

AMCS
ACTIVITIES
NEWSLETTER
Number 35 May 2012





AMCS

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

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

This issue was edited by Bill Mixon, with help from Yazmin Avila, Yvonne Droms, Rodolfo "Fofo" González, Jim Kennedy, Mark Minton, Peter Sprouse, and Jack "Solo" White.

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

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Front cover

Joel Tomé descending
95-meter Pozo Toto-
Naco, Puebla, during
the 2011 GSAB
expedition. Photo by
Gustavo Vela.

Back cover

Cavers at the bottom
of the Jungle Drop
into the Sótano de San
Agustín entrance to
Sistema Huautla, Oax-
aca. Photo by Michael
Thomas.



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NEWS

Ruins in Cueva del Boruco Número 1, Rancho Casa Blanca, Mpo. Madera, Chihuahua. Photo by Carlos Lazcano from his new AMCS Bulletin 22, *Return to the Forgotten World*.

MEXICO NEWS

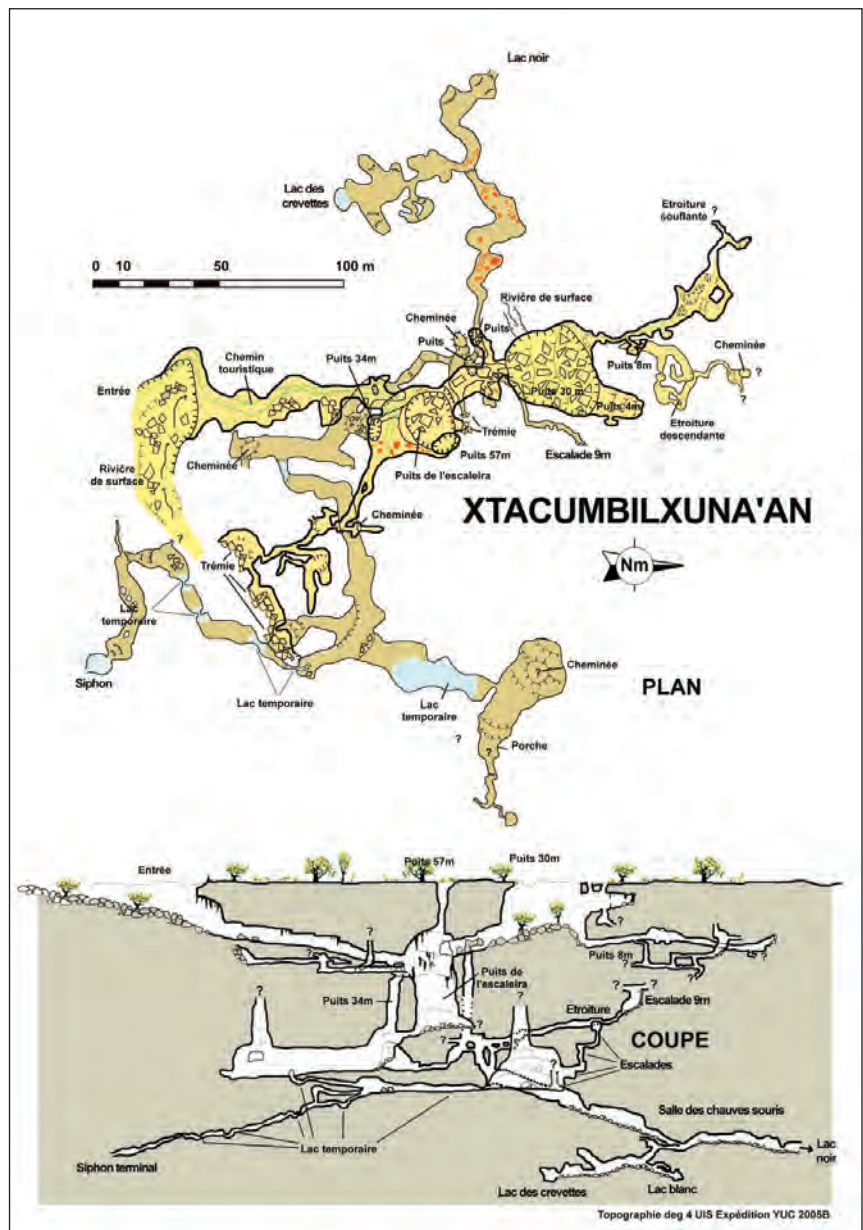
Compiled by Bill Mixon

CAMPECHE

The **Grutas de Xtacumbilxunaan** were made famous by Frederick Catherwood's color drawing of the log stairway used by local Maya to fetch water from the cave, made during his and John Lloyd Stephens's 1839–1840 visit to the Yucatan. It was first published as an engraving in Stephens's *Incidents of Travel in Yucatán* (1841). Stephens's text, in which he referred to it as the cave at Bolenchen, was reprinted in *AMCS Activities Newsletter* 20, pages 88–92. The cave is operated as a show cave today, and there was an article dated February 1, 2012, in the web site of *Diario de Yucatán*, www.yucatan.com.mx/20120131/nota-7/229168-ja-princesa-esta-escondida!.htm. A link in the article connects to a gallery of twenty-six photographs. The article describes the legend behind the name of the cave as well as the tour, which covers 250 meters to a depth of 75 meters. *Source*: Called to our attention by Fátima Tec Pool. The cave map is from Christian Thomas's report on his Expédition YUC 2006 B.

valuable source of water in the karst. *Source*: Kur number 15, December 2010, pages 14–15 (www.laventa.it/documenti/kur/kur15.pdf; ignore

the incorrect table of contents there). Another article in the issue reports that they found "tens of caves" near Lázaro Cárdenas, exploring



CHIAPAS

In April 2010, explorers from the Italian group La Venta Esplorazioni Geografiche visited the Selva Ocote again. Some members of the group revisited the **Ombigo del Mundo** (see *AMCS Activities Newsletter* 34) and rigged a tyrolean across it in order to shoot 3-D videos of the pit. A small team discovered another sótano about 300 meters to the west, and it went down over 110 meters to a choke. And at the bottom of a small valley, they found a dry passage that led some 30 meters to a sump, a very



Tour route in Grutas de Xtacumbilxunaan, with log ladder (probably a reconstruction).

Drawing from 1840 by Frederick Catherwood.



and photographing 4 kilometers of large passage.

In April 2011, La Venta returned to the El Ocote Biosphere Reserve for their twenty-fourth visit since their descent of the Río La Venta canyon in 1991. In the Unesco region they explored a large new tunnel, **Cueva del Plátano**, over 1.5 kilometers long. "Great exploration possibilities are also present in the little-known area of La Florida, where a big resurgence explored for just a few hundred meters waits for our next expedition." *Source: Kur number 16, June 2011.*

The book *Río La Venta: Tesoro de Chiapas*, the Spanish version of the 1999 book *Río La Venta: Treasure of Chiapas*, was reprinted in 2010 at the request of the government of Chiapas. With the new printing of five thousand, the total number of copies of the book in all languages (Italian, Spanish, English, and French) is thirteen thousand. *Source: Kur number 14, June 2010.* The AMCS has copies of the English version for sale. See www.amcs-pubs.org/other/otherpubs.html.

Cueva del Puercoespín and **Sumidero de Higo** are caves located on the San Fernando Plateau, close to the Cañón del Sumidero. In these caves, partially known before by the Grupo Espeleológico Jaguar of Tuxtla [see *AMCS Activities Newsletter 28*, pages 185–187], new passages have recently been explored by members of the La Venta team, Grupo Jaguar, and other Mexican cavers. The new explorations show the presence of holes and big passages near the walls of the Cañón del Sumidero and cast a whole new light on the San Fernando karst area. Various unexplored entrances give new, interesting perspectives for future exploration. *Source: English abstract to article "Viaggio de ricerca nella luce degli altipiani San Fernando, Cañón del Sumidero," by Francesco Sauro, Mauricio Náfate López, Kaleb Zárate Gálvez, Giorgio Annichini, and Natalino Russo, Speleologia 64, June 2011, pages 44–49.*

Members of Associazione La Venta returned to the Selva Ocote area



in April 2011. "Finally we went to San Fernando for a quick recon in **Sumidero Higo**. The new passage that the Grupo Jaguar had discovered by climbing led to a huge room, followed by a steep phreatic ramp that leads to a large underground stream at -300 meters. Half a kilometer downstream, past lakes and sand banks, a waterfall was reached that was not descended due to lack of equipment. And so the way to the Cañón del Sumidero has been reopened." *Source:* Part of a note in *Speleologia* 65, December 2011, pages 86–87, by Francesco Sauro, translated from Italian by Yvonne Droms. Note that these new passages are not on the map published here.

Anthropologists in Mexico say the remains of 167 bodies found in a cave in the southern state of Chiapas were part of an ancient burial ground. The Instituto Nacional de Antropología e Historia said tests

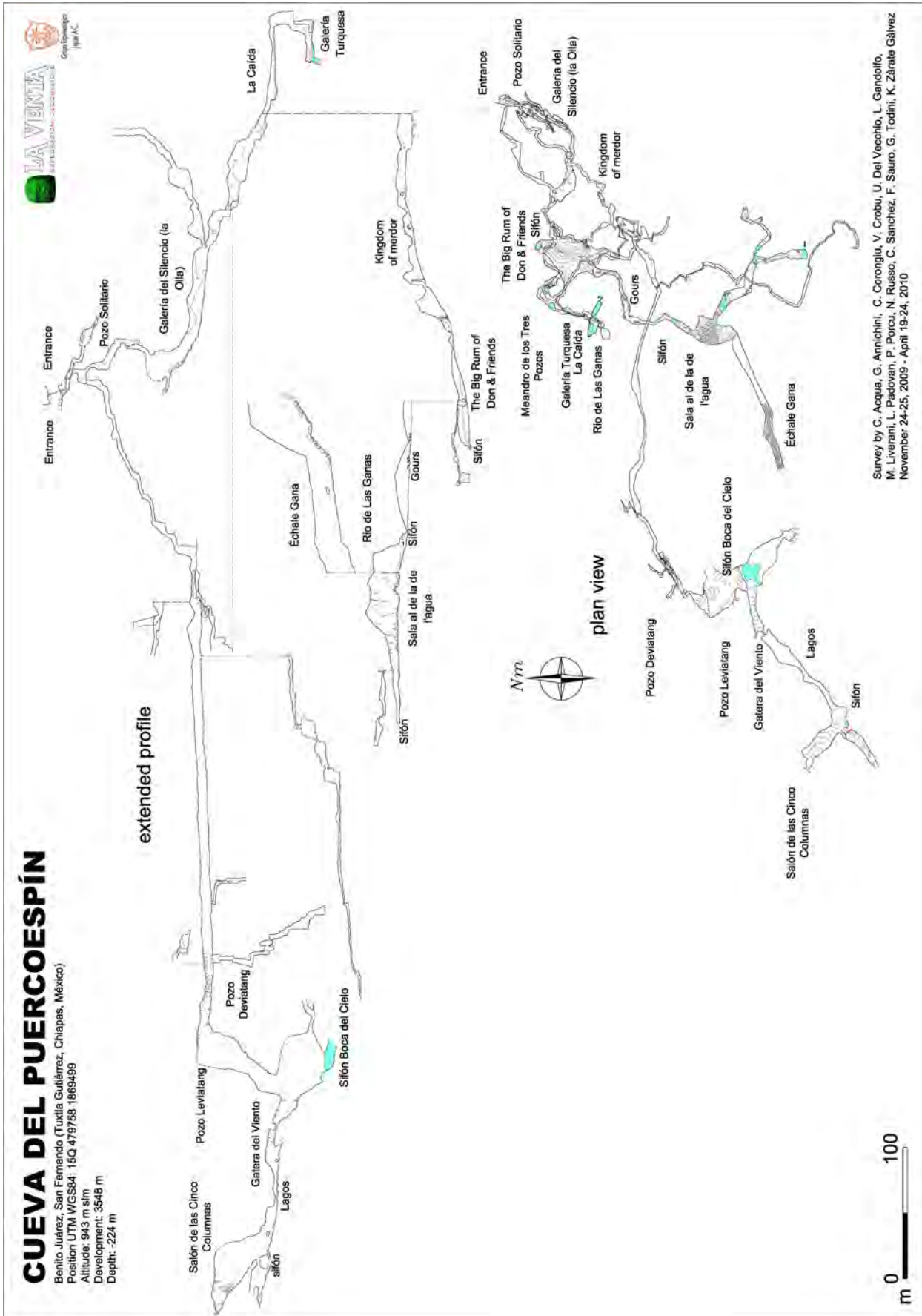
showed the remains dated back to the eighth century. Scientists hope pottery found in the cave will help them determine the community those buried belonged to.

It was first feared the bodies could belong to victims of the decades-long civil war in neighboring Guatemala. Farmers had found the bodies in a cave on the Nuevo Ojo de Agua ranch, some 20 kilometers from the Guatemalan border, and alerted the authorities. Initial tests suggested the bodies were at least fifty years old, leading some activists in Guatemala to speculate they may have belonged to victims of the 1960–1996 civil conflict. But forensic experts have since said the skulls showed signs of a deformation typical of native communities dating back one thousand years and more. The Maya people who thrived in the region for nearly two thousand years used planks to flatten and elongate the skulls of their children.

Anthropologists continue to examine the remains in an effort to determine the sex, age, and ethnic make-up of the bodies. *Source:* BBC news release, 11 March 2012, at www.bbc.co.uk/news/world-latin-america-17335586.

CHIHUAHUA

Jointly organized by the Molisani Speleological Association and the La Venta Association, the Hundido 2010 expedition took place in November 2010 in the state of Chihuahua. Its objective was to thoroughly investigate the vast karst area in the desert of the Sierra del Diablo. The first few days were dedicated to the exploration of **El Hundido**, a 183-meter-deep pit, whose bottom is covered by a 150-meter-wide lake of sulfurous water. The cave had been checked briefly by La Venta cavers in November 2009 and even earlier explored by American cavers (see *AMCS Activities Newsletter* 32,



pages 121–128). This 2010 expedition attempted to find the roosting location of the nearly two million pipistrelle bats that leave the cave each evening in a huge cloud. A large window was found; it gave access to a 30-meter-long fossil passage, whose morphology was of obvious hypogenic origin. Other large windows were found, containing enormous domes of corrosion, which were occupied by various colonies of pipistrelles. After Hundido, the expedition concentrated on the Apache Canyon, a fascinating area rich in Indian shelter caves and arrowheads. The last days of the expedition were spent in the nearby Sierra Mojada. Although no big system was found, the area shows great potential, especially when you consider the presence of sulfur caves of hypogenic origin, like Hundido. It's possible that future searches will bring major surprises, since the geology of the area is similar to that of the Guadalupe Mountains in New Mexico, home of the most famous hypogenic caves in the world: 200-kilometer-long Lechuguilla and the show cave Carlsbad Caverns. *Source:* Note by Francesco Sauro and Leonardo Colavita in *Italian in Speleologia* 64, June 2011, page 72, summarized by Yvonne Droms.

Dr. Penelope Boston is analyzing samples from the giant crystals of Naica Cave, Chihuahua, Mexico, with colleagues at UNM and several virologists from the University of British Columbia. The microbiology of the crystal fluid inclusions is exceedingly interesting, and the

Mexican TV crew member Mario Corsalini in an ice suit by one of the amazing gypsum crystal flowers in the Naica mine. *Michael Spilde.*



researchers have developed a list of organisms that are present within a number of hot and extreme habitats in the Naica Cave system. There is sequenceable DNA material in the crystal fluid inclusions, red wall deposits, and the black imbedded material. These microorganisms are all novel strains and show that their nearest genetic relatives are geographically distant, but exist in environments that share similarities with Naica Cave, such as active volcanic terrain in Kamchatka, Russia, and certain caves in Australia. Water samples were analyzed and show a very high metal content. *Source:* *National Cave and Karst Research Institute 2009–2010 Annual Report*, page 7, download from www.nckri.org/about_nckri/annuals/NCKRI_09-10_Annual_Report.pdf.

A paper by A. E. S. Van Driessche et al. describes experiments on the growth of the giant gypsum crystals in the mine at Naica in the paper "Ultraslow Growth Rates of Giant Gypsum Crystals" in the *Proceedings of the National Academy of Sciences of the United States of America*, volume 108, 2011, pages 15721–15726 plus supplementary material. The crystals are believed to have grown very slowly from water only slightly supersaturated and over a narrow temperature range. Laboratory experiments with crystals growing in water from the mine found the slowest rate of growth at 55°C, $1.4 \pm 0.2 \times 10^{-5}$ nanometers/second, which amounts to about half a millimeter per thousand years. However, at a slightly higher temperature, 57°, a crystal a foot in diameter could have grown in 100,000 years. The whole paper may be freely fetched from www.ncbi.nlm.nih.gov/pmc/articles/PMC3179101/pdf/pnas.1105233108.pdf. (Easiest is to search for PNAS and go from there.)

Abstract: "The Present Day Genesis and Evolution of Cave Minerals inside the Ojo de la Reina Cave (Naica Mine, Mexico)," by Giovanni Badino, et al.

Ojo de la Reina is the first and the smallest cave intersected at the –290 level in the Naica Mine (Mexico),

therefore it was the first cavity in which the lowering of temperature induced by mine ventilation caused condensation over crystals' surfaces since 2005. The consequent dissolution of the gypsum crystals and subsequent condensed-water evaporation lead to the deposition of several new minerals, among which some highly soluble Mg/Na compounds (bloedite, epsomite, halite, hexahydrate, kieserite, starkeyite). The single available source of Mg and Na ions in this minerogenic environment is represented by the huge fluid inclusions widespread within the crystals. The condensation occurs mainly along the widened principal exfoliation (010) planes, and allows an easy and fast opening of the fluid inclusions that consequently drip Mg-rich fluids stored inside them. Finally the evaporation of the relatively small volumes of involved water allows the development of the high soluble Mg and Na compounds.

Source: Article in *International Journal of Speleology* 40(2)125–131, July 2011, freely available at [www.ij.speleo.it/pdf/75.615.40\(2\)_Badino.et.al.pdf](http://www.ij.speleo.it/pdf/75.615.40(2)_Badino.et.al.pdf), called to our attention by Mark Minton.

COAHUILA

There was a news article in *Nature* volume 476, page 19, August 3, 2011, about groundwater depletion in the Cuatro Ciénegas basin and the efforts of researchers to partner with local Mexican farmers to protect the area via potential commercialization of biological materials discovered by the scientists. It is freely available at www.nature.com/news/2011/110803/full/476019a.html. *Source:* Diana Tomchick.

DISTRITO FEDERAL

Press reports dated September 14, 2011, tell of a collapse in a yard in Iztapalapa in the Cerro de la Estrella area. It was caused by an underlying cave, one of many in the Estrella area. Gustavo Vela says that the collapse was only a kilometer from his home. *Source:* Tlamaqui e-mail list post by Gustavo Vela; <http://mx.noticias.yahoo.com/que%20causa-cueva-050654710.html>.

GUERRERO

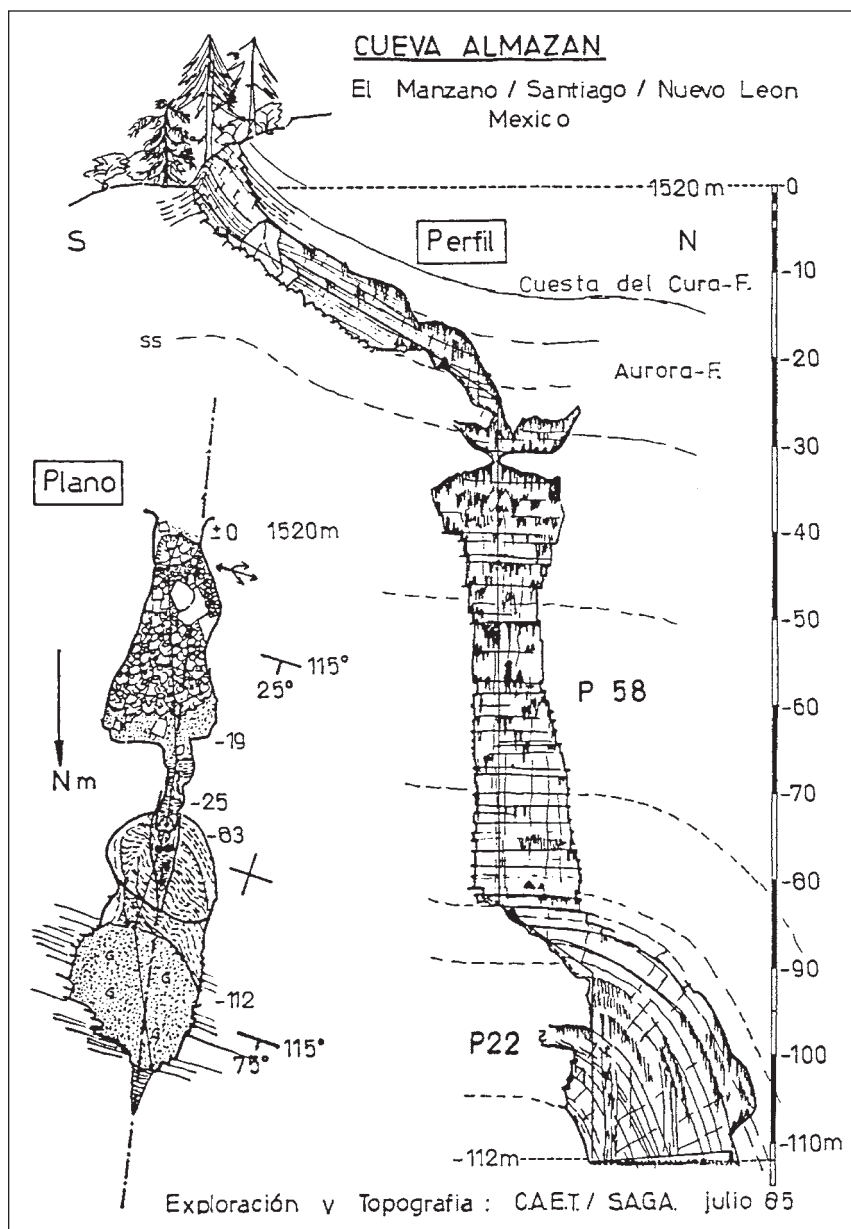
The Sociedad de Espeleosocorro Integral has recommendations for times to visit the **Ríos Subterráneos Chontalcoatlán** and **San Jerónimo** (the Dos Bocas caves) in Guerrero. The best time for tours is January and February. There is little risk of rain in March and October, but high risk of rain in April and November. Visits to the caves are not recommended in May through October. *Source:* Post to Tlamaqui e-mail list by Draco group, February 14, 2012.

