
12 m
air
air
H_2O
Droms' Lullaby
12 m
-153
Depth (meters)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
General Exploration and Rigging Notes:
1) This cave is ULTRA slimy with thick deposits of clay coating walls, floor, and ceiling. It aggressively sticks to itself and anything it touches. There are a few pools near the base of each drop that can be used to laboriously clean off ascenders, but all the ropes are horribly coated with mud; Jumars work if thumbed; Crolls seem to work ok without attention; Jammers frequently need thumbing as well. PVC type suits and bags fare considerably better than ballistics nylon, which sucks up mud and triples in weight. Cave temperature is approximately 11C.
2) Beware of the rock in this cave, particularly below the 4th pitch. Frequently, large chunks just fell out of the walls and roof when we were grooming and probing for good rig points. The walls and ceiling in the horizontal passages leading up to each pitch are heavily eroded -- almost chemically etched -- to a depth of more than a centimeter, with many places involving rotten rock to much deeper depths. A sharpened flat blade on a Geologist's hammer is a very useful rigging tool.
3) Numbers beside pitches on the Profile represent rope length required for rigging. Re-belays are shown as small circles.
4) Map symbols are AMCS standard.
Plan
?
?
Fossil Route
Hindenburg Hall
0
50
100
meters
air
H_2O
Droms' Lullaby
air
Entrance
The Utterly Unctuous Umbilical
N_m

Around the campfire that night, Pete and Mike began taunting each other about the lead, and Pete noted that they weren't actually leaving until morning. Mike called his bluff, and before they knew it they were packing their bags and selecting ropes for a midnight push. Bill said he'd give them until 5 A.M. before calling out the cavalry. The two hiked back up to Pinos in the subfreezing darkness and quickly rigged back down to the lead. Pete's pit turned out to be a nice, free 26-meter drop that belled out at the bottom. A breakdown collapse soon required crawling over slabs, getting them totally muddy. Another 50 meters of walking passage brought them to a slot and another drop of 20 meters. At the bottom Mike cut the tail off their last rope. Only a short distance farther, another pit consumed this last piece of rope in a 15-meter drop. In only 15 more meters, they had to stop at yet another drop, their seventh, estimated at 15 meters deep. The cave was dropping fast, but was also very muddy in between drops. Tired but elated at having a going lead, the intrepid pair derigged the longer ropes and staged the shorter ones, returning to camp just before 5 A.M., right on schedule. They even managed to get a couple of hours of sleep before breaking camp and heading down the mountain for home. Although they didn't survey, they estimated the cave to be 150 to 200 meters deep. Not bad, and considering the elevation the potential looked great.

A return trip came in April, after a push in Caracol crapped out in yet another hideously narrow slot at –300 meters. Most of the team left for the States, but Yvonne Droms, Bart Hogan, Bill Stone, and I decided to give Pinos another look and to survey the previous scoop. To our surprise the logs we had stood up beside the road in January were gone, and the beautiful llano we had camped in was fenced off. Nevertheless there was still no sign of anyone living up on the mountain above Leñadero. This time we drove all the way up to the cave on the old ridge road, camping in a nice pine-oak grove only a stone's throw from the entrance. There are some interesting old ruins on the road at this point, a half-buried circle of flat stones maybe a meter and a half in diameter and a couple of trenches partially lined with rocks. We have no idea what these obviously manmade features were, but they bear no obvious connection with the cave. The weather was considerably milder in spring than it had been in winter. A hummingbird was active in the entrance, and buzzed us periodically as we got on and off rope.

We rigged the entrance with a redirection to get a better hang, and also rerigged most of the known drops in the cave with rebelays to make them safer. Even so there were several incidents of rockfall that were a bit too close for comfort. The rock is very corroded and not to be trusted without vigorous pounding. Airflow was only moderate in the upper part of the cave down to Hindenburg Hall, where Bill's explosion had occurred, but steadily picked up as we got deeper. We were soon very aware of the ubiquitous mud, which made doing anything an ordeal. We installed approach lines at the tops of several of the drops to add to the safety of getting on and off rope while slipping and sliding. At the bottom of Pete and Mike's last drop there were some unusual hexagonal calcite crystals up to 10 centimeters long growing out of a ledge. The drop that had stopped Pete and Mike was 20 meters deep, with a less muddy, but narrow bit of passage at the bottom. At the next corner the entire cave became inclined at a steep angle and mostly too narrow to fit through. At the widest spot we rigged our last rope, and only Yvonne slithered down the awkward 12-meter slot. The airflow had picked up dramatically by this point. At the bottom the passage split, with both directions carrying air and getting too narrow to negotiate easily. We decided to call it a night and began surveying out. The mud made it interesting trying to keep the book clean and instruments and tape readable. Fortunately there were a few small pools of water to wash things off periodically. Yvonne made several trips back and forth, moving our packs ahead while the other three of us surveyed. This shuttle service made it much easier for us to move quickly and keep our hands a bit cleaner. Climbing the drops was a real ordeal, as every piece of gear had become a ball of mud. Cams required thumbing in order to hold, and didn't always, even then. Finally we tied into the old survey at Hindenburg Hall and headed out. It had rained during the night,

Bill Stone views a lacy remnant of a flowstone floor. *Yvonne Droms.*



Many adventures were had on the way out of the mountains in April. See Yvonne Droms's article in the August 2002 *NSS News.*
Mark Minton, Yvonne Droms.

probably when we had noticed the increased airflow, but by the time we emerged just before dawn, it was clear and beautiful. We got cleaned up and ate a little while watching the sunrise, before crashing after a very satisfying seventeen-hour trip.

Sótano del Camino de los Pinos turned out to be only 153 meters deep, including our new finds, a bit less than originally estimated. The cave is somewhat of an enigma, with its entrance nearly on top of the ridge and no catchment to speak of. There are no arroyos leading to it, and no sink at the entrance. Nevertheless, there is flowstone lining one wall of the entrance drop almost all the way down. It seems like the current entrance is part of an older system formed in land that was much higher and has subsequently been eroded away. The passage is heading east-northeast, and currently ends at about the same elevation as the sinkhole-valley floor, and it should be just emerging from under the ridge. It will be interesting to see which direction the cave goes from here. If it drains to Arroyo Luna several kilometers away, the depth potential could be in excess of 1000 meters. With the entrance at over 2800 meters elevation, it must be one of the highest going leads in the entire Purificación area. You can bet we'll be back.

Sótano del Camino de los Pinos

Esta cueva en el área de Purificación de Nuevo León fue descubierta en enero del 2002 y topografiada entonces y durante un segundo viaje en abril. La elevación de la entrada es mayor a 2800 metros. Aparentemente es una cueva vieja, al encontrarse la entrada en una cresta, sin nada que drene hacia ella. Los pasajes son muy lodosos.

AN ADVENTURE IN OAXACA

Ernie Garza

The Cerro Rabón, a high limestone karst area east of Huautla, Oaxaca, had long been noticed by cavers. There had been several attempts to venture into its mysterious interior, but cavers had been thwarted by the unfriendly local Mazatecs. Caving in the region was concentrated in the San Agustín area instead, yielding some of the deepest caves in the world. In 1984, several of us made a flight over the Cerro Rabón in a chartered small plane, and the promise it disclosed led to several caving expeditions to the plateau. The deepest cave found so far, Kijahe Xontjoa, is over 1200 meters deep.

Several years ago, while living in Los Angeles, I received a call from a Swiss archaeologist, who asked if I could go shoot photos of their sites in the Cerro Rabón. I jumped at the chance to go caving and get paid for it, as their studies would take them into numerous caves with ancient burials in them. As a bonus, I could attend the annual Texas Old Timers caver reunion in central Texas on the way home. First I flew to Austin for a friend's wedding, and then I went on to Oaxaca, where I was met by Roman Hapka, Fabiene Rouvinez, and their assistant. The next day found us winding our way through the dry cactus desert of the central valley of Mexico. From Teotitlán, the road rises sharply into the Sierra Mazateca, for a two-and-a-half-hour drive on a road now paved all the way to Huautla. In the old days, the unpaved road was deeply rutted and had countless potholes, and, higher up, got much wetter and muddier. There were places where vehicles would slither around in the mud, threatening to careen off the precipitous road.

Huautla is a fabled city, mainly because of its association with the magic-mushroom ceremonies that are part of the Mazatec culture. San Agustín is not far away, but we took a dubious-looking bus to San José Tenango, the end of the road and the trail-head for San Martín Caballero, where the field house for the caving expeditions in the Cerro Rabón is located. We bought some food, arranged for mules to carry our gear, and then started on the five-and-a-half-hour hike to San Martín through mountainous, forested terrain. The next few days flew by very fast for me. Every day there was something interesting to photograph, from beautiful ceramics, some whole, to human bones. The area we canvassed is six to seven thousand feet in elevation, and the prevailing moist winds from the Gulf of Mexico deposit a great amount of rain. There are immense trees completely covered with secondary growth, and, aside from a few main trails, the locals do not venture deep into the forest. It is the very essence of a virgin cloud forest.

The day came when I had to say my goodbyes, and early one morning I started hiking to Tenango, giving myself plenty of time for the 2 P.M. bus to Huautla, where one can catch a direct line to Mexico City. I arrived in town, after more than five hours, very tired and ready to get on down the line. To my dismay, I discovered that there was no bus to Huautla that day, so I went around asking if anyone else was going there, but to no avail. I purchased a pen from a small *tienda* so I could at least write about my misadventures.

Anselmo is one of the first people I had met in San Martín when we did a recon into the area in 1985. He is a Mazatec and speaks his native language, but he also speaks and writes fluent Spanish. He has households in San Martín and in Tenango and supports two wives. There was nothing to do but go to his house and wait, but time was slipping away. Luckily, before long a people's truck showed up, headed for Huautla. This is an ordinary pickup truck that has been equipped to carry passengers crowded in the back. I dumped my gear in the back and quickly climbed on, and we were on our way. The open back afforded a tremendous view of the steep, jungle-covered mountains. In a few flat places, small thatched huts with smoke billowing out of them could be seen. They reminded me of similar places I had seen in Papua New Guinea. As we approached San Agustín, the shadows were already long, and I felt for my wallet in my back pocket. To my horror, it was not there. I tore at my packs and checked everything twice, but my wallet was not to be found. I had but a few coins in my pocket, not even enough to pay the driver, so I let him hold my Swiss Army knife until I could pay him. I never saw him again. There was nothing to do but seek out a friend

who would loan me enough to stay at the local flophouse. There was no chance of getting back to Tenango that night, but I figured that my wallet had been left on the counter of the *tienda*. All I had to do was get back there and retrieve it, and I could still make it to Texas. Little did I know what was in store for me.

Early the next morning found me trying to find a bus or truck going to Tenango, but no one seemed to be going there. At last I found a truck going to San Andrés, a few miles down the road. Bouncing along the bumpy road, we came to a halt at the edge of town. There was no way to go any farther, as the road was filled with market-day stalls and a mass of humanity. San Andrés is located on a ridge between the San Agustín doline and a steep valley, and its only road runs through the center of town and was choked with market-day activities. With my bulky backpack, I walked several blocks, dodging people and, at the end, live animals that were for sale there. As luck would have it, there was a beer truck at that end of town, and the driver agreed to take me to Tenango. What I didn't realize was that we would be stopping to deliver beer at every little *tienda* and town along the way. Eventually we arrived in Tenango, and I rushed to the store where I would find my wallet. The store keeper had not seen it, although I was somewhat suspicious of that. My vision of Texas was dashed, and I went to Anselmo's to plan what to do to get home.

Anselmo's first response to my problem was to announce it on the town public address system. We went to the town square, where the official buildings stand, and he proceeded to blast out a long message in Mazatec, mentioning my name a few times. Now everyone in town knew I had lost my wallet, so we returned to his house to wait. Then he came up with a second idea. He knew a woman who had once helped a man find his lost money, and would I like to see this lady? I could not quite understand how this poor woman could possibly help me find my wallet, but I was a desperate man grasping at straws, so I agreed. He led me to the far end of town, where an unfamiliar trail led uphill for farther than I expected. Finally we came to a large concrete-block house with a corrugated metal roof. It had two doors and only a small window, a dirt floor, and sparse furnishings. On one wall were several framed pictures of Christian saints, but not much else decorated the walls. There was a bird perch hanging from the ceiling, and on it was a spectacular scarlet macaw. The lady was not home, but a young boy went to fetch her.

A very ordinary looking middle-aged woman arrived, and she set up three old metal folding chairs; Anselmo and I sat next to each other, while she set up her chair facing us. My friend told her the story, speaking in Mazatec, and I heard my name several times, each time being embarrassed by it all. The lady spoke for a length of time, with Anselmo asking me questions and relaying the answers to her. I was hoping they wouldn't notice my squirming in my chair.

All of a sudden, the woman changed her demeanor. She took on the appearance of falling into a deep trance, continuing to speak in her language. She continued like that for a long while, me not understanding a word. Occasionally, she would break out in Spanish, reciting a Christian prayer, then drop into Mazatec again. I lost all track of time as she continued like that, and then suddenly she stopped and was finished. She told Anselmo that someone had found my wallet by the side of the road and was debating what to do with it. With that, she left the room, leaving Anselmo and me looking at each other and wondering, what next? She reappeared carrying some newspapers and three long home-made candles, and without speaking went over to the wall where the pictures were mounted and took one down and brought it over to a small table. She carefully wrapped the framed picture and the candles in the newspaper, telling Anselmo that I was to burn a candle each night in front of what turned out to be a picture of San Antonio de Padua. We thanked her and then bounded down the trail toward Anselmo's house, the precious package tucked under my arm.

My plans to attend the event in Texas already ruined, I did not want to spend the night in Tenango, so I grabbed my pack and headed to San Martín once again. Night overtook me about an hour from the field house, and I had to stop and break out my carbide light. There are a few huts by the trail, and as I passed, the dogs went berserk, threatening to tear me up. The field house is basically a two-room structure made of limestone blocks and a metal roof. When I walked up, I could see that the door was closed, and light streamed from gaps in the structure. I could hear conversation inside. I stood there for a moment and then knocked. It got very quiet, and someone inside said, "Ah *merde.*" Roman asked in Spanish who it was, and I answered in my very poor French, "I am hungry. Do you have anything to eat?" Roman slowly opened the door and looked at me as if seeing a ghost, for he thought I'd be in Texas by then. They all wanted to know what had happened, and I told the story over a plate of spaghetti. At the point about the candles, I reached for my pack and pulled out the package, set up the picture, and lit a candle. In unison, all the cavers jumped up and scrambled for their cameras. Later, Roman said, "Glad you here. We put you to work."

Two days later, word came from Tenango that my wallet had been found, but no details. I stayed an additional day up on the plateau and then said my goodbyes again. After another five-hour trek, I went straight to Anselmo's house in Tenango, where he indeed did have my wallet, with all the money and cards still in it. Someone had found it along the road a couple of miles from Tenango, where it had fallen off as I rode toward Huautla, preoccupied by the scenery. In a couple of days I was safely back in L.A., thinking that the woman had made a lucky guess about my wallet and no doubt increased her status in the community, somewhat at my expense.

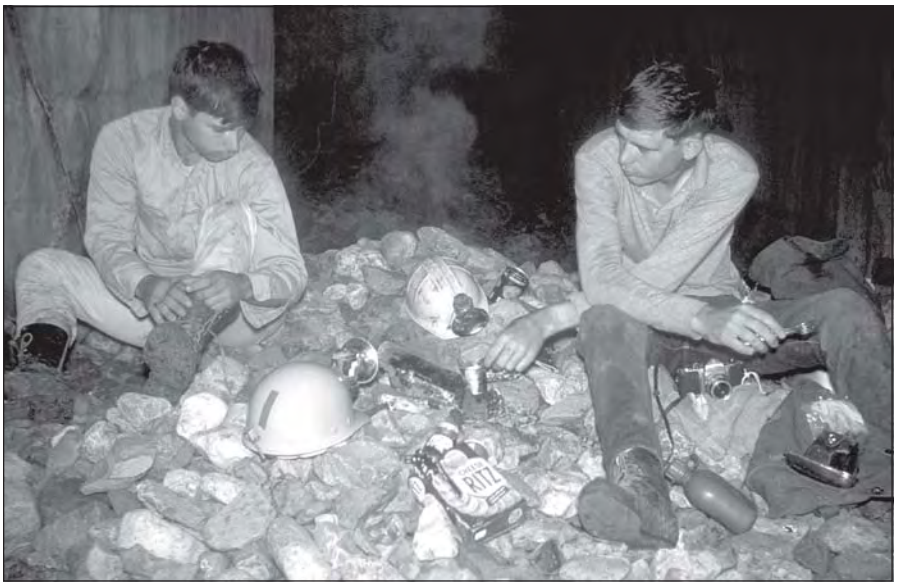
For several years I was convinced that that was the whole story. One day not long ago, it dawned on me that there was more to this than I had realized. Anselmo had done me a good turn, and without his help I would not have recovered my wallet. The woman was a powerful shaman, or medicine woman. She had invoked the native gods as well as the Christian one in a solemn ceremony, and anyone going against them was doomed to great hardship. Everyone in the community had heard about the ceremony, I'm sure, and whoever had found the wallet was powerless to do anything but return it. Perhaps a young person could resist, one who no longer followed the old ways. But it was found by an older man who knew what was necessary in view of the shaman's ceremony. It was their powerful belief system that resulting in my good fortune.

About four years ago, I had occasion to venture into the Cerro Rabón again, this time leading a botany student to study the flora in the area. After long anticipation, I met Anselmo at his store and finally asked him about the woman. He said she had indeed been a powerful healing woman, but that she had died some two years before. I explained to him my initial doubts and then my enlightenment, and I gave him my gratitude for having arranged my meeting with her.

Una Aventura en Oaxaca

Después de una salida al Cerro Rabón, Ernie Garza perdió su cartera en el camino entre Tenango y Huautla, en Oaxaca y la recuperó con la ayuda de una curandera local.

History



Camping underground in 1965: no freeze-dried for these two. John Fish, left, and David McKenzie in Sótano de la Joya de Salas, Tamaulipas. Photo by Orion Knox. This trip, the original exploration of a cave that became the second-deepest in Mexico at the time, is reported in the *Association for Mexican Cave Studies Newsletter,* vol. 1, no. 6, pp. 54–58.

CAVES OF TINUM, YUCATÁN

Fred Devos

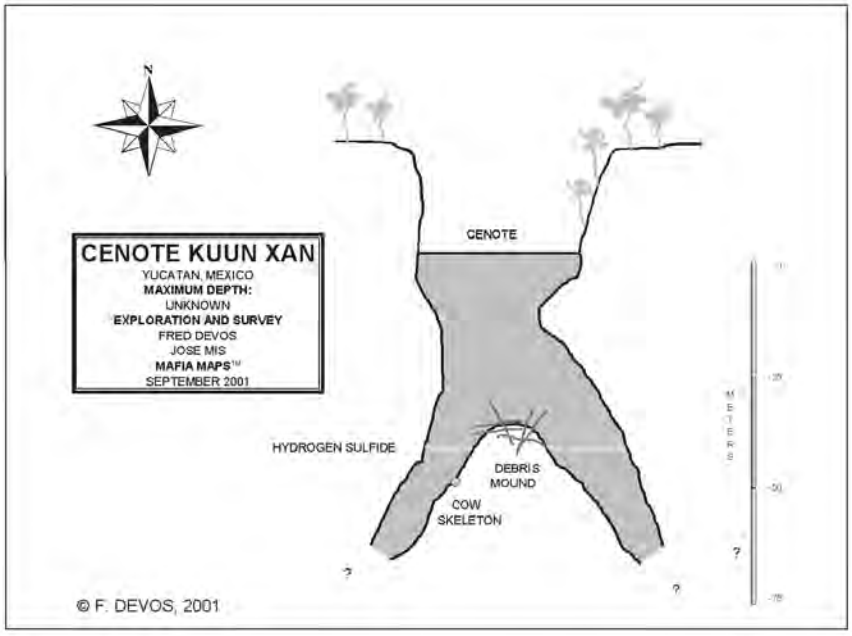
In late September 2001, I was invited to join José Mis in exploring cenotes and dry caves near his hometown of Tinum, Yucatán, located near the center of the Yucatan Peninsula. The first site we visited was Cenote Kuun Xan, a large cenote on the ranch of José's in-laws. An initial dive revealed a deep, cone-shaped sinkhole typical of the area. The visibility cleared at 9 meters depth. At –36 meters, a debris mound, including tree branches and the skeleton of a cow, poked up through a thin wisp of a sulfur layer. A trip with mixed gas will be needed to explore deeper.

Five years before, José's father-in-law had been shown the entrance to a dry cave, and now, with amazing memory, he led us through 5 kilometers of dense jungle to the exact location of the small opening in the jungle floor. Using a fallen tree, we shimmied down into the small hollow. Hundreds of bats streamed from two tunnels sloping down from the room. The eastern passage got wet, and our light revealed hundreds of white shrimp scurrying about the muddy bottom. The roar of a thousand bat wings echoed through the sculptured tunnel. We were able to walk another 30 meters before the waist-deep mud bogged us down.

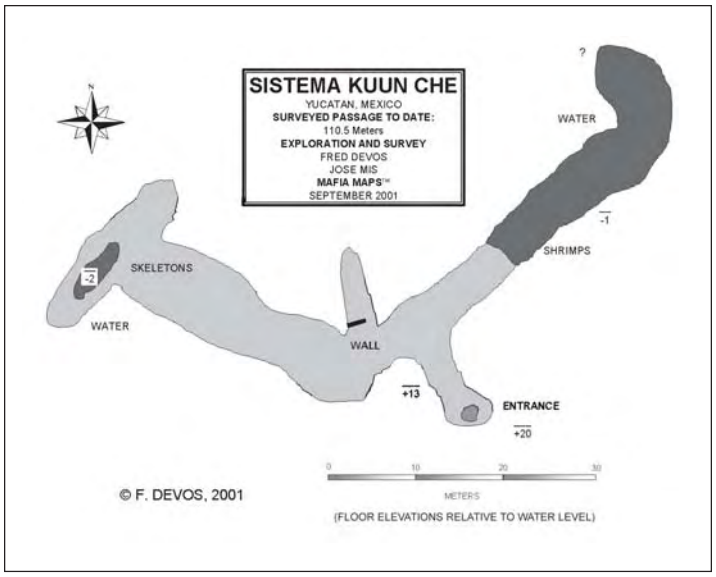
The western tunnel of Gruta Kuun Che led us past a small side room that had been deliberately sealed up with rocks and mud. The wall had recently been broken through, and holes in the floor hinted of looting.

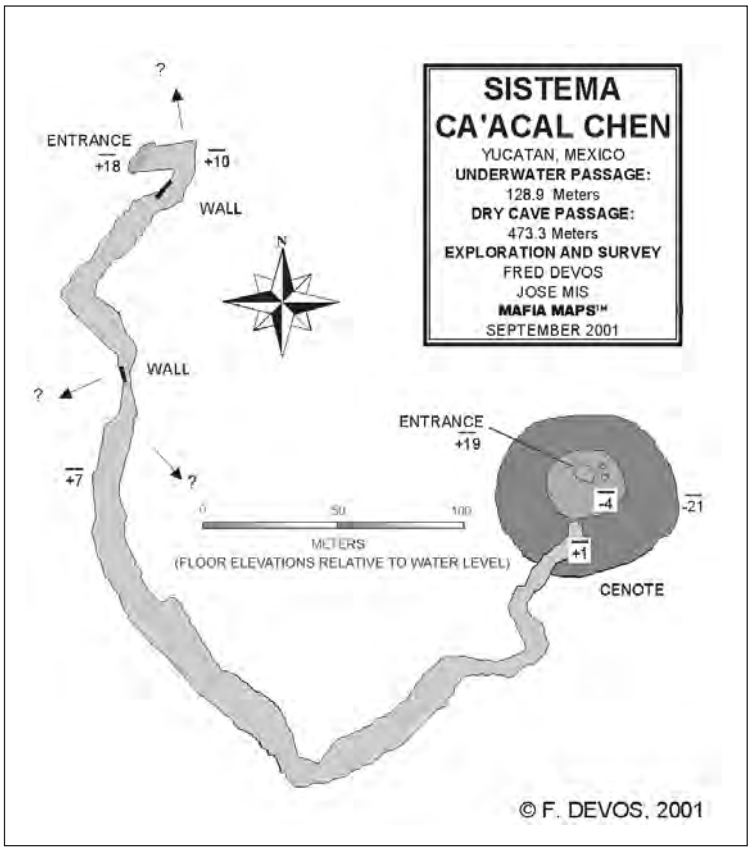
The passage ended in a clear pool. Being a diver at heart, I had brought a mask, and in jeans, boots, and helmet, I dove beneath the surface. In the distance, under a small overhang, my light revealed four human skeletons. Surfacing, I realized that I was not the only one out of breath. José was also gasping from the stale air. We hastily surveyed back to the entrance.