Abstract: "A 2400 Yr Mesoamerican Rainfall Reconstruction Links Climate and Cultural Change," by Matthew Lachniet, et al. Droughts are a recurring feature of Mexican climate, but few high-resolution data are available to test for climate-change forcing of Mesoamerican civilizations. We present a quantitative 2400 yr rainfall reconstruction for the Basin of Mexico, from a precisely dated and highly

resolved speleothem, that documents highly variable rainfall over the past 2400 yr. Dry conditions peaked during a 150-yr-long late Classic (ca. 600–900 CE) [Common Era] mega drought that culminated at 770 CE and which followed centuries of climatic drying that spanned the fall of the city of Teotihuacán ca. 550 CE. The wettest conditions in the 1450s CE were associated with flooding in the Basin of Mexico. Our data suggest that rainfall variability was likely forced by the El Niño–Southern Oscillation, and impacts on spring-fed irrigation agriculture may have been a stressor on Mesoamerican civilizations. *Source:* *Geology*, volume 40, pages 259–262, March 2012.

MICHOACÁN

"Mexico News" in the last issue, number 34, quotes Polish cavers as writing that **Cueva Vinata** is 3300 meters long. Mark Minton points out that the map in *AMCS Activities Newsletter* 23 (1999) has it at 4666 meters and that Chris Lloyd reported a length of 5478 meters in 2009. Probably the Poles include only the part of the cave up to the sumps.

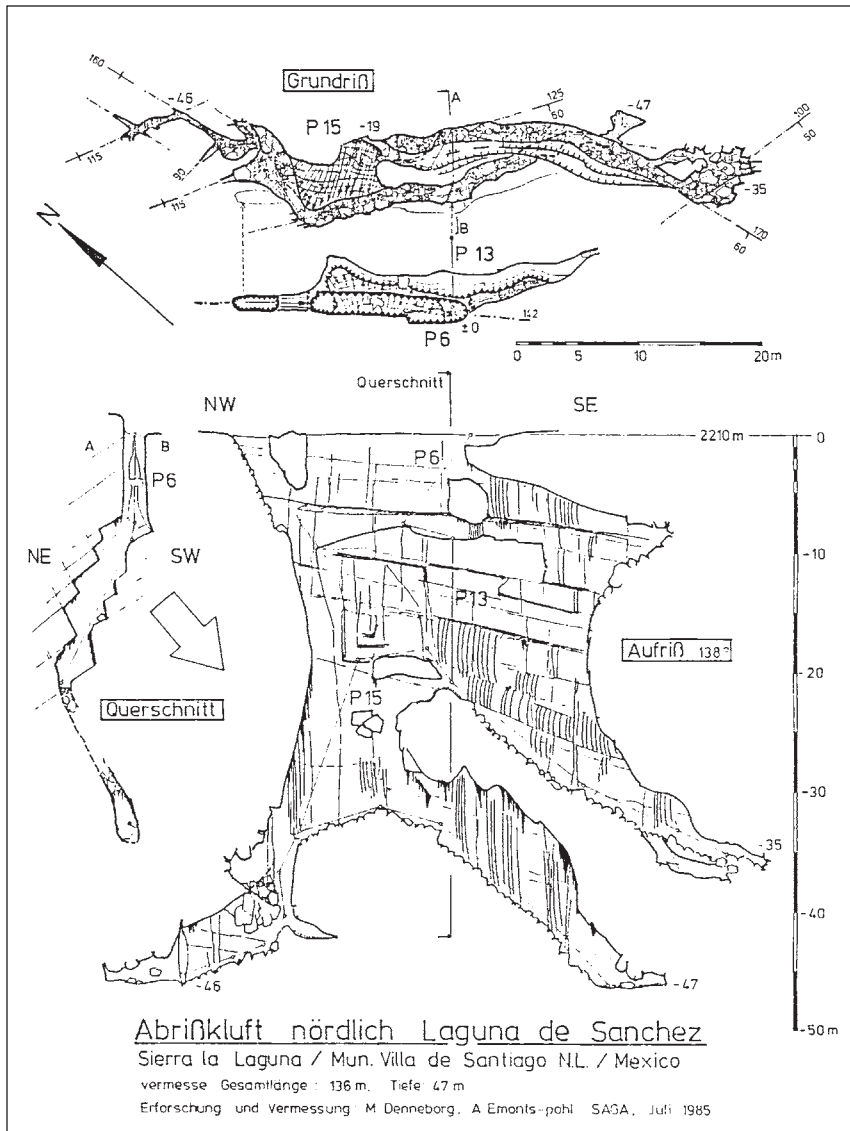


NUEVO LEÓN

The maps of **Cueva Almazán** and the fissure cave near **Laguna de Sánchez** are from a 1986 thesis by Andreas Emonts-pohl, "Geologie und Hydrogeologie im Bereich Laguna de Sanchez–Cola de Caballo/ Sierra Madre Oriental (Mexiko)." Jim Kennedy, who has had a caving project in the area for several years, had obtained a photocopy of this thesis, along with another on the same area from the same year by Michael Denneborg, and Bill Mixon scanned them for the AMCS library (in German, PDFs available from AMCS on request).

OAXACA

In January 2012, cavers Chris Jewel, Laura Trowbridge, Mirek Koptowski, Claire Cohen, and Mike Thomas arrived in Huautla from Britain on a recon trip in preparation for a planned return in 2013 to dive the final sump in **Sistema Huautla**, which has been seen by only two people, back in 1994 (see *AMCS Activities Newsletter* 21, pages 44–64, and the book *Beyond the Deep*). American cavers Ernie Garza and Jon Lillestolen assisted them, Ernie in arranging housing and permission and Jon in rigging the cave. On January 10–13 the cave was rigged from the



Cavers at the bottom of the Jungle Drop into the entrance to Sótano de San Agustín, Oaxaca. Mike Thomas.

village of Oztotulco in an isolated saddle on the right flank of the Tepetzala valley, at 1200 meters elevation. Eighteen members in total, including three Mexicans, participated in the month-long expedition, whose objectives comprised four main areas of interest.

A small team spent a week in the cirque of Cuaxipetstli in difficult conditions of little water, high heat, long hikes, and full sun. Two caves were discovered and explored, one of which was a 180-meter pit, and a few other holes were found, but it was a disappointment after the hopes raised by Google Earth's tantalizing dark spots.

On the Ocotepetl plateau only one of the pits discovered in 2010 was explored this year. **Sótano del Toto-Naco**, with its vast 95-meter entrance pit followed by three parallel 20-meter pits, ended at -125 meters.

There was no time on this expedition to return to the very promising Vallée de François, where in 2003 two deep but clogged pits were explored to -180 and -200 meters.

In the Evaluastle basin the cave **OZ20**, which had been explored in 1995 to -260 meters and 2.6 kilometers, was rerigged in an attempt to find and follow the missing air and to connect it to the cave **CO2**. After dropping down another five pits and adding 830 meters of passage, the

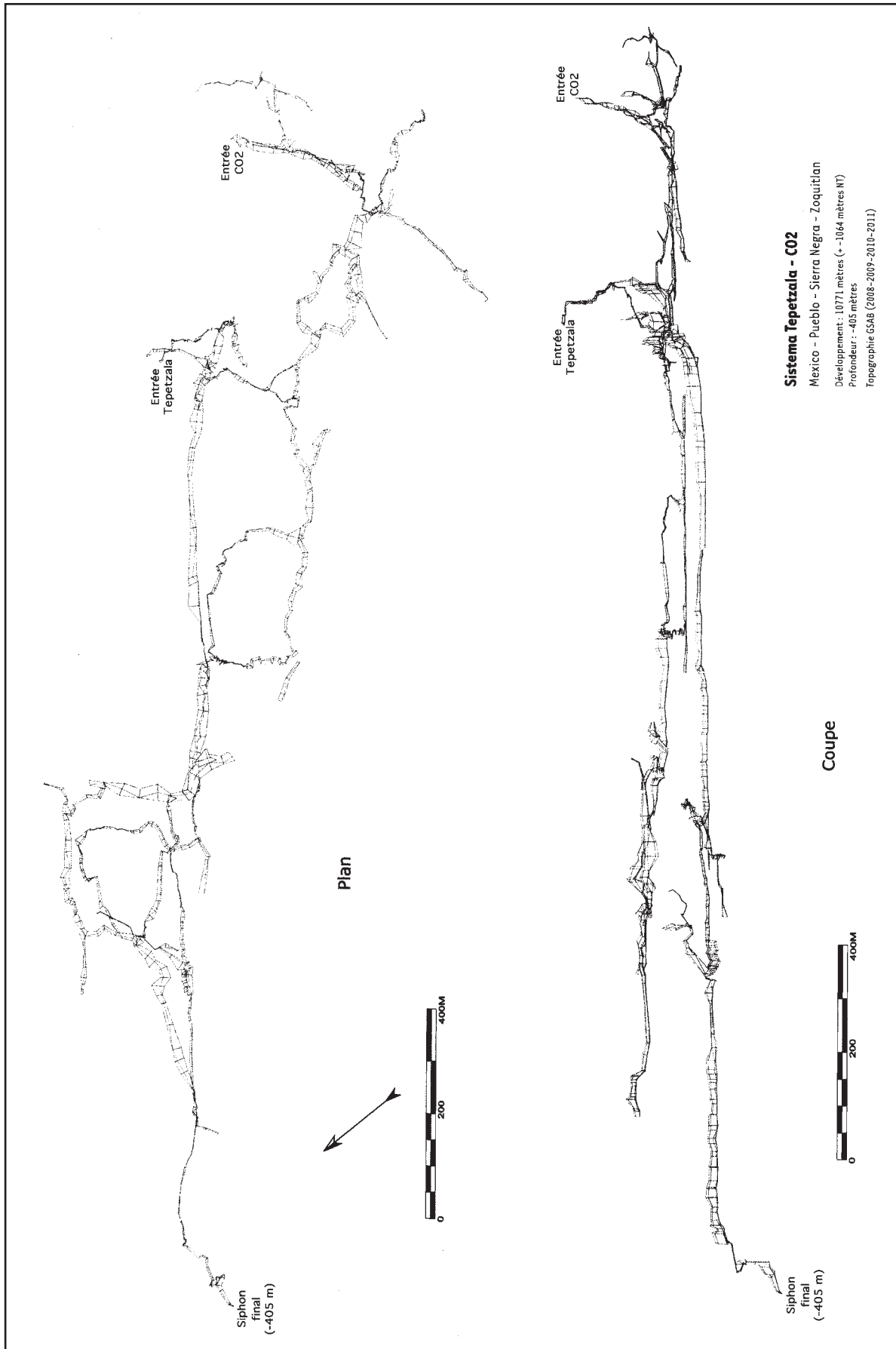
San Agustín entrance down to the 620 Depot at about that depth (see map in *Activities Newsletter 26*, page 10). Some of the drops were rigged with rope that had been stashed in the cave since 1994. The trip met all its objectives and set up good contacts for 2013. *Source:* Summarized from a long trip report by Mike Thomas at www.cdg-exped.org/index.php/2012-recon-trip/report.

PUEBLA

The Groupe Spéléo Alpin Belge has a web site at <http://sites.google.com/site/speleogsab/> that contains information on their Expé projects in Mexico from 1980, when they helped with the rescue of a badly injured Polish caver from Sótano de San Agustín in Oaxaca, through 2012,

with links to published articles in French on the expeditions. The site includes a spéléométrie page that gives the lengths and depths of the largest caves they have explored. The table is reproduced, with corrections, here. Among six large rooms they have discovered, the largest is the Salle La Muñeca Fea, with an area of 46,377 square meters (about 11.5 acres). There are also links to many cave maps from their explorations in Puebla and Oaxaca, although the resolution of the maps is generally dismal. *Source:* Mark Minton.

In early 2011, the Groupe Spéléo Alpin Belge (GSAB) returned to their exploration zone in the Sierra Negra of Puebla, setting up a new base camp 450 meters above the



Sistema Tepetzala - CO2

Mexico - Pueblo - Sierra Negra - Zoquitlan

Développement : 10771 mètres (+ -1064 mètres NT)

Profondeur : -405 mètres

Topographie CSA6 (2008-2009-2010-2011)

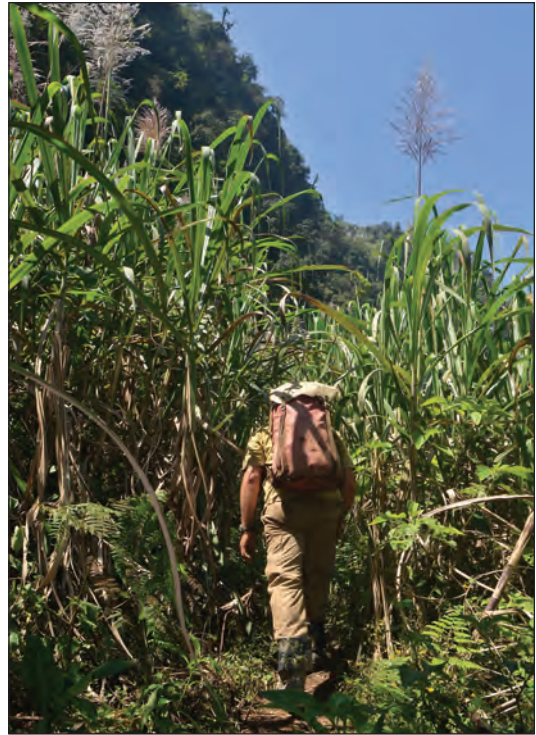
PRINCIPAL CAVES IN SISTEMA T'ZONTZECUICULI

Zoquitlán-Coyomeapan-Tlacotepec de Porfirio Díaz-
San Miguel Eloxochitlán-Alcomunga
Puebla and Oaxaca

Caves more than 100 meters deep or 500 meters long.
March 15, 2012

<https://sites.google.com/site/speleogsab/home>,
with some corrections by Mark Minton

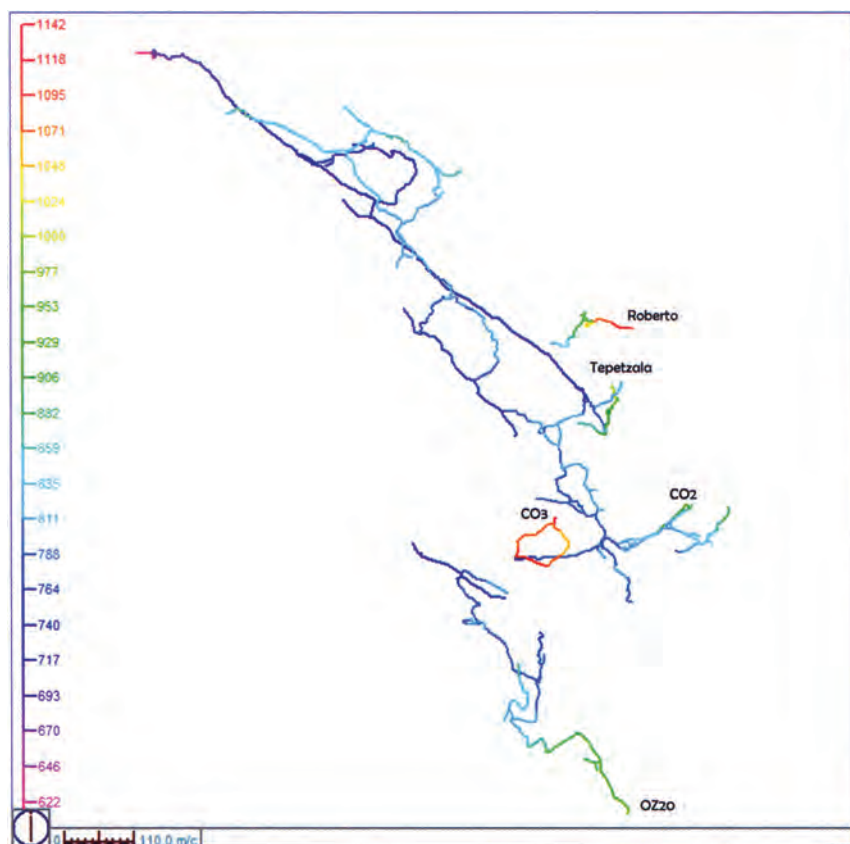
Principal Zone	depth	length	Principal Zone continued	depth	length
Akemati	1226	4918	Sótano del Dolmen (Croz 1)	150	150
Sistema Nogochl (Akemabis-Santito)	1182	6308	Sótano Americano	150	250
Sistema de Ocotempa	1070	4720	OT3	138	150
Sistema H31-H35	753	5745	Sótano del Toto Naco (OT1)	125	150
Aztotempa	700	4000	Cueva Ocotepetl (OT2)	124	382
El Santo Cavernario-Tototzil Chichiltic	667	2539	TB2	120	120
Sistema Atlalaquia	623	4530	HU20	116	120
Sistema Coyolatl-Esperanza (TZ 57)	620	22221	TPB-00-X	115	150
Méandre Qui Traverse	588	2500	HU2	102	115
Yometa	582	721	Doline Tropicale (OC30)	100	140
Sistema Tepetzala (TB86-TB1-CO2-CO4)*	554	16527	Cueva de Cruztitla	96	694
Sistema Tepepan Zaragosa (TZ48/62)	501	5264	OZ40*	90	790
Sumidero de Tepecuitlapa (TZ3)	485	1442	Montitla	71	1020
Tlamanictli (TZ1)	450	2093	CO3	70	555
Sistema H3-H4	430	1300			
Sistema TZ2-TZ7	314	1390	Resurgence Zone		
Pomnosatl	310	560			
Sumidero de Campo Nuevo	309	824	Cueva Xantilco-OZ8	299	1687
Sótano Atlalaquia	285	470	Atlixicaya	232	11120
Sistema Evalhuastle (OZ21-OZ30-OZ31)*	280	3576	Sistema Putrefacción (OZ567)	139	983
TZ44	272	665	Cueva Caña (OZ11)	104	1220
TZ-00-14	268	642	Cueva del Río Topizatl	50	1290
Sótano Malamujeres	264	300			
OZ20	260	3430	Southwest Zone (Zoquitlán)		
TZ56#	253	628			
Cuaubtempa	232	250	Quipa Xitlama	339	450
Las Siete Cabezas (TZ-00-16)	190	350	Sótano del Río Coyomeapan	337	3900
Sótano de los Colibrís (TZ25)#	189	354	Sumidero del Río Xocotlat	323	1500
Croz 2	180	180	Aquidouci	235	650
Sótano Cirque Cuauxipetstli	180	180	Cueva de las Ranas	135	500
Aztutla	177	420			
Cueva Sin Nombre (TZ50)#	166	465	Northern Zone (Alcomunga)		
Doline à Mais	161	212			
Cueva de los Sueños (TZ40)#	160	1520	Sistema Ictlatlela	297	1835
TB12	160	400	Sistema Holjuaztle	204	1630
NM2	160	160	Corralco	180	550
Olbastl Mixtli (Sótano Nube, OT5)	160	160	AL7	71	800
Sótano del Totem	153	428	La Borrachón	40	600
TB3	150	400			
OC2	150	150	* Exploration continues.		
OC4	150	150	# Surveyed passage only.		



GSAB 2012 PHOTOS BY
GUSTAVO VELA

Clockwise from upper left:
Richard Grebeude in cave OZ20.
Roland Gillet on the way to cave CO2.
Roland Gillet sketching in CO2.
Franco Attolini in CO2.





team stopped at the foot of a large, perched passage. CO2 is only 50 meters away at the same elevation, so a connection seems probable in the future. A new cave was found on the northern crest of the basin, CO3, resulting in the discovery of a huge room, 180 meters by 180 meters, named Salle Perlipopette. Considering its location, it is possible it will connect to the system. Finally, CO2 was the big winner on this expedition. The team added an additional 5860 meters of passage (of which 5307 was surveyed), discovered a new entrance, and connected CO2 with Tepetzala.

The **Tepetzala** System has reached a length of 11,835 meters (of which 10,771 is surveyed) at an unchanged depth of 405 meters. The prospects and the potential are great for the 2012 expedition: lots of going leads, strong air in large passages, and it's all going into the mountain straight for the minus-one-thousands that were explored twenty-some years ago. They're only half-way there, but CO2 has provided access to large fossil passages in Tepetzala that are perched 80 meters above the current

river level and were not reachable from the main active stream in Tepetzala during its exploration.

In total, the 2011 expedition netted 7660 meters of virgin cave, of which 6637 meters was surveyed. *Source:* Article by Richard Grebeude in French in *Regards* 76, September–November 2011, pages 9–12 (available at <http://sites.google.com/site/speleogsab/home/expes-antérieures>), summarized by Yvonne Droms.

The March 2012 expedition by the Groupe Spéléo Alpin Belge to their exploration area in the Sierra Negra resulted in about 8.5 kilometers of new discoveries, of which 7,748 meters was surveyed. Seventeen members participated, including two Mexicans.

On the plateau of Ocotepetl, located about 350 meters above the camp, three new caves were found and explored: **Cueva Ocotepetl** (OT2), 382 meters long and 124 meters deep, **Olbastl Mixtli** (OT3) or **Sótano de las Nubes** (Cave of the Clouds), a 138-meter blind pit, and OT4, a 70-meter pit, also blind.

In the vast Evalhuastle doline

just below camp, **OZ21**, explored in 1997 to 2400 meters long and 277 meter deep, and **OZ20**, explored in 1995 to 3430 meters long and 260 meters deep, are separated by just a few hundred meters, but head off in different directions, the first toward the resurgence **OZ9** at the bottom of the canyon in the village of Oztotulco and the second in the opposite direction toward the vast **Sistema Tepetzala**. The direction of OZ21 was verified, and two nearby caves, **OZ30** and **OZ31**, were surveyed and connected to it, adding 1590 meters and bringing the length of the new Sistema Evalhuastle to about 3916 meters, of which 3576 m have been surveyed.

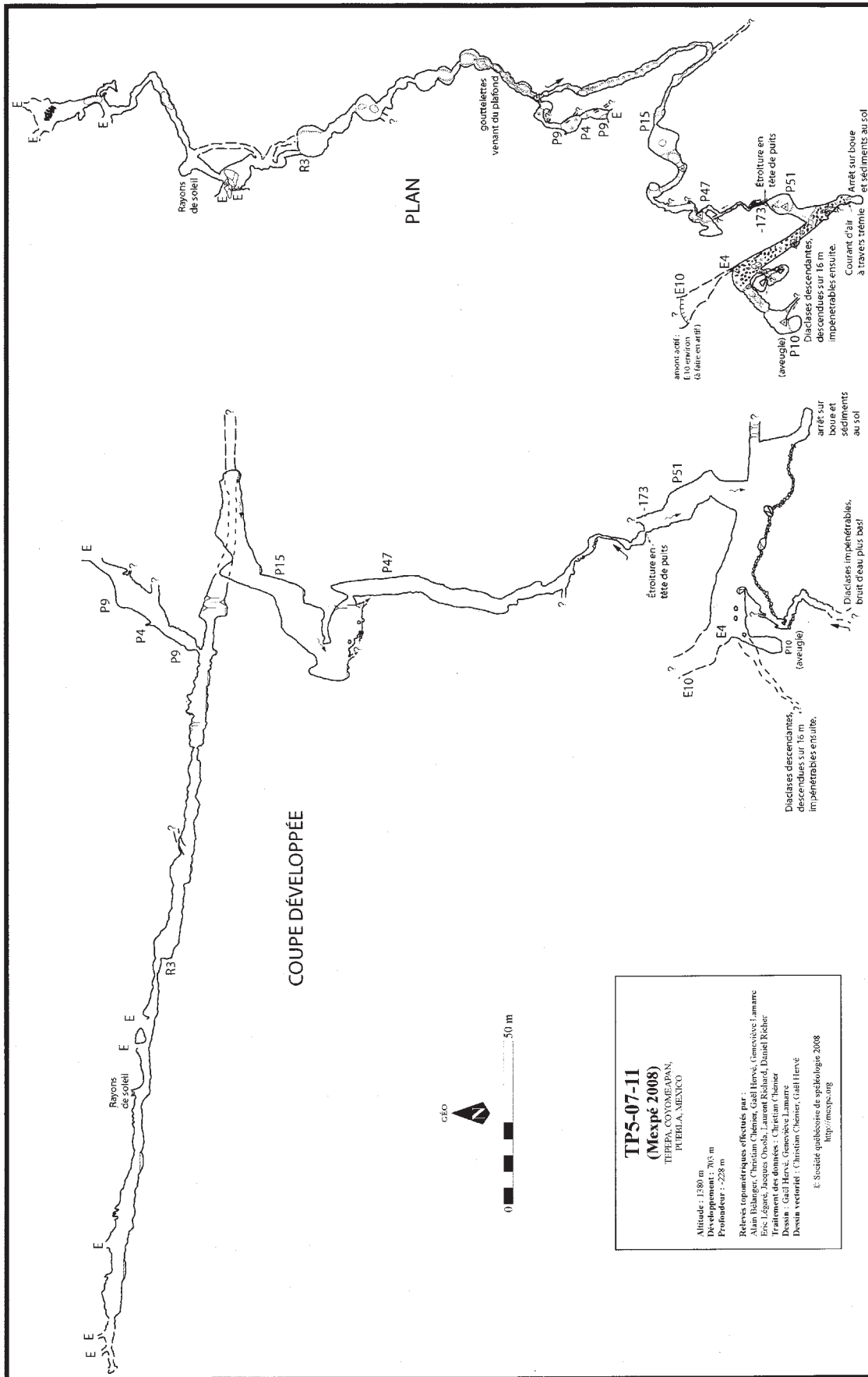
At the end of the expedition, **OZ40** was explored for 800 meters to a depth of 90 meters. After coming close to passages in OZ20, it took off straight for OZ21. It could be a missing link between OZ20 and OZ21. A junction of all these caves seems conceivable, and it would bring the length of Sistema Evalhuastle to more than 10 kilometers, and there is still also the hope of connecting OZ20 to the Sistema Tepetzala.

At the end of the 2011 expedition, Sistema Tepetzala was 11,805 meters long (10,750 meters surveyed) and 405 meters deep. This year, two to four teams were underground for three to four days at a time, bivouacking at two different locations in the system. This allowed for a thorough exploration of the system, and by the end of the 2012 expedition, Sistema Tepetzala had reached a length of 17,530 meters (16,527 meters surveyed) and a depth of 554 meters.

One hoped-for connection was achieved when **Cueva Roberto** (TB1) was linked to the system, adding 150 meters to its depth. Sistema Tepetzala now has four entrances: Tepetzala (TB84), **Natitla** (CO2), **Tetonton** (CO4), and Roberto (TB1).

Other highlights of the 8 kilometers explored in Tepetzala during the 2012 expedition were:

- A new connection of CO2 to Tepetzala by way of Moria.
- The discovery of the upstream continuation of Paseo de la Sierra.
- The farthest point in the cave in



2011 was extended by over 1.5 kilometers, including hundreds of meters of passages 25 to 40 meters high and 50 to 70 meters wide.

- The survey was almost caught up, leaving only 1 kilometer of side passages unsurveyed.
- The main lead is getting close to **Tlamanictli** (TZ1, 2,093 meters long, 450 deep), which was explored in 1999.

At a depth close to major passages in Tepetzala, Tlamanictli contains a huge room, the Salle La Muñeca Fea. It is hard to imagine that a connection will not happen. Besides adding 2 kilometers and an additional entrance to the system, this connection would make the system over 700 meters deep and offer a superb cross-over trip.

Elsewhere in the area, **OZ32** was explored for 100 meters to a depth of 60 meters, and it continues. A few pits were found above the lead in OZ21 that goes toward the resurgence OZ9. This area, called Cosavicotla, will be an objective of the next expedition in 2013.

Source: <https://sites.google.com/site/speleogsab/resultats-mexplo-2011>, translated and summarized by Yvonne Droms.

Abstract: "The Mexican cavernicolous *Pseudosinella* (Collembola: Entomobryidae) with description of a new species," by José Palacios-Vargas and Blanca Mejía Recamier. A compilation of the information on the genus *Pseudosinella* from Mexican caves was undertaken, and one new species from Puebla State is described and illustrated: *P. rochezi*, sp. nov. It is similar to *P. bonita* Christiansen, 1973 and displays typical troglomorphic characters. An identification key for all Mexican cave species of the genus is presented.

Source: *Subterranean Biology*, volume 8, pages 49–55, 2011. The full paper (doi: 10.3897/subtbiol.8.1231) is available at www.umae.org/paginas/mundos.php.

Sous Terre, magazine of the Société Québécoise de Spéléologie, volume 22 number 1, winter 2012, contains articles on their Mexpé expeditions to Puebla in 2008 and 2009. The map

MEXPÉ 2011 SURVEYS (dimensions in meters)

number and name	length	depth	complete?
TQ14-11-05 La Traversita	2203	165	N
TQ14-11-02 Flor del Sol	1075	70	Y
TQ13-11-01 Sótano Datong Oshko	900	334	Y
TQ13-11-02 Cueva Fútbol	877	413	N
TQ15-11-10 Sótano Cañón "S"	827	216	N
TQ15-11-02 Cueva Hugo	189	135	Y
TQ14-11-01 Cueva Rana	<u>71</u>	3	Y
	6141		

reduced here of **TP5-07-11** is from the centerfold of the issue. The issue also includes a very large, folded sheet with the map of **Tres Quimeras** on both sides of it; a too reduced version of that map is in "Mexico News" in number 33.

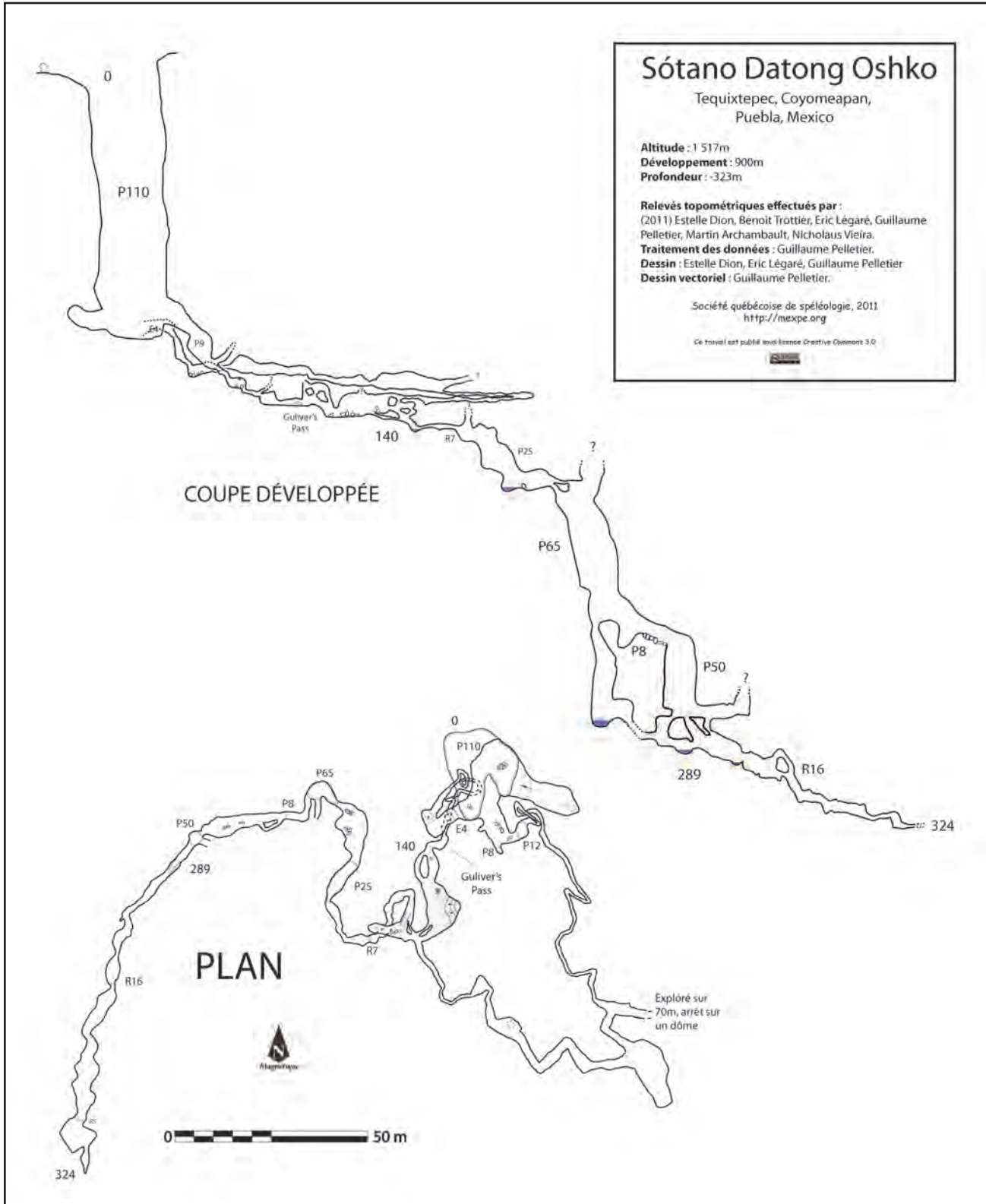
The Société Québécoise de Spéléologie has a nice publication about their Mexpé 2011 expedition to Puebla on the web. The version in Spanish is at http://mexpe.org/fr/historique/mexpe2011/INFORME_MEXPE_2011_ES.pdf, and a French version, which has additional pages containing a diary of the trip, is at http://mexpe.org/fr/historique/mexpe2011/INFORME_MEXPE_2011.pdf. These are nicely laid out as printable PDF files, a lot more useful than the usual

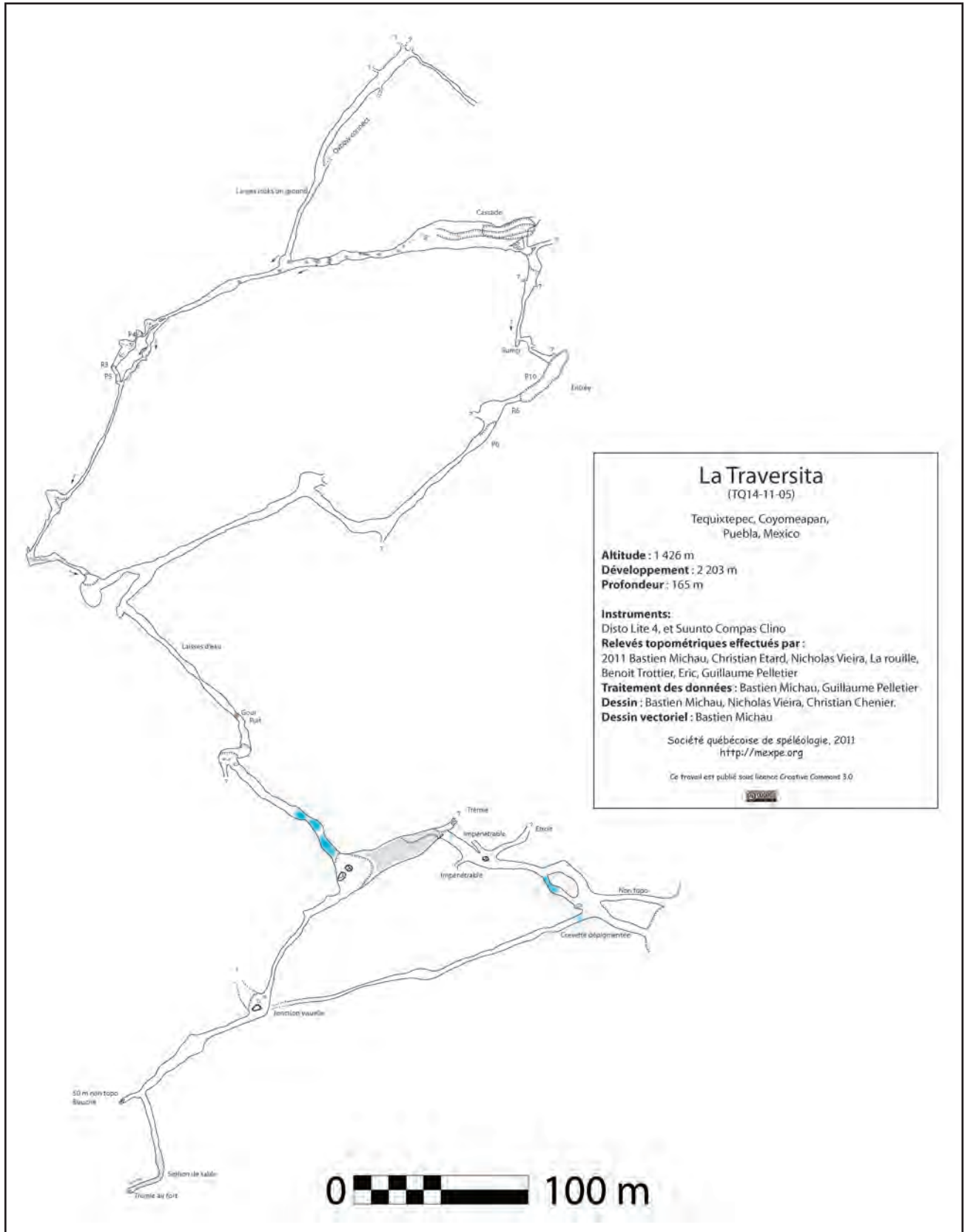
blog-style mess. During late March and early April they surveyed over 6 kilometers of cave. The maps here of **La Traversita** and **Sótano Datong Oshko** are from their report. **Cueva Fútbol** was in the center of the village of Tequixtepec, next to the school and the soccer field. A large horizontal entrance led, at a depth of around 134 meters, to a near sump that was lowered, although the cave is likely still dangerous in wet weather. The cave was left going in large passage at –413 meters and 877 meters in length.

The 2012 Mexpé expedition of the Société Québécoise de Spéléologie completed the exploration of **Cueva Fútbol** at –555 meters. An inlet passage was discovered, but sumps block progress both upstream and downstream. Caves **Cañón S** (–220 meters) and **Chicharrón Vegetariano** (–299 meters) are both series of drops that lead to long active meanders that become impenetrable. Much prospecting by machete was done and dozens of entrances were found, with only a few being interesting: **Las Ilusiones Perdidas**, **Cue-va-de-retro**, **Dora la Exploradora**, **El Pulparindo Carnívoro**, and **El Pancho Cavernario**, the last being 450 meters long. A total of twenty-four caves were discovered and more than three kilometers was surveyed. Source: Preliminary report on the trip at http://mexpe.org/es/doc_es/InformePreliminarMexpe2012_V3.pdf.

The Club de Montañismo y Espeleología de Tehuacán has a web site at www.asperos.com.mx. It contains little about caving.







QUERÉTARO

Abstract: "Spatial and Temporal Distribution of Protozoa at Cueva de los Riscos, Querétaro, Mexico," by Itzel Sigala-Regalado, et al.

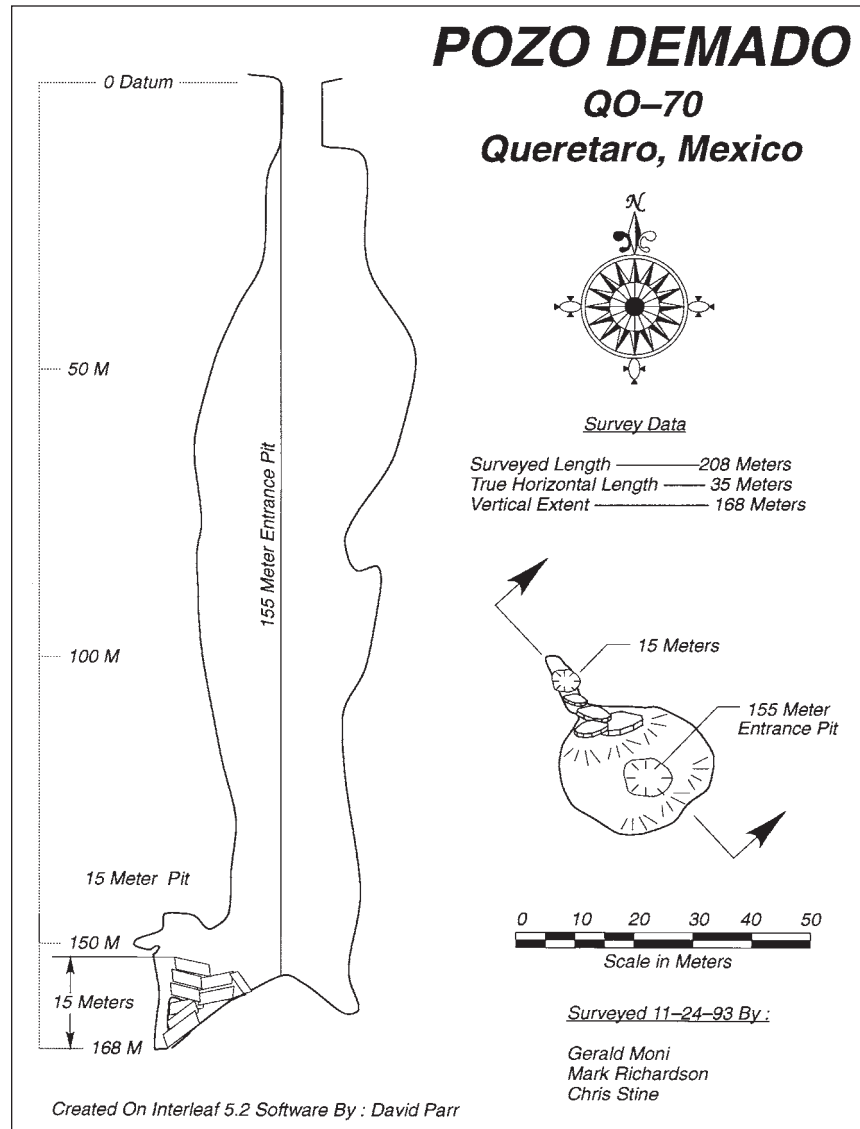
Protozoa are important members of ecosystems, but protozoa that inhabit caves are poorly known worldwide. In this work, we present data on the record and distribution of thirteen protozoa species in four underground biotopes (water, soil, bat guano, and moss), at **Cueva de Los Riscos**. The samples were taken in six different months over more than a year. Protozoa species were ciliates (eight species), flagellates (three species), amoeboid (one species), and heliozoan (one species). Five of these species are reported for the first time inside cave systems anywhere, and an additional three species are new records for Mexican caves. *Colpoda* was the ciliate genus found in all cave zones sampled, and it inhabited the four biotopes together with *Vorticella*. The biotopes with the highest specific richness were the moss, sampled near the main cave entrance, and the temporary or permanent water bodies, with ten species each. The greatest number of species was observed in April 2006 (dry season). With the exception of water, all biotopes are studied for the first time.

Source: *Journal of Cave and Karst Studies*, volume 73, number 2, August 2011. The full paper, pages 55–61, is available at www.caves.org/pub/journal/PDF/v73/cave-73-02-55.pdf.

Pozo Demado is among the caves cataloged during a Thanksgiving 1992 trip to Mexico. A report on that trip is in *AMCS Activities Newsletter* 20, pages 93–108. The pit was revisited and mapped in 1993, but we have not published the map until now, evidently.