Later that afternoon, we visited a dry cave connected to a water-filled sinkhole, Sistema Ca'acal Chen. From a small hole in the jungle floor, a passage leads southwest. Snow-white stalactites hang from the ceiling of smooth, sculpted limestone. At two places we noted partially dismantled man-made walls similar to that seen in Kuun Che. After 400 meters, the phreatic tube narrows and seems to end, but the walls and ceiling suddenly disappear where the passage opens in the side wall of a giant dome room. From 18 meters above, shafts of light come through three small holes in the ceiling, and the floor is clear, blue water. Diving gear was lowered to us, and we measured a water depth of 21 meters and an underwater circumference of about 100 meters.



Se visitaron y topografiaron tres pequeñas cuevas cerca del poblado de Tinum, en la porción central de la península de Yucatán. Una de ellas conecta con un cenote.



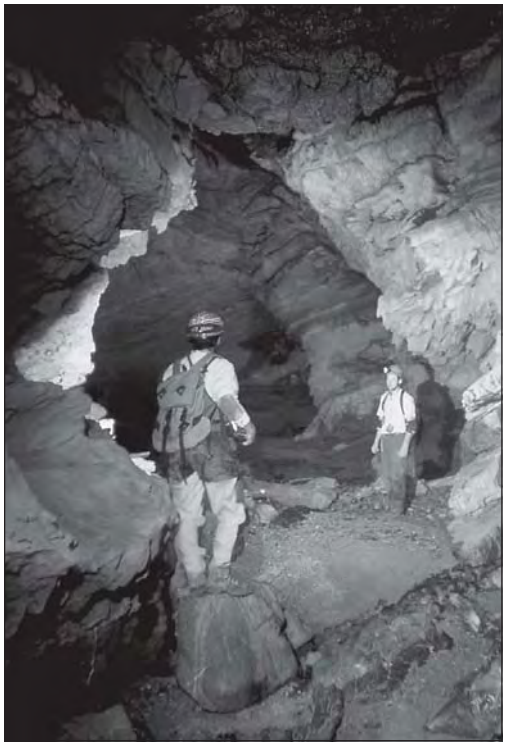


EXPLORATION DURING MEXPELEO 2002

Bev Shade, Peter Sprouse, and Chris Lloyd

Several large, promising sink holes are located on or adjacent to the grounds of Mexpeleo 2002, and two were mapped. Exploration of Cueva de Posada de la Paz No. 3 is described in detail below by Chris Lloyd, and Resumidero de Posada de la Paz No. 1 was surveyed to a boulder choke on 30 December. Guillaume Pelletier's map of No. 1 accompanies this article. Chris Lloyd reported that Resumidero de Posada de la Paz No. 2 is blocked by old pipes, so this stream sink was not surveyed.

Terri Whitfield and Aaron Miller in Resumidero de San Francisco. *Peter Sprouse.*



Convention participants also surveyed two caves in a large *dolina* approximately 4 kilometers south of the convention site. Several stream sinks in the *dolina* had been previously noted by Ramón Espinasa during a reconnaissance trip, but not explored. During Mexpeleo, one stream sink and one cave were explored and mapped by Grace Borengasser, Nick Johnson, Kelly Mathis, Christie Rogers, Bev Shade, and Jake Turin. The entire depression is covered by heavy, thorny brush, with abundant *mala mujer* nettle, biting ants, and ticks. The bugs were the source of the cave names. Care should be taken on any return trips to dress protectively against the bugs and plants.

A previously unknown cave there, Nacimiento Garrapata, is a pretty resurgence cave 73 meters long. Exploration was halted by an active spring in the back of the cave. During the dry season, water levels may get low enough for the sump to be passable. Water issuing from the cave was noticeably cooler than local surface water. This cave was mapped on 27 December by Nick Johnson, Christie Rogers, and Bev Shade.

One of the caves previously discovered by Ramón Espinasa was Resumidero de Hormigas A, a significant stream sink that is 138 meters long and 40 meters deep. This cave takes all the water from two surface streams that converge at the entrance. Although both streams were dry in December, there was flowing water in the bottom of the cave. The cave corkscrews down through old cemented breakdown to a 17-meter-deep pit. At the base of the pit, the cave goes upstream to a constriction and downstream to a sump. The upstream constriction did have significant airflow, but does not appear to open up. The downstream sump was murky, and no continuing underwater passage could be seen. Several leads remain at about 15 meters depth. The best lead is at the base of the first drop and trends southeast. The cave was mapped on 27 and 28 December by Grace Borengasser, Nick Johnson, Kelly Mathis, Christie Rogers, Bev Shade, and Jake Turin.—*Bev Shade*

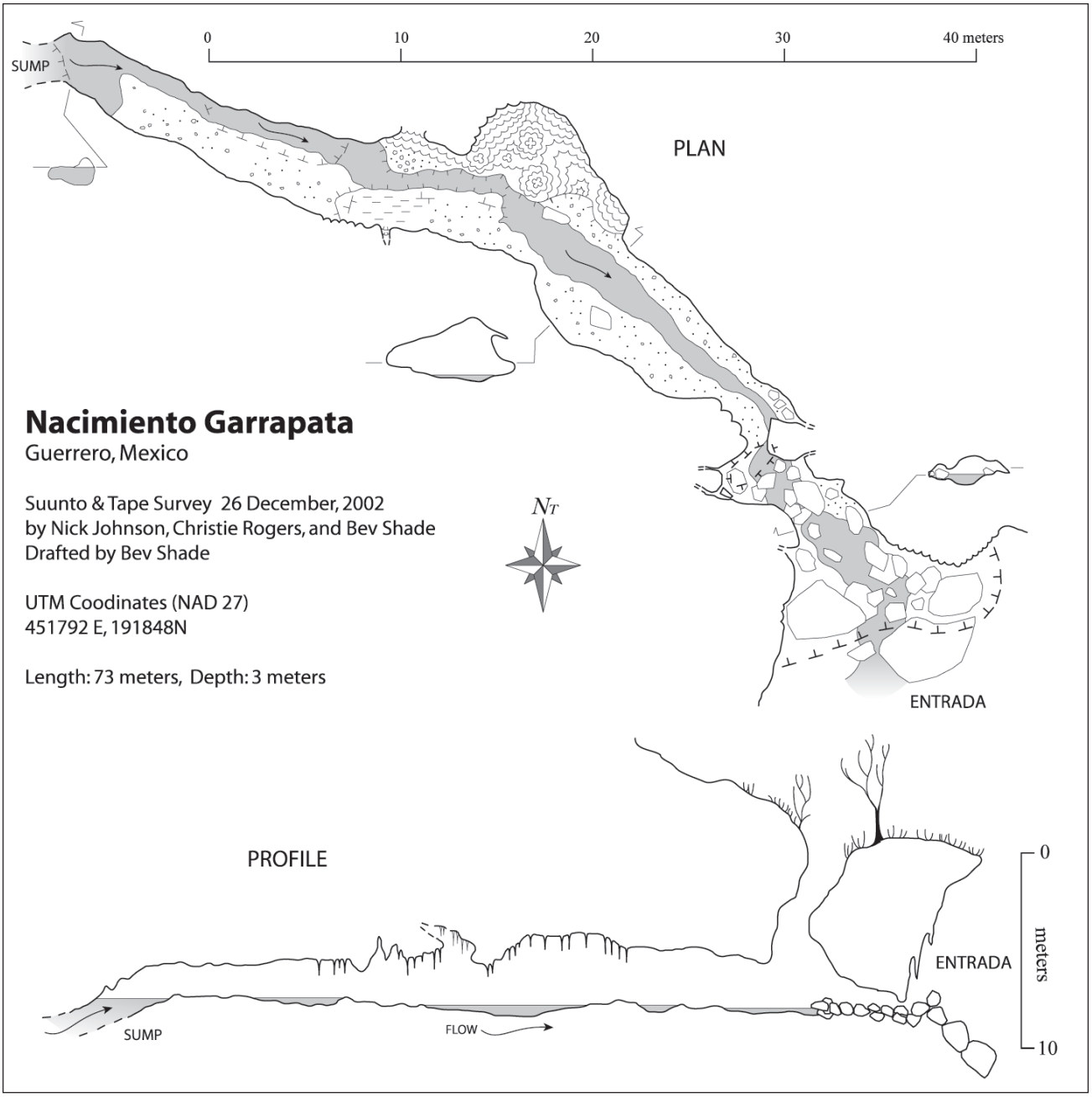
A large sink shown on the topo map near Ojo de Agua de San Francisco, 15 kilometers south of Mexpeleo, was checked out by Peter Sprouse, Andy Stough, Colin Strickland, Pete Strickland, and Terri Whitfield. They followed a logging road right to the edge of the 800-meter-long sink. A steep hike through oak forest got them to the flat bottom, where they followed a major drainage into an inviting cave entrance. Resumidero de San Francisco consists of nice walking passage to a large room, where the drainage enters a sandy belly crawl too tight for any of the team to pass. Just to the west they found another walk-in entrance that takes a smaller arroyo, which was named Cueva Jugo de Bichos, in reference to the many harvestmen present. A short distance from the entrance was a

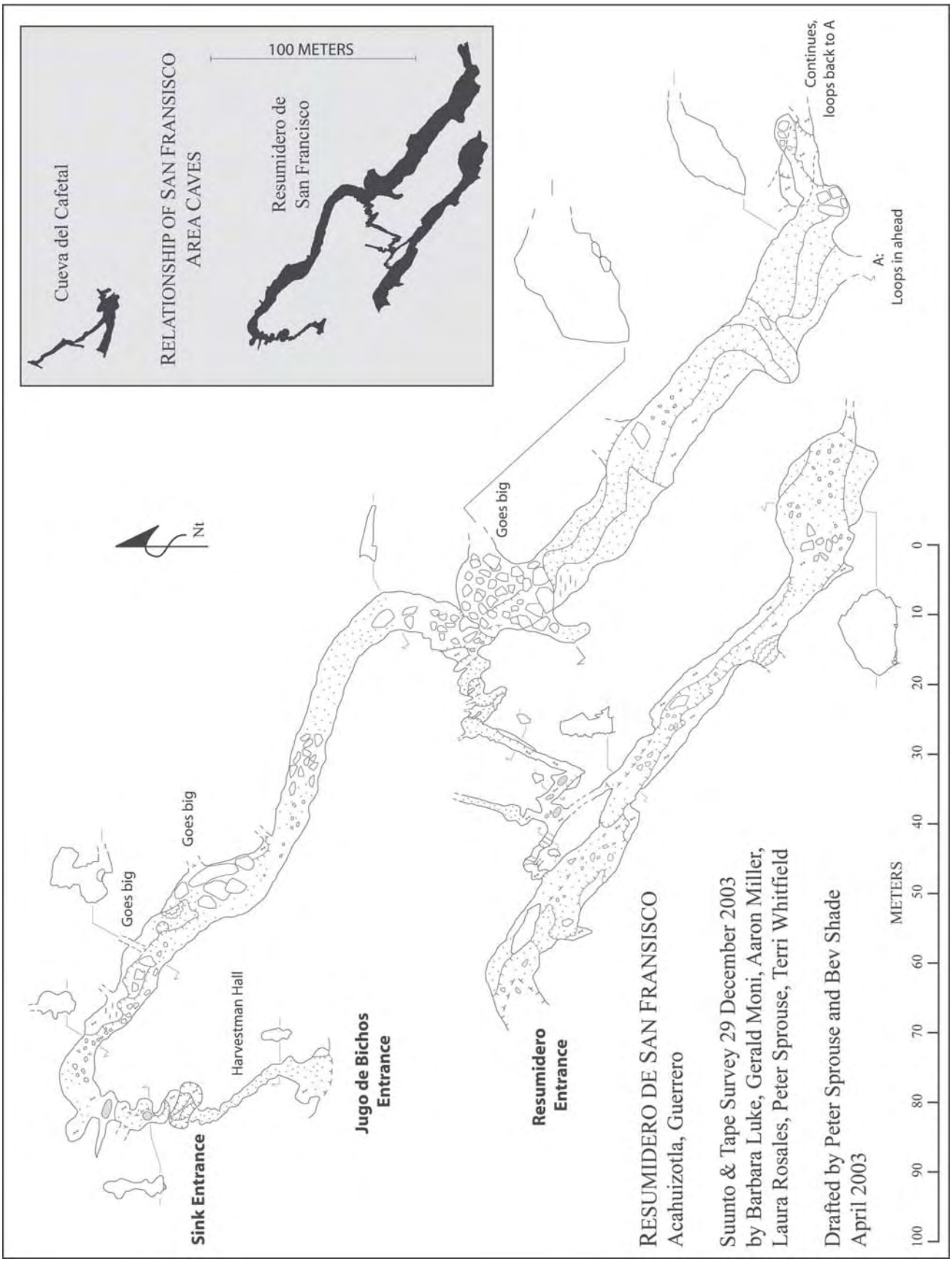
constriction full of harvestmen, illuminated by light from a second entrance just beyond. By circling overland, the second entrance was found in a sinkhole, and Peter explored it, following a winding canyon passage. Soon he could see light from a small third entrance up on a ledge, which Colin happened to be checking. Colin squeezed through and joined Peter in exploring the main passage. The passage shrank to a stoopway where they climbed up through some breakdown into a large chamber and the continuation of walking passage. They left the lead for a later visit and rejoined the others to continue recon.

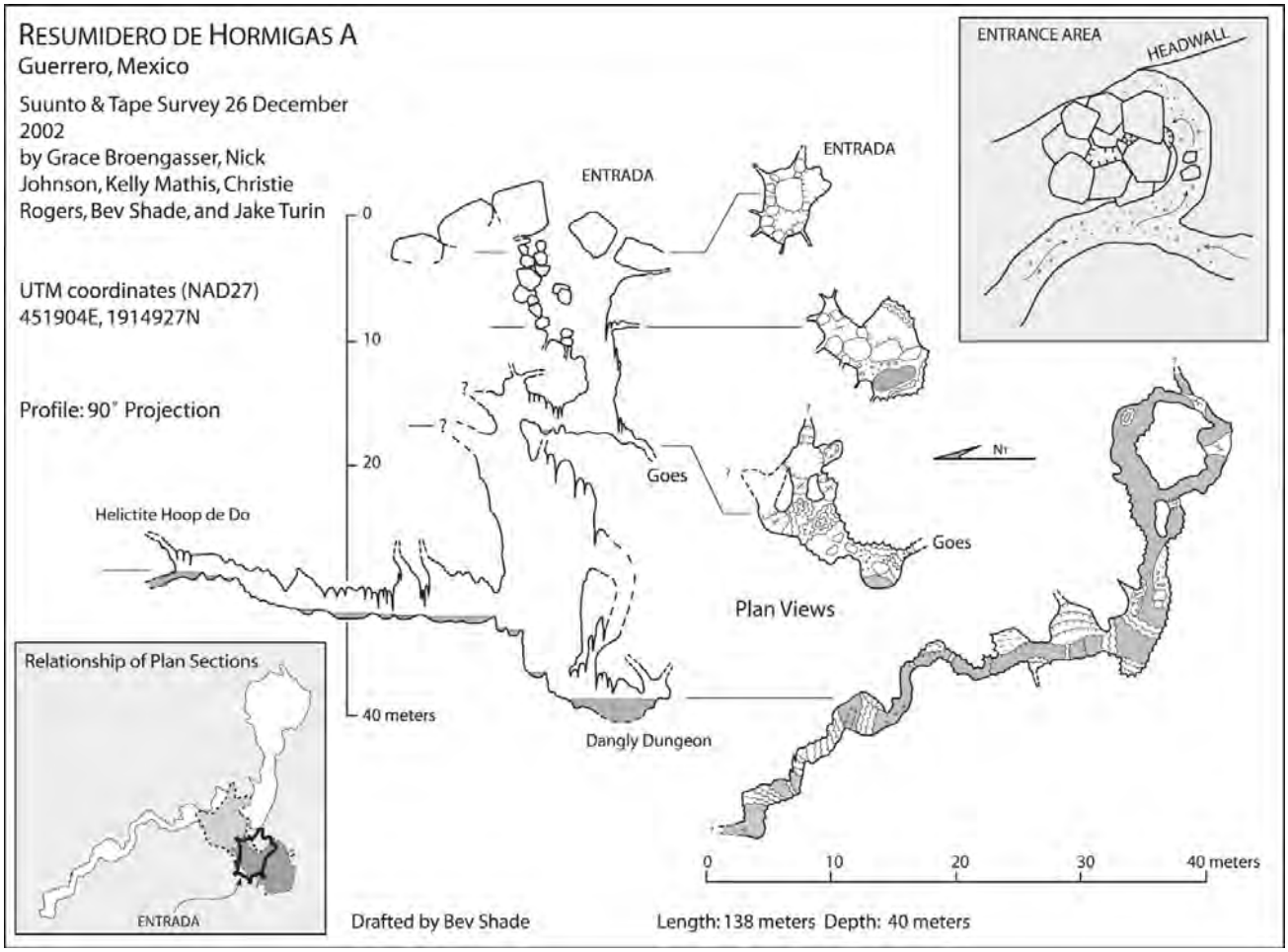
A somewhat smaller sink just to the west of the main one, really part of the same large *dolina,* contained another large entrance in a coffee grove. It went in about 20 meters and pinched, but a climbdown just inside the entrance was checked by Andy, who reported several passages going.

Peter and Terri returned on 29 December with Laura Rosales Lagarde, Barbara Luke, Aaron Miller, and Gerald Moni. Barbara, Laura, and Gerald began the survey of Jugo de Bichos, while the others mapped Resumidero de San Francisco. The San Francisco team found a crawlway two shots in that they pushed to the west, connecting into Jugo de Bichos at the base of the breakdown climb. The other team mapped beyond the previous limit of exploration in nice walking passage, and it continued with airflow beyond where they stopped. The total surveyed length of the joined caves was 425 meters at the end of the day.

After tying into the other team




RELATIONSHIP OF SAN FRANSISCO AREA CAVES
Cueva del Cafetal
Resumidero de San Francisco
100 METERS
Nt
Sink Entrance
Harvestman Hall
Goes big
Goes big
Goes big
Jugo de Bichos Entrance
Resumidero Entrance
Continues, loops back to A
A: Loops in ahead
RESUMIDERO DE SAN FRANSISCO
Acahuizotla, Guerrero
Suunto & Tape Survey 29 December 2003
by Barbara Luke, Gerald Moni, Aaron Miller,
Laura Rosales, Peter Sprouse, Terri Whitfield
Drafted by Peter Sprouse and Bev Shade
April 2003
METERS
0 10 20 30 40 50 60 70 80 90 100



and then finishing the known part of San Francisco, Aaron, Peter, and Terri went to the adjacent sink to map Cueva del Cafetal. Below the climbdown it continues both upstream and downstream, though the stream was dry. In the downstream direction it soon pinches at a stal choke with good airflow that wouldn't be too hard to open up. The lead appears to be heading toward Resumidero de San Francisco. The upstream passage leads to an ascending canyon passage that was abandoned with two going leads. To date, Cafetal has 104 meters of surveyed length. Both San Francisco and Cafetal are great leads. Hopefully, they will be explored and completely surveyed in the future. *—Peter Sprouse*

The Cueva Posada de la Paz No. 3 was first shown to cavers in the spring of 2002, when Ramón Espinasa and Vicente Loreto first explored three pitches, mainly through boulders, to the top of a narrow rift. On a return trip the rift was descended, and Vicente pushed on through some very tight passage to squeeze out into a borehole-size opening that was blowing air into the passage above. Lacking further rope and another caver, the lead was left until the 2002 Mexpeleo.

The cave is located in the bottom of a 100-meter-wide doline about 100 meters east of the road and the east end of the Posada de la Paz. Its name is due to its proximity to the ranch and the likelihood that it will connect to two pits that are within its grounds. Depending on how the irrigation ditches are set up, it is either dry or quite wet with a small stream. Conditions were quite wet when Chris Lloyd arrived with a team of four others during Mexpeleo to continue the exploration and begin the survey. Vicente returned to be our route-finder, probe, and dam engineer and brought along Victor Hugo from Guadalajara and Susana Salazar and Sergio Gómez from Spain.

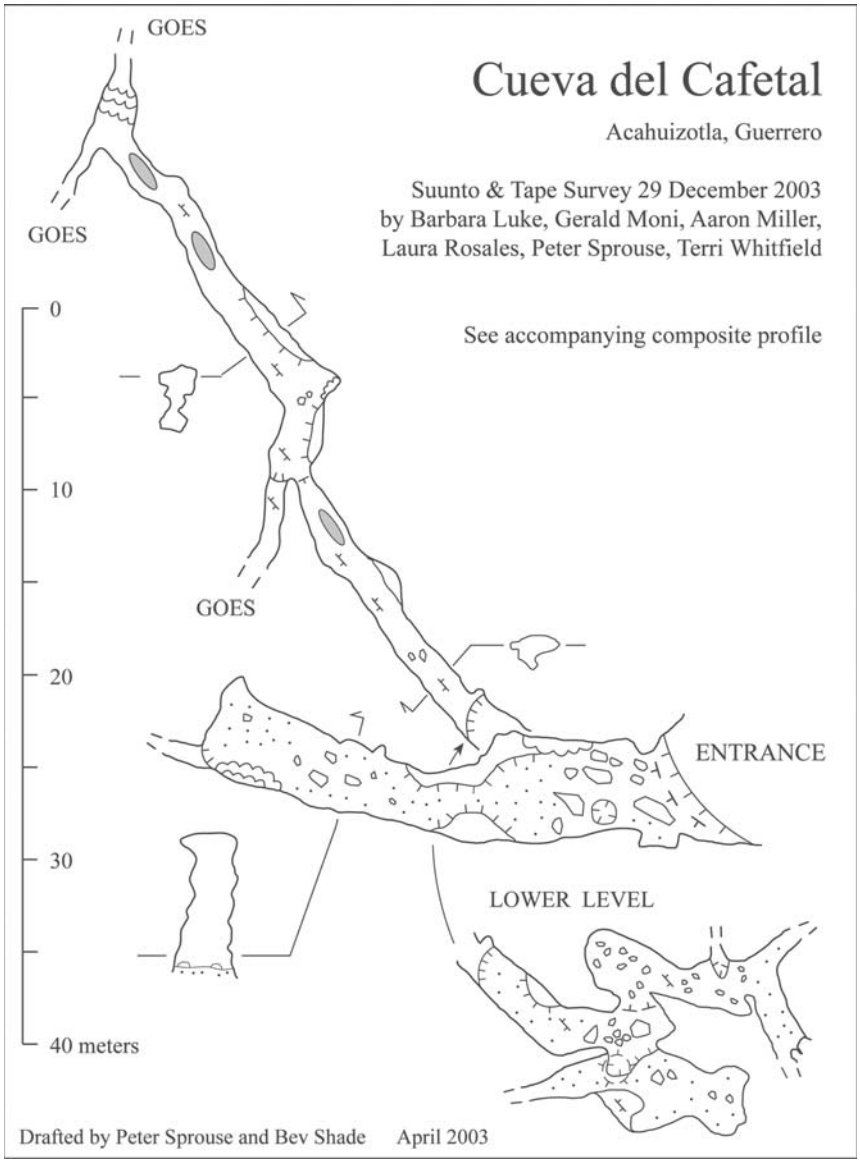
The first pitch is about 5 meters deep and lands in a small chamber some 5 meters across. When the waterfall is flowing, the drop can be done out of the water by rigging off a Y-hang. Various ways on appear, but all choke out in the boulders, except for a very obscure narrow hole back under the rope drop. This second drop can be rigged with the continuation of the entrance rope and drops a further 4 meters into another 5-meter-diameter chamber. A crawlway out of this chamber leads to a larger room that slopes down to the top of a 2-meter waterfall that can be downclimbed on the left side going in. Here one finally gets the impression that one wall is solid rock and not just a boulder pile.

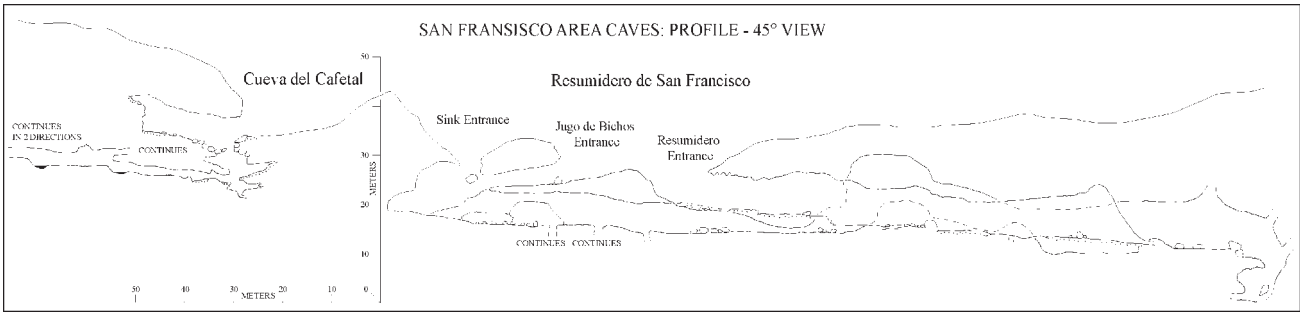
Back under the waterfall, another chamber slopes downward until one is forced against the wall next to a large rock. Squeezing down

through the opening brings one to the top of the next pitch, which was rigged off a bolt to give a drop just to the side of the falling water. This 6-meter pitch lands in a larger chamber that slopes down to another 4-meter pitch to the floor. Here a stream heads off horizontally before turning a corner through a curtain of water and disappearing beneath large boulders. After crawling over the boulders and around a corner, one comes to the head of the narrow rift.