QUINTANA ROO

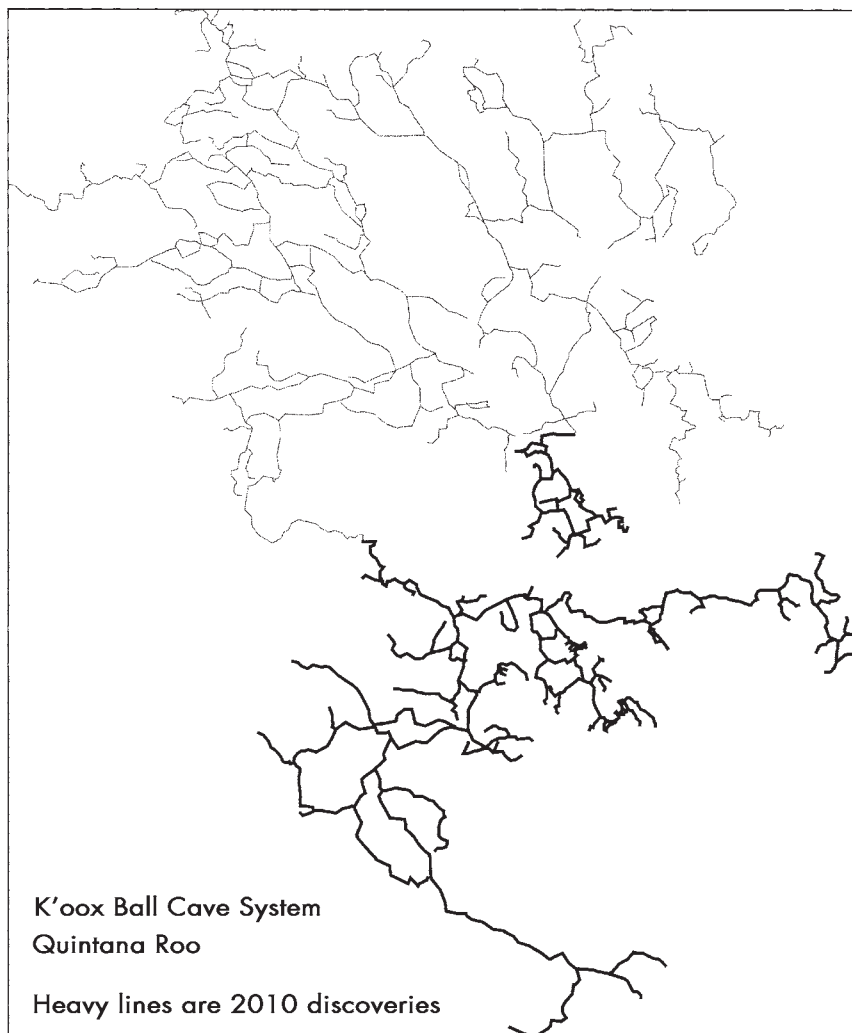
In 2010, members of the Czech and Slovak Speleological Societies organized their tenth and eleventh expeditions to the Yucatan Peninsula, where they continued to explore the extensive submerged cave systems near the village of Chemuyil. The



exploration started in 2003. Thanks to a fire that almost deforested a large part of the jungle last year, it was possible to discover ten new cenotes in the area south of the **K'oox Baal** cave's known parts. The cenotes were gradually surveyed, and in four of them large new extensions were discovered. First, more than 2 kilometers in the **Ha'as Kak Cenote** and 1.5 kilometers in the **Kot Be Cenote** were revealed, and they were then linked together and connected to the **K'oox Baal** system. In the **Sax Xib Cenote**, 1.5 kilometers was explored and connected directly to **K'oox Baal**. The most significant discoveries were made in the **Balam Ts'al Cenote**, where large corridors reached the length of 3.6 kilometers before they were also connected to

K'oox Baal. In the spring of 2010, **K'oox Baal** therefore reached a length of 28.6 kilometers. On the second expedition, in autumn, 2.3 kilometers more were discovered, and thus the total length of the **K'oox Baal Cave System** exceeded 30 kilometers, at 30,339 meters. Source: English abstract of article "Xibalba 2010—K'oox Baal má 30 Kilometrů," by Zdeněk Motyčka and Daniel Hutňan, *Speleofórum* 30, 2010, pages 50–52. The length of the cave has since grown; see next item.

A Czech team of cave divers connected 36.7-kilometer-long **K'oox Baal** to the nearby **Sistema Tux Kupaxa** on December 9, 2011, taking the total explored length of underwater passages to 56.5 km. The



explorers claim this as the world's fourth longest underwater cave, and work continues. Only 2 kilometers distant is the current fifth longest, the **Xunaan Ha** system with over 51 kilometers. A connection would take this to almost 110 kilometers. *Source: Descent 224, February-March 2012, page 5.* Both caves have grown since.

While other team members are surveying [**Sistema Cocodrilo** on Cozumel] using traditional methods to compile information and produce a detailed map of the system, I have been using video mosaic techniques to mosaic the system. So far we have over six hours of video decompiled into eighty thousand individual JPEGs. I am combining these JPEGs into mosaics of the system. By combining individual pictures a visual portrait of the length of the cave is

produced. These mosaics will provide a pictorial map of the system, adding detail not normally available from your average surveying project. *Source: Michael Angelo Gagliardi in Underwater Speleology 39(1)20-21, January-March 2012.*

I am writing this today as a chosen representative of the Cocodrilo/Dos Coronas Exploration and Mapping Expedition. On Sunday, October 16, we had a member of our team, Brendan Lee Nappier, die during a survey dive in **Sistema Cocodrilo** on the island of Cozumel. The team has asked me to post this report to prevent and dispel any misinformation or misconceptions of this tragic accident. The team is understandably distraught about the loss of our good friend. I will use no names in this report other than the victim's.

The expedition was to survey,

map, and document the Sistema Cocodrilo. Sistema Cocodrilo is a land-locked system that contains several thousand feet of passage, most never getting deeper than 40 feet. The Cocodrilo team arrived on-site at approximately 10 a.m. and began gearing up in the parking lot of the dive site. The team consisted of five divers. The dive plan was to swim to the Air Dome room approximately 4200 feet [1300 m] into the cave and video-map the room. The plan was cut very short.

Two divers were using passive semi-closed rebreathers driven by two aluminum 80s. One Al 80 had 32% nitrox, while the other contained air. The 32% drove the rebreathers, while the air was bailout. The other three divers were on open-circuit sidemount. Each open-circuit diver carried an additional tank. All open-circuit tanks contained air. The day before the dive three more 80-cubic-foot tanks containing air were staged along the dive route. These were placed as additional emergency bailout bottles.

At 11:19 a.m. the team entered the water. The victim led the team. The team planned on a slow-paced swim. At about 15 minutes into the dive the victim began to accelerate his swimming pace, causing the rest of the team to string out into two groups, two divers in front trying to keep pace with the leader, followed by the second pair falling behind. Approximately two minutes later, the victim had outpaced the second and third diver and began convulsing. He then drifted to the ceiling. When the two closest buddies got to him he was unconscious and his regulators were out of his mouth. The victim's bailout regulator was observed to be deployed and dangling. His rebreather loop and his bailout tank had been closed; neither buddy saw when he closed them. Both buddies deployed and attempted to get a regulator in the victim's mouth. The victim's jaw was clenched and had to be pried open to insert the regulator. The regulator was purged into his mouth. By this point all four members had gotten to the victim, and they began a coordinated rescue attempt. Three divers began swimming the victim

out of the system, while also keeping the regulator in his mouth and purging it. The last team member kept the line well lit and guided the team out of the system. It took approximately eighteen minutes to get the victim to the surface. His gear and suit were cut away and CPR was administered in round robin by three team members. The last member got people on the surface to call for EMTs. After about twenty minutes an ambulance and local police arrived and took control of the body.

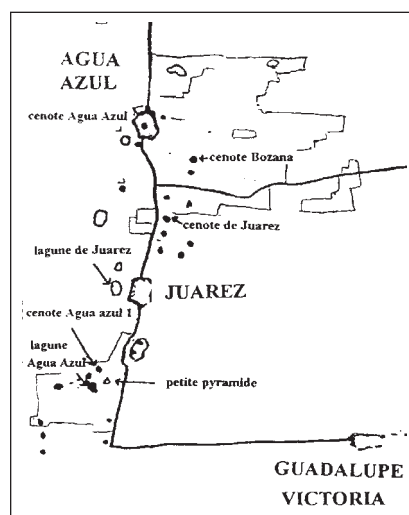
An autopsy was performed, and the team was informed by local officials that the cause of death was carbon monoxide poisoning. Both Brendan's rebreather and his teammate's rebreather were found to be in working order. We have now been led to believe (but we have no way of verifying) that this is not the first case of bad nitrox fills on the island. We have halted all diving till we can be certain of what we are breathing. We also urge anyone going on any similar expedition to add a carbon-monoxide analyzer to his dive kit. We all are buying one now. Brendan was young, intelligent, and in shape; he did nothing wrong and no rules were broken. There is no good reason why Brendan was taken from us. He died because he had the misfortune of breathing bad air. Brendan was our friend and he was taken from us too soon.

Source: Post by Michael Angelo Gagliardi at www.rebreatherpro.com/2011/10/report-on-mexico-rebreather-fatality.html.

To the west of Puerto Morelos, **Cenote Zapote** and a couple of other cenotes contain strange bell-shaped formations. Those at a water depth of around 35 meters in Cenote Zapote are perhaps the best developed. Source: Article by Leigh Stone and Christine Loew, with photos by Andreas "Matt" Matthes, in *NSS News*, March 2012, cover photo and pages 9–11.

The dry cave **Santa Cruz** near Akumal was mentioned in the article starting on page 91 in *AMCS Activities Newsletter 34*. Melissa Hendrickson prepared the map here in 2007.

The paper "Relative Sea Level Fluctuations during the Early-Middle Holocene Based on Speleothems from the Circum-Caribbean Region," by Gina Moseley, Peter Smart, David Richards, and Dirk Hoffmann was presented at the Twenty-First Cave Science Symposium of the British Cave Research Association in March 2010. The research included investigating a speleothem from 6 meters below present-day sea level. U-Th dates ranged from 9.8 ± 0.4 to 6.2 ± 0.6 ka (thousand years before present), and occurrences of serpulid worm colonization gave clues to sea levels during that interval. The speleothem was from "the Yucatan Peninsula," presumably Quintana Roo. A PDF of all the abstracts from the symposium can be downloaded from <http://bcra.org.uk/pub/docs/downloads.html?f=cks109023.f>. Source: *Cave and Karst Science* 37(1)27, 2010.

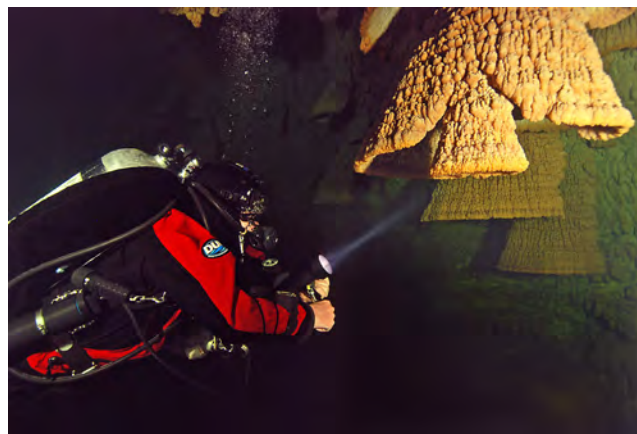


Among the areas visited by Christian Thomas and fellow French divers in 1995 were the villages Agua Azul and Benito Juárez, farther inland than most of the caving activity in Quintana Roo. They explored and sketched the cenotes **Agua Azul**, **Agua Azul 1**, **Bozana**, and **Juárez**. Source: *Cenotes du Yucatan, Expéditions de 1995 et 1996*, by Christian Thomas, pages 83–87.

There is a twelve-minute video about the problems of development and pollution on the Riviera Maya at <http://www.youtube.com/watch?v=xmbWRCpTmLE&sns=fb>. Source: Gustavo Vela.

In 1996, French cave divers explored and mapped two underwater caves southwest of Sistema Ponderosa. They called them **Cenote Cuzel** and **Cenote Taj Mahal**, but they did

The strange formations in Cenote Zapote, Quintana Roo. Divers are left Ivan Smigoc, right Leigh Stone. *Andreas A. Matthes*.

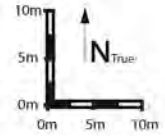


Santa Cruz
Akumal, Quintana Roo, Mexico

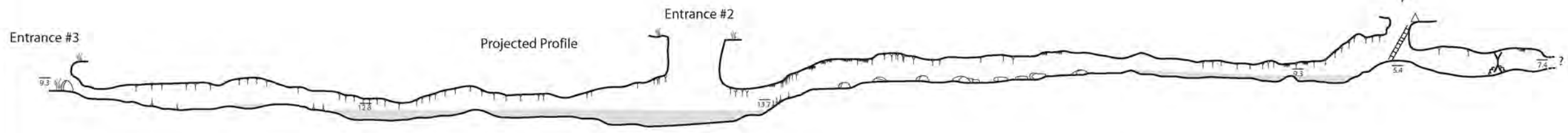
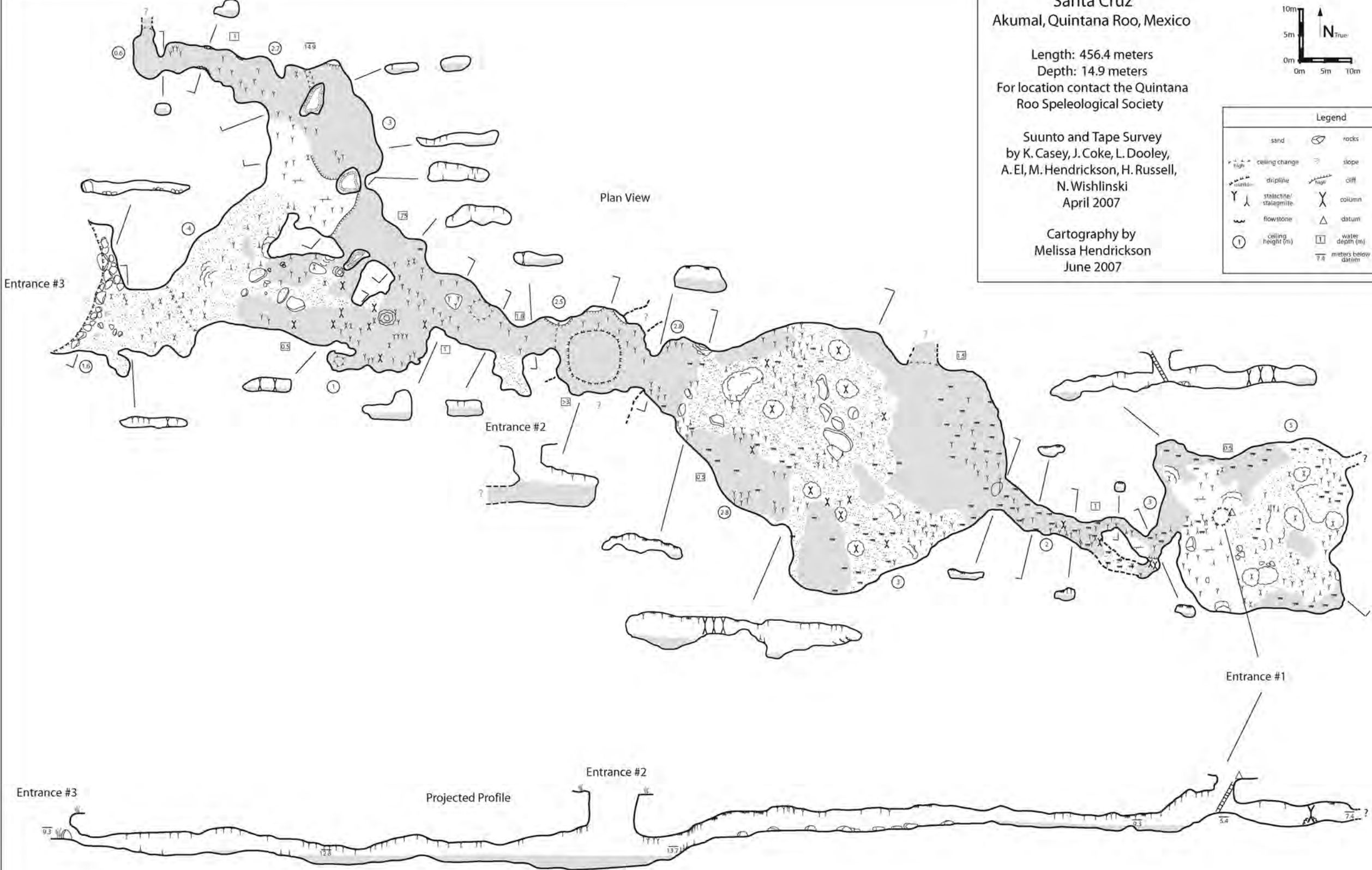
Length: 456.4 meters
Depth: 14.9 meters
For location contact the Quintana Roo Speleological Society

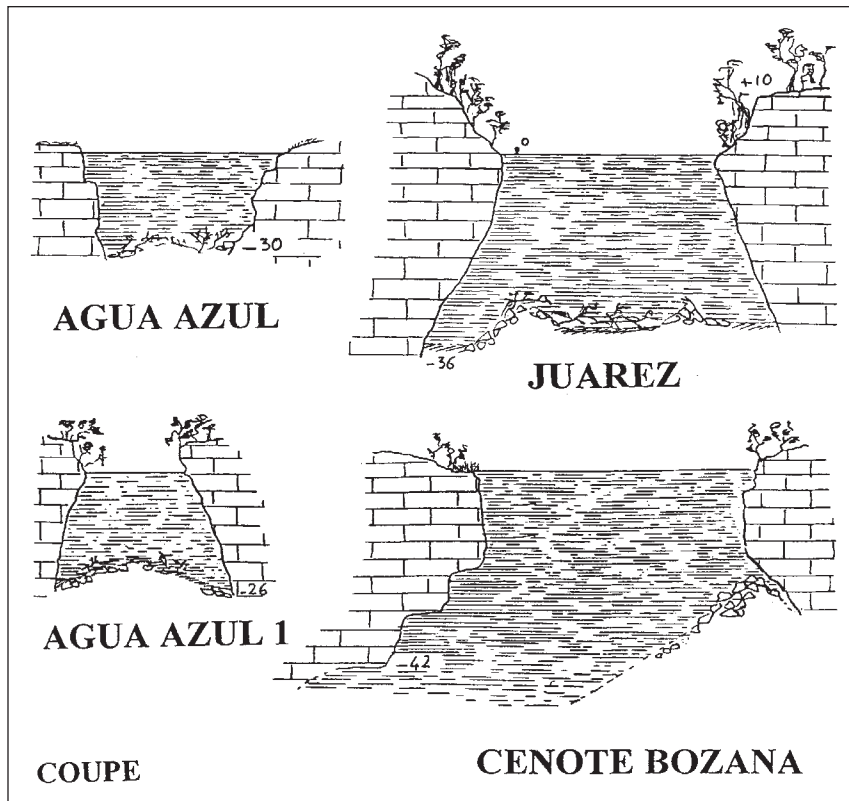
Suunto and Tape Survey
by K. Casey, J. Coke, L. Dooley,
A. El, M. Hendrickson, H. Russell,
N. Wishlinski
April 2007

Cartography by
Melissa Hendrickson
June 2007



Legend			
	sand		rocks
	ceiling change		slope
	dripline		cliff
	stalactite/stalagmite		column
	flowstone		datum
	ceiling height (m)		water depth (m)
	ceiling height (m)		meters below datum
	lead		underwater lead
	soda straws		drapery
	bedrock		

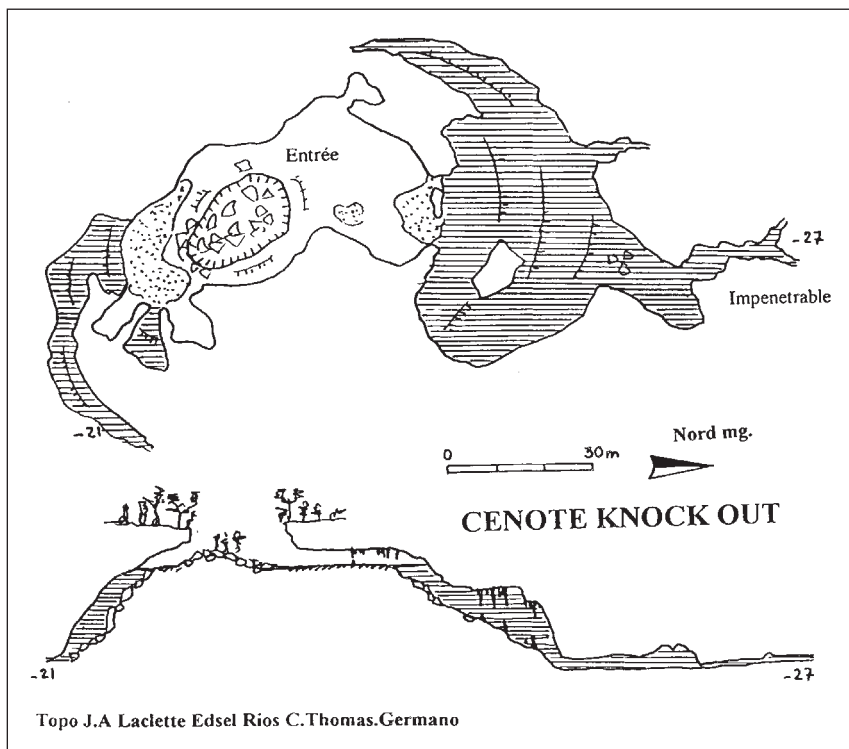




not report them to the Quintana Roo Speleological Survey. Since then, they have been resurveyed and extended by other divers. Cenote Cuzel is now part of **Sistema Aktun Koh**. Today, the same area also holds **Sistema Heder**, **Cenote Escondido**, and **Sistema Minotauro**, and the area looks ripe for some connections between these caves. Among the other things they explored were **Cenote Jaguar** and **Cenote Knock Out**. Sources: *Cenotes du Yucatan, Expéditions de 1995 et 1996*, by Christian Thomas; Jim Coke.

The article "Freshwater Resources in the Yucatan Peninsula," by Sam Meacham, pages 6–12 in *Sustainable Management of Groundwater in Mexico: Proceedings of a Workshop*, published in 2007 by the National Academies Press, Washington, D.C., can be read at www.nap.edu/openbook.php?record_id=11875&page=6.

Juan Jacobo Schmitter-Soto, a researcher at Colegio de la Frontera Sur (Chetumal), provides several recommendations for preservation of the water in cenotes used by tourists. (1) Avoid the removal of vegetation surrounding the cenote. (2) Forbid swimmers from using tanning oils, which accumulate on the surface and prevent oxygenation of the water. (3) Limit the number of swimmers when some cichlid fish are caring for their young. (4) Do not use them for aquaculture. Source: www.yucatan.com.mx/20110714/nota-10/148769, mentioned in a Tlamaqui post by Fátima Tec Pool. Related posts on the same date, July 14, 2011, on the same site are at /148742, /148752, /148760, and /148778.



Topo J.A Laclette Edsel Rios C.Thomas.Germano

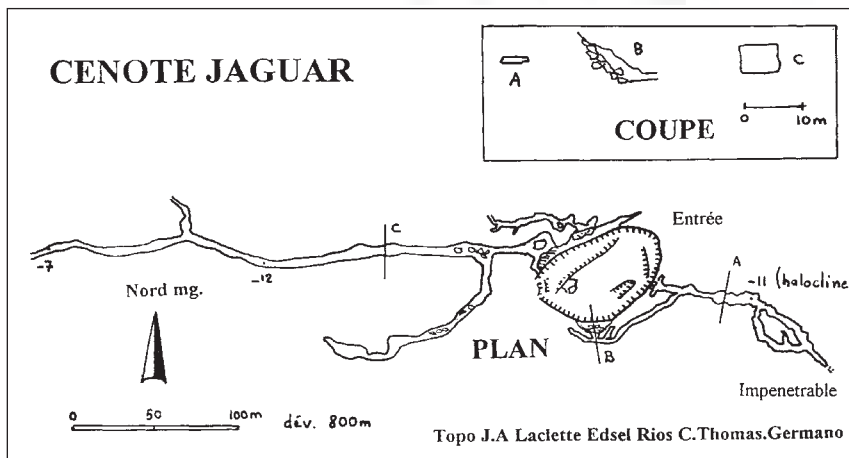
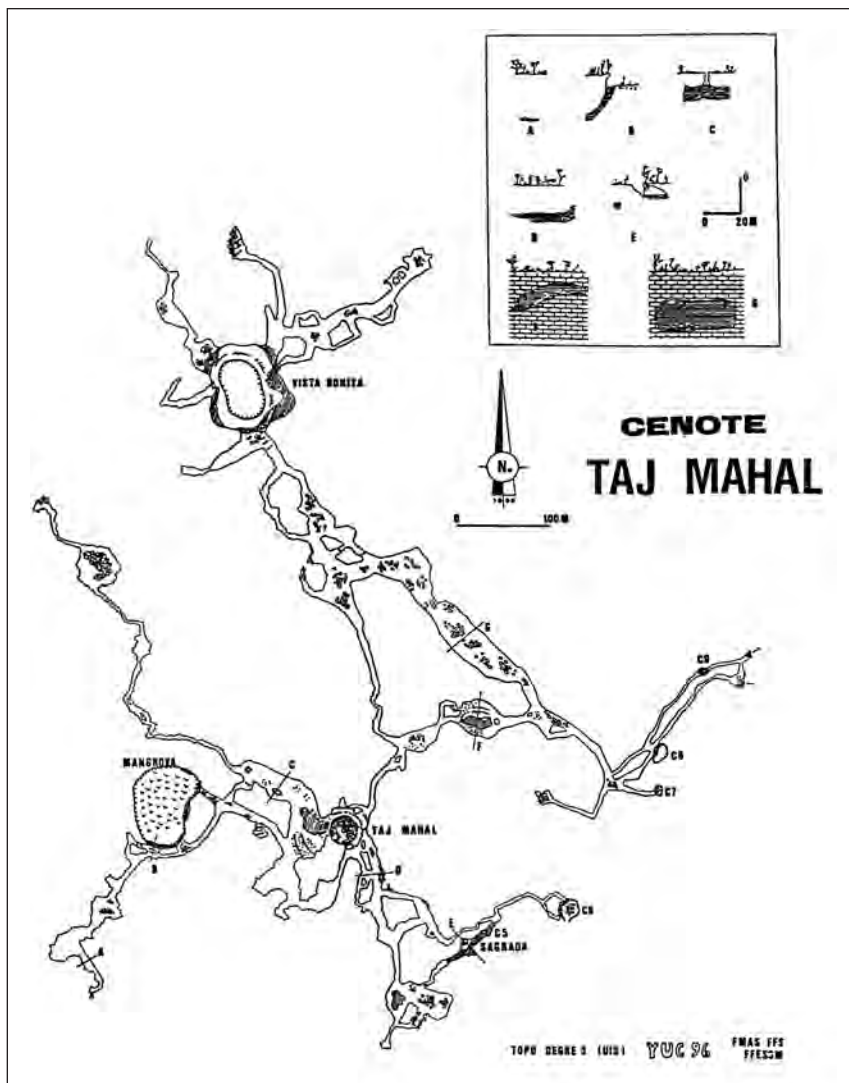
Abstract: "Eolianites and Karst Development in the Mayan Riviera, Mexico," by Kristen Kelley and an unreasonably long list of phony authors.

Coastal Quintana Roo, Mexico, including islands such as Cozumel and Isla Mujeres, contains numerous ridges of Quaternary eolian calcarenite in two packages, one Pleistocene and one Holocene. The Pleistocene eolianites are recognizable in the field by well-developed terra rossa paleosol and micritic

crust on the surface, containing a fossil epikarst. The foreset beds of these eolianites commonly dip below modern sea level, and fossilized plant root structures are abundant. The Holocene eolianites lack a well-developed epikarst, and have a calcarenite protosol on their surfaces. The degree of cementation, and the grain composition, are not reliable indicators of the age of Quaternary eolianites.

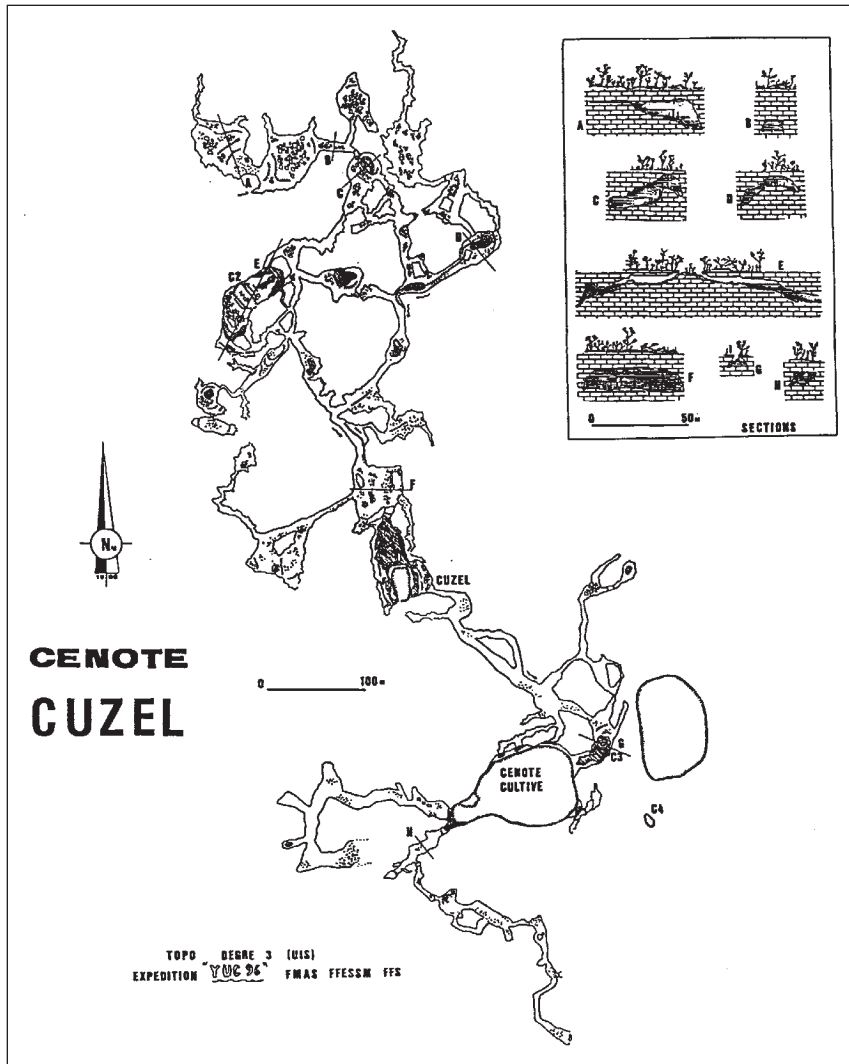
The Pleistocene eolianites have been previously described (e.g. Ward, 1997) as exclusively regressive-phase eolianites, formed by the regression during the oxygen-isotope substages 5a and 5c. However, certain eolianites, such as those at Playa Copal, contain flank margin caves, dissolution chambers that form by sea water / fresh water mixing in the fresh-water lens. For such mixing dissolution to occur, the eolianite must already be present. As the flank margin caves are found at elevations of 2 to 6 m above current sea level, the caves must have developed during the last interglacial sea-level highstand, and the eolianites could not have formed on the regression from that or younger highstands. Therefore the eolianites must be transgressive-phase eolianites developed at the beginning of the last interglacial sea-level highstand, or either transgressive- or regressive-phase eolianites from a previous sea-level highstand that occurred earlier in the Pleistocene. There is no field evidence of oxygen-isotope substage 5c or 5a eolianites as suggested by Ward (1997).

Most coastal outcrops show classic regressive-phase Pleistocene eolianites as illustrated by complex and well-developed terra rossa paleosols and epikarst, and dense arrays of fossilized plant roots. However, in addition to flank margin caves, other evidence of transgressive-phase eolianites includes notches in eolianites on the west side of Cozumel, with subtidal marine facies onlapping the notches. The absence of a paleosol between those two units indicates that the eolianite is a transgressive-phase deposit from the last interglacial. All Holocene eolianites are, by definition, transgressive-phase units.



Source: *Speleogenesis and Evolution of Karst Aquifers* 11, 2011, pages 32–39, reprinted from *Proceedings of the 12th Symposium on the Geology of the Bahamas and Other Carbonate Regions*, 2006, pages 88–99. Full article: [\[.info/directory/karstbase/pdf/seka_pdf9854.pdf\]\(http://speleogenesis.info/directory/karstbase/pdf/seka_pdf9854.pdf\).](http://speleogenesis</p>
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There is a nice eleven-minute video of cave diving in Quintana Roo at www.karstworlds.com/2012/02/mexico-cave-diving-expedition.html



to break undisturbed calcite ice to temporarily surface. No connection to Dino was found, but the length of Cueva Dino was extended to nearly 4 kilometers. In mid-January 2012, Gustavo Vela and friends returned to Cueva Dino (Río Escondido or Cenote Maravillas) to continue the resurvey. On this trip the cave went from 3715 meters long to 4889, according to a preliminary tally of the results. *Source:* Posts to Tlamaqui e-mail list by Gustavo on December 28, 2011, and January 30, 2012.

“Mexico News” in number 34, pages 6–27, describes the removal by INAH divers of the remains of the skeleton of the Joven de **Chan Hol** from that underwater cave; see also the article on the cave and map on pages 59–63 of that issue. According to a press release in April 2012, a second skeleton in the cave, the Joven de Chan Hol II (or according to another source, the Hombre del Templo), has been discovered missing, and the theft has been reported to the Procuraduría General de la República (attorney general’s office) in Cozumel. *Source:* <http://lucsdelsiglo.mx/site/index.php/alminuto/546-desaparece-cadaver-de-hace-10-mil-anos> and other sites; called to our attention by Jim Coke.

(and probably elsewhere on the web, as things work these days). The cave, discovered in October 2011, is **Cenote Muk K’in** near the town of Muyil south of Tulum. It is currently 3980 meters long. *Source:* Jim Coke.

Cueva Dino and the **Río Secreto** system. The divers went 300 meters farther than they had before, finding a skylight where they had

On Thursday, April 19, 2012, three divers died in **Cenote Chac Mool** during a “cavern dive.” They were Spanish guide Ismael García

Canadian Caver number 75, undated but about January 2012, contains an article by Chris Lloyd on pages 4–15 about the March 2011 dry-cave project in Quintana Roo (see also *AMCS Activities Newsletter* 34, pages 91–97). The article includes highly detailed, though much reduced, maps of some of the mazy caves near Playa del Carmen.

In November 2011, cavers and divers sought a connection between

Aida Ferreira reading the clinometer in Cueva Dino (Cueva Río Escondido).
Gustavo Vela.





Aida Ferreira and Roberto Rojo in one of the many entrances to Cueva Dino. *Gustavo Vela.*

Manzanares and recently married Brazilian couple José Brugnaro Neto and Renata Alves Quirino Costa Brugnaro. They entered the cenote at 4:00 p.m., an hour before closing time. The three had not surfaced at 5:00 when the tourist attraction closed, but authorities were not notified until seven hours later. The bodies were located and recovered by a diver from the ProTec Dive Center in Playa del Carmen.

Cenote Chac Mool is very popular, with over a hundred divers there every day. The guide was making his third cavern dive of the day. Apparently the group went onto a cave-diving line to the first formation room, well beyond the cavern zone in daylight that can be visited by divers without full cave-diving training. Guides in the area often do not follow the rules with their paying customers, but in this case there is no way to know whether the guide took the Brazilians beyond the cavern zone or they took off on their own with the guide in pursuit.

Both the Akumal Dive Shop employing the guide and the management of the cenote are under investigation for criminal negligence. *Source:* Based on reports quoted in a message from Jim Coke. See <http://mexicogulfreporter.blogspot.com/2012/04/three-drown>

Alex Álvarez (left) and Daniel Riordan return from a dive in Río Secreto. *Gustavo Vela.*

-at-playa-del-carmen-cenote.html and www.asserduikers.nl/asserduikers/forum/index.php?action=printpage;topic=1121.0.

There is a short promotional write-up about the show cave **Río Secreto** at www.gadling.com/2012/01/08/exploring-the-underground-caves-of-rio-secreto-in-mexico/. There is a gallery of photographs included on the site.

On February 15, 2012, the Quintana Roo Speleological Survey's archive of data for underwater caves in Quintana Roo passed 1000 kilometers of total survey length. If dry caves are included, the thousand-kilometer mark was reached in April 2011. A search of the survey archives by Simon Richards determined that over 350 cavers have contributed to the surveys of the wet and dry caves. *Source:* www.caves.org/project/qrss/new.htm.

Alessandro Reato reports on a planned development over part of the **Xunaan Ha** cave system at www.filoariannadive.com/Inglese/articoling.htm. There seems to be an error in scale where he superimposes the development plan on the cave map, but nevertheless this is yet another example of how development in the area threatens the caves, which as very close to the surface and easily polluted. A lot of other information on underwater caves in the area is elsewhere on the dive shop's web site www.filoariannadive.com/Inglese/progetti-ing.htm.

See also the abstract of "The Role of Cenotes in the Social History

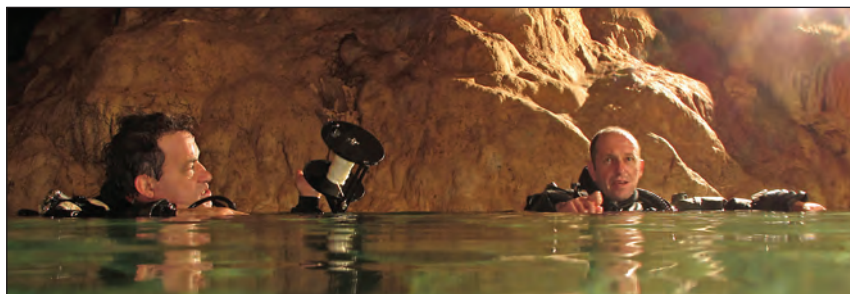
of Mexico's Yucatan Peninsula," by Paul George Monro and Maria de Lourdes Melo Zurita, under Yucatán.

SAN LUIS POTOSÍ

On New Year's Eve, 2011, John Deighan, Alex Booker, Beth Mutchler, Sarah Crowder, and Robert Harris went to **Hoya de las Guaguas** in San Luis Potosí, Mexico. The high side of the pit (202 m) was rigged, after which John rigged and descended the low side (147 m) to verify that the high-side rope reached the bottom. Each caver had a radio. Beth and Robert descended the high side first without incident. When Sarah rigged in and proceeded toward the lip on the high side, she had difficulty moving, and it was suggested that she drop to four bars, which she did. However, as she reached the lip, the fourth bar (which did not have the rope holding it to the rack body at that point—her rack was still horizontal) dropped off the rack body just as she went over the lip, resulting in an out-of-control rappel.

John applied a bottom belay, slowing her enough that when she landed on him he sustained no injuries. Sarah, however, had her gloved left hand on the rack body as she passed the lip, resulting in her hand being trapped between the rope and the rack body below the three bars on the rack. The result was that the back of the three middle fingers of her left hand sustained severe rope burns. Alex next rappelled the long drop, bringing clean bottled water and some disinfectant and bandages and proceeded to clean and bandage the injured hand. All cavers, including Sarah, climbed out of the pit. The pit was derigged and the cavers went back to their hotel rooms in Huichihuayán.

After some failed attempts to find





The alleged petroglyphs near Xilitla.

medical attention in Mexico the next day (though antibiotics were purchased and started), the following day the cavers drove to Brownsville, Texas, where emergency-room doctors redressed the wound. A day later, everyone was back home in Virginia. *Source:* John Deighan.

Petroglyphs have been reported in the community of Xilitilla, and the tourism office of the municipio of Xilitla are planning project “Rescantemos Xilitilla” to protect the stones from thieves. The “petroglyphs” sure look machine-made to me. *Source:* Post to *PulsoSLP* web site dated 9 November 2011, www.pulsoslp.com.mx/Noticias.aspx?Nota=61162, called to our attention by John Greer.

Mike Frazier reports that the road to **Sótano de las Golondrinas** has been paved most of the way to the cave and should be finished soon, along with a new, larger parking area. Tickets can be purchased at a kiosk at the top of the stairway leading to the pit. It costs 20 pesos to view the pit and 200 pesos to drop it. The period when ropes can be in the pit is restricted so as not to interfere with the flight of the birds.

President Felipe Calderón is figuratively going out on a limb—and literally down a sinkhole, up a river (with a paddle) and over the top of a few pyramids—in an attempt to boost Mexico’s flagging tourism industry. The balding, 49-year-old leader is personally trying to change his country’s violent reputation by appearing as a sort of adventure tour guide in a series of TV programs to be broadcast starting in September on Public Broadcasting

Service stations in the United States. The president dons an Indiana Jones–style hat and a harness and descends a rope into the 1,000-foot-deep (375-meter) **Sótano de las Golondrinas**, accompanied by Peter Greenberg, host of the *The Royal Tour* TV series. Calderon also straps on scuba tanks to lead Greenberg into a sinkhole lake known as a cenote in the Yucatan.

And he helps a Lacandón Indian paddle a boat down a river in a jungle in southern Chiapas state. *Source:* From an AP dispatch by Mark Stevenson, August 19, 2011, found at m.washingtontimes.com/news/2011/aug/19/mexicos-president-becomes-tv-adventure-guide/. There were several videos on the web, but most or all have been deleted. Some photos from Golondrinas are at www.flickr.com/photos/petergreenberg/6101351223/in/photostream/.

Authorities are concerned that caves in both the Valles area and the Huastecan region are being used for rites of black magic and Satanism, activities that they fear will have a negative impact on visitors. Eduardo Saab García, regional director of tourism, said that the rituals are very different from the ceremonies held since ancient times by the Huastecan culture to honor their gods and nature. The recent rites use red and black candles and even human bones, whereas the traditional ceremonies use incense, medicinal plants, and songs and dances. The most recent occurrence to be discovered was in **Cueva de Los Sabinos**, a major attraction near Ciudad Valles that contains, among other things, blind fish. Practitioners of the rites go at night to evade even the *ejidatarios*, who are taking steps to protect the caves. Other caves that have been used for witchcraft are around Tamasopo, Aquismón, and Xilitla. *Source:* Press release on a number of web sites in July 2011, mentioned in a post to the Iztaxochitla e-mail list by Juan Montañón Hirose.

A milestone of sorts: **Sótano del Arroyo**, once the longest known cave

in Mexico, has just dropped off of the list of the fifty longest caves in Mexico. *Source:* Mark Minton.

See the note on Mexican blind tetras under Tamaulipas.

TABASCO

Could life exist on planets less hospitable than our own? Scientists studying a tiny Mexican fish say it’s quite possible.

The fish we study are extremophiles, meaning they are adapted to life at the edge of biological tolerance,” says Katherine Roach, a graduate student at Texas A&M University in the wildlife and fisheries sciences department.

Roach, together with Kirk Wine-miller and collaborator Michael Tobler, recently authored a paper on the fish published in the journal *Ecology*. The small fish they studied is *Poecilia mexicana* found in the **Cueva del Azufre** [Cueva de la Villa Luz] or the “cave of sulfur” located in Tabasco state, Mexico.

The small (about 2.5 inches at maturity), almost blind fish live in total darkness swimming in oxygen-starved water with hydrogen sulfide concentrations so toxic they would kill most other life forms, according to Roach.

“Our research shows that organic carbon produced by sulfur bacteria oxidizing dissolved hydrogen sulfide, a process called chemoautotrophy, is the main food source for the fish,” Roach says. “Though it is known that simpler life forms flourish by feeding through this process, ours is the first study to actually document a fish, a true vertebrate, directly receiving its sustenance through bacteria performing chemoautotrophy.

“Their ecosystem in the cave is basically self-sustaining without much input from plants at the surface. As a result, our research has implications for discovering life outside the earth. If these complex vertebrates can thrive on sulfur bacteria, why couldn’t similar, more evolutionary derived organisms be supported by chemoautotrophic bacteria on other moons or planets such as Europa, one of Jupiter’s moons? It may not be altogether impossible.”

Roach explains that most of the earth's ecosystems have food chains supported by organic carbon produced from the fixation of atmospheric carbon dioxide by plants using sunlight. These, in turn, release breathable oxygen into the atmosphere.

Roach says another study in Movile Cave in Romania a few years ago examined a population of macroinvertebrates that have been isolated in the cave for some 5.5 million years, which also feed on chemoautotrophic bacteria.

"What makes our study so exciting is that we're the first to actually document a fish, a relatively large and complex vertebrate, that is able to thrive by being solely supported by chemoautotrophic-processed hydrogen sulfide bacteria," Roach says.

Source: university press release at www.futurity.org/science-technology/extreme-cave-fish-with-alien-appetites/ dated October 6, 2011, called to our attention by Jerry Atkinson. The full paper is available online at www.esajournals.org/doi/pdf/10.1890/11-0276.1.

Ph.D. student Laura Rosales-Lagarde continues her research on the origins of the hydrogen sulfide and other gases and waters flowing into **Cueva de la Villa Luz** and other sulfur caves and springs in the region of southern Tabasco, Mexico. Ms. Rosales-Lagarde anticipates completion of her dissertation in fall 2010.

Laura Rosales Lagarde collecting water samples in the rimstone-dam area of Cueva de la Villa Luz, Tabasco. Penelope Boston.