The narrow rift is inclined and was rigged with a bolt low down, backed up around a thread overhead. After the initial 5 meters, one is squeezing down between walls that get closer and closer together. Once the floor is reached, there is an even narrower slot, partially blocked by boulders, down between the walls. By lowering yourself into the opening, you can stand with the walls touching you front and back. From that position it is possible to sit down, with difficulty, by moving your legs into the space below. Once sitting, you then follow your legs down into a slightly larger space by doing a roll-over maneuver. Here in the bigger space, you are then forced to either follow the water straight down the very narrow slot or traverse up and over into a parallel canyon. Both routes are quite tight and come together at the bottom, opening up into a low-ceilinged chamber. A narrow crawl out of this chamber was opened up a bit by Vicente and his hammer, and it leads to the Borehole Chamber, seen by Vicente on his earlier scouting trip.

From the balcony of this large chamber, a trickle of a waterfall could be seen coming out of the roof about 8 meters to the right, while a dry way on in front of us sloped down out of sight. After placing a bolt in the roof, Chris went down the 8-meter drop first, followed by Sergio. An initial check of the waterfall area showed the water to be dropping down a 10-meter pitch through big boulders in the floor, so the dry route was looked at next. After a series of small downclimbs, the floor then disappeared down another 10-meter pitch, but this was traversed around by Sergio after Chris chickened out. A short way ahead Sergio came to another opening between the boulders, and after dropping rocks we thought we were looking at a 20-to-30-meter-deep pit, for which we did not have enough rope. This seemed like a

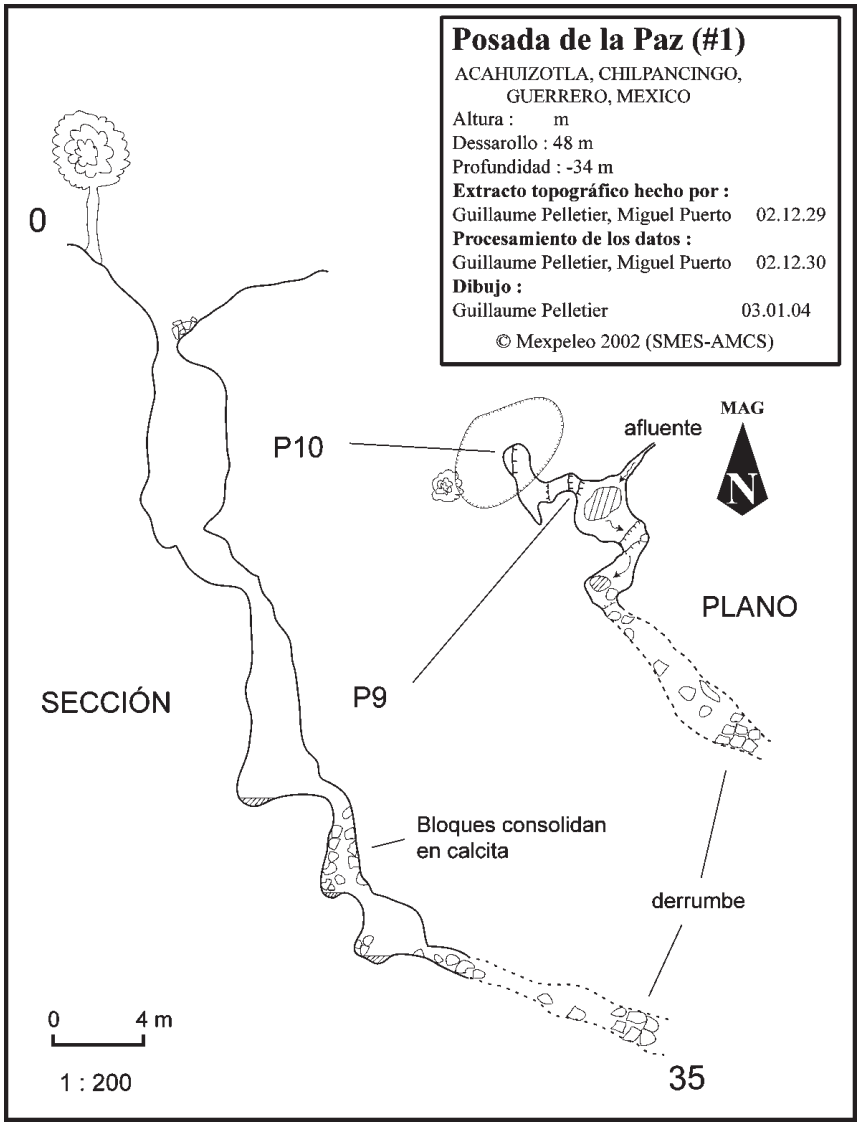


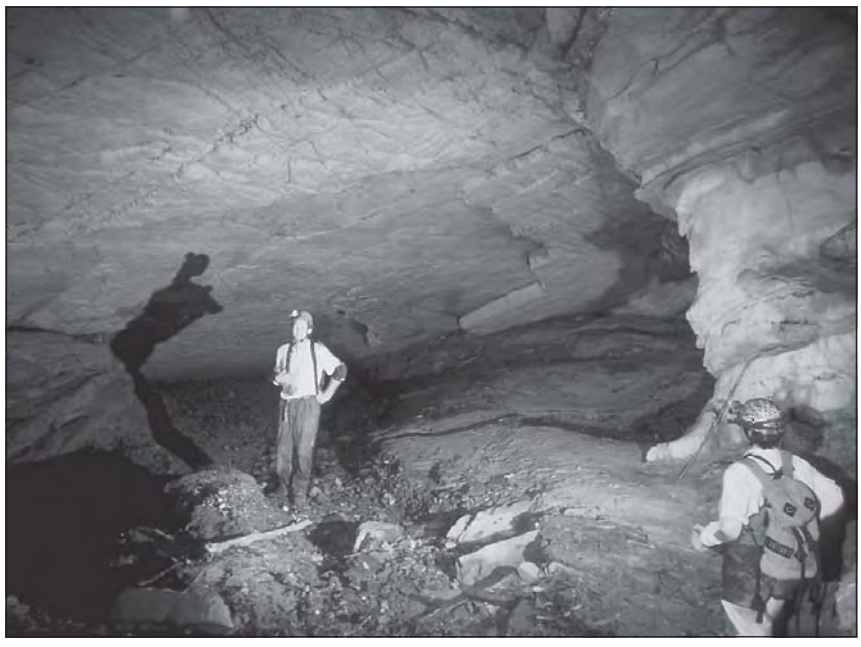


good time to turn back, and the survey was left to the next day in hopes that we could divert the water from the irrigation ditch some more. By the time we climbed out the entrance drop it was almost dry, so Vicente's earlier engineering there seemed to have worked.

The next day saw us back again, this time trading Vicente for Mario Escalante. We found that Vicente's engineering project had been de-engineered, leaving us in the water once again. On the way down, we changed the rigging in the narrow rift to a ladder and took that rope farther into the cave with us. Once in the Borehole Chamber, Sergio and Mario went ahead to start rigging the next drop, while Chris began the survey with Susana and Victor, following them down. We only surveyed the dry route, because what had been a small trickle of a waterfall the day before was now an impressive torrent of water soaking everything on the other side. Just as the survey crew had caught up to the rigging crew, they were off down the next pit. Each person oohed and aahed as he went down, but then after a silent period was heard to scream loudly. After three people all did the same thing, I finally figured out that they must have been swinging into the waterfall at that point. Sure enough, Susana then repeated the same yell, before I got my turn in the shower. The pitch did not turn out to be as deep as we had thought, but after hanging free for 10 meters, one had to swing into the full spray of the waterfall for the last 6 meters. The Spaniards were quite impressed by this, as they go to great lengths to avoid water back home, and thus I figured that this pitch should be named Welcome to Mexico.

At this point we were in a rift passage at least 15 meters tall and 4 to 5 meters wide, and the way on split into two branches. We took the right branch first and clambered down over big boulders past nice flowstone on the wall. After 40

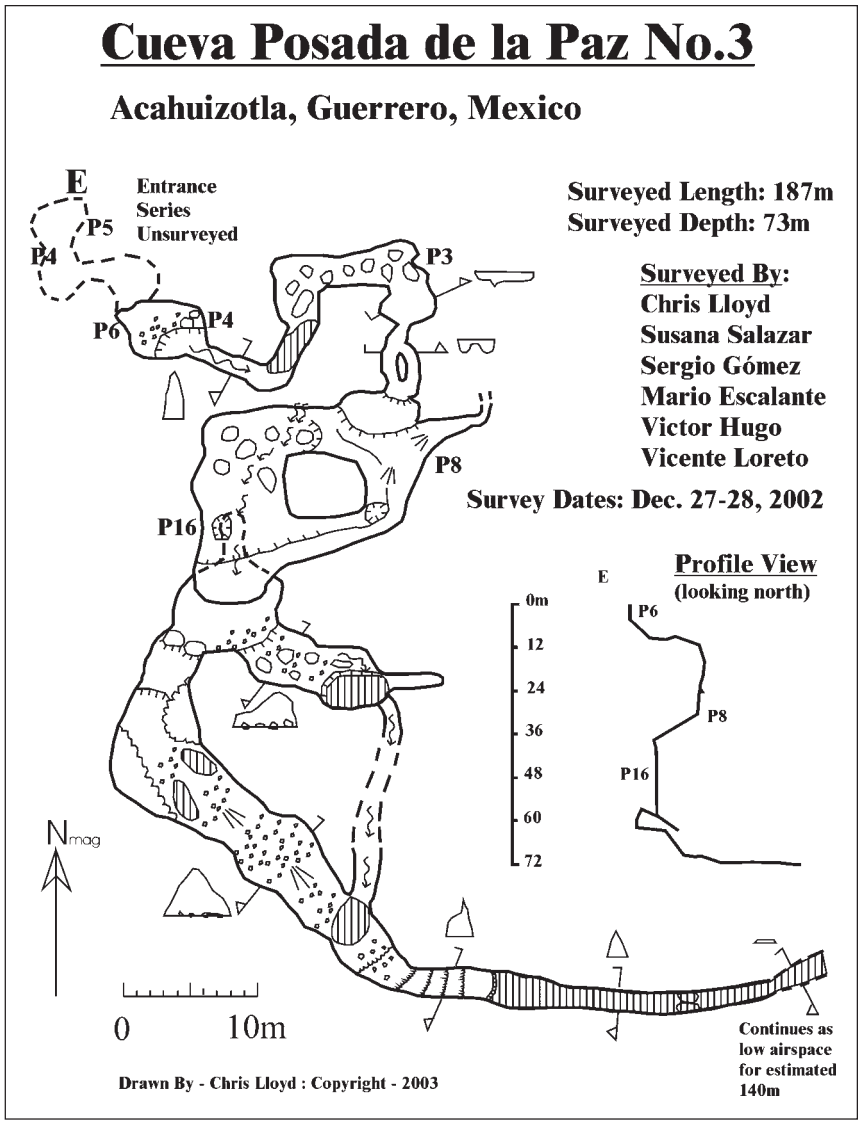




Terri Whitfield and Aaron Miller in Resumidero de San Francisco. *Peter Sprouse.*

meters, a pool was reached that had beautiful formations above, just begging to have their photo taken. A bit farther down, an inlet comes in from the left side, and once again we were following the flow of water. After a small cascade, we dropped into a lake passage with the ceiling height now down to 2 meters and the width also only 2 meters. Wading through the water, we progressed about 40 meters more before the ceiling came down almost to water level. Peering ahead, we could see low air space of about 20 centimeters for at least 6 meters and what looked to be more of the same on out of sight. Not wanting to get fully soaked before having to survey out, we declined to push this wet part, figuring someone else could be lured in from the crowds back at Villa de la Paz.

The survey back went well, with Mario getting the unenviable job of holding the station under the full force of the Welcome to Mexico waterfall. Fortunately it was all uphill from there, so we all stayed warm despite being wet. Before heading up the waterfall, though, Sergio and Mario checked out the other branch, which takes most of the water. It must join back into the main route where we saw the inlet, though they did not actually complete the traverse. We made it to the top of the 6-meter waterfall pitch before the density of drips became too much for keeping the survey book dry, so only a little bit needs to be finished in the entrance series.



As expected, I was able to get Jonathan Sims interested in pursuing the low-air-space section the next day. He went in with his nose near the ceiling for what he estimated to be 140 meters, before the roof came down even more and his nose was actually dragging against the ceiling. Not liking the black, yucky stuff that his nose was plowing through, he turned back, still feeling the breeze moving through the cave. It appears that this is a near sump that gets backed up by something on the low side and needs to be checked again in the peak of the dry season to see if the water level has gone down. Considering how nice some of the passage before that point is and how nice the nearby Acahuizotla is, it is definitely worth another look.—*Chris Lloyd*

Exploración de Cuevas en Mexpeleo

Durante Mexpeleo 2002 en Guerrero, varias cuevas fueron exploradas y topografiadas en los alrededores de la Posada de la Paz, lugar de la convención.

El Primer Congreso De Arqueología Subacuática Y Espeleológica

FIRST CONFERENCE ON UNDERWATER CAVE ARCHAEOLOGY

Dominique Rissolo and Guillermo de Anda Alaníz

In late spring of 2002, the Primer Congreso de Arqueología Subacuática y Espeleológica brought an international group of archaeologists and divers together to discuss the past, present, and future of cenote archaeology on the Yucatan Peninsula. The conference involved a series of presentations by noted scholars, followed by roundtable discussions. During this forum, cave divers and archaeologists were encouraged to share experiences and raise concerns. The conference had two main objectives: to initiate a constructive dialog between cave divers and archaeologists that will hopefully lead to future collaborative research efforts and improved communications with Mexican institutions, and to lay the groundwork for a protocol for recording and reporting archaeological deposits in underwater caves that will reflect the direct input of both cave divers and archaeologists.

The conference was an excellent opportunity for students and scholars to interact with representatives from several institutions, agencies, and organizations, as well as individuals from the professional diving community and the interested public. The conference hoped to formally recognize the invaluable role that cave divers play in the exploration and preservation of underwater caves and cenotes and to encourage them to join archaeologists from both Mexico and the United States to discuss our common goal for the responsible stewardship and increased understanding of these fragile environments. We are pleased to report that the conference was, by most measures, a success. Attendance exceeded our expectations, and we were fortunate to have such a diversity of interests represented.

The Primer Congreso de Arqueología Subacuática y Espeleológica was sponsored by the University of California Institute for Mexico and the United States, with the support of the Facultad de Ciencias Antropológicas of the Universidad Autónoma de Yucatán (UADY) and the Instituto Nacional de Antropología e Historia (INAH). Conference organizers included Guillermo de Anda Alaníz, UADY; Dominique Rissolo and Scott L. Fedick, UC Riverside; and Kurt R. Heidelberg, Statistical Research, Inc. The event was coordinated by the Center for the Archaeology of Sub-aquatic Caves, which was honored to host the Subdirección de Arqueología Subacuática, INAH and the Taller de Arqueología Subacuática, UADY.

Two separate but similar sessions, one in Akumal, Quintana Roo, and the other in Mérida, Yucatán, brought together a total of eight presentations. The inauguration was delivered by Dominique Rissolo, and each session was concluded by a roundtable discussion moderated by Guillermo de Anda Alaníz and Kurt R. Heidelberg. Following the list of the presentations below are brief accounts of both the Akumal and Mérida sessions of the conference.

"La Arqueología Subacuática en Cenotes, una Disciplina Científica en Desarrollo," Guillermo de Anda Alaníz, Facultad de Ciencias Antropológicas, UADY.

"Cavernas y Cenotes en el Área de Calica, Quintana Roo," Luis Alberto Martos López, INAH.

"Contribución al Conocimiento de la Morfología de la Planicie del Norte de Yucatán a través de las Actividades del Espeleobuceo," Jorge Pérez Aguilar, Facultad de Ingeniería, UADY.

"El Significado del Estudio de las Cuevas y Cenotes para el Entendimiento de la Cosmovisión Maya," James E. Brady, Department of Anthropology, California State University, Los Angeles.

"Reflexiones en Torno al Patrimonio Cultural Subacuático de Yucatán," Eunice Uc González, Centro INAH Yucatán.

"Proyecto Atlas Arqueológico Subacuático Para el Registro, Estudio, y Protección de los Cenotes en la Península de Yucatán," Octavio del Río, Arturo González y Carmen Rojas, Subdirección de Arqueología Subacuática, INAH.

"Elementos Tafonómicos en el Registro e Interpretación de Conjuntos Óseos de Cenotes," Vera Tiesler Blos, Facultad de Ciencias Antropológicas, UADY.

"El Arte y Simbolismo de Cuevas y Cenotes en la Cultura Maya Antigua," Andrea Stone, Department of Art History, University of Wisconsin, Milwaukee.

On the sunny afternoon of May 29, conference participants gathered in the breezy Centro Ecológico Akumal, Quintana Roo, overlooking beautiful Akumal Bay. We are grateful to Donald Brewer and Charles Shaw for hosting the

conference at CEA and to Gonzalo Arcila, of the Akumal Dive Shop, for graciously facilitating the event. Those in attendance largely represented the local cave diving community, and we were pleased to see among them archaeologists from the INAH office in Cancún. Although most cave divers are familiar with and can readily identify the physical remains of ancient Maya cave use, the presentations exposed them to the major research questions currently being addressed by cave archaeologists from Mexico and the United States. Implicit here was our goal to make the results of our investigations more accessible to divers and to highlight the potential for future collaboration.

The open roundtable discussion could have benefited from a more conducive format. Nevertheless, a number of important issues were introduced. Immediately apparent was the anticipated lack of consensus. Our growing fascination with cenotes has given rise to a number of conflicting and competing interests among recreational and professional divers, tourists and explorers, private landowners and *ejidatarios*, foreign and national researchers, and Mexican universities and INAH. In some ways, we have only begun to peer beneath the surface of these often murky and turbulent waters. A second major issue concerns the somewhat nebulous (or at least widely misunderstood) governmental protocol for securing access to and officially reporting cenotes of archaeological importance. The Subdirección de Arqueología Subacuática was explicit in publicly defining their role within INAH, and left little question as to whom must be contacted concerning all matters having to do with underwater archaeological deposits in Mexico. While countless differences remain, the Subdirección have clearly demonstrated the soundness and sophistication of their research methodology and have openly expressed their willingness to work more closely with the cave diving community in Quintana Roo.

The beer and *botanas* of the post-conference reception helped to diffuse some of the tension that had built up over the course of the afternoon. This decidedly more casual venue proved to be an excellent opportunity for participants to meet each other and share stories of their recent discoveries. Many enjoyed Sam Meacham's impromptu presentation on his work in Sistema Ox Bel Ha and his involvement in local water quality studies. Perhaps most importantly, cave divers were able to speak directly with INAH archaeologists, putting a human face on what many unfortunately saw as an anonymous and monolithic agency, while creating new professional acquaintanceships that were a long time coming.

The Mérida, Yucatán, session was held in the Auditorio José Tec Poot at the Facultad de Ciencias Antropológicas of UADY. Saturday, June 1, was devoted entirely to presentations, while the following day was set aside for a longer roundtable discussion. We would like to acknowledge Francisco Fernández Repetto, director of the Facultad, for hosting the conference and extend our gratitude to the students of Taller de Arqueología Subacuática at UADY for volunteering their time and effort. The *taller* is a unique and innovative program offering students hands-on instruction in underwater archaeological methods and was created by Alberto Pérez Romero, Guillermo de Anda Alaníz, and Wílliam Vargas Cano.

The roundtable discussion in Mérida was in some ways more formal and revealed a certain dynamic not present in Quintana Roo. Most divers living in Yucatán are Mexican nationals (if not native *Yucatecos*) and bring with them different attitudes and expectations regarding access to and conservation of cenotes. Many of the sentiments expressed reflected, however subtly, historical differences between local and national interests. Nevertheless, most participants sought common ground for the sake of regional patrimony and to ensure the viability of cenote exploration. Carlos Evia, an anthropologist and noted cenote historian and folklorist, remarked that such discussions were not new to the conference but have been on-going for at least twenty years.

We were excited to learn that the inauguration of a new underwater archaeology exhibit at the Museo Regional de Antropología, entitled De las Aguas Sagradas de Yucatán, was scheduled to coincide with the conference. The exhibit, which was created by José Luis Rodríguez de Armas, displayed three hundred artifacts recovered from the famous cenotes of Chichén Itzá and Mayapán. Museum director Blanca González was kind enough to invite a group from the conference for a special viewing.

The conference organizers would like to thank Adriana Velázquez Morlet, director of Centro INAH Quintana Roo, Luis Millet, director of Centro INAH Yucatán, and Pilar Luna, director of the Subdirección de Arqueología Subacuática, for their enthusiastic endorsement and for their dedication to the study and protection of Mexico's invaluable underwater sites. We of course appreciate the participation and support of all those who attended, and look forward to a future of constructive dialog and collaboration. The Primer Congreso de Arqueología Subacuática y Espeleológica was only a first step toward addressing the seemingly insurmountable differences that continue to affect us, despite our common passion for cenotes and for the stories from a distant past hidden within their depths.

Esta conferencia ocurrió durante la primavera del 2002, con sesiones en Akumal, Quintana Roo y Mérida, Yucatán. Hubo ocho presentaciones formales y además oportunidades para discusiones entre espeleobuzos, arqueólogos y agencias gubernamentales acerca del registro, estudio y preservación de sitios arqueológicos subacuáticos en México.

THE MAYAN MAZE OF ACTUN KAUA

George Veni

LA HISTORIA. Actun Kaua is located under the Yucatecan town of Kaua, roughly midway between Valladolid and Chichén Itzá. David McKenzie first heard of the cave from a guide at Grutas de Balankanche, and on 8 January 1972 he did a preliminary exploration with Anne Binkley and three local guides. They descended a wooden ladder in the 7-meter-deep entrance pit to a complicated maze of passages and stayed mostly in some large passages, later called La Ruta Maya for the many primitive drawings covering the walls.

In 1974, when James Reddell was doing a biological survey of caves throughout the peninsula, he and McKenzie began to systematically explore and map the cave. By consistently surveying left turns in one direction and right turns in the other, they encircled and then filled in a distinct South Maze area. Moving on, they defined the south, east, and southwest limits of the North Maze. In trying to delineate the outer extent of that maze, McKenzie and Reddell pushed out two survey branches. One defined the "left wall," leading about 200 meters west into what is called the West Maze, which contains dozens of branching passages. The other survey extended north from the northeast end of the North Maze, further delimiting the eastern edge or "right wall" of the cave. It then cut an arbitrary route southwest along the easiest path through the maze area to connect to where the North and West mazes join. This survey formed a loop that encompassed what appeared to be a complicated portion of the cave. By the time McKenzie and Reddell finished, about 6.8 kilometers of maze was surveyed.

This complex cave served as inspiration for McKenzie to develop the Walls computer program for cave survey data processing and plotting. Walls is best known for statistically examining survey data and determining where blunders and systematic errors are most likely to be present, and thus also identifying the areas of a survey that are effectively error-free. However, the main feature of Walls that was inspired by the cave, and which only recently became technically feasible, is the ability to draw the cave walls and details and have the program realistically adjust those drawings as needed to adjust the map following new loop closures.

In 1994, Peter Sprouse led a group to Actun Kaua, and two teams surveyed within McKenzie and Reddell's loop through the North Maze. One team systematically surveyed the maze at its west end, and the other cut a west-to-east route through the middle of the maze and included some spray shots and loops in the larger areas. Together they surveyed about 730 meters.

For three weeks in December 2001 and January 2002, the project was more vigorously reactivated. David McKenzie led a group to the cave with the primary objective of completing the survey of the passages within that North Maze loop. He was accompanied by Allan Cobb, Orion Knox, Linda Palit, and me. James Reddell and Marcelino Reyes were present during much of that time, but focused on checking leads elsewhere in the area, where they found several interesting caves.

The survey team found that the North Maze loop encompassed the most complicated part of the cave surveyed to date. Much of the passage is less than a meter high, and typical survey shots were about 5 meters long. Each night the survey data were entered into Walls. New plots of the cave were printed to assist the next day's work. Any errors or questionable sections of survey identified by Walls were checked and corrected the next day in the cave to produce a high-precision survey. Given the nature of the passages and the quality of survey desired, considerable time and effort were needed in this area, which is only 100 meters long by 30 to 80 meters wide. On average, a typical eight-hour survey day yielded 150 to 200 meters of passages within an area only 30 to 40 meters long by 10 to 15 meters wide. By the end of trip, the area within the North Maze loop was complete except for one small section, and the cave reached a length of 9.4 kilometers.

EL AÑO NUEVO. The 2002–2003 trip to Actun Kaua began on 18 December 2002, when Reddell and Reyes returned to the Kaua area and hired Fortunato, a prophetically named guide, to take them to every cave he knew of and could learn about. Their primary interest was to expand on the biological collections made by Reddell in the 1970s, with

Linda Palit in the Ruta Maya. *Orion Knox.*

a secondary goal of better understanding cave origin in the Kaua area.

On 29 December 2002, Knox, McKenzie, and I returned for two weeks of mapping in the cave. We were supposed to be joined by two other teams that unfortunately had to cancel at the last minute. McKenzie stayed an extra four days to survey some other caves in the area with Reddell and Reyes.

The first day in the cave yielded two new observations. First, I took a closer look at the geology and determined that, while the Maya mined a lot of clay out of the cave, they did not remove nearly as much as had been previously believed. The ever-present "clay line" along the walls is mostly the result of natural removal of clay. The second discovery was that two hurricanes about four months earlier had caused water levels in the cave to rise about 1.5 meters, and they had only receded 0.2 meters. Knox and McKenzie had hoped to complete the survey left over from the previous year within the North Maze loop, but found much of the passage wet or under water. This changed the strategy for the two-week trip. They had also planned to define the north and northeast extent of the cave for a couple hundred meters and then fill in the maze between there and the West Maze survey. When they consulted the data in Walls later that day, it was clear that most of the West Maze would be very wet or flooded. Rather than contend with water, low airspace, and lots of mud, all of which would slow the survey, the new plan was to complete all dry areas at the north end of the cave and into the West Maze between the water and the existing survey.

For the next few days, progress was slow, with only about 100 meters of survey gained each day. Much of the passage was a low, belly-crawl maze. Survey shots were many but short. Additionally, considerable time was spent tying the new survey to the 1974 and 1994 surveys. Several survey stations in both of those efforts had not been not permanently marked and had been disturbed by people moving through the cave. As many as five resurvey shots were needed to reestablish some stations for accurate reference in the new survey. All new survey stations were permanently marked.

We took a break from the cave after four days. McKenzie caught up with drawing the cave map in Walls, while Knox and I were inventive. Collecting materials from local hardware stores, we assembled a float and connected it to a 30-meter tape. We visited with the *secretario* of Kaua (effectively the town's manager) and asked for someone reliable to help in our plan. The police *commandante* volunteered. Together we visited a water well that had been surveyed the previous year and determined to have the same water level as the cave. The *commandante* will once a week, during his regular rounds through the town, lower the float into the well and record the water level, and he will mail me the results each month. The data will be plotted and used to confirm suspicions that water levels should be lowest around April, and this will help us schedule the 2004 trip to Kaua when as much of the cave as possible is likely to be above the water table.

By 4 January 2003 we had surveyed across the top of the North Maze, adding a few hundred meters of passage. We added a comparatively narrow fringe of maze, but did not substantially alter the look of the map. That changed as we moved into the West Maze. Over the next five days, the West Maze morphed from a single line on the

Peter Sprouse in Actun Kaua. *Susie Lasko.*

Linda Palit in the North Maze. *Orion Knox.*

map with an occasional loop to a highly complex area 60 meters long and 15 to 35 meters wide nestled between the West Maze's southern limit and the high water to the north. Some of the passages there are two or three times larger than those surveyed earlier in the trip, but that really isn't saying much, since many of those passages are no more than a meter wide by half a meter high. We realized that we probably had the dubious honor of traveling the farthest in Mexico to survey the greatest length of small passages.

Despite the mean passage size, the results of the survey were worthwhile. The maze shows a distinct pattern of the groundwater movement that created the cave. Much of the North Maze converges downward to a west-trending passage, which we wanted to examine more closely, but we were blocked by a sump. However, the West Maze is breaking away from that pattern, but not enough of it is yet surveyed to speculate on where it might lead.

Actun Kaua, curiously, stays below certain neighborhood blocks of the overlying town. On our second and last day off from surveying, we drove all of the streets with a GPS unit, recording a track-log that we would later import into Walls to draw an overlay of the town on the cave map. We made special note of and sketched major buildings, and later we added surface surveys from the previous year to two cenotes and several wells, three of which intersect the cave.

On a whim and hunch, we also drove that day a little west of Kaua to the Chichen Itza airport. The modern facility seemed deserted, with only one car in the large parking lot. By sheer luck, we found the pilot of one aircraft in temporary residence. It wasn't clear if the Cancún-based helicopter was there waiting to pick up tourists, but it was clear that the pilot had time to fly us over Kaua and then over the ruins of Chichen. He called Cancún, and we negotiated a price with his boss, then we enjoyed a spectacular twenty-five minutes of flying over and photographing the ruins and forest-covered karst.

On 9 January 2003, we planned to check out one of the caves found by Reddell and Reyes earlier in the week, but car trouble foiled our caving plans. Meanwhile, Reddell and Reyes had car trouble of their own, when they found the military ready to tow their car away on a report that it had been abandoned. After Knox and I left the next day, the rest stayed until the fifteenth, finding more caves. They were joined by cave diver Fred Devos from Quintana Roo, whom they showed some of the area's diving leads. Fred plumbed one large lake in a cave to a depth of 29 meters and plans to dive it sometime soon. By the end of the trip, Reddell and Reyes, with a lot of help from their guide Fortunato, had found four new cenotes and twelve new caves, some of which are quite sizable and potentially significant. None are mazes like Kaua, although one big one is complicated and may have a maze level.

Linda Palit in the South Maze. *Orion Knox.*

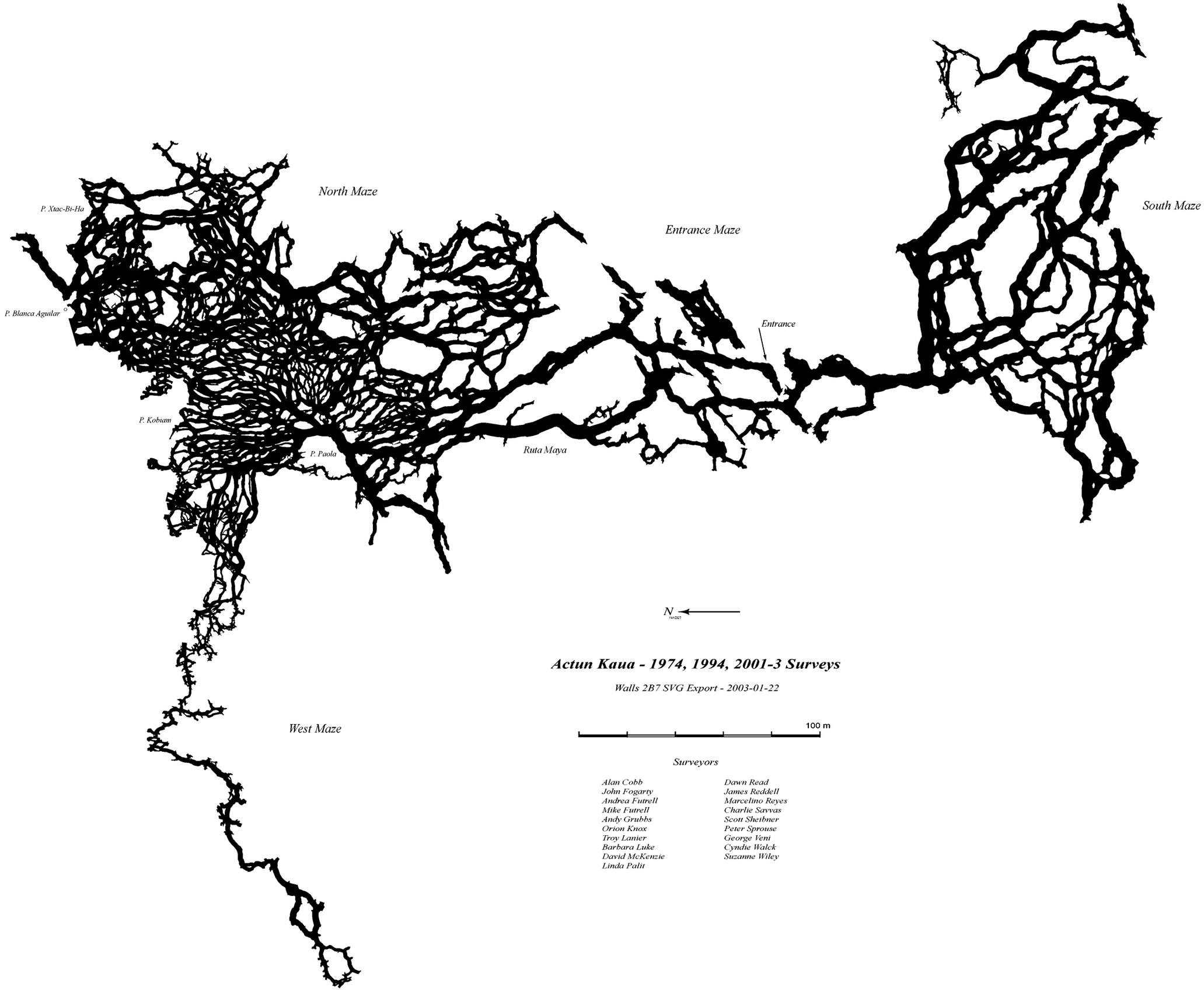
EL FUTURO. Assuming our water-level monitoring effort goes well, we hope to return to Kaua in the spring of 2004, when water levels should be low. We are looking for careful, detail-oriented cavers with the patience to survey small and intricate maze. With enough people, we could work in Kaua in shifts, with some surveying the maze one day, while others survey

new caves in the area. Devos has plans to dive the cenote closest to the cave, about 110 meters to the north, and hopes to make a connection. That trip will likely happen before we return, and we wish him well.

Many questions remain about Actun Kaua, such as the reason for its radically different development compared to most other caves, including those nearby, and whether the part we know is only a branch of a far more extensive complex. Other questions about Actun Kaua revolve around its length. During this trip we surveyed nearly 1.2 kilometers, but did not extend the cave's 25.8-meter depth. Some of this was clearly resurvey and is not considered part of the cave's length. However, in a maze so convoluted, with 565 loops surveyed to date, it is often difficult to say where a series of closely-spaced cave passages ends and a broad room filled with bedrock pillars begins. With no firm rules to guide us, we place the length of the cave at 10.36 kilometers and look forward to returning again to unravel more of its mysteries.

Actun Kaua

Las primeras exploraciones en este laberinto de cueva en Yucatán fueron hechas en los inicios de los setentas, topografiando 6.8 kilómetros. El proyecto se reanudó durante los inviernos del 2001-2002 y 2002-2003, teniendo ahora la cueva una longitud de más de diez kilómetros, aunque no está claro cómo definir la longitud de un laberinto tan complicado. El mapa tiene actualmente 565 pasajes o porciones topografiadas que eventualmente conectan a pasajes ya exporados ("loops").



N (MAGNETIC)

Actun Kaua - 1974, 1994, 2001-3 Surveys

Walls 2B7 SVG Export - 2003-01-22

100 m

Surveyors

Alan Cobb
John Fogarty
Andrea Futrell
Mike Futrell
Andy Grubbs
Orion Knox
Troy Lanier
Barbara Luke
David McKenzie
Linda Palit
Dawn Read
James Reddell
Marcelino Reyes
Charlie Savvas
Scott Sheibner
Peter Sprouse
George Veni
Cyndie Walck
Suzanne Wiley

Sistema de los Tres Amigos

Nindo Ka, Sierra Mazateca, Oaxaca, Mexico

Suunto and Tape Survey

Surveyed by Proyecto Cerro Rabon

Te Chan Xki (Feb 19th) 2003

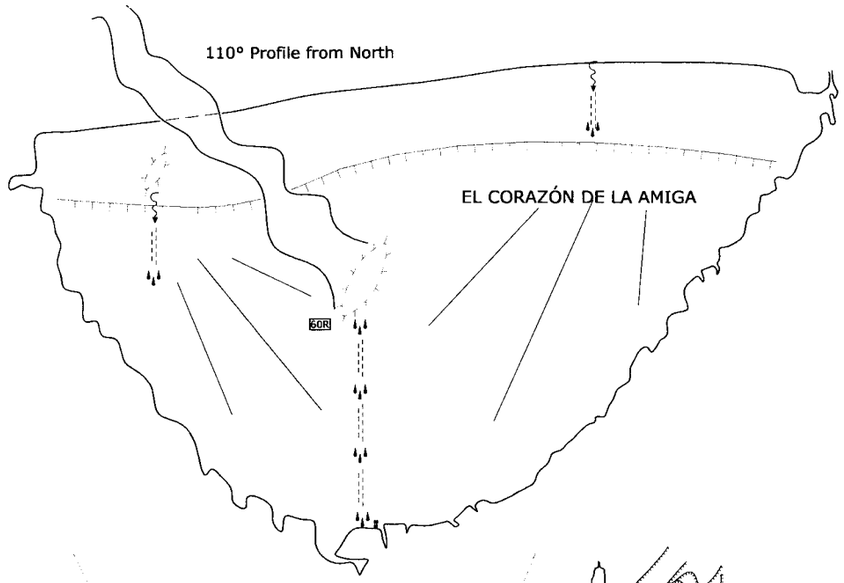
Cartografía de Chris Andrews

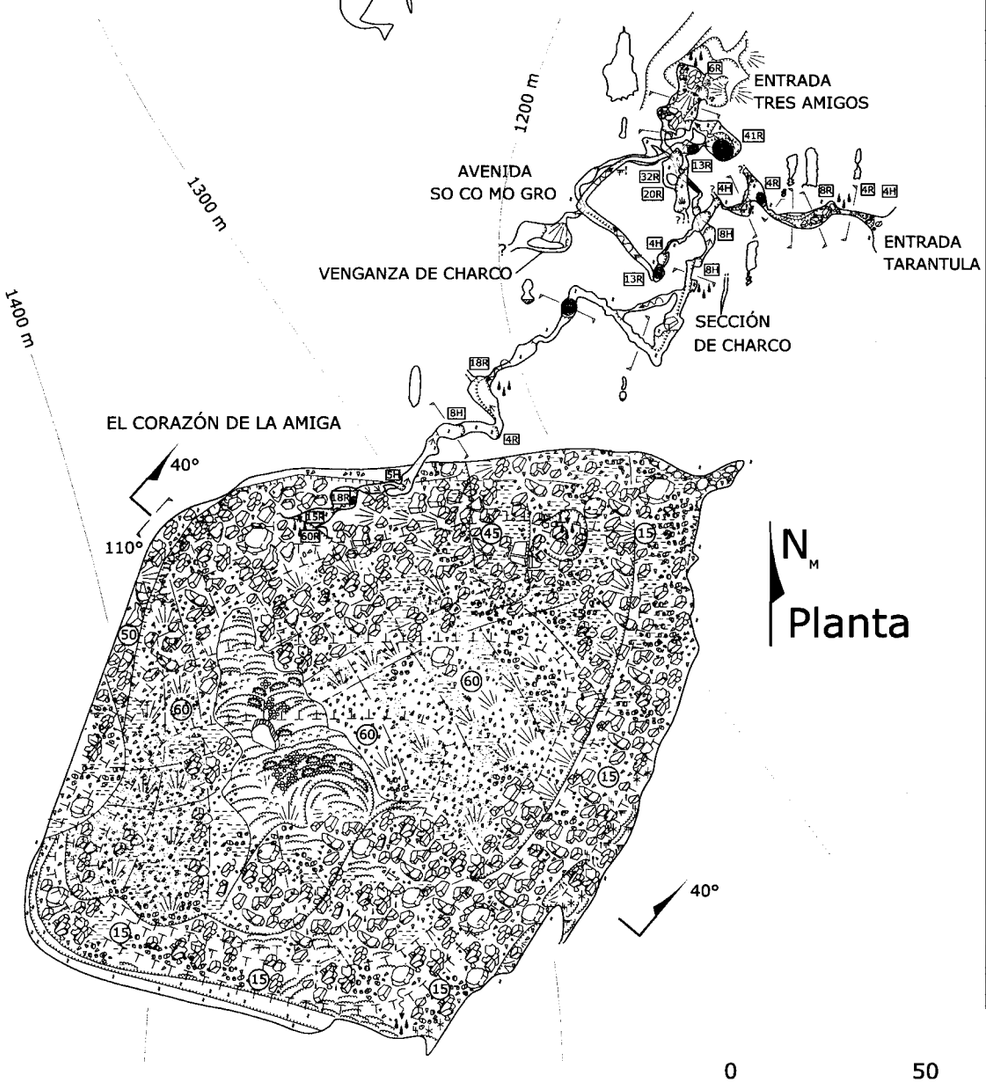
EL PERSONAL ENUMERA:

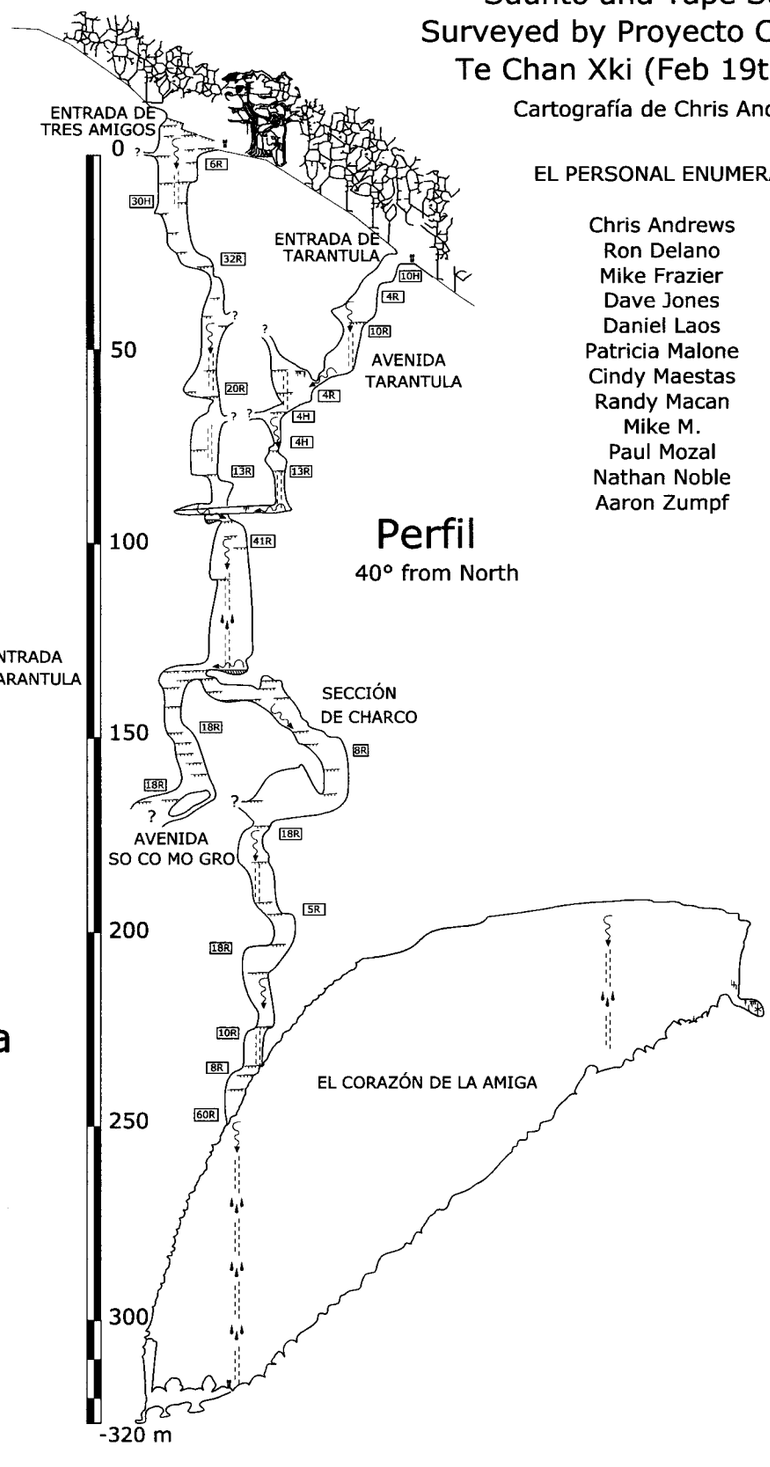
Chris Andrews
Ron Delano
Mike Frazier
Dave Jones
Daniel Laos
Patricia Malone
Cindy Maestas
Randy Macan
Mike M.
Paul Mozal
Nathan Noble
Aaron Zumpf

EXPLICACIÓN

SLOPE
VERTICAL DROP
UNDERLYING PASSAGE
PIT
DOME
PILLAR
BEDROCK
BREAKDOWN
GRAVEL
MUD / CLAY
20 CEILING HEIGHT (m)
8R RIGGED ROPE LENGTH (m) R: Pit; T: Traverse, H: Handline
320 ELEVATION (m) FROM LOWEST SURVEY
HUMAN SCALE
STALACTITE STALAGMITE COLUMNS
STRAWS
FLOWSTONE
CALCITE FLOOR
CALCITE GOUR
CAVE PEARLS
HELICTITE
ARAGONITE
POOL
WATER FALL

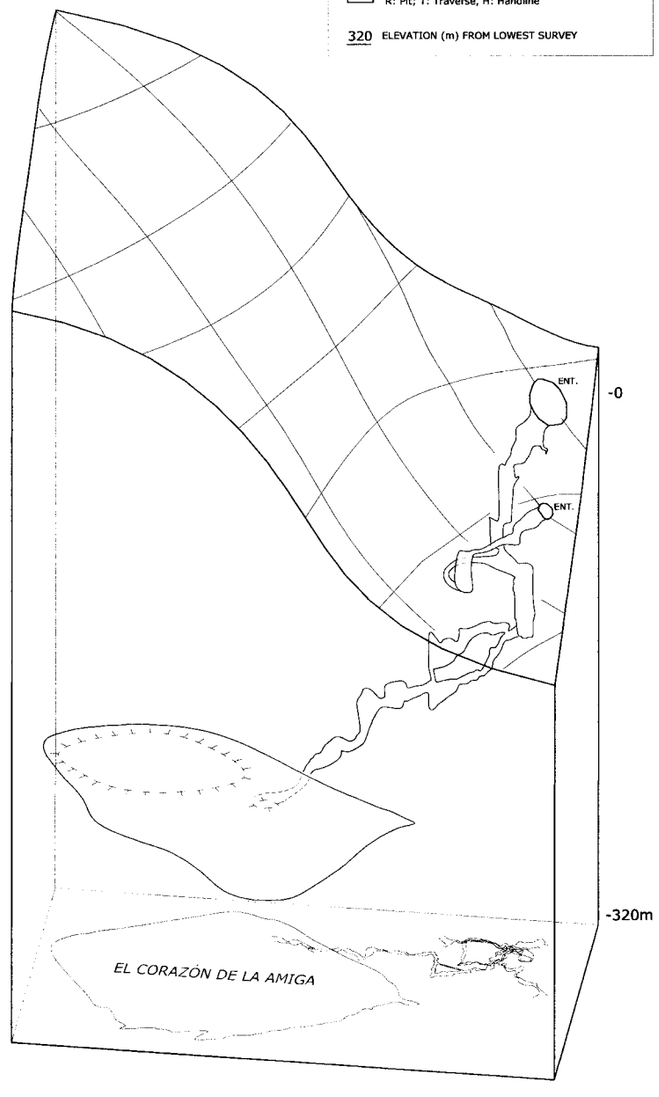






Perfil

40° from North



3D Half Scale
Topography at 100m Interval

0 50 100 150
meters

Surveyed length of 1340 m (4397 feet) and vertical extent of -320 m (-1050 feet)

CAVING ABOVE THE NACIMIENTO DEL RÍO URUAPAN

Randy J. Macan

On the western side of Presa Alemán in the northern part of Oaxaca is a huge uplift of limestone located in the Sierra Mazateca. Near the small town of Jalapa de Díaz along the Río Santo Domingo is a rock peak named Cerro Rabón (Rump Hill). The area around the base of the limestone below Cerro Rabón contains numerous resurgences for all of the rainfall that falls above. The largest in the area is called Nacimiento del Río Uruapan and is on the western side of a huge drainage basin between Cerro El Ocotal and Cerro Rabón. [See article on the cave at the *nacimiento* in this issue.] The source of the water emerging from this impressive resurgence has been sought by many expeditions since cavers first documented it in 1970. Above the Uruapan resurgence, the topographic map shows numerous sinkholes and apparent insurgences near Cerro El Ocotal. The largest cave on the plateau near San Bartolomé Ayautla is Kijahe Xontjoa. It is over 1200 meters deep, but the water inside it appears to be trending away from the Nacimiento del Río Uruapan and toward another spring to the north. Six hundred seventy-five meters above the Uruapan resurgence, a cave entrance in the dense cloud forest drops into the sharp, water-hungry limestone, and the airflow within beckons. This cave, Cueva de Los Tres Amigos, is located at an elevation of 1175 meters on the steep limestone slope above the resurgence. The average slope here is roughly 40 degrees, and level areas are very rare. The area just above Tres Amigos is somewhat flat (I stress *somewhat*) and large enough to camp about eight or so people comfortably, with a little room for a group tarp.

By February 12, the 2002 Cerro Rabón Expedition, led by Mike Frazier, had been whittled down to three members. Aaron Zumpf and Daniel Laos, after securing permission papers from the necessary government offices in the small town of San Bartolomé Ayautla, had driven back to Colorado. Paul Mozal and I were the only other members, besides Mike, who remained in town. A few days earlier, Bob Stucklen had planned to fly Mike over the Cerro Rabón area in his little four-seat airplane. However, Bob heard that the Alemán Airport, where he was to meet Mike, was closed by the *federales*, and if he landed there, his airplane would be confiscated and possibly destroyed. Bob ended up aborting the mission and flying back to the United States.