Since the late 1990s, Cueva de la Villa Luz has drawn increasing attention from cavers and scientists. Dripping with sulfuric acid, and with frequently deadly concentrations (to humans) of hydrogen sulfide (H_2S), carbon monoxide (CO), and other gases in the air, the cave has boasted a stunning array of microbial and higher life forms. These organisms are ultimately living off the oxidation of H_2S gas as the base of the food chain.

Dr. Penelope Boston has been working on various aspects of the system since 1998, and one of the great puzzles has been the source or sources of the hydrogen sulfide and other gases. Are they volcanic? There is a nearby volcano, El Chichón, that erupted last in 1982. Is the sulfide derived from some sort of subsurface rock source? The answer to this question is critical for proper interpretation of both the geochemistry and unique biology of the system. This is the problem that Laura Rosales-Lagarde chose for her Ph.D. work as a NCKRI Scholar.

Ms. Rosales-Lagarde has made major strides in our understanding of the geochemistry and structural geology of the system. In summary, there are complex structural controls that have produced two separate hydrological systems: a shallow, meteorically-driven system with fresh water and low or no concentrations of H_2S , CO, CO_2 , etc., and a deep briny and gas-rich anaerobic aquifer. These two hydrologies meet and mix in the cave, in some other nearby sulfidic caves, and in a number of surface sulfide springs in the area. The mingling of these distinct waters may be largely responsible for the amazing biomass production and species diversity within Cueva de Villa Luz.

The sources of the different gases are numerous. They include reduction of evaporites (mainly gypsum, $CaSO_4$) from layers located below the limestone in which the cave is formed. This reduction may be thermal or biological in origin, but sulfur isotopic values tend to support a microbial interpretation. Pyrite within thin shale layers also serves as a source of some sulfide. Brines associated with petroleum production

in the surrounding area also appear to contribute to the overall unusual gas environment of the caves and springs. Lastly, the volcanic activity in the area does contribute perhaps as much as 15% of the gas, at least episodically. The gas composition of the cave can vary on timescales as short as seconds to as long as days. The episodicity of gas emissions from the over thirty springs within the cave does not seem to depend on season (wet versus dry), or on other features of seasonality like temperature.

Careful mapping and structural analysis of the area has revealed some clues to the hydrological and geochemical behavior and sources. In addition, this information is also useful in understanding the routes of fluid migration of petroleum as well as water. Besides the intrinsic scientific value of the study as applied to the caves, the results of this research will help illuminate the behavior of a large number of springs (over 50) in the area that are of significance to the local populations.

Source: *National Cave and Karst Research Institute 2009-2010 Annual Report*, pages 14–15.

Abstract: "Molecular Identification and Description of the Female of *Nothoaspis reddilli* (Ixodida: Argasidae) from a Cave in Southeastern Mexico," by Carmen Gumán, et al.

Nothoaspis reddilli Keirans and Clifford, 1975 was described from three males collected in Grutas de Xtacumbilxunaán, Campeche, Mexico, but the female has remained undescribed for 36 years. Recently, females of this species were collected from **Cueva de Villa Luz** (= Cueva de las Sardinas, Cueva del Azufre), in Tapijulapa, Tabasco, Mexico. We present a morphological description of the female stage, together with 16S rDNA sequences that confirm the conspecificity of our female, male, and nymphal specimens.

Source: Article in press in the *Journal of Parasitology*, <http://dx.doi.org/10.1645/GE-3146.1>, called to our attention by Mark Minton. Probably it would have gotten the authors kicked out of the biologists' union if they'd confessed to knowing that the critter is called a tick by

the rest of us.

TAMAULIPAS

News reports on September 9, 2011, say that Mexican authorities found 19,000 pounds of pot and a large cache of firearms and ammunition in a "cave" near the village of Anzaldúas, Tamaulipas. As the village is in the middle of an area of flat fields, it is likely that the "cave" was artificial. *Sources:* www.themonitor.com/news/inside-54588-cave-mexican.html, Peter Sprouse.

The blind Mexican cavefish (*Astyanax mexicanus*) have not only lost their sight but have adapted to perpetual darkness by also losing their pigment (albinism) and having altered sleep patterns. New research published in BioMed Central's open access journal *BMC Evolutionary Biology* shows that the cavefish are an example of convergent evolution, with several populations repeatedly, and independently, losing their sight and pigmentation.

The blind cavefish and the surface dwelling Mexican tetra, despite appearances, are the same species and can interbreed. The cavefish are simply a variant of the Mexican tetra, albeit one adapted to living in complete darkness. A team of researchers from Portugal, America, and Mexico studied the DNA from eleven populations of cavefish (from three geographic regions) and ten populations of their surface-dwelling cousins to help understand the evolutionary origin of the physical differences between them.

While results from the genotyping showed that the surface populations were genetically very similar, the story for the cave populations was very different. The cave forms had a much lower genetic diversity, probably as a result of limited space and food. Not surprisingly the cave populations with the most influx from the surface had the highest diversity. In fact there seemed to be a great deal of migration in both directions.

It has been thought that historically at least two groups of fish lived in the rivers of the Sierra de El Abra, Mexico. One group originally colonized the caves, but became extinct

on the surface. A different population then restocked the rivers and also invaded the caves.

Prof. Richard Borowsky, from the Cave Biology Group at New York University explained, "We were fortunate in being able to use *A. mexicanus* as a kind of 'natural' experiment where nature has already provided the crosses and isolation events between populations for us. Our genotyping results have provided evidence that the cave variant had at least five separate evolutionary origins from these two ancestral stocks."

Dr. Martina Bradic, who lead the research, continued, "Despite interbreeding and gene flow from the surface populations, the eyeless 'cave phenotype' has been maintained in the caves. This indicates that there must be strong selection pressure against eyes in the cave environment. Whatever the advantage of the eyeless condition, it may explain why different populations of *A. mexicanus* cave fish have independently evolved the same eyeless condition, a striking example of convergent evolution."

Source: Item on Science Daily web site (www.sciencedaily.com/releases/2012/01/120122201209.htm, January 22, 2012) called to our attention by Roger Moore. The full article is freely available at www.biomedcentral.com/content/pdf/1471-2148-12-9.pdf.

VERACRUZ

The speleology branch of the Club Exploraciones de México, Sección Veracruz, as been seeking out and exploring caves since 2005 on the Río Naolinco lava flow, which originated from El Volcancillo about eight hundred years ago. They have explored the following caves in the Municipio de Jilotepec:

Cueva La Virgin, 0715940 2172136, elev. 1388 meters

Cueva los Cochinos, 0715940 2172136, elev. 1388 meters

Cueva La Envidia, 0715940 2152163, elev. 1379 meters

Sistema del Falso, 0716398 2172490, elev. 1358 meters

Cueva del Tirantes, 193817 965631, elev. 1384 meters

Hoyo del Becerro, 193619 965822, elev. 1667 meters

Río Subterráneo Huichila, 19° 36.635'N 97°03.273'W, elev. 2007 meters

The Hoya del Becerro is a crater 97 meters deep. The Río Subterráneo Huichila (or Cueva Huichila) is 1106 meters long and 272 meters deep. *Source:* <http://espeleojarocho.blogspot.com/2007/07/proyecto-vulcano-espeleolgico-jilotepec.html>, partly reproduced in more printable form at www.oztotl.com/ps/reports/Jilotepec.pdf. Unfortunately the maps are illegible. Much additional information on the group's activities can be found at Guillermo Gassos's blog, <http://espeleojarocho.blogspot.com/>.

There is a blog trip report on a visit to **Cueva Pintada** and a pit not named near the town of Huatusco at <http://espeleojarocho.blogspot.com/2011/06/prospeccion-espeleologica-huatusco-2011.html>. *Source:* Tlamaqui e-mail list post by Rafael Aguilar, July 15, 2011.

Following a visit in July 2011, when 858 meters was surveyed, **Cueva de la Escalera**, the longest lava tube in Veracruz, is 2178 meters long and 149 meters deep. At least another 300 meters of passage has been seen. *Source:* Tlamaqui e-mail list post by Ramón Espinasa, August 1, 2011.

Further visits to **Cueva de la Escalera**, the longest lava tube in Veracruz, were reported in long posts on the Tlamaqui list in October 2011 and February 2012. Surveying finally reached the end of the cave, though some side passages and overlapping levels remain unsurveyed. Statistics reported by Ramón Espinasa are a mapped length of 2.761 kilometers, a straight-line extent of 2.172 kilometers, and a 2.463-kilometer traverse from the entrance to the end. The vertical extent is 166 meters, including two pits and some easy climbs.

In December 2011, Mar Ríos, Roberto Calderón, and Guillermo Gassos accepted an invitation from Ing. Régulo León-Arteta and the

CUEVA DE LA ESCALERA

Veracruz

Photos by Gustavo Vela



Top: Ramón Espinasa
Middle: Denise Vera and
Ruth Diamant
Bottom: Francisco Ruíz

ejidatarios at Apazapan to investigate rock shelters and caves with cultural remains. Promising rock-art sites were found and will be reported to INAH. A collection of photographs of the trip is at <http://espeleojarocho.blogspot.com/2012/01/proyecto-apazapan-2012.html>. Source: Post to Tlamaqui e-mail list by Guillermo Gassos on January 2, 2012.

YUCATÁN

A thirty-nine-page article "Reporte de la **Gruta Madre Cristalina**, Valladolid, Yucatán, México" by Carlos Augusto Evia Cervantes of the Grupo Espeleológico Ajau is at <http://bitacora.ajau.org.mx/?p=642> or http://oztotl.com/ps/reports/reporte_madrecristalina.pdf. The map included is compressed so severely that it cannot be printed here, and the same map in *Las Cuevas de Yucatán, N° 1, La Región de Valladolid* (see review in this issue) has part of the map buried in the spine and can't be reproduced either.

Six four-page PDF files about caves in Yucatán are found at www.fatimatecpool.info. Titled *Espeleodifusión* ____, with the blank filled by Tecoh, Opichén, Maxcanú, Tekax, Homún, and Santa Rita, they contain cave descriptions, with photos, maps, and other material such as history and legends.

A report "Manifestaciones Culturales in las Cuevas de Santa Rita, Yucatán, México" by Raúl Eresto Manzanilla Hass and María José Gómez Cobá of the Grupo Espeleológico Ajau is at <http://secretos subteraneos.blogspot.com/>. It was presented at the X Coloquio de Arte Rupestre in 2009; unfortunately the version on the web lacks the illustrations. Specific caves mentioned are **Aktun K'aab** (spelled K'ab in this report; also known as Cueva de las Manos), **Aktun Piits'** (Cueva del Algodón), and **Cueva Madre Cristalina**. A blurb by Elsi Lara Villanueva, evidently for tourists, on the caves of Santa Rita is at www.box.com/shared/1y6fq29fjrc19k03ini. (Why do people do that? Some of us type URLs, not just click on links.) Specific caves mentioned are Aktun K'aab and Cueva Madre Cristalina.

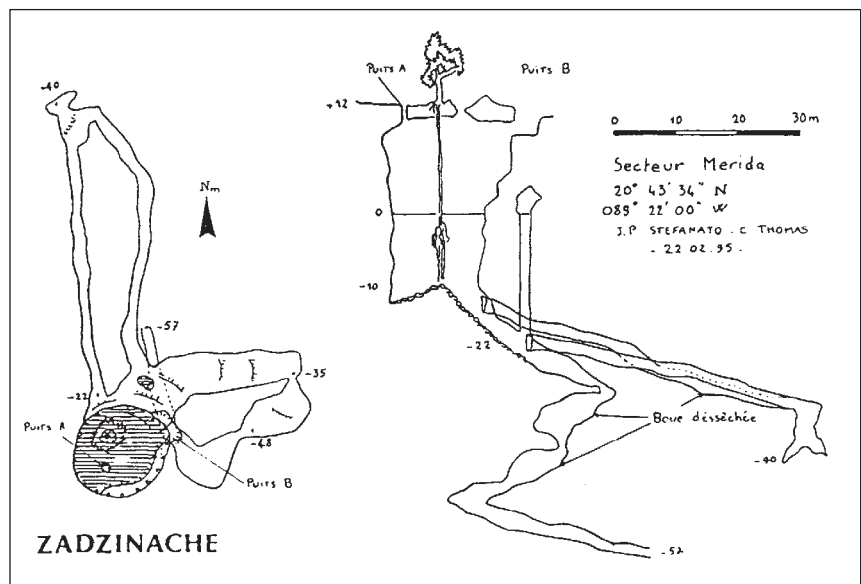
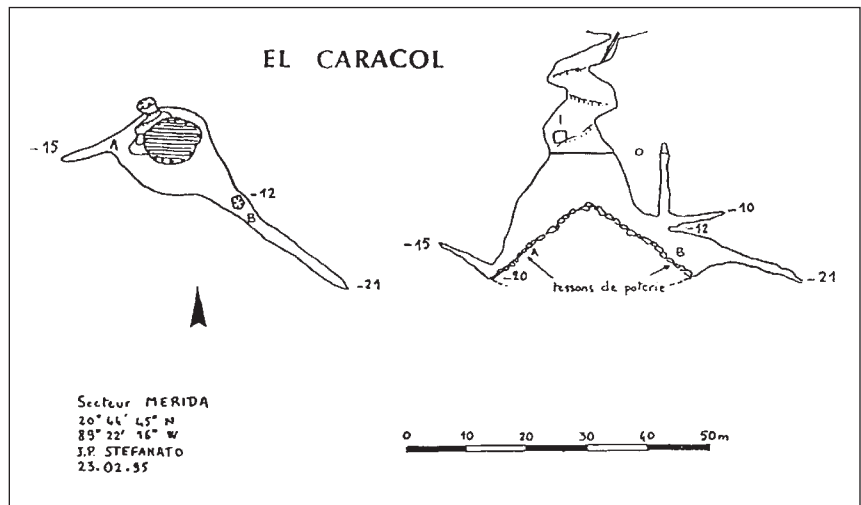
Yet another article on caves of the area, "Las Cuevas de Santa Rita" by Carlos Augusto Evia Cervantes is at <http://antropologiaencavernas.webatu.com/investigacion/cuevas-desantarita.pdf>.

In 1995, French cavers led by Christian Thomas visited cenotes in the vicinity of Mérida. **Cenote Zadzínache**, **Cenote El Caracol**, and **Cenote Papacal** (or Papakal) are all in Mpo. Cuzamá, judging by the location map in their report. Note that the depths shown on the profile maps are from the water surface, not the cave entrance. Source: *Cenotes du Yucatan, Expéditions de 1995 et 1996*, by Christian Thomas, pages 91–94.

Abstract: "The Role of Cenotes in the Social History of Mexico's

Yucatan Peninsula," by Paul George Munro and Maria de Lourdes Melo Zurita.

Mexico's Yucatan Peninsula has had a complex and dynamic history, which has seen processes such as the rise of the Maya civilization, colonial conquests, indigenous rebellions, and a range of commercial activities. The peninsula also represents a unique ecological place in the world: no rivers or major lakes exist on its surface—rather fresh water can only be found in its extensive underground flooded cave system, which is only accessible through *cenotes* (water sinkholes) that sporadically pierce the landscape's surface across the region. This paper seeks to reconcile the above observations, analysing how the peninsula's dynamic history and its unique ecological landscape



have interacted, producing certain environmental, social, political, and economic outcomes. Thus, presented in this paper is an alternative perspective on the peninsula's history, cast through an environmental historical lens that elicits nature's role as a historical actor.

Source: PDF proof of paper in *Environment and History*, volume 17, number 4, November 2011, pages 583–612; abstract at www.eric.a.demon.co.uk/EH/EH1723.html.

Meticulous mapping and excavations at an ancient cave in the Yucatan Peninsula are revealing the vitality of the site to the ancient Maya—for both religious ritual and human survival. The city is located in the elevated Puuc Region of the Yucatan in Mexico. The city, featuring a great pyramid and other elaborate architecture, was built above one of the few cave systems in the region that penetrates to the permanent water table. Mapping and excavations of the ancient city revealed a network of cisterns and reservoirs that fed the community's water supply. The cave exploration has discovered hills of broken pottery and charred sacrifices, indicating the cave was a key religious site that involved worship of the rain gods.

Researcher Nicholas Dunning, a

University of Cincinnati professor of geography, says the cave, located in the ancient ruins of the city of Xcoch, was used continuously from at least 800 BC until the nineteenth century, when it was still used for rituals. UC geography doctoral student Eric Weaver has led a team mapping **Actun Xcoch**, assisted by other experienced cavers including UC biology graduate students Beth Cortright and Jane Slater.

"This is in a region that has no surface water," says Dunning. "There are only a handful of caves that go deep enough to get to the permanent water table, so for any place that's bone dry for five months out of the year, this is a pretty special location."

Two large reservoirs are located in the middle of the city next to the monumental architecture, and the smaller reservoirs and cisterns extend into the residential area and surrounding farm land. Dunning says the area was by far the largest city in the region during the Preclassic Period around 800 BC to AD 100, but adds that there are significant signs the city was abandoned between AD 100 and 300, most likely due to drought.

"The Maya built a stairway to the cave entrance that we have to crawl in to enter and look for

stalagmites—cave formations," says Dunning. "Since this is a seasonal climate, the stalagmites act in the way that tree rings do, recording the rainfall because they only grow during the part of the year when there's rain."

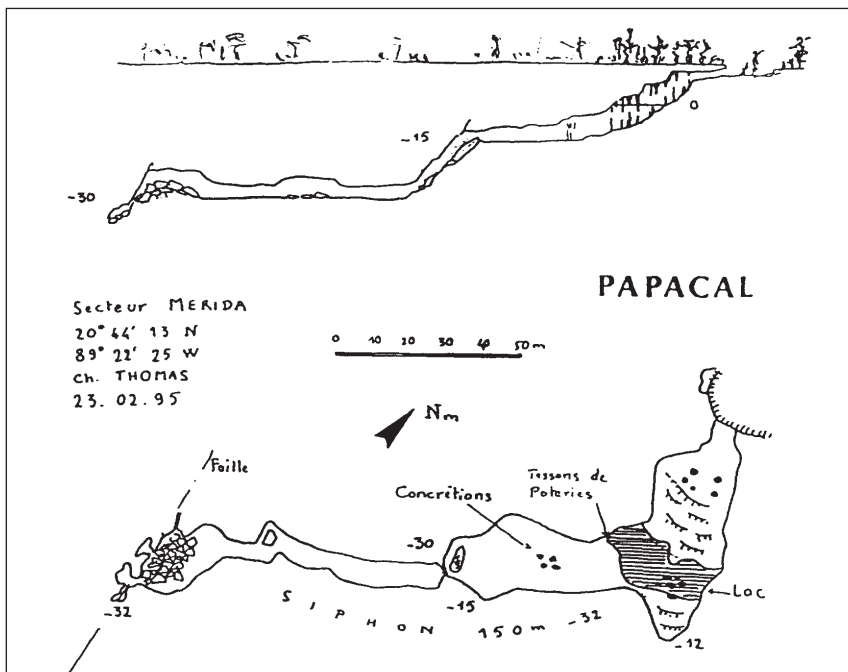
The field work is far from glamorous. Entering the deep cave involves a good deal of crawling through long, narrow tunnels. The summer expeditions also involve working in hot, humid temperatures that can rise as high as 105 degrees. "The oxygen content is so low, you can't even light a match," says Dunning.

"We found all kinds of broken pottery," Dunning says. "The Maya 'sacrificed' pottery by putting materials in it, then ritually killing it as a means of releasing its essence or to receive blessings from the rain gods with their sacrifices," Dunning says. Human and animal remains were also found, but researchers are still exploring whether those remains were sacrifices or burials.

Source: University of Cincinnati publicity release by Dawn Fuller, www.uc.edu/news/NR.aspx?id=15166. See articles on Actun Xcoch in this issue.

Mexican archaeologists exploring a sinkhole cave, or "cenote," in the Yucatan Peninsula pre-Columbian site of **Chichén Itzá** discovered a funerary offering consisting of six human bones as well as vessels, jade beads, knives, and other artifacts. "According to experts, the offering was made as a rain-invoking ritual in the ninth and tenth centuries, when the Maya had suffered two periods of drought," the National Institute of Anthropology and History, or INAH, said in a statement. The objects were found "carefully and selectively placed" at the bottom of a flooded cave that is linked by a 25-meter-long tunnel to a cenote near the Kukulcán pyramid, INAH said. The institute added that the discovery was made during cave and cenote exploration work being carried out by INAH and the Autonomous University of the Yucatan.

Bone remains of at least six individuals—"probably sacrificed during a couple of intense periods



of water shortages between 900 and 1,200 years ago—as well as ceramic objects, jade and shell beads, flint knives, and animal bones, were found at the site. At the bottom of the cenote, at a depth of about 50 meters, archaeologists also found bone remains of another twenty individuals and more than one hundred animal bones, ceramic objects, and sculptures, “most notably one of a standard bearer with features similar to [that of] a jaguar,” INAH said. Archaeologists also discovered another figure with “goggled eyes, similar to the faces that appear on the Tlaloc-type vessels” found at the Balankanche network of sacred caves, also in the Yucatan Peninsula. Due to their characteristics, these discoveries recall the finds made at Chichén Itzá’s Sacred Cenote, the region’s most important, the institute added.

Marine archaeologist Guillermo de Anda, who has worked in the area for the past four years, said these types of funerary offerings—which have been found in five cenotes in the Yucatan—are indicative of “a ceremonial practice [that has been] recently identified and is under study. He added that it is clear that the people whose remains were discovered “were not thrown from the surface, but instead were placed along the walls of the cenote.” *Source:* May 2011 press release quoted at <http://laht.com/article.asp?CategoryId=14091&ArticleId=394968> and other places.

According to the Secretaría de Desarrollo Urbano y Medio Ambiente, there are 2,460 cenotes in the state of Yucatán. *Source:* Report at www.reforma.com/estados/articulo/634/1267692/?Titulo=olvidan-municipios-cenotes-en-yucatan, by Pedro Diego Tzuc, November 11, 2011.

Abstract: “Collapse of Classic Maya Civilization Related to Modest Reduction in Precipitation,” by M. Medina-Elizalde and E. J. Rohling.