Despite these two bad omens, Mike didn't want to just give up. He agreed to hire a few Ayaytla locals who seemed interested in helping the remaining group up a trail to the Cerro Rabón rim. That night, we slept in front of the church square under the roof of the old municipal offices. The locals came up all night to sit on the benches around us and talk to one another, but we slept well, all things considered.

After our quick breakfast on the thirteenth, the only guy to show up to guide us was a man in his forties named Pedro. He staggered up basted in *caña* and assured us he would take us to a cave that he knew up on the rim. We loaded him down with a bag of rope and tarps and followed him up the hill out of town. Along the way, he stopped and talked to a young man named Jasper, who turned out to be his cousin and who offered to help us too. We agreed, since he didn't appear intoxicated and looked stronger than Pedro. He grabbed the group bag and hurried up the hill, while we tried to keep up. The trail led up into the clouds above the Uruapan resurgence, with the road between Jalapa de Díaz and Huautla snaking far below. When we reached the main drainage ravine, we were led to a small flat area in the forest and told that this was a good place to camp. Jasper wanted to come back the next morning and show us some more caves, while Pedro was to camp with us. That night, Pedro drank his *caña* and made quite a bit of noise, but we slept well in our Hennessey tent-like hammocks anyway. The next morning, after a quick breakfast and with no Jasper in sight, we started to hike straight up the hill. Soon, Jasper and his cousin Lorenzio appeared, grabbed the group bag, and followed the steep trail being cut wildly by Mike. After a couple of hours of this, we stopped to rest and discuss our options. The three cousins didn't want to go up anymore. They wanted to show us a cave a little way back down the hill instead. A discussion ensued, but, inevitably, we followed the guides back down. After half an hour, we were near the point where we had been an hour and a half

Mike Miskol in jungle camp at Tres Amigos. *Pat Malone*.

before, and we stopped at a cave entrance with the sound of water falling somewhere inside. The opening was roughly 3 meters by 4 meters, with a 3-meter climbdown. When we asked the name of the cave, we were told it hadn't been named. So we quickly decided to name it Cueva de Los Tres Primos, Cave of the Three Cousins, which was all right with them. Looking around, we found a small flat spot and started setting up a base camp, and, with a few hours of daylight left, told them we would pay them after they showed us some more caves around the immediate area. Within two minutes, Mike and I were staring into a much larger hole just below Tres Primos that had more water falling into it. The three cousins showed us a couple more, smaller holes, but the daylight was starting to wane, so after we paid them all, they hurried back down the hill toward town, leaving us alone up in the forest to finish setting up camp.

On February 14, we decided to survey Tres Primos first, to a length of 80 meters. Then we ate a good lunch and started for the larger cave, which we decided to name Cueva de Los Tres Amigos, Cave of the Three Friends. The entrance drop, rigged from the top of the sink, was 25 meters, with a small stream emerging about one-third of the way down and cascading to the bottom. The passage continued down over breakdown to a 31-meter pit. The airflow at this point was going in and enticing us on. Mike rigged this drop with one of the last ropes we had with us and surveyed down it. The cave dropped again at the bottom, and it required more rope. With all the air and the rapid descent the cave was making, we quickly decided to take the next day off and run back into town for the last of our rope. It rained all night.

When Paul and I hiked into town to retrieve the last of the rope, stored at our friend Vincente's house, the sun was shining, but the trail into town was still extremely muddy and slick in most spots. Meanwhile, Mike set up a nice camp and rerigged the entrance, giving us some additional rope to work with. That night, too, it rained. In the middle of the night, the tree that Paul had tied one end of his hammock to snapped off and dropped him to the ground, emptying the contents of one of the tarps onto him and trapping him in the hammock. It turned out that the tree, roughly sixteen inches in diameter, was actually dead and had snapped off about ten feet up. Paul was not a happy camper, and swore he would never sleep in a hammock again.

On February 16, we gathered up all our rope, bolts, and survey gear and returned to Tres Amigos to push the next drop. It turned out to be a 20-meter drop, and the cave immediately dropped again about 13 meters to a room that had an infeeder, doubling the volume of the water that flowed in the passage. Past a deep little pool, the water flowed over the edge into a black abyss, which turned out to be the deepest drop of the cave so far, about 41 meters. From here, the cave took on a different appearance, with the water continuing to flow downward through a tight section,

Randy Macon at the entrance to Tres Amigos, with Mike Frazier and Paul Mozal barely visible setting a rebelay below. *Cindy Maestas.*

eventually named the Sección de Charco. After a series of short drops, eating up all the rope, we reached a drop that looked like 20 meters or so, halting our progress. The resulting survey had a passage length of 341 meters and a depth of 194 meters. We returned to the surface after spending over fourteen hours in the cave, thoroughly soaked and exhausted. It was still raining when we emerged from the pit, and it continued to rain all night. [Their map appears on page 11 of *AMCS Activities Newsletter* 25.]

With the new day came a new rainstorm, and as we sat under the group tarp, with mud all around us, we started to snap at each other in the discomfort. With only the three of us, no surface support, and only three locals who knew where we were, maybe it was time to declare our mission a success. After all, we had salvaged an expedition that almost didn't happen by locating and pushing a 190-meter-deep cave with going passage, and maybe found a side door into the Uruapan Resurgence.

The 2003 Cerro Rabón Expedition members converged on the small village of Ayautla on February 17. This year, the team consisted of Mike Frazier, Patricia Malone, Daniel Laos, Aaron Zumpf, Nathan Noble, Paul Mozal, Cindy Maestas, Chris Andrews, and Mike M., and me, all from Colorado, and Dave Jones and Ron Delano. Enrique, who is the son of one of the town's founders and who has one of the largest houses in town, was generous enough to open up his home to us. He allowed us to use his stove, bathroom, front room, and refrigerator. This was especially generous, since there were twelve of us this year, and we had a lot more gear than last year. The gear consisted of one hundred bolts and hangers, eighteen hundred feet of rope, and a Bosch Annihilator cordless hammer drill with extra bits. That night, everyone slept in Ayautla except Dave and Ron, who decided to go back into Huautla.

At 6:50 A.M. on the eighteenth, the sherpas arrived, geared up, and waited while everyone else scrambled around. Mike F. and Paul left with them to find and flag the trail, going on memory from the year before. Mike followed the sherpas down to a cave a little above the Uruapan resurgence. This cave had a large entrance that Mike pushed to a seemingly free-climbable drop, and it was still going big. But Mike knew we had to reach our objective first, and save this one for another day. Somehow he convinced the weary guides to get their packs back on, because this wasn't the cave that they agreed to carry the bags to. After hiking back up the hill to the trail and making several wrong turns on it, the sherpas' patience started to fade as they followed Mike farther away from Ayautla. Just as they were about to give up, Mike heard some water that turned out to be Tres Amigos, and it was even still daylight. Mike paid the sherpas and arranged to have some of them come back in a week to help remove gear. Meanwhile, the flagging that was left along the trail to help the other cavers locate the campsite was being removed by some of the locals, causing some commotion. However, it was planned beforehand that every group was to carry at least one radio, and eventually the core group made it to the camp before dark.

Dave and Ron didn't make it into Ayautla until after everyone else had left. They ended up communicating with base camp by driving to the Uruapan resurgence and using their radio. They decided to stay in Huautla another evening and try to rustle up a couple of guides and join us the next day. That evening in camp, the stash of gear and food from the previous year was located and sorted through. Everything was dry and intact, with the exception of the Hennessey hammocks. They were soaked and smelly, but everyone had planned on other sleeping accommodations anyway, so they were not used.

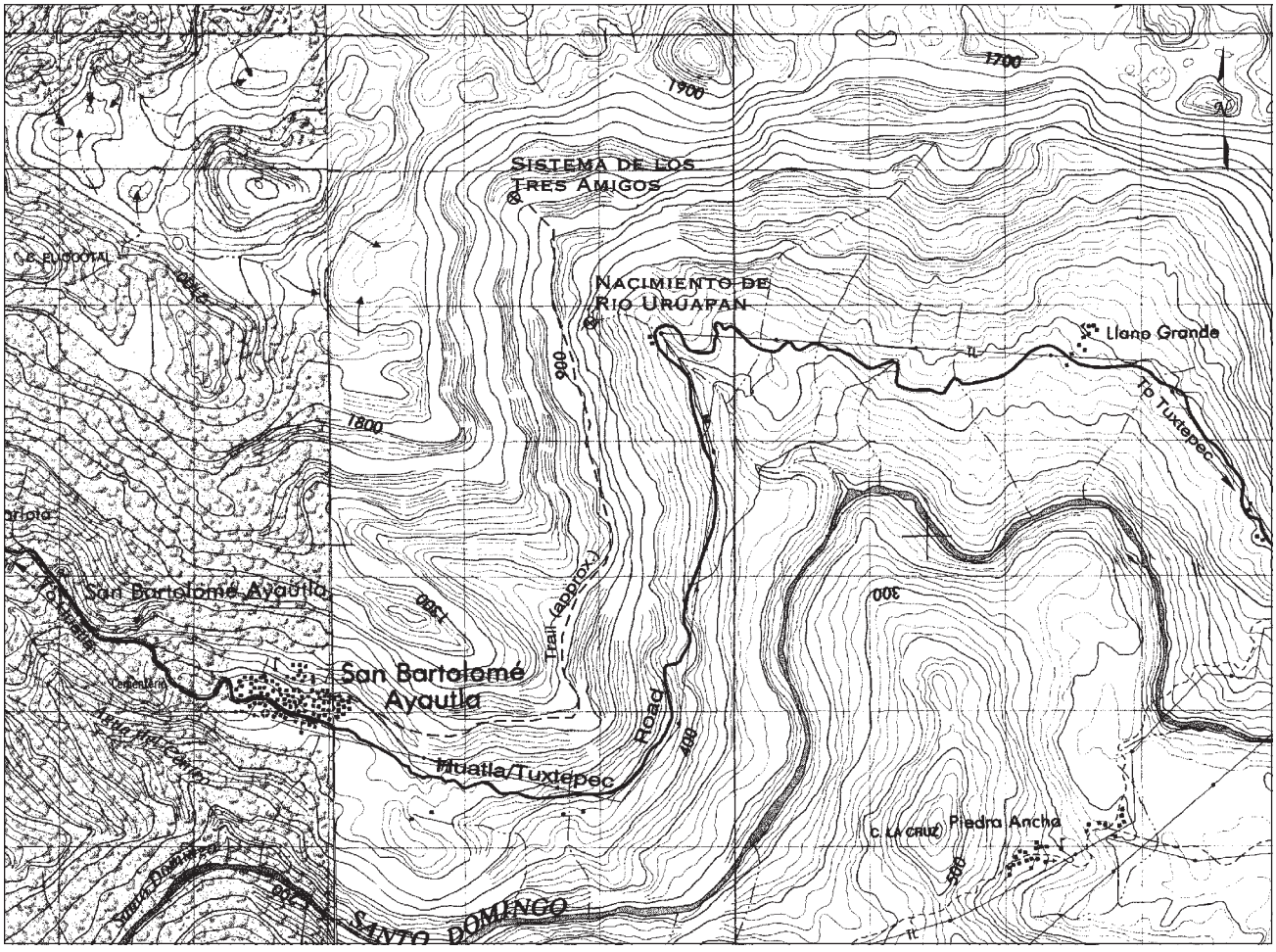
Mike Miskol surveys into the Tarantula Passage in Tres Amigos. *Pat Malone.*

On February 19, Nathan, Aaron, and Daniel decided they were going to reach the top of the slope and look for a good spot for a satellite camp farther up the drainage, along the rim of the Cerro Rabón massif. They gathered up some supplies, a GPS, and a couple of radios, and proceeded to hack their way through the dense jungle. Thirty minutes later you could still hear them slashing around like a band of wild *gringos* about 150 meters above us. After a big breakfast and sorting and dividing up the gear, Mike F., Paul Mozal, and I started into Tres Amigos around noon to check the status of the ropes and bolts from last year, as well as to rerig and push the cave. While working their way to the bottom, several bolts and ropes were replaced to make things a little safer. With the hammer drill, the bolts were going in easily, but the repairs and safety adjustments were taking time. By 3:00 in the afternoon, they reached the end of the 2002 survey and rigged the drop, which turned out to be 20 meters deep. The passage immediately started to get muddy, with walls of mud 12 feet high, which looked discouraging. However, the water

continued down through a keyhole, which seemed to have at one time been blocked up with mud before washing out and leaving behind the mud above normal flood flow. Beyond this short drop, the passage is in sharp, water-eroded limestone and snakes down to a 4-meter pit. The passage continues to another pit of 3 or 4 meters, and then, after a drop of 15 meters, the passage starts sloping downward and drops into another pit. This one seemed a little more ominous than the others, and what appeared to be our last rope was rigged with a rebelay, and Mike went down first. After a minute or so, Mike's screams could be heard, but were barely audible. After another fifteen minutes, he crested the edge at the rebelay and said he had run out of rope and it looked like another 30 meters of rope was necessary. After Mike safely reached the top, I found a piece of rope in the bottom of his bag that had been stashed there when he wasn't looking. This turned out to be a good thing, and the entire drop was rerigged with a knot to cross. This rope combination left less than 3 meters on the ground, so they knew there would be no more rigging that day. The room the drop landed in was enormous, measuring 140 by 150 meters, with an average ceiling height of over 80 meters. The shape of the room is similar to an amphitheater that rises above the floor of the drop into it and arcs around in a semicircle. The entire slope was covered with breakdown from fist-sized to the size of a small bus. Near the top of the slope, a small infeeder trickled in, creating cave pearls and a beautiful flowstone slope over 50 meters long. Other parts of the room were nicely decorated with soda straws, helictites, and popcorn. The water coming into this chamber made its way down to the lowest point in the room, near where the rope landed, and disappeared into a tight crack in the floor under relatively large breakdown. Good airflow was also noticed here, an enticing lead for the next trip. After being in the cave over fifteen hours, everyone eventually made it out, utterly exhausted. When the team discussed the find, Mike F. proposed naming it El Corazón de la Amiga, for Leslie Elles, a caver who had driven down to the border from Colorado for an emergency truck trade with Nathan, who couldn't cross with his own truck because he had failed to turn in its papers a few years before.

Earlier that day, Chris and Mike M. had looked at a cave a little below the Tres Amigos entrance. They rigged a couple of pits and pushed it down to another drop. This cave was named Tarantula Cave (Toracho in Mazatec) and was assumed to be an infeeder to Tres Amigos, so they did a surface survey to tie in to the entrance of Tres Amigos.

Dave and Ron radioed up and said they had found a cave they wished to survey and had borrowed 100 meters of rope from a coil that had been left back in town



due to lack of sufficient load-hauling ability. They then hired two sherpas to carry the remainder of the coil, about 300 meters, up to the main group in base camp.

While Mike F., Paul, and I took a gonk day on the twentieth to recover from the hike up and the deep push into Tres Amigos, Patricia rallied Chris and Mike M. into surveying into Tres Amigos. Due to potential errors in the initial survey, it was decided to resurvey the cave and create a more detailed map from the new data. They ended up getting to the bottom of the 41-meter pit and also surveying up another infeeder to the base of an 8-meter waterfall, for a total of about 210 meters.

Later that evening, Daniel, Aaron, and Nathan returned, saying they had almost made it to the top, but had run out of water. From the GPS data they captured, it was discovered that if they had veered a little to the left (south) they would have come upon what looked on the map like a large flat area that might contain a sinkhole. But, being discouraged, they set up their sleeping bags and relaxed. Later that evening, Aaron and Nathan decided to go in a check out Tres Amigos. Near the end of the Charco passage, Nathan stepped on a piece of knobby limestone eroded out from the wall, and it broke off without warning. He attempted to catch himself by spreading out his arms in the vadose stream passage and "chicken winged" himself, spraining his shoulder. The going out for them was slow, but luckily Nathan got out on his own power, and the rest of the group heard about the accident from him personally.

A survey team composed of Mike F., Patricia, Cindy, and me went in the next day and started surveying where the previous team had stopped. That day 160 meters of passage in the Sección de Charco was mapped. Chris and Mike M. worked in Tarantula, surveying and rigging as they went.

Two survey teams went into Tres Amigos on February 22, one going to the bottom of the rope in El Corazón de la Amiga to survey out, and another starting where the previous survey teams had stopped. On the way out, an upper, dry lead that had been continually bypassed was finally pushed. This passage had always been assumed to connect to the Sección de Charco, but it veered right and started to parallel it instead. The passage turned out to be the ancestral stream passage that the water followed prior to the crack that became the Sección de Charco formed. This could be another passage that pops somewhere into the ceiling in the El Corazón chamber, or it could bypass the room altogether and lead to other rooms that eventually hit the main Uruapan stream passage. With the news of this exciting new lead, the team left the cave. The total survey length that day in Tres Amigos was about 230 meters, to a depth of 320 meters. Mike M. and Chris succeeded in connecting Tarantula to the infeeder passage at the top of the 41-meter pit, creating Sistema de Los Tres Amigos and acquiring about 200 meters of additional survey.

The next day, two teams went in, with one heading down to El Corazón de la Amiga to perform a detailed survey of it and also to push the room for additional leads. The other team went to survey the fossil stream passage until they ran out of rope. That passage went to a couple of short drops of about 4 meters each, which soon exhausted the rope supply that was available to them. At the last drop, a small passage led around another 4-meter drop. This small bypass was named Venganza de Charco, Charco's Revenge, for obvious reasons, and a trickle of water came out and started following the passage. That day 91 meters was surveyed in this dry lead, and 590 meters was surveyed circling most of the wall in the El Corazón chamber.

On the twenty-fourth, we awoke and started to slowly sort through the gear and pack for the hike out. The sherpas surprised us by arriving at 10 A.M., which got everyone bustling. In an amazingly short time of three hours, camp was torn down and group gear was packed and carefully hidden. Everyone ended up arriving in Ayautla at Enrique's house in the middle of the afternoon. By dinnertime we were sitting in Rosita's Restaurante in Huautla eating everything she and her daughters brought out from the kitchen.

All things considered, the 2003 Cerro Rabón Expedition was a success. The cave that was less than 200 meters deep in 2002, Tres Amigos, was surveyed to a depth of 320 meters, with 1340 meters of surveyed length. In the process, a mammoth chamber with a 2-hectare floor was discovered, with airflow at the bottom. An additional lead was discovered that seems to be a dry, fossil passage with noticeable airflow. There are other leads that need to be checked as well, before this cave is finished. With the passage heading toward the theorized trunk passage of the Nacimiento del Río Uruapan and the large room we encountered, the potential is very good for additional discoveries and possibly a main trunk connection. The group is planning another trip down there next year, when we hope to create an upper satellite camp on the rim in addition to pushing Tres Amigos. The potential is there.

Sistema de Los Tres Amigos

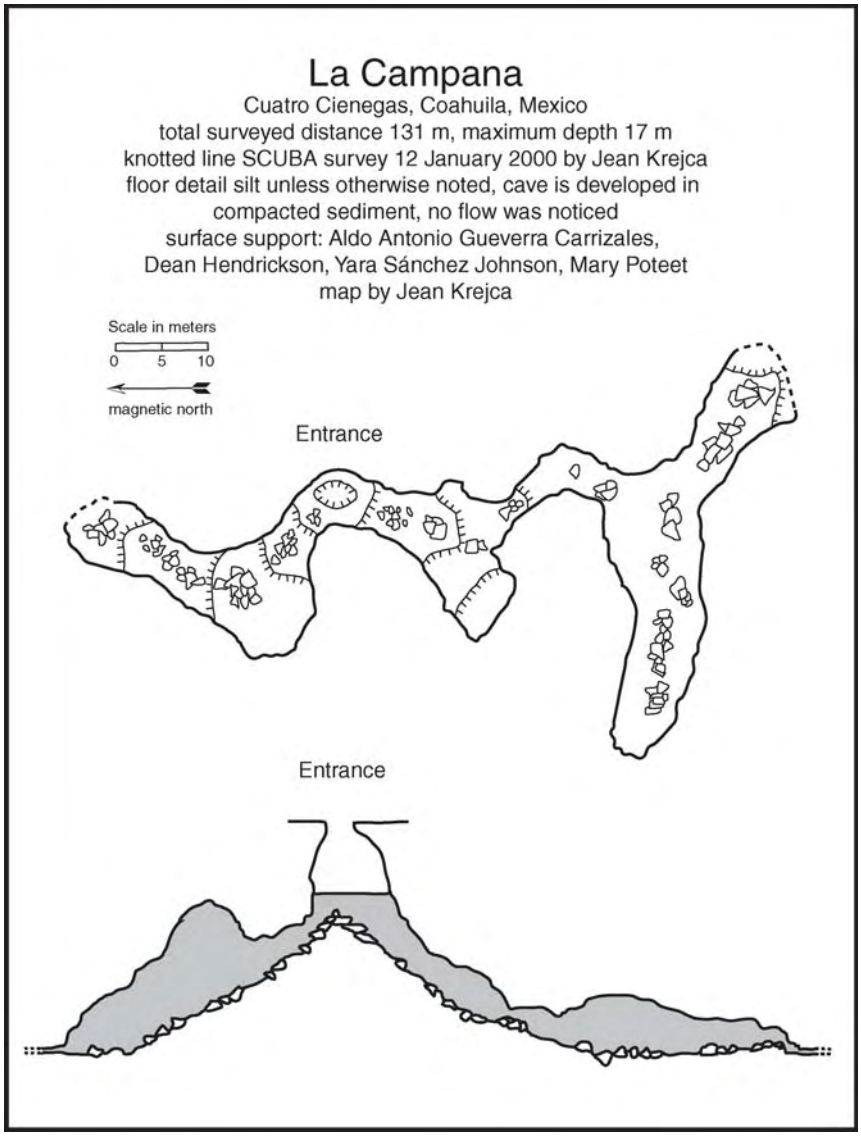
En 2002 y 2003, espeleólogos de Colorado (Estados Unidos) descubrieron y exploraron el Sistema de los Tres Amigos, que está localizado en la pendiente sobre el Nacimiento del Río Uruapan en Oaxaca. La cueva tiene una bóveda inclinada con una base de 140 por 150 metros y una altura de 80 metros. Se notó flujo de aire donde el agua se pierde a través de bloques de derrumbe a –320 metros.

LA CAMPANA

Jean Krejca

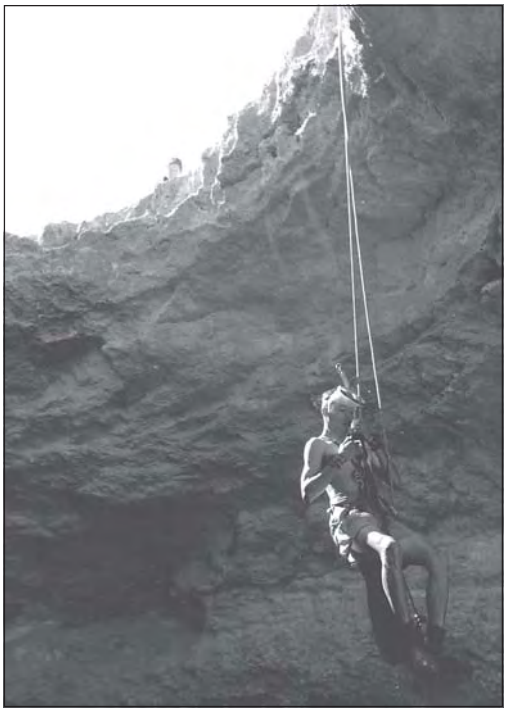
On 12 January 2000 Aldo Guevara, Dean Hendrickson, Yara Sánchez Johnson, Mary Poteet, and I visited La Campana, which has a cenote-type entrance and is located in the Cuatro Ciénegas basin of Coahuila, Mexico. The cave is developed in compacted sediments rather than solid bedrock. An entrance rappel of approximately 6 meters leads to the water level, and the rest of the cave exploration was done using scuba. There are two underwater passages that descend down the slope of the breakdown cone below the entrance. The northwest passage quickly becomes quite large, and looking back provides a scenic view of a shaft of light coming down the entrance. This passage terminates where the ceiling comes down to within centimeters of a silt floor at about 15 meters depth. The south-trending passage also enlarges, then quickly reaches a low area 1 meter by 2 meters. Care must be taken here, as percolation can diminish visibility quickly. Beyond this low spot, a bifurcation is reached. The right branch heads westward, then ends in about 75 meters. The left branch heads southeast and terminates where the ceiling nearly meets the silt floor at 17 meters depth.

No flow was noticed during this visit, but the cave is likely to be one of many conduits of groundwater flow that exist in this basin. No troglobitic organisms were found, though the entrance room has an assortment of common spring fauna such as the glass shrimp, *Paleomonetes*.



This cave is also discussed in D. A. Henderson, J. K. Krejca, and J. M. R. Martinez, Mexican blindcats genus *Prietella* (Siluiformes: Ictaluridae), an overview of recent explorations, *Environmental Biology of Fishes* 62:315–337 (2001).

Aldo Gueverra ascends the entrance pit, while Mary Poteet peers over the edge. *Jean Krejca.*



La Campana

La Campana es un tiro que lleva a pasajes inundados. Está formado en sedimentos compactados, no en roca sólida, en los alrededores de Cuatro Ciénegas, Coahuila. No se observó flujo cuando el mapa fue hecho, ni fauna acuática, pero es probable que la cueva sea uno de los conductos de agua subterranea en el área de Cuatro Ciénegas.

Book Review

Caves of the Golondrinas Area. Peter Sprouse and Jerry Fant. Association for Mexican Cave Studies, Austin, Texas; 2002. 8.5 by 11 inches, 74 pages. AMCS Bulletin 10. Softbound $15, hardbound $25 [sold out], plus $3 postage from AMCS, PO Box 7672, Austin, Texas 78713 or www.amcs-pubs.org.

This reviewer has no doubt that *Caves of the Golondrinas Area* will be regarded as a classic caving publication. AMCS Bulletin 10, released in December 2002, very thoroughly covers a well-defined area of caves in the vicinity of Sótano de las Golondrinas, "the most spectacular and renowned pit in the world." Golondrinas was discovered by cavers in 1967, and since then has been the first Mexican cave destination for many hundreds of cavers from around the world. The challenge it presented cavers led to the development of the rappel rack and modern caving ropes. An excellent history of Golondrinas is a highlight of this book.

Color cover photographs make this publication appealing from the first look. The front cover presents the oft-shown entrance drop of Golondrinas from the bottom, with two people climbing the same rope in tandem and a summer shaft of light reaching the bottom. The back photo may cause some controversy. A BASE jumper is looking up at the camera as he smiles and falls free backward into the void. Beginning in 1995, BASE jumping Golondrinas has been on television, and the resulting attention given to this cave has given rise to strange notions, such as mysterious flying rods, UFOs, and so on.

Other highlights of AMCS Bulletin 10 include excellent geology and biology descriptions, an alphabetical index to seventy caves in the area, and an impressive artistic map of Sótano de las Golondrinas drawn by Austin's Peter Sprouse at his best.

And there's more. Pages 31–72 are a chapter entitled "Other Caves in the Area," consisting of seventy-three cave descriptions, thirty-seven cave maps, and location coordinates. There's also a comprehensive bibliography.

In summary, *Caves of the Golondrinas Area* is one of, if not *the,* best AMCS publication to date, and that's saying a lot when comparing it to the many publications that have consistently been excellent for nearly forty years. All cavers who have caved in Mexico, think they ever will, or like owning impressive caving publications are going to want a copy.—*Bill Steele.*

NACIMIENTO DEL RÍO URUAPAN

Pat Kambesis

For the past thirty-seven years, cavers have been searching the remote mountain ranges of southern Mexico in pursuit of cave systems with great depth potential. Their successes are reflected in the discoveries and explorations of some of the world's deepest cave systems, including the likes of Sistema Huautla, 1475 meters deep, and the remote caves of the Chilchotla area in the Sierra Mazateca. Explorations by the Swiss-led Cerro Rabón Project revealed the existence of Kijahe Xontjoa, 1223 meters deep, and associated caves in the Cerro Rabón area. Sistema Cheve, just deepened to 1484 meters, and its related caves see the persistent efforts of American and international cavers, who continue to pursue a route through the Sierra Juárez that will take them to the cave's resurgence and a world depth record. But even with these explorations by many cavers for many years, there are still unchecked areas of great depth potential within spitting distance of the Río Santo Domingo, the river to which both Huautla and Cheve resurge. Evidence of this flows from the mouth of a massive cave entrance called Nacimiento del Río Uruapan and down a 2-kilometer-long spring run named Río Uruapan, which empties into the Río Santo Domingo.

Though the indigenous people of the area have known about the Uruapan for as long as they have occupied these remote mountains, it wasn't until the late sixties or early seventies that the spring's existence was brought to the attention of cave explorers. A team of Canadian cavers noted the spring during one of their reconnaissance trips.[1]

In the early eighties, Huautla cavers began looking for springs that would help them determine the depth potential of the Huautla area. They relocated the massive spring and deemed it a possible, though not probable, resurgence for the Huautla system. An initial recce dive of the spring reported 400 meters of submerged passage at a depth of up to 50 meters that continued.[2]

Starting in the mid-eighties, the Swiss-led Cerro Rabón Project began working the Cerro Rabón area. One of their teams located the Uruapan during an archaeological reconnaissance of the area in 1992.[3]

In the spring of 1994, as a side trip from a Huautla diving expedition, I, along with Don Coons, Shirley Sotona, and Doug Strait, decided to do an initial recce of an area between Huautla and Cerro Rabón that looked great on the topographic maps. The Cerro El Ocotal, located on the high plateau between Huautla and Ayautla, had the earmarks of a significant recharge area: big sinkholes and sinking streams at high elevation, a 1500-meter-high limestone cliff line, and a huge spring emerging from the base of that cliff that had "big, deep cave system" written all over it. However, though we had official permission to visit all areas of that part of the plateau, the local people didn't buy into that. And since we had not personally negotiated that access, we decided not to push the issue. That, combined with Don's broken ribs from our last camp-staging trip into the Huautla system, prevented any aggressive pursuit of the Cerro El Ocotal area. Instead, we decided to look for the mysterious spring that we had heard about for so many years.

Modern progress made that search very easy. The road circumnavigating the base of the Cerro Rabón was, for the most part, easy going for a four-wheel-drive vehicle. After spending a rather strange night in Ayautla, we journeyed east until we found the spring run. The nearly washed-out bridge, bent rebar, and large rocks and boulders gave a clear indication of serious water flow. We found a reasonably secure place to park and then hiked into the jungle, following the sound of rushing water.

Thirty minutes of jungle time brought us to the base of the high limestone cliffs that we had been following on our road trip from Huautla. A rushing cascade of water flowed down a steep 30-meter ramp and into the spring run. And, just like the reports said, the water came from the mouth of a big cave entrance. We hiked up a slope adjacent to the ramp and into a cave entrance with dimensions of 25 meters high and 30 meters wide. Some small man-made terraces had been built near the entrance by the region's earlier inhabitants. Don said that the cave had not been mapped, so we broke out the survey gear and went to work. Inside,

See also the article on Sótano de Los Tres Amigos in this issue.

a phreatic corridor floored with bedrock, breakdown, and water led to the shoreline of a gorgeous blue-green lake. The lake passage, located approximately 50 meters from the entrance, is developed on a set of prominent ceiling joints trending 330 degrees. At the end of the lake, the ceiling arches down to the water and the passage definitively sumps. The length of the lake from the shoreline to the sump was triangulated to be 45 meters.

An ascending side passage west of the shoreline takes off on a southerly joint trend. After approximately 50 meters, the passage splits at a T junction, with the main axis developed on a joint trending 250 degrees. This area of the cave is located at a higher elevation than the entrance section. The passage is somewhat dry, with breakdown and flowstone coated with mud covering the floor. Small lines of stalactites and straws follow the joints in the ceiling.

The western end of this passage is a muddy sump and contains a climbing lead. The eastern end terminated for us in a near-choke of formations heading upward. As I worked to complete the sketch, I started noticing small dots of what looked like red nail polish close to some of our stations. I had heard that the Swiss cavers of the Cerro Rabón project mark their survey stations in this manner. I did some checking after our excursion and found out that the Swiss had indeed mapped the cave in 1992 during an archaeological reconnaissance. They had surveyed up the climb that stopped us into steeply ascending passage that ended at two small entrances situated 80 meters above and 50 meters south of the main spring entrance.[3]

We measured the temperature of the cave water to be just under 18 degrees Celsius, several degrees cooler than the Río Santo Domingo. This indicates that the drainage is not immediately local and most likely comes from much higher elevations. Some quick and dirty measurements of stream velocity, width, and depth gave a rough estimate of discharge of around 2 cubic meters per second. Other springs that resurge onto the Río Santo Domingo, including the Cheve and Huautla related resurgences, have discharges that range from 0.37 to 1.85 cubic meters per second.[4]

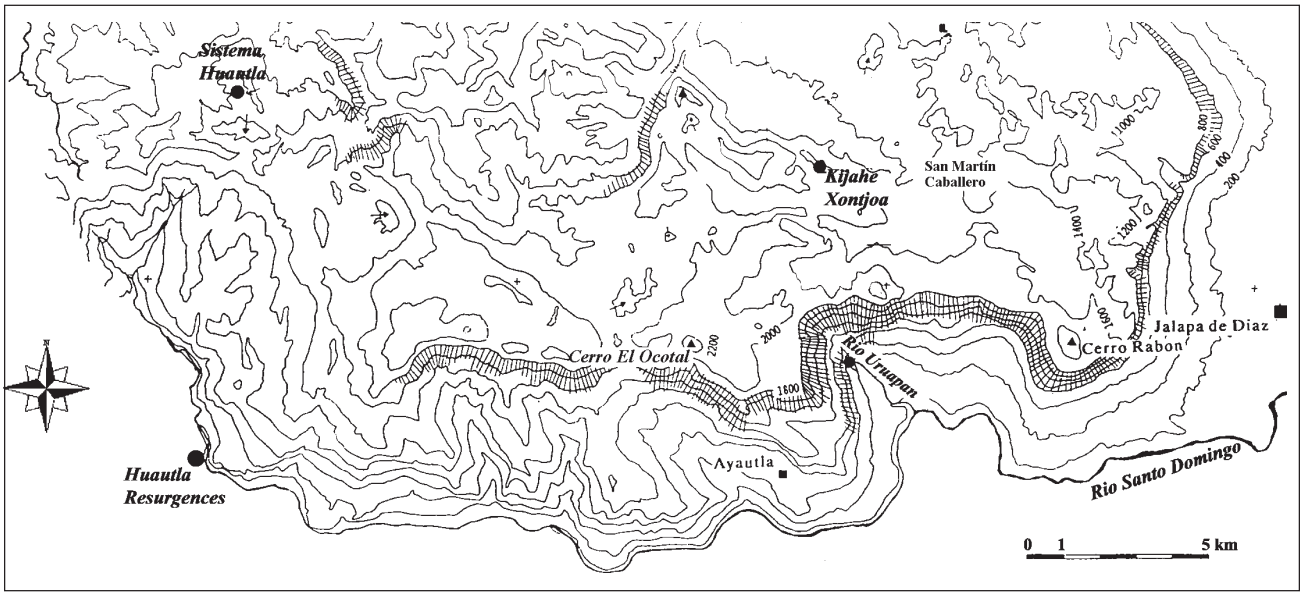
The Uruapan sump must be the end of the main drain for a very significant recharge area located somewhere on the top of the plateau, as indicated by the discharge estimate and temperature. The parallel side passage located south of the main passage does not appear to be related to the main sump or its drainage. This passage may drain a much more local area than the main sump.

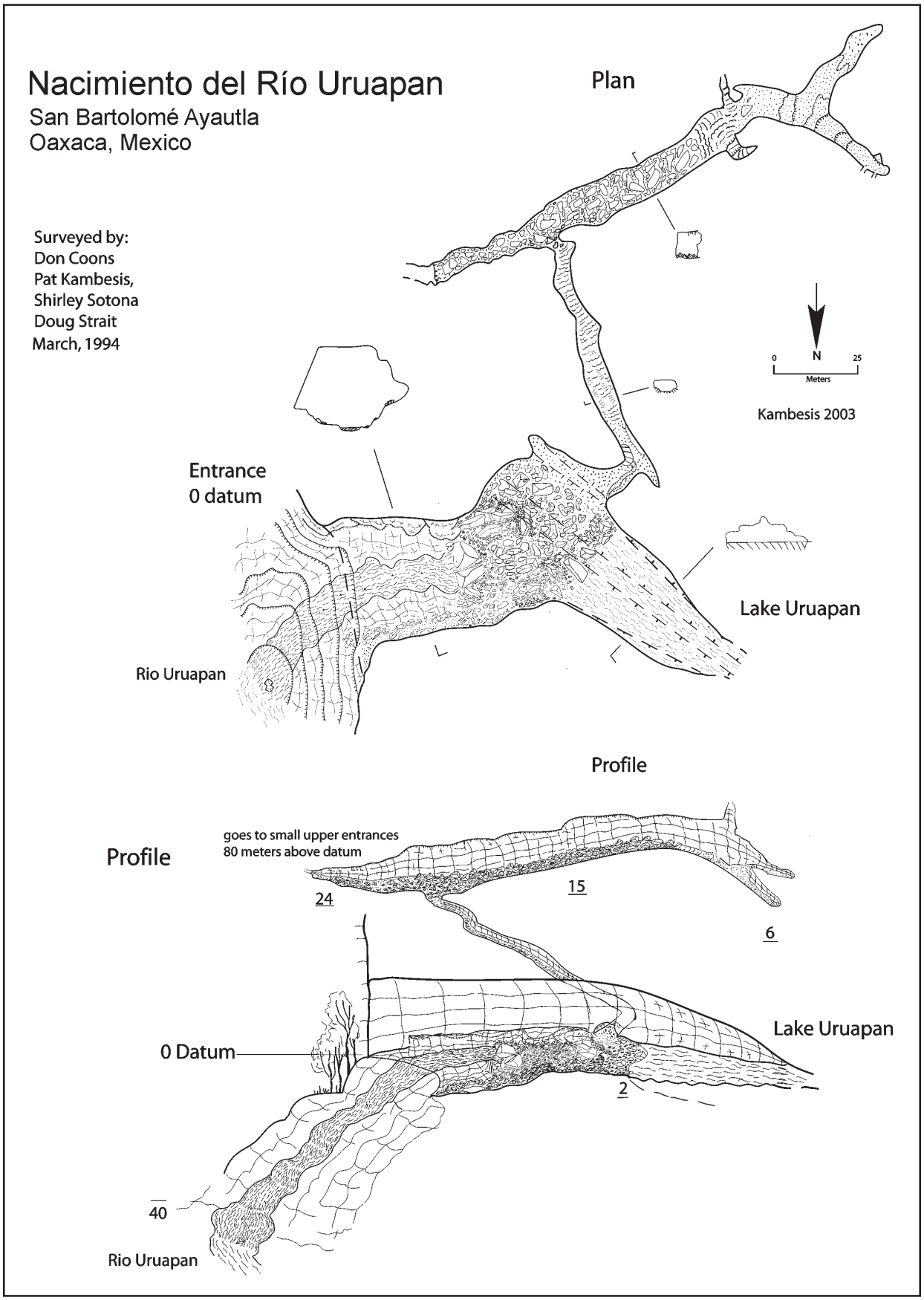
The surveyed length of the cave is 340 meters, with a vertical extent of 85 meters. This includes the Swiss survey to the second set of entrances. It does not include the depth of the lake or the sump. The entrance elevation is 500 meters.

Later in the spring of 1994, Bill Farr tried his hand at cracking the Uruapan sump. He reported that his dive traversed at least 500 meters and that he eventually came up in air-filled passage with a 14-meter waterfall dome.

A geologically significant feature of this area of the plateau is the fault of the Cerro Rabón Thrust that is exposed along the mountain front. Early to middle Cretaceous limestones overlie highly folded strata of Early Cretaceous age. This out-of-order rock sequence is characteristic of thrust faults. The boundary of these two sequences of rock defines the thrust fault proper. It appears that the hydrologic base level of the area is defined by the fault, and the water emerging into the Río Uruapan may

Map showing the location of the Río Uruapan, Sistema Huautla and its resurgences, and Kijahe Xontjoa. The resurgence for Kijahe Xontjoa is located at Presa Miguel Alemán, 16 kilometers northeast of the Uruapan. Modified from Hapka 1992 (reference 3).




Nacimiento del Río Uruapan
San Bartolomé Ayautla
Oaxaca, Mexico
Surveyed by:
Don Coons
Pat Kambesis,
Shirley Sotona
Doug Strait
March, 1994
Plan
N
0
25
Meters
Kambesis 2003
Entrance
0 datum
Lake Uruapan
Rio Uruapan
Profile
Profile
goes to small upper entrances
80 meters above datum
24
15
6
Lake Uruapan
0 Datum
2
40
Rio Uruapan

The Nacimiento del Río Uruapan. *Doug Strait.*

be flowing at or near the top of the fault.

Dye traces conducted by Jim Smith for his thesis work proved that the Uruapan does not serve as a resurgence for any part of Sistema Huautla.[4] And though Kijahe Xontjoa is located less than 6 kilometers northeast of the Uruapan, survey results of the Cerro Rabón Project indicate that Xontjoa is not related to the Uruapan, because the Uruapan is higher in elevation than the known base level in Xontjoa.[3] Cerro Rabón Project cavers have located the Xontjoa resurgence in the Presa Miguel Alemán reservoir, located 16 kilometers to the northeast of Uruapan. This indicates that Uruapan and Xontjoa are contained within different drainage basins.

The structural boundary between the Huautla area and the Cerro Rabón massif is defined by a large normal fault that has uplifted the Sierra Jurárez block.[4] Smith speculates that there should be another significant fault boundary between Xontjoa and the Uruapan, as implied by the differing base levels of the two. Because the Uruapan resurgence is higher in elevation than Xontjoa base level, it is possible that the recharge for the Uruapan is draining a higher-elevation fault block. In general, these observations support the conclusion in Smith's thesis that the configuration and extent of the Sierra Mazateca drainage basins are controlled by the complex structure of the area. In order to truly understand the geology, hydrology, and cave development in the area, more field work is required.

Though the Cerro Rabón proper is subject to a lot of rainfall, more than three meters per year, none of the water accumulates on the surface. Instead it disappears into the many pits, sinkholes, and sinking streams that rob the top of the plateau of most of its water. Once the water goes underground, it finds its way to base level via shafts, domes, joints, and possibly faults. At some points the areas of recharge coalesce and are directed to their ultimate base levels via large phreatic conduits. These conduits expel their waters in springs that feed major rivers of the area. This is the hydrologic blueprint for the known cave systems of the region. The upper reach of the Uruapan, which is known to contain air-filled passages, will undoubtedly connect to cave that follows that model. And if so, this will add yet another thousand-meter-deep system to the known ranks.

The Nacimiento del Río Uruapan is a significant drain for an undefined recharge area between the Huautla drainage basin to the west and the Kijahe Xontjoa drainage basin to the east. The Cerro El Ocotal area, located between these two drainage basins, with its lack of surface streams and abundance of sinkholes, shafts, and sinking streams, is a likely candidate.

---

1. Mike Shawcross, Mexico '70. *Canadian Caver* 2, 1970, pp. 38–52.
2. Bill Stone, Reconnaissance to the Huautla Resurgence. *AMCS Activities Newsletter* 13, 1983, pp. 42–46.
3. Roman Hapka, El Nacimiento del Río Oropan. *Cavernes,* vol. 36, no. 2, 1992, pp. 14–19; Thomas Bitterli, ed., *Proyecto Cerro Rabón 1990–1994,* pp. 83–85.
4. James Smith, *Hydrogeology of the Sistema Huautla Karst Groundwater Basin,* AMCS Bulletin 9, 2002. (Published version of a 1994 MS thesis.)

Nacimiento del Río Uruapan

El corto Río Uruapan drena parte de la cordillera de caliza al norte del Río Santo Domingo, en Oaxaca. Sin embargo, el agua de la cueva profunda más cercana, Kijahe Xontjoa, no llega al manantial, se cree que resurge en la Presa Miguel Alemán. El sifón en la cueva del nacimiento ha sido buceado por 500 metros hasta un domo con aire y una cascada.

HISTORY

SPELEOLOGICAL SURVEY OF MEXICO 1963

As Terry Raines has pointed out, this is the fortieth anniversary of the activities of the AMCS in Mexican caving. Below is the text of the first report of the Speleological Survey of Mexico, soon renamed the Association for Mexican Cave Studies. The spelling of cave names has been preserved from the original, so some pecularities will be noted. See also the article on the history of Mexican caving by Bill Stone and Terry Raines in AMCS Activities Newsletter *22 for more about the early history of Texas cavers in Mexico.*

SPELEOLOGICAL SURVEY OF MEXICO

editor : T. R. Evans
associates : James Reddell, Terry W. Raines, Wm. H. Russell

A Brief Check List
of the Caves of
Mexico Arranged by
State – Feb. 6, 1963

Note : This list contains all of the known caves and cave leads in Mexico that our survey contains. One asterisk after the name of the cave indicates that we have reliable, firsthand information about the cave. Two asterisks indicates that the cave is mentioned in Dr. F. Bonet's book Cuevas de la Sierra Madre Oriental en la Region de Xilitla, published by the Instituto de Geologia of the Universidad Nacional Autonoma de Mexico in 1953. We are considering the unmarked caves as leads until we obtain more information about them. Please read over this list and let us have any information that you can supply about the caves, especially the unmarked ones. We also want information on caves that you know of that we do not have listed. Remember, if a cave is not listed here, we have no information whatsoever about it. Locations, descriptions, fauna, etc. all interest us.

Please address your reply to :
Speleological Survey of Mexico
P.O. Box 7672 UT Station
Austin 12, Texas [now Austin, Texas 78713]

Chiapas
Cave Where the Sun Shines at Night
Cueva Chorreadero*
Municipal Park Cave*

Coahuila
Cueva de las Animas
Grutas de Arteaga*
Cueva de la Candelaria*
Cueva del Charro
Cueva de Espana*
Cueva del Guano
Cueva del Leon
Cueva de la Mina de la Mutua
Cueva de la Norte
Cuevas Pailas
Cueva de los Pinos
Cueva del Porvenir
Cueva del Pozo
Cueva del Socovon
Cueva del Sombrerillo
Cueva de San Vicente
Cuevas (1 & 2) (near Parras de la Fuanta)

Durango
Cueva de la Hundida
Grutas de Mapimi*
La Cueva de la Ventana

Guerrero
Boca del Bocacito
Boca del Diablo*
Cave near Acahuizotla*
Cave near Almolonga*
Grutas de Cuetmula
Dos Bocas*
Grutas de Cacahuamilpa*
Cave near Iguala
Cueva de Juxtlahuaca*
Cave near Mexcala*
Cueva de la Penita*
Cueva de Carlos Pachecho*

Hidalgo
Cave near Chapulhuacan
Grutas Xoxafi*

Mexico
Cueva de la Estralta

Morelos
Cave near Tenoztlan*

Nuevo Leon
Cueva de Agua
Caves near Aramberri
Cueva la Boca
Gruta de Palmito (Bustamante)*
Cueva del Carrisal*
Cueva de Casa Blanca
Cave near Garcia
Grutas Garcia
Cueva de la Mina de la Blanca
Cueva del Murcialago

Oaxaca
Las Cuevas
Cave near Huajuapan de Leon*
Cave near Mixtequilla
Cueva Pina del Colorado*
Cave near Potrero

San Luis Potosi
Cuevas del Ahuate (1-4)**
Cueva del Aire**
Sotano de la Arroya*
Cueva de la Barranca**
Cueva Chica*
Gruta del Choy
Cueva de Los Cuchos**
Cueva Grande
Cueva de La Hoya**
Sotano de Huitzmolotitla*
Cueva del Jobo**
Cueva de La Laja**
Cueva de Madrono**
La Cueva El Nilo
Cueva del Nacimiento del Rio Huichihuayan**
Cueva de los Palmas
Cueva de Potrerillos**
Cueva de la Puerta**
Cueva de Los Sabinos*
Cueva del Salitre**
Gruta de Taminul
Cuevas de Taninal
Cueva del Tapatio**
Sotano del Tigre
Sotano de la Tinaja*
Cueva del Toro**
Venatana Jubail
Cave near La Siete (Pinnacle near Tlamaya)
Cueva de la Mujer de la Agua**
Sotanos del Cerro Miramar
Sotanos del Ejido de Las Jollaa
Sotanos del Ejido de San Antonio

Sinaloa
Cueva Chinacaterra*

Sonora
La Cueva El Tonel*
La Cueva El Tigre*

Tamaulipas
Cueva del Abra*
Cueva de los Cuartetes
Cueva del Nacimiento del Rio Mante
Cueva del Pachon*
Cueva de Quintero*
Cueva de San Rafael de los Castros

Veracruz
Cuevas de Acultzingo*
Cueva de Agua*
Cueva Arriba*
Gruta de Atoyac
Cueva del Balcon del Diablo*
Sotano de la Capilla Blanca*
Sotano de la Cascada de Agua*
Sotano del Crucero*
Eight-Second Pit near House*
Fissure Cave of Ojo Zarco*
Sotano Groble*
Infinity Pit*
Cueva del Moral*
Cueva del Ojo de Agua*
Sotano de Oztoatlicholea*
Pit near "Y" in Road*
Gruta de Parajo Nuevo
Sotano del Puente Natural
Cave near Las Vigas*
Cueva del Rio Tequila
Varios Sotanos cerca de Tequila (8-10 unnamed pits)

Last-minute additions :

Coahuila
Cueva de Bernardo
Shelter Cave near San Lazaro
Unnamed Cave W of Hwy. 57, 5 miles S of Km. 1012
Unnamed Cave NW of Cuatrocienegas

Nuevo Leon
Cueva de Leon
Cueva de las Nevadas
Two Unnamed Caves on Mt. "El Oriente" – SW of El Cerrito
Unnamed Cave near Iturbide
Unnamed Cave NW of Los Ramones
Gruta de la Virgin

Now that you have finished reading over the list, do you have any information that we could use. If so, please drop us a line.