The disintegration of the Classic Maya civilization in the Yucatan Peninsula and Central America was a complex process that occurred over an approximately 200-year interval

and involved a catastrophic depopulation of the region. Although it is well established that the civilization collapse coincided with widespread episodes of drought, their nature and severity remain enigmatic. We present a quantitative analysis that offers a coherent interpretation of four of the most detailed paleoclimate records of the event. We conclude that the drought occurring during the disintegration of the Maya civilization represented up to a 40% reduction in annual precipitation, probably due to a reduction in summer season storm frequency and intensity.

Source: *Science*, volume 335, pages 956–958. One of the climate records is inferred from the $\delta^{18}\text{O}$ record in a speleothem they named Chaac from a cave at the town of Tecoh.

Abstract: “Karst of Yucatán: Role of Geothermal flux, faults, sea water, and evaporites in its genesis,” by Christian Thomas.

The caver who dives in Yucatan caves finds out that the saltwater underlying the halocline is warmer than the overlying freshwater. He also notes that there are differences in temperature from one cenote to the other. How can we explain these temperature differences? Why is the saline aquifer warmer than the freshwater aquifer?

These temperature gaps actually indicate a mode of heat transfer by convection from geothermal sources and the existence of two systems of thermal plumes (freshwater and saltwater). The platform of Yucatan was the subject of intense caving exploration and many physico-chemical measurements, which allowed us to quantify the magnitudes of these phenomena.

Numerical modeling is used to define conditions for the establishment of such flow regimes and stresses the importance of hydraulic conductivity and the role of fracturing. The contribution of the geochemistry of freshwater is used to evaluate the depth to which thermal plumes are formed. The analysis of heat exchange with the deep waters of the Caribbean Sea and the antagonistic role of the Yalahua *laguna* are advanced to explain the “cold” area

in the north of the peninsula.

The mechanisms of karstification, amplified by feedback effects that result from these movements of water, are outlined. The genesis of the blue holes and the existence of short horizontal tunnels at the halocline level can be explained this way. The deep dissolution of Cretaceous evaporites, particularly in the area of Lake Chichencanab, is evaluated, thus providing a novel interpretation of the existence of large collapse structures visible in satellite photography in this area. These karstic phenomena are not directly influenced by rainfall, the dissolution “engine” being only heat flow, and thus can be classified as hypogenic.

Source: English abstract of article in *Karstologia* 55, 2010, pages 1–18. The French title of the article is “Le karst du Yucatán: rôle du flux géothermique, des failles, de l’eau de mer et des évaporites dans sa genèse.”

Eight female ticks of the species *Antricola marginatus* were collected on guano in **Grutas de Calcehtok**, Yucatán, and found to have large numbers (from 105 to 466) of larvae of the species attached to their backs. This sort of maternal behavior has not often been observed in ticks. *Source:* Press release in Spanish at www.abc.es/20120223/ciencia/abci-garrapatas-comportamiento-maternal-201202231808.html. The scientific article, “Maternal Care in the Soft Tick *Antricola marginatus*,” by Marcelo Bahia Labruna et al., is in press at the *Journal of Parasitology*. The abstract is at www.ncbi.nlm.nih.gov/pubmed/22300344.

The ancient remains of four prehistoric bears have been discovered by archaeologists diving in underwater caves in the state of Yucatán. Scientists think the extinct species lived in the caves in the Ice Age before they became filled with water. *Source:* Press release in January 2012 that is accompanied by a Flash video that can be seen, among other places, at www.bbc.co.uk/news/world-latin-america-16632419.

MISCELLANEOUS

The eleventh Semana de Cuevas, arranged by the Facultad de Ciencias, Universidad Nacional Autónoma de México, was held at the Juriquilla campus in Querétaro from Monday through Friday, November 7–11, 2011. The second Gran Concurso de Fotografía Cavernícola occurred in conjunction with the conference. The following talks were on the schedule.

Monday

Inauguración. Pedro García Barrera, Juan Morales Malacara, José G. Palacios Vargas, and Miguel Hernández Patricio.

Espeleobiología de la Cueva de Los Riscos. Juan Morales Malacara, I. G. Hernández-Sandaval, I. Sigala-Regalado, A. Espino del Castillo, R. Parede-León, M. Hernández-Patricio, S. Soriano Morales, M. Vega-Orihuela, C. Chávez, L. A. Abela Posada, and C. A. Rosas Sánchez.

La importancia de las interacciones bióticas en cuevas. Garbiela Castaño-Meneses.

Vegetación y flora asociada a la Cueva de Los Riscos, Jalpan, Querétaro, México. Luis Hernández-Sandoval, Mahinda Martínez y Díaz, Yolanda Pantoja Hernández, and Juan B. Morales Malacara.

Historia y actualidad en la bioespeleología en México. José Guadalupe Palacios Vargas.

Arañas del género *Euagrus* (Araneae: Dipluridae), habitantes de las profundidades. Daniela Candia Ramírez.

Tuesday

Fauna epizoica de *Eptesicus fuscus* (Chiroptera: Vespertilionidae) de la región neártica y neotropical. Carmen Flores Martínez.

Tubos de lava en la cuenca alta del Río Actopan, Veracruz. Ramón Espinasa-Pereña.

(title not announced). Fabián Vergara Ovalle.

Diversidad de artrópodos de la cueva "La Joya," Taxco, Guerrero. Ezel Gallindo Pérez.

Uso y abuso de las cuevas en la región serrana de Tabasco. Eladio Terreros Espinosa.

Cuevas y abrigos del norte de

Guerrero: Evidencias de ocupación humana. Raúl Berrera Rodríguez.

Wednesday

Comparación de la entomofauna cavernícola de dos estados diferentes de México: Una visión global. Laura Andrea Abela Posada and Carlos Andrés Rosas Sánchez.

Primer registros de gasterópodos en el Sótano la Tinaja, San Luis Potosí. Arzú Rivera García.

Crecimientos algales de la Cueva de Los Riscos (Querétaro) y Las Kármidas (Puebla). Erika Susana Loyo Espíndola and Eberto Novelo Maldonado.

Troglomorismos y diversidad de especies de la familia Protoschizomidae (Arachnida: Schizomida) en México. Rodrigo Monjaraz-Ruedas.



Estudio prospectivo de la artropodofauna asociada a mamíferos pequeños (reodores y murciélagos) de dos localidades de la Mixteca poblana. Antonio Barrientos Martínez.

Thursday

Acarología subterránea: Registro de la fauna que habita en las cuevas. Ignacio Vázquez-Rojas and Mercedes G. López-Campos.

Ectoparásitos de murciélago hematófago en la Cueva de Los Riscos, Jalpan, Querétaro. Claudia Marcela Chávez Ramírez.

La importancia de cuevas horizon-

tales, como escuelas de bioespeleología. Arturo García Gómez.

Estalagmitas como testigos geoquímicos de las variaciones ambientales pasadas. Pilar Aliaga Campuzano and Juan Pablo Bernal Uruchurtu.

Milpiés: Diversidad, hábitats extremos y el caso del orden Poydesmida. Adrian Reyna-Domínguez.

Revisión de arañas de cinco grutas de Guerrero. Francisco Medina Soriano and Laura L. Del Castillo Martínez.

Friday

Buscando cuevas en el Río Petlapa: Explorador y fotógrafo. Gustavo Vela Turcott.

Murciélagos, dueños de la oscuridad. Roberto Rojo-García.

Colección de miriápodos de laboratorio de espeleobiología de la Facultad de Ciencias, Campus Juriquilla. Miguel Hernández Patricio.

Diversidad de protozoos ciliados en cinco biotopos de cuevas de México. Itzel Sigala-Regalado and Rosaura Mayén-Estrada.

Carga parasitaria de murciélagos cavernícolas: Estado nutricional e inmunocompetencia. Ulalume Hernández Arciga.

Primer hallazgo de la hembra de la garrapata *Nothoaspis reddelli* (Acari: Ixodida: Argasidae) y notas sobre el posible comportamiento de cuidado parental en las garrapatas *Anticola marginatus* (Argasidae) en cuevas del sureste de México. Ricardo Paredes-León and Carmen Guzmán-Cornejo.

Blood-feeding vampire bats have evolved the ability to detect infrared (IR) radiation as a means of locating hot spots on warm-blooded prey. Only three other vertebrate lineages have this 'sixth' sense: three distantly related groups of snakes (pit vipers, pythons, and boas). In all cases, the IR sensor is a highly specialized facial structure called the pit organ. In the snakes, a non-heat-sensitive ion channel (vertebrate TRPA1) has become an infrared detector. As reported in this issue, vampire bats use a slightly different molecular mechanism whereby RNA splicing generates a variant of the ubiquitous TRPV1 heat-sensitive channel that

is tuned to lower temperatures. Comparison of this channel's gene sequence with the equivalent in other mammals lends support to the hypothesis based on molecular data that these bats are evolutionarily grouped with horses, dogs, cows, moles and dolphins (in the Laurasiatheria superorder), rather than with humans, monkeys, and rodents (in the Euarchontoglires) as originally proposed on anatomical criteria. *Source*: "Editor's summary" of paper in *Nature*, vol. 476, pp. 88–91, 4 August 2011, from www.nature.com/nature/journal/v476/n7358/full/nature10245.html, where the authors' abstract can also be seen (but not the full paper unless you pay). Diana Tomchick called this to our attention.

Several issues of *Mundos Subterráneos*, the magazine of the Unión Mexicana de Agrupaciones Espeleológicas in Mexico City, are available on the group's web site at www.uma.org. Included are the first five (1990–1994) and some recent issues, starting in 2008. In addition, a number of the issues are at the Karst Information Portal, at <http://karst.lib.usf.edu/index.php?P=BrowseResources>; search for *Mundos Subterráneos* (with no accent).

Various information on Mexican caves can be found at <http://www.showcaves.com/english/mx/index.html>. Most interesting might be the information on Mexican show caves, although just about all of it is very obsolete. (The history of Grutas de Bustamante ends in 1998, for example.) There are short lists of other caves, karst features (all cenotes), mines, and "subterranea." The main index to the site, <http://www.showcaves.com/english/index.html>, contains links to similar information for many other countries.

The Servicio Geológico Mexicano has free geological maps that can be downloaded from its web site. The 1:250,000 series is available for almost all of Mexico from http://portaljsp.sgm.gob.mx/cartas_impresas/productos/cartas/



[cartas50/geologia/numcarta50.html](http://portaljsp.sgm.gob.mx/cartas_impresas/productos/cartas/cartas50/geologia50/numcarta50.html). Maps at a scale of 1:50,000 for about a quarter of the country are available from a similar URL: http://portaljsp.sgm.gob.mx/cartas_impresas/productos/cartas/cartas50/geologia50/numcarta50.html. Flash will be needed to select the map you want, which can then be downloaded as a PDF file about 3 MB in size. The AMCS has archived all the maps available there as of January 2012 and can supply one if you can't navigate the site or it disappears.

The Instituto Nacional de Estadística y Geografía (INEGI) has an interactive digital map of Mexico at <http://gaia.inegi.org.mx/mdm5/viewer.html>. I haven't had any luck working it.

Useful tables of place names are provided by INEGI at www.inegi.org.mx/geo/contenidos/geoestadistica/catalogoclaves.aspx. Besides containing the geographical coordinates for all the listed places, it should be useful for checking spellings and determining what *municipio* a village is in, among other things. I don't seem to be able to get to that URL directly, but only by going to www.inegi.org.mx/default.aspx, specifying "Versión completa," and then selecting "Catálogo de entidades, municipios y localidades" from the menu on the left, and the

site sometimes crashes Safari. Your mileage may vary.

There is an extensive dictionary and concordance of the Yucatecan Mayan language at www.famsi.org/reports/96072/. It was compiled by David Boles from numerous sources over the period 1997 through about 2005, with some updates as recently as 2011. It gives English equivalents of Mayan words and extensive quotations of sources, mostly Spanish. Because of its compactness, the shorter "Combined Mayan-Spanish and Spanish-Mayan Vocabularies" pointed to at www.famsi.org/research/bolles/CombinedVocabularies.pdf will probably be easier to use, although it appears to really only be Mayan to Spanish. *Source*: Jim Coke, Mark Minton.

The web site <http://espeleorescatemexico.org/> mentioned in "Mexico News" in the last issue now leads to something not even remotely connected to cave rescue—an example of the need to publish information on paper, hint, hint. There is a new web site, www.espeleorescatemexico.elclandelosmoteros.com, for Espeleo Rescate México, but it is very much a work in progress; there is text on the home page, but the links lead to mostly empty pages. Héctor Martínez Cerda is now the president. *Source*: Mark Minton.



Mark Minton
May 2012
Depth in meters

DEEP PITS OF MEXICO

1	El Sótano (de El Barro)	Entrance drop	Querétaro	410
2	Sótano de las Golondrinas	Entrance drop	San Luis Potosí	376
3	Sótano de la Culebra	Entrance drop	Querétaro	336
4	El Zacatón (mostly underwater)	Entrance drop	Tamaulipas	335
5	Sótano de Tomasa Kiahua	Entrance drop	Veracruz	330
6	Sótano de Alhuastle	P'tit Québec	Puebla	329
7	Nita Xonga	Psycho Killer	Oaxaca	310
8	Pozo Poseidon	Entrance drop	Coahuila	288
8	Sotanito de Ahuacatlán	2nd drop	Querétaro	288
10	Sótano del Arroyo Grande	Entrance drop	Chiapas	283
11	Sima Don Juan	Entrance drop	Chiapas	278
12	Hálito de Oztotl	Entrance drop	Oaxaca	250
12	Sima Dos Puentes	La Ventana	Chiapas	250
14	Cueva Santo Cavernario	El Santo Tiro (Pozo Fabian)	Puebla	245
15	Sótano del Aire	Entrance drop	San Luis Potosí	233
15	Resumidero del Pozo Blanco	Entrance drop	Jalisco	233
17	Sistema Ocotempa (OC3)	Pozo Verde	Puebla	221
18	Sótano de los Planos	Puits Tannant	Puebla	220
18	Sótano de Eladio Martínez (S-CHIC 1)	Entrance drop	Veracruz	220
18	Sistema Soconusco	Sima de la Pedrada	Chiapas	220
18	Live in Busch	Entrance drop	Oaxaca	220
22	Sótano de los Coatimundis	Entrance drop	San Luis Potosí	219
23	Pozo del Cerro Grande	Entrance drop	Jalisco	218
24	Sótano de Sendero	Entrance drop	San Luis Potosí	217
24	Resumidero el Borbollón	Tiro Grande	San Luis Potosí	217
26	Sima del Chikinibal	Entrance drop	Chiapas	214
27	Unnamed pit	Entrance drop	Chiapas	210
27	Sistema H3-H4 (HU3-HU4)		Puebla	210
29	Kijahe Xontjoa	So On Jan	Oaxaca	209
30	Nacimiento del Río Mante (underwater)	Macho Pit	Tamaulipas	206
31	Hoya de las Guaguas	Entrance drop	San Luis Potosí	202
32	La Hoyanca	Entrance drop	Tlaxcala	201
33	Fundillo de El Ocote	Entrance drop	Chiapas	200
33	Hard Rock Cave		Oaxaca	200
33	Nita Gatziguin	Entrance drop	Oaxaca	200
33	Sistema de la Lucha	Entrance drop	Chiapas	200
33	Hueholvastempa	Entrance drop	Puebla	200
38	Kijahe Xontjoa	Lajao Se	Oaxaca	199
39	Sima (Cueva) La Funda	Entrance drop	Chiapas	198
40	Sótano de Soyate	Entrance drop	San Luis Potosí	195
41	Sótano de Alpupuluca	Entrance drop	Veracruz	190
41	Sótano de Tepetlaxtli No. 1	Entrance drop	Puebla	190
41	Cueva de los Murmullos (Cueva del Tízar)	Tiro de los Murmullos	San Luis Potosí	190
44	Sótano de Puerto de los Lobos (Sótano Hondo)	Entrance drop	San Luis Potosí	189
45	Cuaubtempa	Pozo con Carne	Puebla	188
45	Hoya de la Luz	Entrance drop	San Luis Potosí	188
47	Sótano de Hermanos Peligrosos	2nd drop	Veracruz	186
48	Atlalaquía (Sótano) de Ahuihuitzcapa	Entrance drop	Veracruz	180
48	Croz 2	Entrance drop	Puebla	180
48	Sima de Veinte Casas	Entrance drop	Chiapas	180
48	Sótano Cirque Cuauxipetstli	Entrance drop	Puebla	180
48	Sistema Ocotempa (OC11)	Puits Analogue	Puebla	180

DEEP CAVES OF MEXICO

Mark Minton
May 2012
Depth in meters

1	Sistema Cheve	Oaxaca	1484
2	Sistema Huautla	Oaxaca	1475
3	Cueva Charco	Oaxaca	1278
4	Akemati - Akemasup	Puebla	1226
5	Kijahe Xontjoa	Oaxaca	1223
6	Sistema J2 (Ozto J2 (Faustino, Barbie) + Last Bash (Hija Puta))	Oaxaca	1222
7	Sistema Nogochl (Olbastl Akemabis - El Santito)	Puebla	1182
8	Sistema Ocotempa (OC3 + OC11)	Puebla	1070
9	Soncongá	Oaxaca	1014
10	Sistema Purificación	Tamaulipas	957
11	Guixani N'dia Kijao (Guinjao)	Oaxaca	955
12	Sistema Perrito (Nia Quien Nita + Nia Nga'co Nita)	Oaxaca	906
13	Sistema Tepepa (Ehécatl+Niebla+Xalltégoxtli+Pozo 4)	Puebla	899
14	Nita Chó	Oaxaca	894
15	Sótano de Agua de Carrizo	Oaxaca	843
16	Sótano de El Berro	Veracruz	838
17	Sótano de Trinidad	San Luis Potosí	834
18	Hard Rock Cave	Oaxaca	830
19	Resumidero El Borbollón	San Luis Potosí	821
20	Las Tres Quimeras	Puebla	815
21	X'oy Tixa Nita	Oaxaca	813
22	Nita Ka	Oaxaca	760
23	Sistema H31-H32-H35	Puebla	753
24	Sonyance	Oaxaca	740
25	Nita Xongá	Oaxaca	739
26	Yuá Nita	Oaxaca	705
27	Aztotempa	Puebla	700
28	Sótano de los Planos	Puebla	694
29	Sótano de Alfredo	Querétaro	673
30	Cueva Santo Cavernario+Tototzil Chichiltic	Puebla	667
31	Sistema de los Tres Amigos (Te Chan Xki)	Oaxaca	659
32	Sistema Cuetzalan (Chichicasapan+San Miguel)	Puebla	658
33	Cueva Tipitcli (Tipitli)	Puebla	653
34	Sótano de Tilaco	Querétaro	649
35	Nita Nashi	Oaxaca	641
36	Cuaubtempa Superior	Puebla	640
37	Oztotl Altepetylacac (Cueva Paisano)	Puebla	638
38	Sistema Soconusco - Aire Fresco	Chiapas	633
39	Sistema Atlalaquía	Veracruz	623
40	Cueva de Diamante	Tamaulipas	621
41	Sistema Coyolatl-Esperanza	Puebla	620
42	R'ja Man Kijao (Nita)	Oaxaca	611
43	Nita He	Oaxaca	594
44	Meandro Que Cruce (Meandre Qui Traverse, H54)	Puebla	588
45	Olbastl Koltik (Sótano Chueco)	Puebla	587
46	Yometa	Puebla	582
47	Sótano de las Coyotas	Guanajuato	581
48	Sistema Los Toros	Nuevo León	576
49	Arriba Suyo Sótano	San Luis Potosí	563
50	Cueva Fútbol	Puebla	555

Mark Minton
 May 2012
 Length in meters

LONG CAVES OF MEXICO

1	Sistema Ox Bel Há	Quintana Roo	234824
2	Sistema Sac Actun	Quintana Roo	217495
3	Sistema Purificación	Tamaulipas	94889
4	Sistema Dos Ojos (Sistema Jacinto Pat)	Quintana Roo	83204
5	Sistema K'oox Baal (+Tux Kupaxa)	Quintana Roo	65987
6	Sistema Huautla	Oaxaca	62099
7	Sistema Xunaan-Há (María Isabella, 3B) - Tixik K'una - Templo	Quintana Roo	59670
8	Cueva del Tecolote	Tamaulipas	40475
9	Sistema Cuetzalan (Chichicasapan+San Miguel)	Puebla	37676
10	Kijahe Xontjoa	Oaxaca	31373
11	Sistema Toh Há	Quintana Roo	31013
12	Sistema Tepepa (Ehécatl+Niebla+Xalltégoxtli+Pozo 4)	Puebla	29401
13	Sistema Soconusco - Aire Fresco	Chiapas	27793
14	Sistema Cheve	Oaxaca	26194
15	Sistema Coyolatl-Esperanza	Puebla	22221
16	Chjine Xjo (Xine Xao, Chine Xao)	Oaxaca	19515
17	Sistema Aerolito	Quintana Roo	18288
18	Sistema Tepetzala (TB84-TB1-CO2-CO4)	Puebla	16527
19	Cueva de Alpazat	Puebla	15200
20	Sistema PonDeRosa (Pondazul, Edén)	Quintana Roo	15019
21	Sistema Yok Ha' Hanil (Río Cristal, Pool Tunich, Río Secreto)	Quintana Roo	14569
21	Sistema Dos Pisos (Ka'p'el Nah)	Quintana Roo	13905
23	Sistema J2 (Ozto J2 (Faustino, Barbie) + Last Bash (Hija Puta))	Oaxaca	13492
24	Sistema Camilo	Quintana Roo	12402
25	Sistema Sac Muul	Quintana Roo	11145
26	Atlixicaya	Puebla	11120
27	Sistema Río La Venta	Chiapas	11020
28	Sistema San Andrés	Puebla	10988
29	Cueva de la Mano	Oaxaca	10841
30	Actun Káua	Yucatán	10360
31	Grutas de Rancho Nuevo (San Cristóbal)	Chiapas	10218
32	Cueva del Arroyo Grande	Chiapas	10207
33	El Chorro Grande	Chiapas	9650
34	Sistema Muul Three	Quintana Roo	9629
35	Sistema Tepetlaxtli	Puebla	9600
36	Sistema Ek Be	Quintana Roo	9408
37	Sistema Brumas-Selváticas	Puebla	9324
38	Sistema Chac Mol - Mojarra	Quintana Roo	9193
39	Cueva Quebrada	Quintana Roo	9000
40	Sótano de Las Calenturas	Tamaulipas	8308
41	Gruta del Tigre	Quintana Roo	8200
41	Sistema Minotauro	Quintana Roo	8072
43	Cenote Doggi	Quintana Roo	7934
44	Sumidero Santa Elena	Puebla	7884
45	Sistema Zapote (Toucha-Há - Vaca Há)	Quintana Roo	7869
46	Sistema La Ciudad	Puebla	7828
47	Cueva Yohualapa	Puebla	7820
48	Cueva de la Peña Colorada	Oaxaca	7793
49	Cueva de Comalapa	Veracruz	7750
50	Sistema de los Tres Amigos (Te Chan Xki)	Oaxaca	7474

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ARTICLES

A full-page photograph of a scuba diver in a cenote. The diver is positioned in the center-right of the frame, facing left. They are wearing a black wetsuit, a mask, and two white scuba tanks. The water is a deep, dark green color, and the surrounding rock walls are rugged and textured. Light rays penetrate from the surface, creating a dramatic, ethereal atmosphere. The overall scene is dark and mysterious.