Note: The caves and cenotes of Yucatan are being considered separately.

Exploraciones Espeleológicas en México en 1963

Esta es la primera publicación, impresa hace cuarenta años, de la organización que posteriormente se convirtiera en la Asociación para el Estudio de las Cuevas Mexicanas. Enumera todas las cuevas mexicanas conocidas por espeleólogos de Texas hasta febrero de 1963.

THE CENOTES NORTH OF TUNKAS, YUCATÁN

Oliver Knab

I made three cave diving trips to the Yucatan Peninsula during 2001 (4 February to 4 March), 2002 (19 January to 2 March), and 2003 (15 January to 21 February). The peninsula comprises 190,000 square kilometers of limestone plateau. Eighty-one different cenotes were visited. My main goal was the area north of Tunkas, Yucatán.

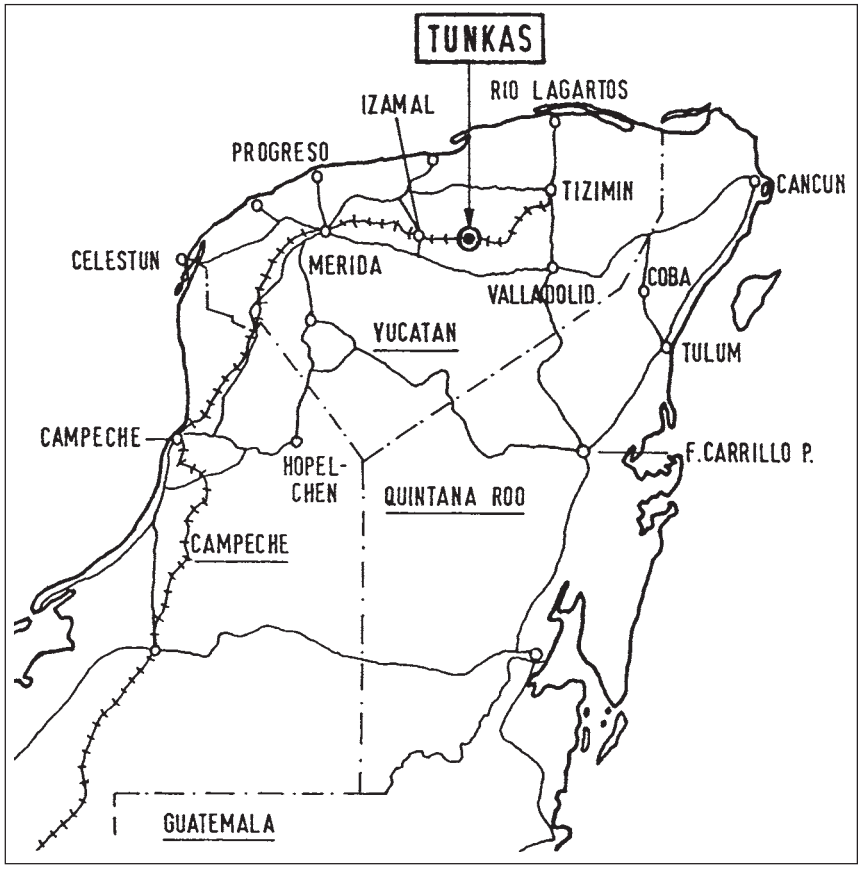
The Ecology Department of Mexico has registered about twenty-five hundred unexplored cenotes. The word *cenote* is derived from the Mayan *dzonot*. The measured water temperature in the cenotes ranged from 24.6 to 28.3 degrees Celsius. The inland sinkholes, however, are mostly at 27.0 ± 0.5 degrees. Twenty aquatic troglobites are known from the Yucatan, eighteen crustaceans and two fish.

The area north of Tunkas has an impressive scrub-shrub landscape on horizontal limestone plateaus containing *ranchos* and their cenotes. Trees and cacti of various colors complete the landscape and, for the ornithologists, shelter interesting birds of all imaginable kinds and colors.

Fifteen objects of speleological interest were found along the unpaved road leading north from Tunkas. GPS was used to determine the positions of the caves given on the maps and should be used to find them. Distances in the text from the railroad in Tunkas are approximate, having been measured with a car odometer. Humun Dzonot is a world-class dive site, to me among the ten most beautiful sinkhole dives in the world. It was dived with two 80-cubic-foot aluminum tanks and nitrox 33 deco bottles on a downline. The main work, however, was plumbing the bottoms of the cenotes and sketching plans and some cross-sections.

1. Cenote #1. Located 2200 meters north of the rail line and 300 meters east of the road. Subterranean lake about 22 by 50 meters, water tannic-yellow, water depth 0.2 to 3 meters. Old formations on the ceiling. Good access via a breakdown slope, but not recommended for diving. Roost of pigeons and doves, and conspicuous stone column at the south end.

2. Cenote #2. Located 3300 meters north of the rail line and 250 meters west of the road. Half-moon-shaped opening 8 by 12 meters, with ceiling threatening to cave in. Round subterranean lake, diameter about 44 meters, flowstone on the south wall. Water turquoise blue, visibility 3 to 15 meters. Large stalactites on the ceiling. A vertical cenote



Based on a translation from German by Katie Arens.

somewhat recommended for diving.

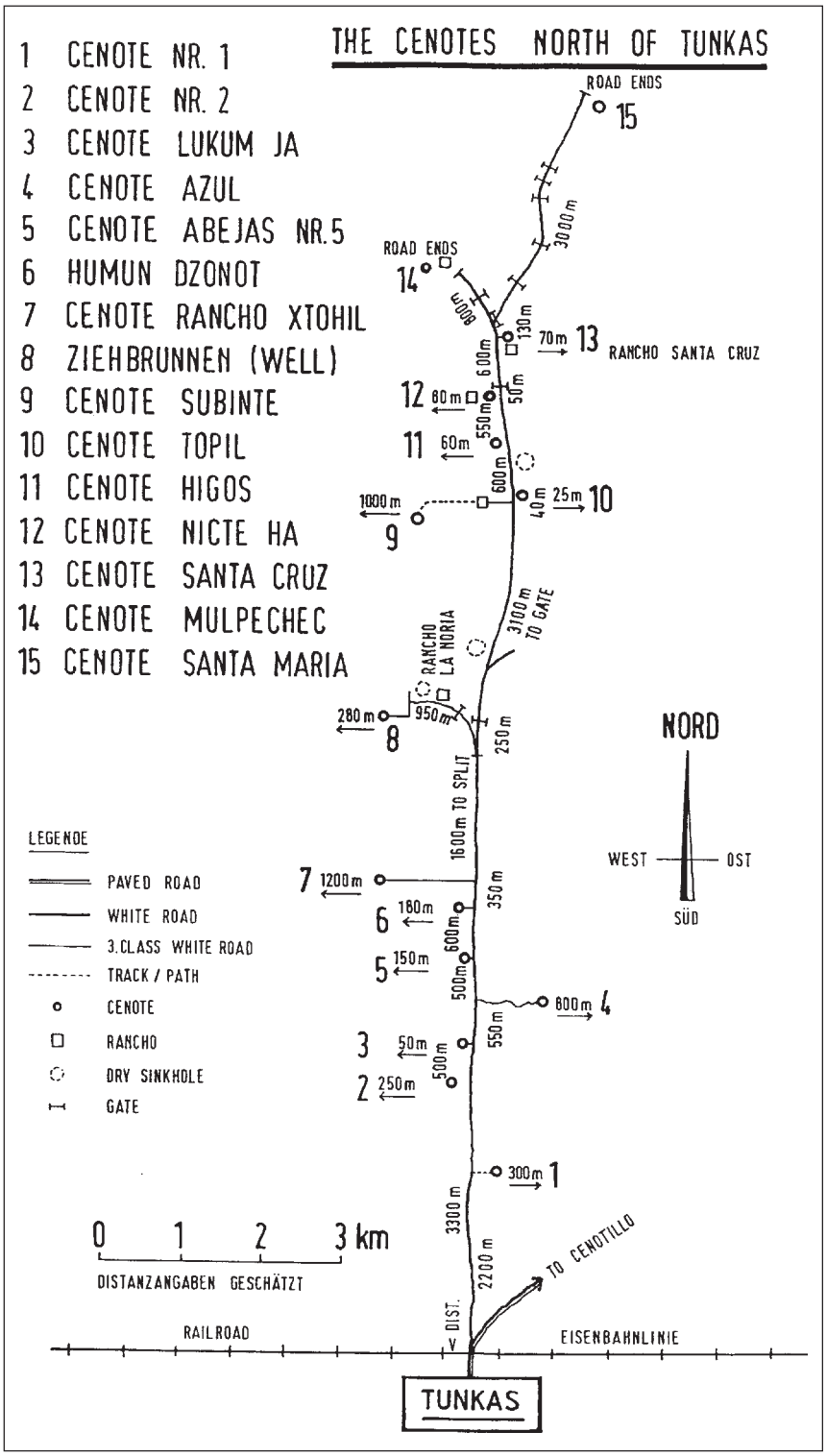
3. Cenote Lukum Ja. Located 3800 meters north of the rail line and 50 meters west of the road. An old water-filled sinkhole about 35 meters in diameter. Access over a rock ledge. Descent to the water via 4- or 5-meter drop on roots. Height of shaft above water 10.7 meters; water depth 11.3 meters. Dark, clear water. Interesting large-leafed plants around the rock ledge. Cenote recommended for diving.

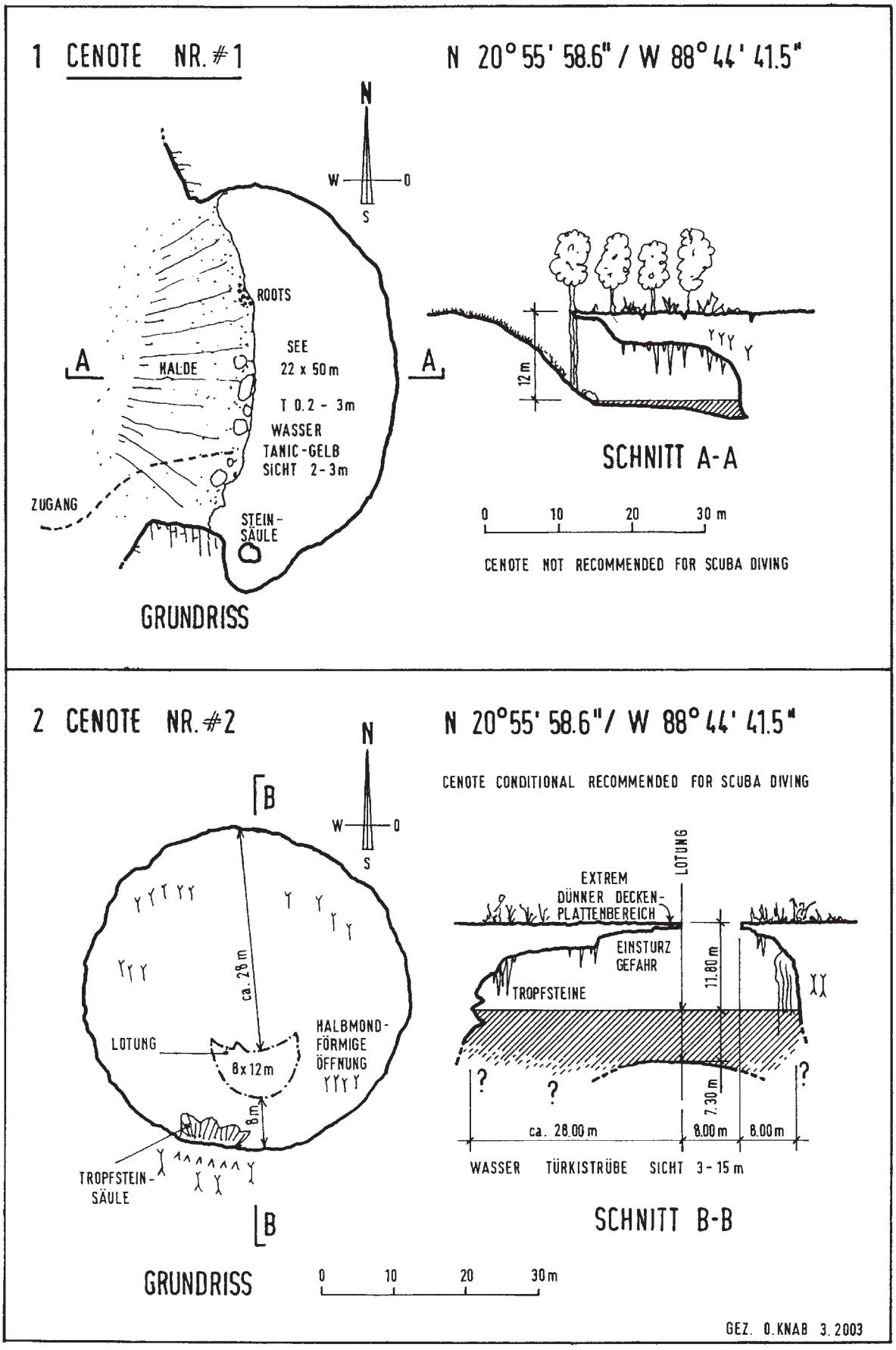
4. Cenote Azul. Located 4350 meters from the rail line and about 800 meters east of the road. Round, water-filled sinkhole, diameter about 40 meters. Sloping ceiling to the cenote rim. Drop to water 2 to 3 meters, water depth 8.15 meters. Water quality variable, on 3 February 2002 clear and blue, on 13 February 2003 dark and green, with visibility 0.2 meters. Somewhat recommended for swimming.

5. Cenote Abejas Número 5. Located 4850 meters from the train line, 150 meters west of the road. Deep, water-filled sinkhole with a small entrance hole 2 by 1.6 meters in the ceiling. Tree roots reach from the entrance down to the water level. Dimensions of water surface unknown. Rappel descent of 10.4 meters to the water, plumbed at 36.4 meters deep. Bee hives were noted 20 meters from the entrance. Recommended for diving.

6. Humun Dzonot. This giant underwater shaft is a world-class diving location. Clear, blue water with 30 to 35 meters visibility. Located 5450 meters from the rail line and 180 meters west of the road. North of the cenote entrance there is a small entrance leading to a cave passage that gives perfect access to the water. The water surface of 22 by 23 meters tops a conical underwater shaft. Underwater formations up to 2 meters long thrill the diver, as do yellow flowstone-covered underwater walls. Black catfish are found, principally in the upper parts of the shaft at less than 10 meters depth. At 11:45 A.M., laser-like rays of sunlight reach about 40 meters deep on the northwest wall of the shaft. On 2 February and 20 February 2002, I dived to depths of 33 and 34 meters, respectively. From this depth on, the bottom of the shaft is easily seen. The water level in the cenote varies, and Nicolai Toussaint observed, during his dive to –65 meters, a hydrogen sulfide layer at that depth. Exploration of the deep zone below this layer has not been done. Because of the depth, trimix diving is suggested. On 20 February 2002, the dry part of the shaft measured 8.65 meters and the water depth to the top of the talus cone on the floor was 45.9 meters. Highly recommended for diving.

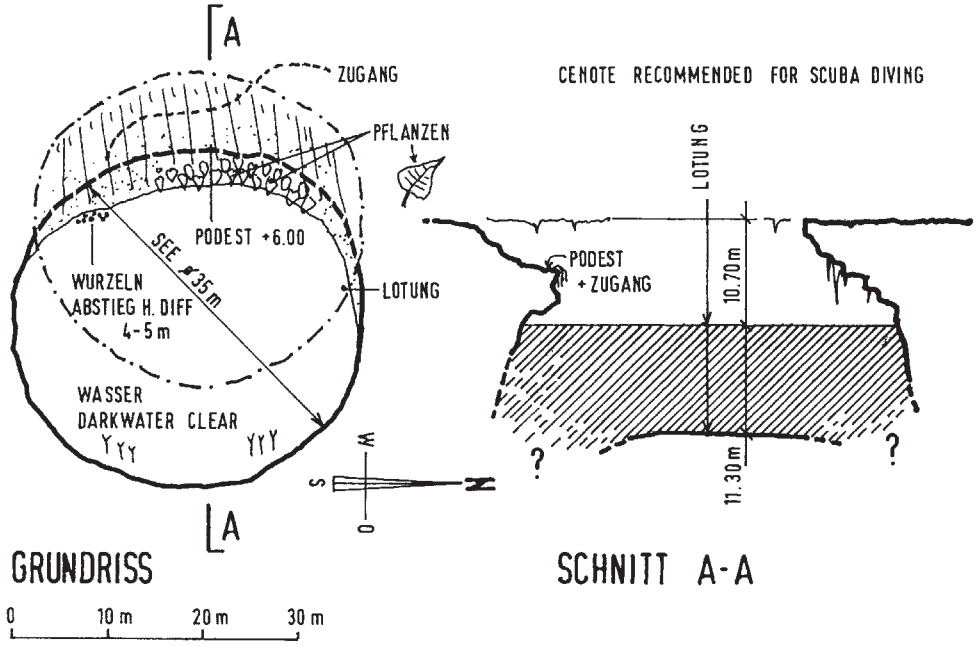
7. Cenote Rancho Xtohil. Located 5800 meters north of the rail line




1 CENOTE NR.#1
N 20°55' 58.6" / W 88°44' 41.5"
N
W
O
S
ROOTS
SEE
22 x 50 m
T 0.2 - 3m
WASSER
TANIC-GELB
SICHT 2-3m
HALDE
A
A
ZUGANG
STEIN-
SÄULE
GRUNDRISS
12 m
SCHNITT A-A
0 10 20 30 m
CENOTE NOT RECOMMENDED FOR SCUBA DIVING
2 CENOTE NR.#2
N 20°55' 58.6" / W 88°44' 41.5"
CENOTE CONDITIONAL RECOMMENDED FOR SCUBA DIVING
B
B
ca. 28 m
LOTUNG
8x12 m
HALBMOND-
FÖRMIGE
ÖFFNUNG
8 m
TROPFSTEIN-
SÄULE
LOTUNG
EXTREM
DÜNNER DECKEN-
PLATTENBEREICH
EINSTURZ
GEFAHR
TROPFSTEINE
11.80 m
7.30 m
ca. 28.00 m
8.00 m
8.00 m
WASSER TÜRKISTRÜBE SICHT 3-15 m
SCHNITT B-B
GRUNDRISS
0 10 20 30 m
GEZ. O.KNAB 3.2003

3 CENOTE LUKUM JA

N 20°56' 14.8" / W 88°44' 29.7"



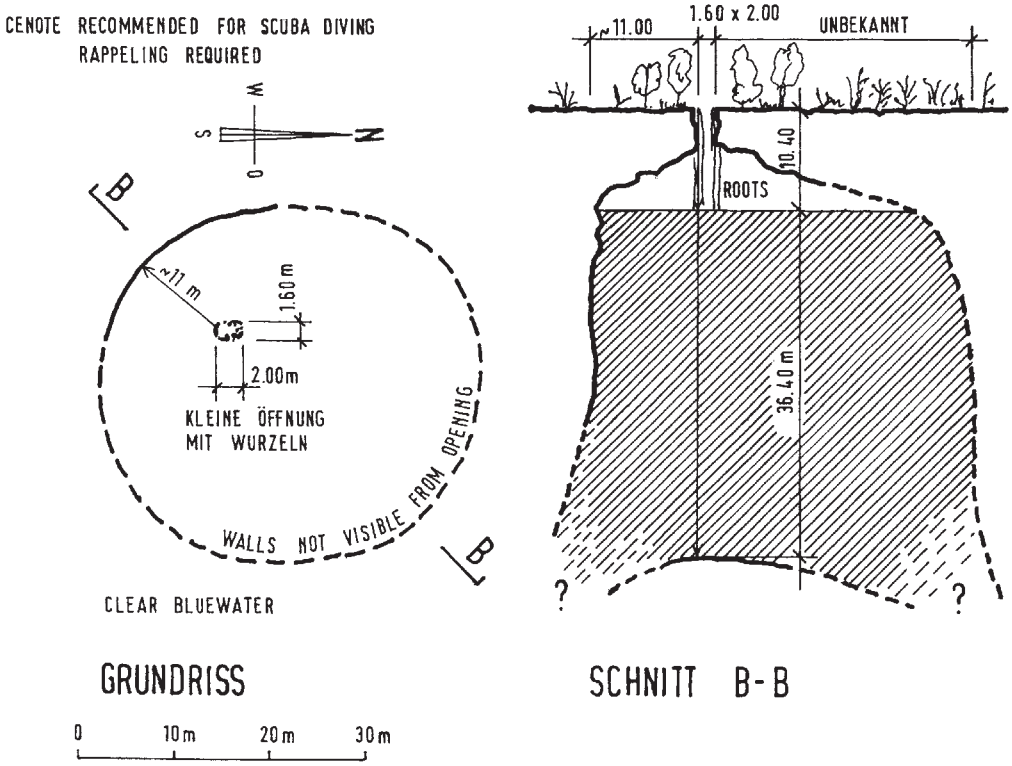
GRUNDRISS

SCHNITT A-A

0 10 m 20 m 30 m

5 CENOTE ABEJAS NR.#5

N 20°56' 53.0" / W 88°44' 26.5"

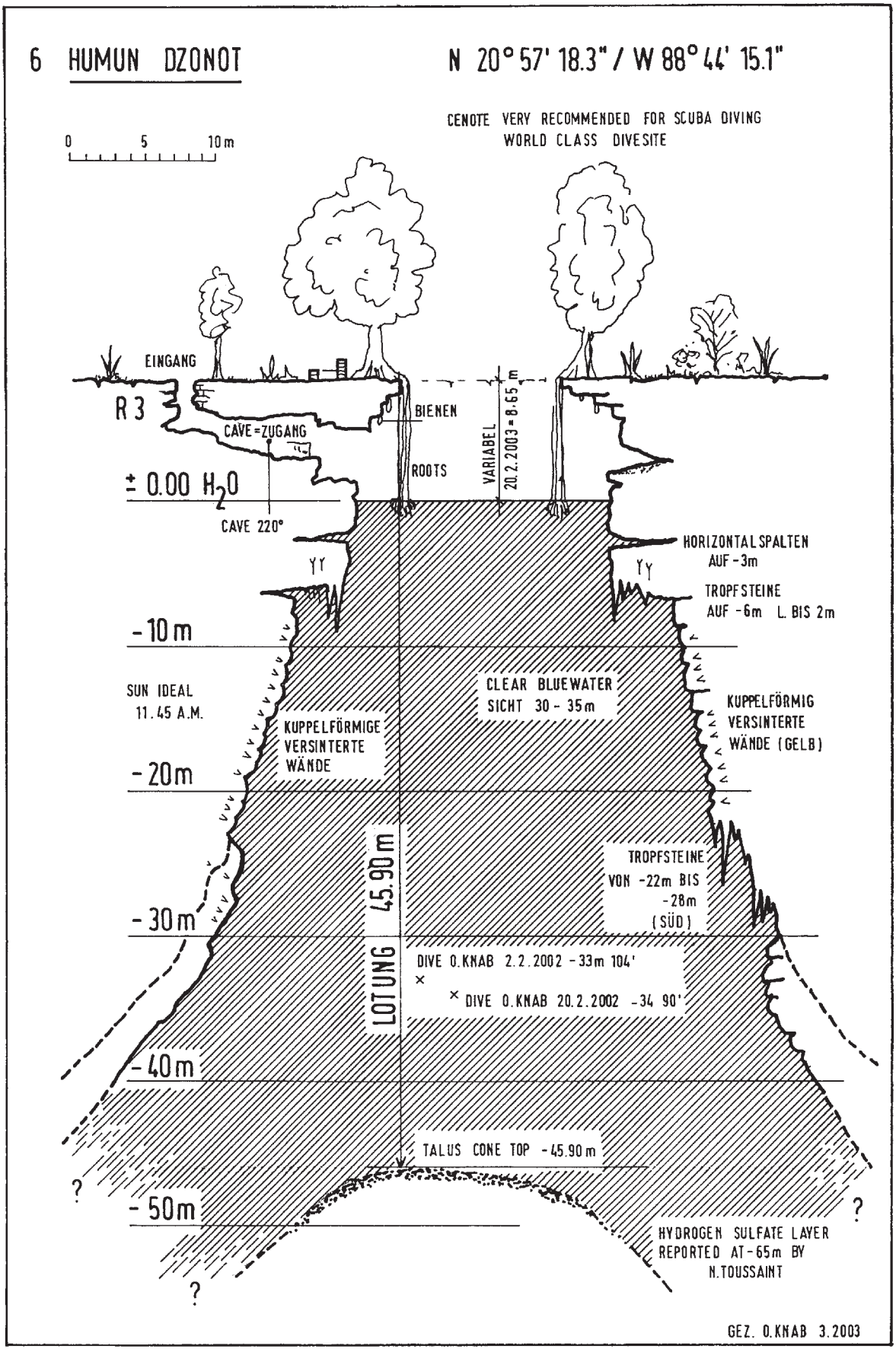


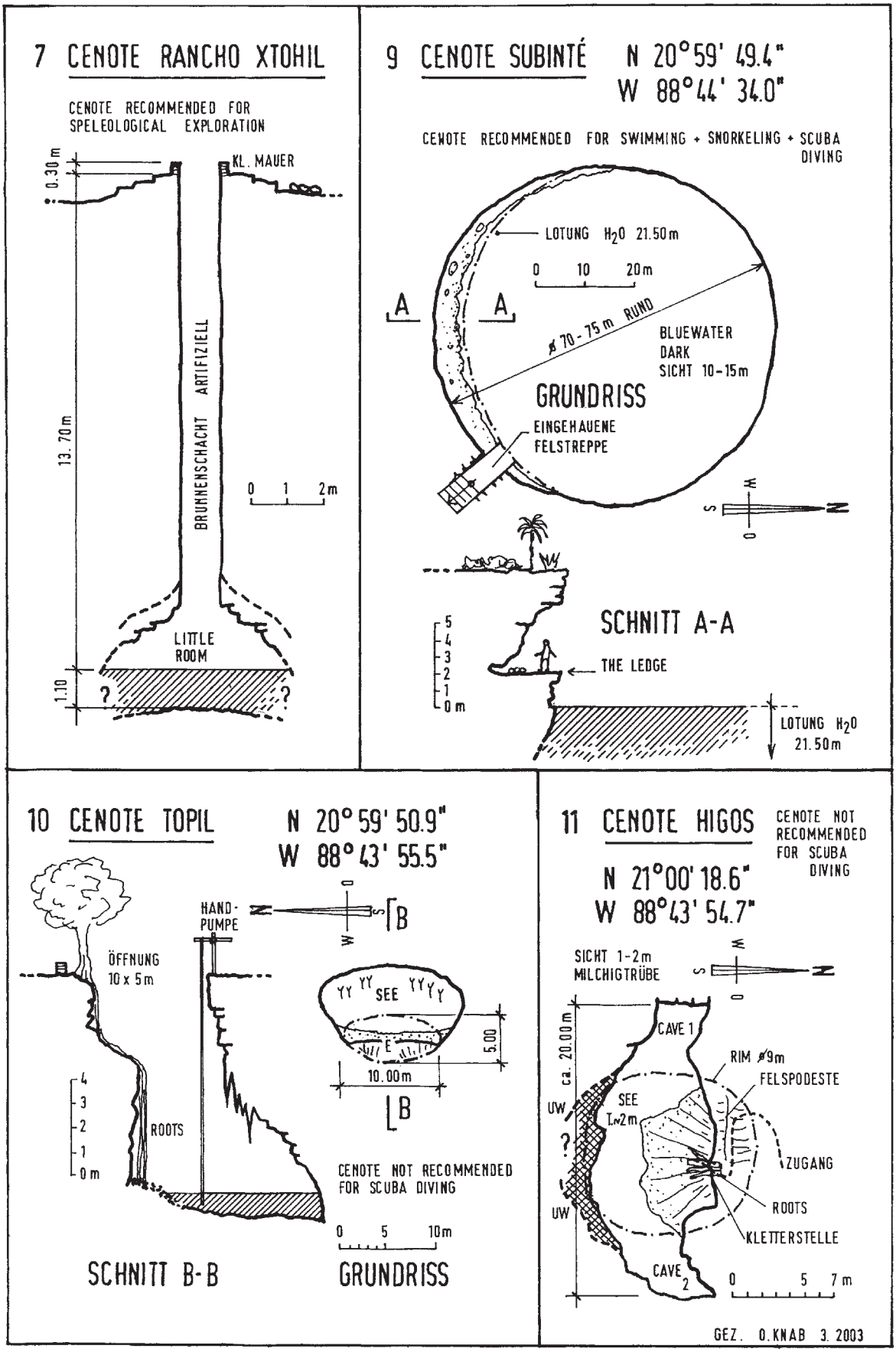
GRUNDRISS

SCHNITT B-B

0 10m 20m 30m

GEZ. O.KNAB 3.2003

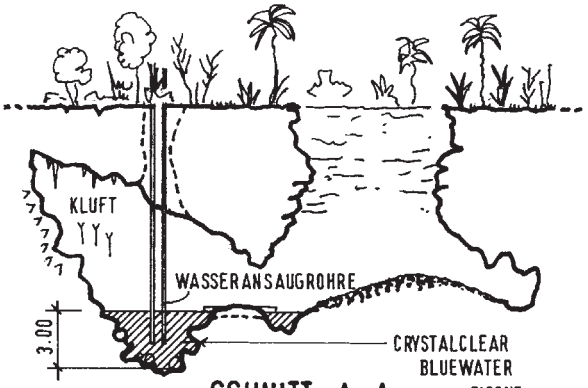

6 HUMUN DZONOT
N 20° 57' 18.3" / W 88° 44' 15.1"
CENOTE VERY RECOMMENDED FOR SCUBA DIVING
WORLD CLASS DIVESITE
0 5 10 m
EINGANG
R 3
CAVE=ZUGANG
± 0.00 H2O
CAVE 220°
BIENEN
ROOTS
VARIABEL
20.2.2003 = 8.65 m
HORIZONTAL SPALTEN
AUF -3m
TROPFSTEINE
AUF -6m L. BIS 2m
-10 m
SUN IDEAL
11.45 A.M.
CLEAR BLUEWATER
SICHT 30 - 35m
KUPPELFÖRMIGE
VERSINTERTE
WÄNDE
KUPPELFÖRMIG
VERSINTERTE
WÄNDE (GELB)
-20m
LOTUNG 45.90 m
TROPFSTEINE
VON -22m BIS
-28m
(SÜD)
-30 m
DIVE O.KNAB 2.2.2002 -33m 104'
DIVE O.KNAB 20.2.2002 -34 90'
-40m
TALUS CONE TOP -45.90 m
-50m
HYDROGEN SULFATE LAYER
REPORTED AT -65m BY
N.TOUSSAINT
GEZ. O.KNAB 3.2003


7 CENOTE RANCHO XTOHIL
CENOTE RECOMMENDED FOR SPELEOLOGICAL EXPLORATION
0.30 m
KL. MAUER
13.70 m
BRUNNENSCHACHT ARTIFIZIELL
0 1 2m
LITTLE ROOM
1.10
?
?
9 CENOTE SUBINTÉ N 20°59' 49.4" W 88°44' 34.0"
CENOTE RECOMMENDED FOR SWIMMING + SNORKELING + SCUBA DIVING
LOTUNG H2O 21.50m
0 10 20m
A A
ø 70-75 m RUND
BLUEWATER DARK SICHT 10-15m
GRUNDRISS
EINGEHAUENE FELSTREPPE
W S N O
5 4 3 2 1 0m
SCHNITT A-A
THE LEDGE
LOTUNG H2O 21.50m
10 CENOTE TOPIL N 20°59' 50.9" W 88°43' 55.5"
HAND-PUMPE
ÖFFNUNG 10 x 5m
B
YY YY SEE YYYY
5.00
10.00m
B
4 3 2 1 0m
ROOTS
CENOTE NOT RECOMMENDED FOR SCUBA DIVING
0 5 10m
SCHNITT B-B
GRUNDRISS
11 CENOTE HIGOS
CENOTE NOT RECOMMENDED FOR SCUBA DIVING
N 21°00' 18.6" W 88°43' 54.7"
SICHT 1-2m MILCHIGTRÜBE
W S N O
CAVE 1
ca. 20.00m
RIM ø9m
FELSPODESTE
UW
SEE
T=2m
?
ZUGANG
UW
ROOTS
KLETTERSTELLE
CAVE 2
0 5 7m
GEZ. O.KNAB 3.2003

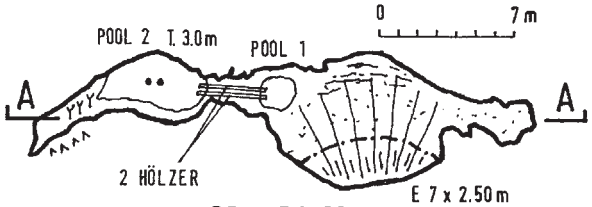
12 CENOTE NICTE HA

N 21°00' 37.6"
W 88°43' 32.3"

CENOTE OF SPELEOLOGICAL INTEREST



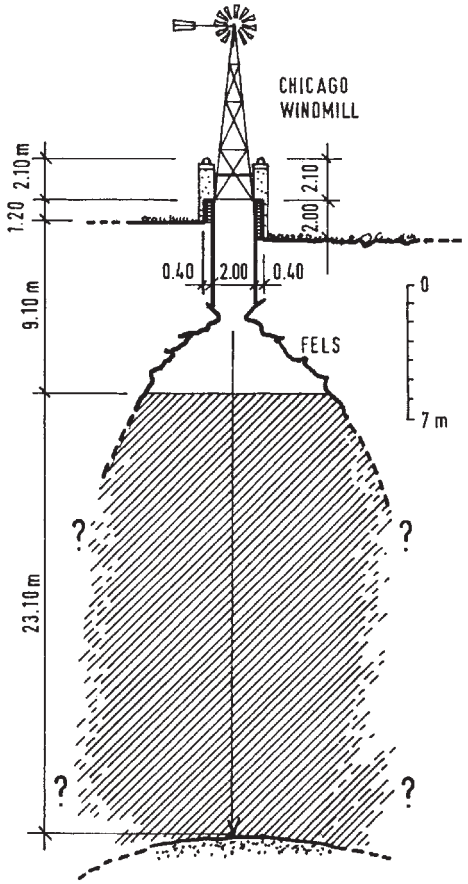
SCHNITT A-A



GRUNDRISS

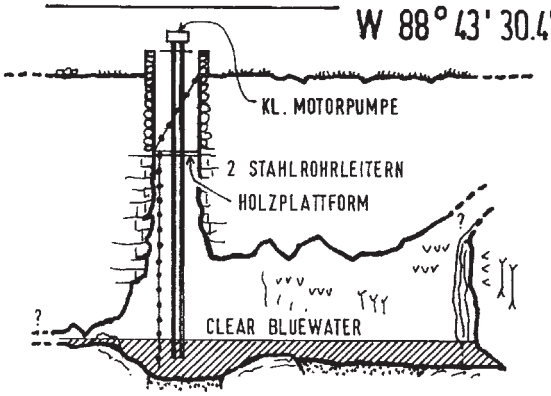
13 CENOTE SANTA CRUZ

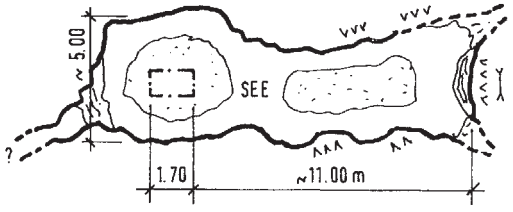
CENOTE RECOMMENDED FOR SCUBA DIVING



N 21°00' 51.5" / W 88°43' 12.8"

14 CENOTE MULPECHEC N 21°01' 39.7" W 88°43' 30.4"

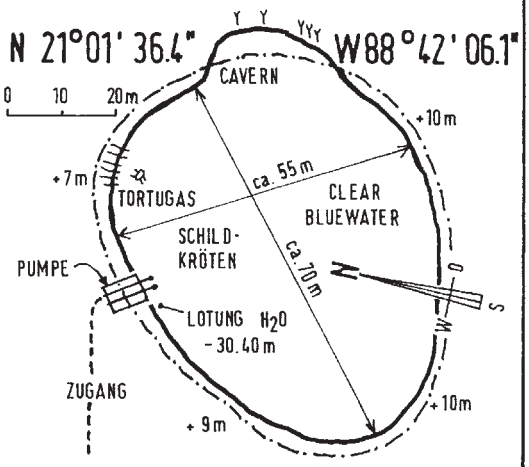




CENOTE OF SPELEOLOGICAL INTEREST

15 CENOTE SANTA MARIA

N 21°01' 36.4" W88°42' 06.1"



CENOTE RECOMMENDED FOR SCUBA DIVING

and about 1200 meters west of the road. An artificially enlarged shaft 13.7 meters deep intersects a small cave room. The measured water depth is 1.1 meters. The shaft has not been descended to explore the room. Worth speleological investigation.

8. Well. North 7130 meters from the rail line, 1330 meters from the fork in the gravel road and 680 meters west of Rancho La Noria, at a windmill on the ranch. Unknown depth to water, listed here because it is a subterranean water source.

9. Cenote Subinte. Located 10,700 meters north of the rail line and 1000 meters west of the road. From the small *rancho*, a horse track leads to the cenote. Large, nearly circular water-filled sinkhole 70 to 75 meters across. Access to the water is by a flight of steps hewn into the stone. On the south side there is an easy ledge under the cenote rim. Dark blue water, visibility 10 to 15 meters. Dry part of the sink about 8 meters deep, water plumbed to 21.5 meters. Recommended for diving, swimming, and snorkeling.

10. Cenote Topil. Located 10,800 meters north of the rail line, 25 meters east of the road. Shaft-like cave opening 5 by 10 meters. Subterranean lake of unknown but shallow depth. Flowstone on the east wall, hand pump for water, and roots down to water level. Not recommended for swimming or diving.

11. Cenote Higos. Located 11,400 meters north of the rail line and 60 meters west of the gravel road. The cenote was named because of the figs that were floating by the hundreds in the pool. A step down to roots and a steep grade lead to the subterranean lake. Two small grottos are found in the eastern and western parts of the cenote. Water quality is variable. On 3 February 2002, the water was milky and clouded, with 1- to 2-meter visibility. Lake depth about 2 meters. Underwater cave still unexplored. Not recommended for diving.

12. Cenote Nicte Ha. Located 11,900 meters north of the rail line and 80 meters west of the road, near the direction sign to Rancho Nicte Ha, posted on a tree, and a small building. A dry sinkhole opens into a small cave with two pools. Black catfish were seen in Pool 2. Cave ends in a flowstone rift. Of speleological interest.

13. Cenote Santa Cruz. Located 12,600 meters north of the rail line and 70 meters east of the road. Under the windmill on a ranch. Dry shaft 9.1 meters deep to water plumbed to 23.1 meters. The underwater dimensions of the cave are unknown; it still needs to be dived. Rope or ladder needed for descent to the water. Recommended for diving.

14. Cenote Mulpechec. Located 13,500 meters north of the rail line at the end of the western branch of the gravel road, at Rancho Mulpechec. A shaft finished with masonry, 1.7 by 0.9 meters. Descent by steel-pipe ladder to a wooden platform at –3 meters. Crystal clear, blue water 1.5 meters maximum depth in a room 5 by 14 meters. Various accumulations of flowstone. Small extension not explored. Two water pipes and a motor pump worth noting. Of speleological interest and recommended for swimming.

15. Cenote Santa María. Located 15,700 meters from the rail line at the end of the eastern fork of the road, at a concrete footing with a pump. Huge cenote lake 55 meters wide and 70 meters long. Descent along wall from 7 to 10 meters high above the water. Plumbed water depth 30.4 meters. Tortoises, cavern in the north-east part with formations, blue, clear water, visibility 20 to 25 meters. Recommended for diving and snorkeling.

Cenotes al norte de Tunkas, Yucatán

Quince pozos o cenotes fueron encontrados al lado de un pequeño camino de terracería al norte del pueblo de Tunkas, Yucatán. El Cenote Humun Dzonot es una de las dolinas más hermosas para bucear en el mundo.

MEXICAN WINTERING SITES OF BATS FROM CARLSBAD CAVERN

David Roemer

Some very basic facts regarding the long-distance seasonal migration of Mexican free-tailed bats (*Tadarida brasiliensis mexicana*) are generally understood. These bats arrive at summer roosts, such as Carlsbad Cavern, in March and April and depart for southern locations in Mexico by late October. These basic facts actually leave quite a lot of room for questions. Where exactly do the bats go in Mexico? Do they more or less group together? How far do they migrate in any given night? Where do they stop over and how far south do they eventually go? Despite their being one of the most numerous mammals in the southwestern United States, the whereabouts and status of winter populations of these animals are still largely unknown. The answers to these questions hold much interest for ecologists and natural resource stewards, who cannot develop sound conservation strategies without some knowledge of the bats' winter habits.

We would probably know even less about wintering Mexican free-tailed bats were it not for the fact that bats are host to the rabies virus. The discovery of rabies in bats in 1953 led to the funding of numerous ecological investigations of insectivorous bats by the U. S. Public Health Service (Davis et al., 1962). This research included banding of large numbers of Mexican free-tailed bats at Carlsbad Cavern (Constantine, 1967) and other locations in New Mexico, Arizona (Cockrum, 1969), Texas (Davis et al., 1962), Oklahoma (Glass, 1958), and Mexico (Villa and Cockrum, 1962). These efforts, conducted duing the late 1950s and the 1960s, established multiple connections between bats at Carlsbad Cavern and other localities, including several winter records from Mexico.

In December 1999, a team of biologists visited four known wintering sites for Mexican free-tailed bats from Carlsbad Cavern to verify that the caves are still used by the bats, record ecological data for the caves, and determine relative numbers of other bat species. The cave sites ranged from desert habitats in northeastern Mexico to tropical environs in the state of Jalisco, eight hundred miles south of Carlsbad Cavern. The project was led by Dr. Troy Best, Department of Biological Sciences at Auburn University, and Dr. Celia Lopéz-González, Centro Interdisciplinario de Investigación para el Desarrollo Integral Regionál of Unidad Durango. Other project participants included John Hunt and Lisa McWilliams from Auburn, Gabriel Villegas-Guzmán and Luís Guevara-Chumacero from CIIDIR-IPN, and David Roemer from Carlsbad Caverns National Park. The project was funded by the Adopt-a-Bat program, with support from the National Park Service, Auburn University, and CIIDIR-IPN.

The first cave that we visited, on December 10, was Cueva del Rincón de la Virgin, perched high above the Chihuahuan Desert among limestone cliffs near Villa de García in Nuevo León. A local goat herder steered us in the right direction, as we had originally set out for Cueva de la Bruja, not Cueva de la Virgin. Hiking to the cave was very much like hiking in Carlsbad Caverns National Park—rugged country with lechuguilla, catclaw, and ocotillo at every turn. When we finally reached the cave, we found that the roost was empty, but there was a lot of guano and other evidence to consider. Among the numerous bat bones in the cave we identified *Tadarida* males, females, and babies. The large amount of undisturbed guano also points strongly toward the use of the cave as a summer roost for *Tadarida*. Even though there were no bats in the cave, we set up mist nets and captured ten *Tadarida,* four males and six females, flying into the cave.

We arrived in the vicinity of Cueva de Guano on December 12, which was a festival day. Our hosts in Nazareno Tres were feeding the entire village, in addition to our team. There was some confusion about where the cave actually is. Our original source told us to look for Cueva de Laguna Seca in the state of Coahuila, but interviews with local residents informed us that there was only one notable guano cave in the area. This turned out to be on the other side of the state line in Durango. Our hosts guided us to the cave, which has a reasonable four-wheel-drive road leading to it to facilitate guano mining. We captured 53 *Tadarida,* 35 males and 18 females, and 153 ghost-faced bats (*Mormoops megalophyla*). As the name suggests, Cueve

This appeared, in somwhat different form, in *Canyons and Caves* 16 (spring 2000) and 19 (winter (2000–2001).

de Guano is likely also a summer roost for *Tadarida,* or the guano bat.

The team spent a lot of time on the road in a crowded VW bus to reach the next two sites. Leaving Durango, we descended mountainous Route 40 to Mazatlán, crossing the Tropic of Cancer on the way, and then headed up the coast to look for Cueva de la Chinacatera. Our hosts in the village of Caimanero arranged for someone to guide us to the cave on December 15. There we discovered another *Mormoops* roost of perhaps two hundred bats. We also captured Parnell's moustached bat (*Pteronotus parnellii*) and the naked-backed bat (*P. davyi*). The naked-backed bat has a wing membrane stretching across the back, which helps to explain its name. The amount of guano in the cave and interviews with local residents suggest that Cueva de la Chinacatera is also used as a summer roost by *Tadarida.* Local residents had mined three hundred sacks of guano from the cave that year.

The last cave on our itinerary is actually a set of three adjacent caves near the village of Soyatlán del Oro, Jalisco. Cuevas de las Garrochas were on our list because a bat banded in Carlsbad Cavern on September 18, 1952, turned up there on November 26 of the same year (Constantine, 1967). We failed to find *Tadarida* there, but we did find a roost of vampire bats (*Desmodus rotundus*) with young. The vampires and a leaf-nosed bat (*Anoura geoffroyi*) were in the first cave. The second cave smelled like *Tadarida* and had lots of guano and *Tadarida* bones. The third cave was too small for bats to use. Interviews with local residents and guano sacks in the cave indicate that this site, too, is primarily a summer *Tadarida* roost.

A team of biologists from Mexico and the United States visited seven caves in Nuevo León, Tamaulipas, San Luis Potosí, Michoacán, Colima, and Jalisco during December 12–21, 2000. A large winter roost of approximately one hundred thousand Mexican free-tailed bats was found at Cueva de La Boca, Nuevo León, and perhaps another ten thousand in Grutas de Quintero in Tamaulipas. Cueva de La Isla Janitzio in Michoacán also had a small colony of free-tailed bats. During the trip, sac-winged bats (*Balantiopteryx plicata*), moustached bats (*Pteronotus parnellii* and *P. personatus*), naked-backed bats (*P. davyi*), long-tongued bats (*Glossophaga* sp.), New World fruit bats (*Artibeus lituratus, A. jamaicensis, Dermanura toltecus, and Sturnira* sp.), common vampires (*Desmodus rotundus*), red bats (*Lasiurus* sp.) and mastiff bats (*Eumops* sp.) were also encountered. Drs. Troy Best and Celia López-González again led the projects. Other participants were Lisa McWilliams, John Hunt, Gabriel Villegas-Guzmán, Hergüín Benjamin Cuevos Arellano, and David Roemer.

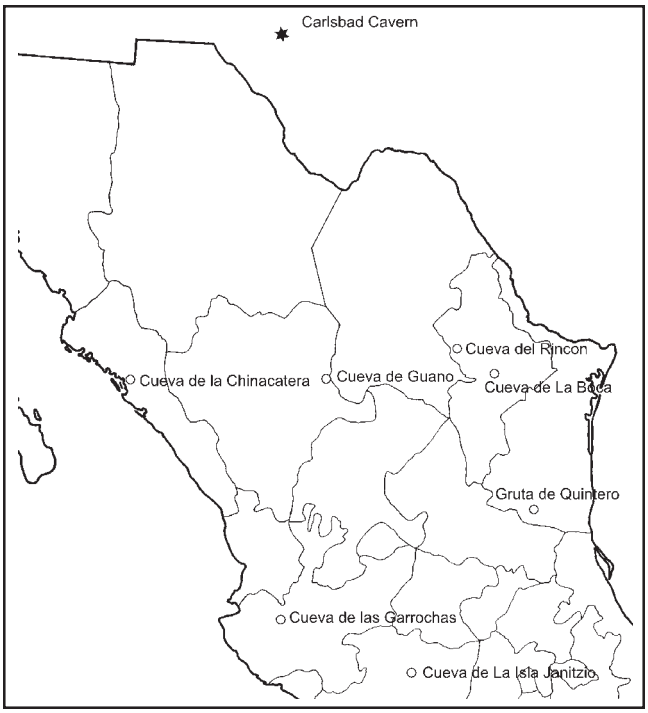
Cockrum, E. L. 1969. Migration in the guano bat, *Tadarida brasiliensis*. *Miscellaneoous Publications, University of Kansas Museum of Natural History* 51:303–336.

Constantine, D. G. 1967. Activity patterns of the Mexican free-tailed bat. *University of New Mexico Publications in Biology* 7:1–79.

Davis, R. B., C. F. Herreid III, and H. L. Short. 1962. Mexican free-tailed bats. *Texas Ecological Monographs* 32(4):311–346.

Glass, B. P. 1958. Returns of Mexican free-tail bats banded in Oklahoma. *Journal of Mammalogy* 39:435–437.

Villa-R., B. and E. L. Cockrum. 1962. Migration in the guano bat *Tadarida brasiliensis mexicana* (Sassure). *Journal of Mammalogy* 43:34–64.



Investigadores Mexicanos y de Estados Unidos visitaron cuevas de México en las que se han reportado poblaciones de murciélagos procedentes de las Cavernas de Carlsbad (*Tadarida brasiliensis mexicana*) que pasan el invierno en México.

History

Cavers camping along the highway near Los Sabinos, San Luis Potosí, Thanksgiving 1964. Some of them had visited Cueva de El Abra, Tamaulipas, and Sótano del Tigre and Sótano de la Tinaja in SLP; others had visited Sótano de Tlamaya, SLP. The three vehicles are, left to right, Terry Raines's truck Fufu, Jim Duke's Mercury, and Orion Knox's Chevrolet. Others in the group were David McKenzie, Phillip Schiffert, John Fish, James Reddell, Dick Smith, Neal Prescott, Dick Childers, Bill Bell, Bob "Rune" Burnett, and Benny Martin. This is the first trip reported in the name of the Association for Mexican Cave Studies, in its *Newsletter*, vol. 1, no. 1, pp. 2–6 (January 1965). Photo by Orion Knox.