Alberto Nava in the La Virgin Cenote entrance to the Aktun Hu part of Sistema Sac Actun, Quintana Roo. *Daniel Riordan.*



UNDERWATER ARCHAEOLOGY AT CENOTE HOLTUN

Jason Richards

Life has centered around the cenotes of the Yucatan Peninsula since people have lived in the semi-arid region. Today, nearly every small town throughout the jungle has, at its center, a cenote from which the people can draw water, a critical resource in a land that has no surface streams. Most cenotes have a micro-ecosystem surrounding their entrances where the temperature remains cooler, huge banyan trees drop their roots through the entrances to draw from the water below, and colorful motmot birds create their nests just below the entrances, while bats and other troglomorphic creatures make residence farther inside. Even before modern times, the cenotes supported life, providing crystal-clear water and drawing animals to serve as a food source for the people living nearby. But in the time of the Maya, the cenote also had a darker side. Caves and cenotes represented a spiritual gateway for the Maya people. Their dark, foreboding, and often difficult-to-reach interiors were considered gateways to the underworld—a passage through which one would have to pass after death. Though this is not completely understood, some sources believe that certain cenotes, or *dznot* in Mayan, served as burial chambers, and some cenotes may even have been the site of ritual offerings, or sacrifices, to appease the Maya gods.

Of the Maya cities of the Yucatan, Chichén Itzá is probably the best

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Slightly edited from an article in the *NSS News*, March 2012.

known to Americans, due both to its sprawling expanse and the large number of artifacts and intact structures that have been studied there. The main part of the extinct city of Chichén Itzá was built around a number of cenotes, the most famous of which is the Sacred Cenote. Beginning in 1904, the Sacred Cenote was dredged for artifacts by archaeologist and U.S. Consul Edward H. Thompson, an act Mexicans consider looting of one of their most precious archaeological resources. The damage continued into the 1970s with the National Geographic Society and CEDAM, the Club de Exploraciones y Deportes Acuáticos de México, conducting wholesale removal of artifacts from the murky green cenote. Eventually, the Mexican government shut down diving access to the site and other cenotes near the city of Chichén Itzá, concerned that items were being removed without any thought to documentation of the artifacts or the preservation of contextual information normally gotten from an exacting physical plot of the location and depth in the sediment from which each artifact is drawn.

The cenotes at Chichén Itzá are not the only sites to suffer from loss of or damage to artifacts. Many Maya villages, once prosperous, have fallen into decline throughout the Yucatan Peninsula, and the cenotes upon which they were built have been forgotten. The adobe and thatch buildings are covered over by the sharp jungle plants, the raised rock roads called *sac-be* that connected cenotes and villages overgrown and crumbling in disrepair. It is

not uncommon to wander through the jungle and happen across a tall mound of rocks, completely covered by jungle vines and plants, that had once been a platform, or even a pyramid, forgotten by the people who no longer need it and never known by the modern-day government that owns it. It is discoveries like these and the lure of Maya treasure to be found at the bottom that bring less than scrupulous dive operations to cenotes throughout the Yucatan. Over the years unknown numbers of precious artifacts have disappeared from well-known cenotes with no record or documentation—valuable archaeological information that is lost forever.

For the last ten years, a loosely organized group of American cave divers has traveled to the Yucatan to catalog, explore, and map any cenotes they could find. The work was plentiful, as it is difficult to drive more than a mile in any direction and not stumble across a new cenote. Over the years, the archaeological aspects became obvious, and a new focus evolved, working in conjunction with Mexican archaeologists, very few of whom are cave divers, to help catalog and provide cursory examinations of possibly significant archaeological sites contained within cenotes. To this end, they began working with an archaeologist at the Universidad Autónoma de Yucatán in Mérida. Professor Guillermo de Anda was creating a fledgling underwater archaeology program at the university and wanted help. He had only a few students and could investigate very few of the potentially thousands of sites. In

addition, due to their limited training and equipment, they were limited to shallower cenotes and shorter times on the bottom surveying the artifacts. The Americans were able to bring diving technology and specialty skill sets to the team that would allow Professor de Anda to rapidly expand his research.

In late 2009, e-mail began flying back and forth between the members of our loose federation of exploration divers and Memo (de Anda's nickname). He related to us during his work with the Mexican government the opportunity had been discussed to dive cenotes associated with the Maya city of Chichén Itzá, the first such dives since access to the Sacred Cenote and surrounding sites had been closed off. Excitedly, he wondered when we could come down and help. To us, having made almost biannual trips to dive the cenotes in the past few years, this was good news—a solid project cave with good potential, rather than the usual wandering around in the jungle interrogating locals about cenotes with our miserable Spanish and nonexistent Mayan language capabilities. As it happened, many of us would be in the adjacent state of Quintana Roo in January on another project. We could tack these caves onto the end of the trip and only make one drive down from the States. From there, logistics discussions ensued, and the plan began to come together.

The two projects together would eventually encompass almost three straight weeks of diving. As all of the sites are a significant drive from anywhere that has scuba tanks, our own compressor and tanks would be required. In addition, due to the suspected depth of the caves, helium would have to be brought along to mitigate the effects of nitrogen narcosis. Due to the limited amount of helium we could carry and the large amount of deep diving expected, this also meant that we would have to bring rebreathers so we could recycle the helium-rich breathing gas, preserving more of it for later dives. For six divers, this amounted to a large amount of equipment and many tanks. On top of that, the Woods Hole

Oceanographic Institution was interested in creating a photo-mosaic of the floor of the cenote, and they had boxes of expensive lights and large batteries that they wanted us to take along. All of this would have to fit in my little Toyota pickup.

Tamara Thomsen, the team photographer, volunteered to be the rider on the drive to Mexico. She drove overnight from her house in Madison, Wisconsin, to my house in Nashville, Tennessee, carrying half a truckload of equipment, including the lights from WHOI. Her boyfriend, Keith Meverden, Coast Guard bum and videographer, would fly in at the start of the Chichén Itzá diving almost two weeks later. My wife, Christina Richards, biologist and survey slave, would meet us at the end of our drive in Cancún, just in time to make all the diving and skip all the driving. Ethan Brodsky, another Wisconsin cave diver, and generally the receiver of abuse, would also fly into Cancún and link up with the rest of the team in time to begin our initial project in Quintana Roo. Evan Kovacs, the director of photography at WHOI's Advanced Imaging and Visualization Laboratory, and his producer, Katie Schuler, would rent a van in Mérida, load up their tons of expensive camera equipment and meet us in Pisté, the little town adjacent to Chichén Itzá, just in time to make the first day of diving at that site.

With all of Tami's gear loaded into my pickup on top of all of the tanks, rebreathers, compressor, and dry-caving and camping gear, we left Nashville for the sprint to the Mexican border. We arrived in McAllen, Texas, the following evening, set to make the border crossing and the bilingual paperwork shuffle early the next morning. The crossing went smoothly, despite my extremely weak Spanish skills, and we began our more leisurely three-day road trip through the whole of Mexico to the town of Mérida, Yucatán. With Tami not feeling comfortable driving on the potholed and ill-marked



Katie Schuler and Evan Kovacs prepare the 3D-HD camera array "Bumble Bee" for lowering in the cave. *Tamara Thomsen.*

roads of Mexico at night and my not wanting to make a 24-hour sprint, we decided to stop midway at a dive site called Zacatón. Zacatón is a geothermal, 300-meter-plus-deep karst spring, notorious for being the site of the death of Sheck Exley, one of the forefathers of American cave diving. [See *AMCS Activities Newsletter 21*, pages 38–43, 99–100.] We stopped at Zacatón long enough to get a hotel room for a few hours rest, a much-needed shower, and an early-morning dive at the spring. It would be an interesting start to our diving in Mexico. The spring steamed in the cool air of the early morning, and we were the only ones there. We quietly geared up and made the 250-meter dive through El Nacimiento, the underwater cave that leads to Zacatón's huge open pit. After staring down into the "bottomless" pit for a few moments, thinking about the diving legends who had made this same dive before us, we returned to the spring, loaded up the truck, and got back on the road.

Beyond Mérida, we soon arrived in Quintana Roo, and with the help of an international-capable phone we met up with our flying partners and began our two-week mapping project there. One of the most important tasks during the two weeks prior to the Chichén Itzá project was Chrissy's learning to dive the rebreather that she would need later in the project. Fortunately, Tami is also a rebreather instructor, so

she brought along one of her spare rebreathers for Chrissy to use. As the rest of the team sat around the oceanside pool drinking umbrella-clad beverages, we laughed that Chrissy looked like some sort of ninja sneaking around on the bottom of the extremely murky pool in her black wetsuit with this huge, bubble-less device. With Chrissy's training finished, and our Quintana Roo project complete, it was time to drive inland to Chichén Itzá.

The plan was to meet in the small town of Pisté, outside of Chichén Itzá. There we would meet up with Memo and "Memo #2," or Guillermo Pruneda Block, a manager for a tourism outfit who arranged access to private sites while we were in the area. After some wandering around in what amounts to three blocks of village, we finally met up with everyone and got settled into a three-room research facility owned by the Mexican government and used during the day for the sorting and restoration of Maya artifacts. At night, we moved in like cockroaches, stringing hammocks across the rooms over piles of blocks carved with various Mayan symbols. The compressors were set up in the grass, and batteries were gathered to be charged. Ropes were untangled and recoiled, and the tanks were sorted for the next day's diving. While the compressors clanged away, we discussed which cave we were going to dive first and other plans for the next two days of diving. Memo described to us a meeting he had recently had with local villagers at the first cave we were hoping to dive; it ended in his making a hasty departure at the point of a machete. He prudently decided that that particular cave would probably not be a viable research subject any time soon. Apparently the locals there were very concerned about divers removing artifacts from their cenote and were not willing to listen to Memo's explanation of our project goals. In the end he selected another promising cave within the

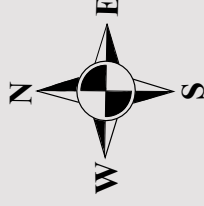
outlines of the historic city of Chichén Itzá. He and one of his students had taken the opportunity prior to our arrival to make a first dive and take a quick look. Without even descending to the bottom of the cave, they had confirmed the presence of artifacts and marked it as needing exploration. After much equipment repair and preparation overnight, the whole team arose early and drove to the cenote site.

We arrived at the cenote on a chilly morning with the sun rising over the banyan trees and the first of our local support crew, men likely descended from the Maya and hired from a nearby village, waiting for us to arrive. As at every cave-diving site I have ever been to, all of the divers gathered around the entrance to take a look at the water. A stately banyan tree shaded the site, its huge roots reaching down into a roughly grave-size *noria* or well that had obviously been shaped by man many years ago. The limestone walls of the pit were topped by a short wall of square limestone blocks sitting on top of the flat ground. The walls of the cenote continued down about 5 meters to where they cut back into a ceiling not visible from the surface. The sun, not high enough to shine down into the hole, only made the pit seem deeper and darker. Someone tossed a rock into the hole, and after a short pause it splashed into the water below, finally revealing the water as dim light reflected off the rippled surface. A quick check with the laser rangefinder revealed the distance to the water was nearly 18 meters, not

unusual for the area. This seemed to finally satisfy everyone, as they wandered away to their respective vehicles to start hauling gear closer to the hole. Ethan began rigging the pulleys that we would use to haul gear in and out of the hole, and within minutes the locals had rigged a tripod-like apparatus, using thick branches and polypropylene donkey rope, that would allow us to place the pulleys directly over the hole. We all stared dubiously at this contraption, but the local rigging team assured us it would be secure. We reasoned that if Evan was happy putting a half million dollars' worth of camera gear on it, we could risk an 18-meter fall into the water. Slowly the pile of gear under the tree grew to ridiculous proportions. WHOI's two massive 3D-HD video cameras, rebreathers, and bailout tanks for Chrissy, Tami, Keith, Evan, and me, double-tank sets for each of the Memos, and decompression tanks for everyone were stacked on the pile. And then came the little boat. It's not every day that you see a boat in the middle of the Yucatán jungle, a place with no surface water. The locals obviously thought we were a little ridiculous; they all had a good look at our Walmart special diving craft before we stuffed it down the entrance in preparation for its becoming our gear platform in the cave. The difficulty with diving many cenotes is that there is no dry ground on which to gear up. This means that you either have to descend on rope with your equipment already on your body, not a safe proposition, as diving

Guillermo de Anda placing marker flags near artifacts while Keith films with the 3D-HD camera. *Tamara Thomsen.*





CENOTE HOLTUN

YUCATAN, MEXICO

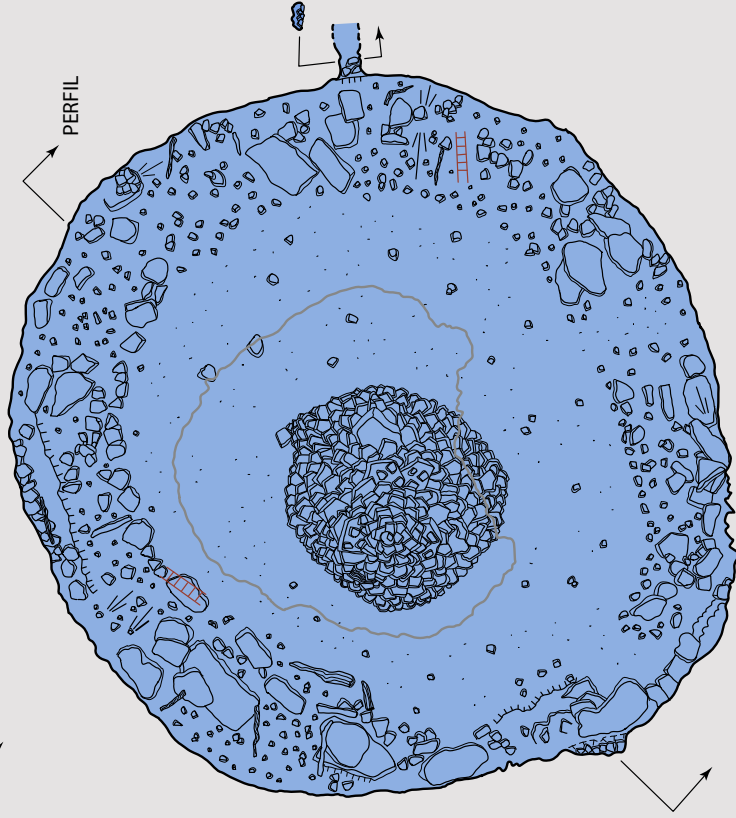
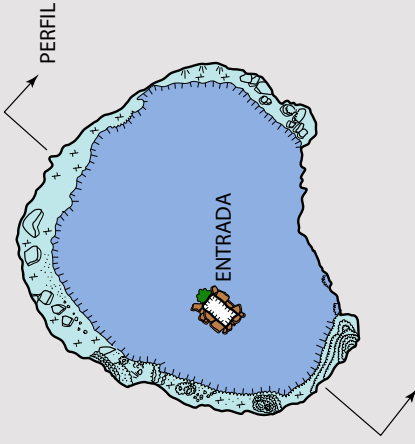
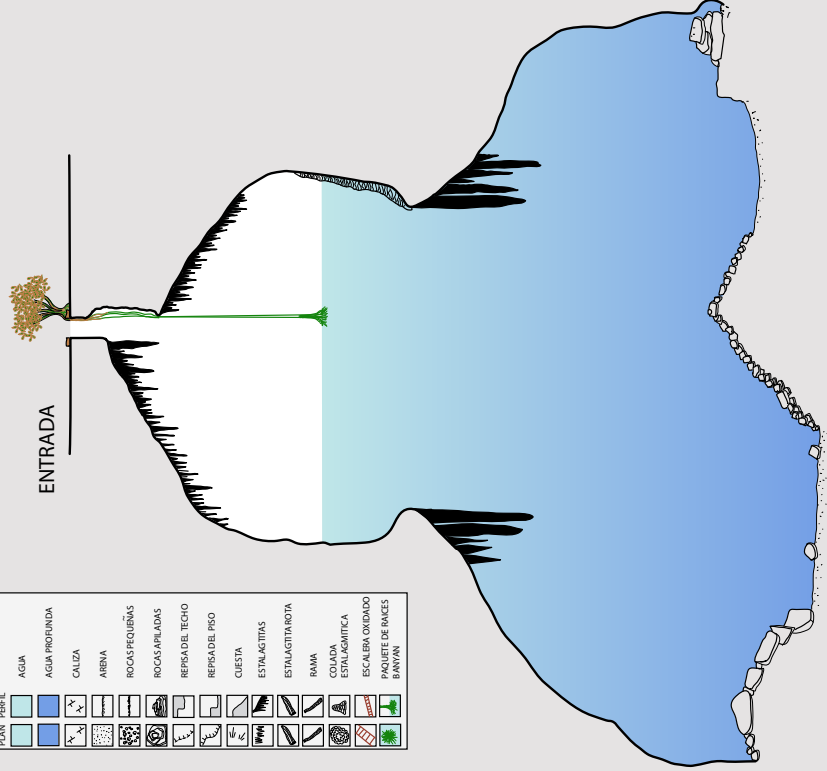
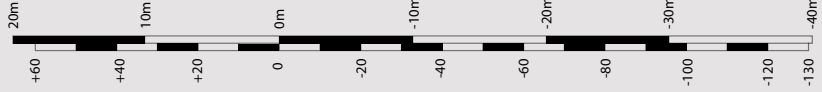
MAPA GRADO 5, 16-17 ENERO 2010

EN COLABORACION CON:
 UNIVERSIDAD AUTONOMA DE YUCATAN
 NATIONAL SPELEOLOGICAL SOCIETY
 WISCONSIN HISTORICAL SOCIETY
 WOODS HOLE OCEANOGRAPHIC INSTITUTE

TOPOGRAFIA: CHRISTINA RICHARDS, JASON RICHARDS
 CINTA METRICA, COMPAS DE BRUNTON CLASSIC
 PROFUNDIDAD CON LIQUIVISION X1 Y DISTO A3
 CARTOGRAFIA: JASON RICHARDS

LAYENDA DEL MAPA

PLAN	PERFIL	AGUA	AGUA PROFUNDA	CALIZA	ARENA	ROZAS FREQUINAS	ROZAS APILADAS	REPSA DEL TECHO	REPSA DEL PISO	CUESTA	ESTALACTITAS	ESTALAGMITA/ROTA	RAMA	COJADA	ESTALAGMITICA	ESCALERA OXIDADO	PAQUETE DE RAJAS	BANVAN
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One of the most interesting finds, a bowl with painting still visible. *Tamara Thomsen.*

gear is not predisposed to vertical work, or you have to float around and wait for someone to lower your gear to you and then gear up in the water. This also is quite difficult, particularly when gearing up involves attaching two very heavy tanks and configuring rebreathers, cameras, and other equipment. With the boat, lines strung around its edge, in the water, gear can be attached to the boat, and divers can attach both gear and eventually themselves to the boat to keep from sinking to the bottom while gearing up. As the gear slowly moved into the hole, the temperature began to creep up, and the divers were ready to get into the water and see what we were in for.

We determined that we would only have two days at the cave, primarily because the amount of money we were asked to pay the locals for access and for their services was more than we expected. As it turned out, we were hiring most of the nearby town. Those who have dealt with this sort of situation will tell you that it is a risky proposition to turn down extra “help” at the risk of being denied access, and the best bet is to be finished before too many people show up to take advantage of the situation. Due to our limited time on site, everyone had very specific goals to complete on each day of diving. On the first dive, Chrissy and I would be responsible for dropping the guideline from the banyan roots on the surface to the

top of the debris mound, then running a line around the outer circumference of the cave, creating a loop to survey and also searching for any passages leaving the main room. This would provide a safety line for anyone working around the periphery of the cave; should they get lost, they would only have to swim in a straight line and either hit the guideline and follow it to the surface or, in the other direction, hit the debris cone and ascend from it to the surface. On this same dive, we would also have to survey the

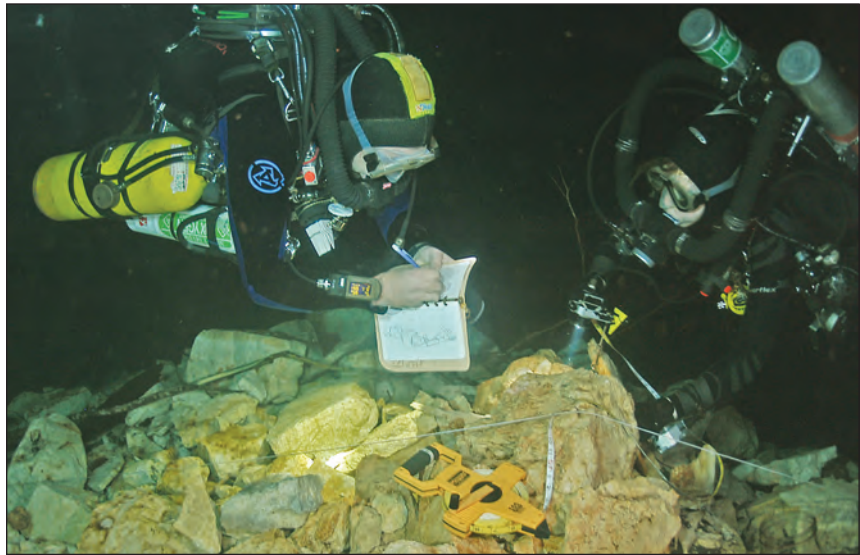
entire guideline that we put in. The two Memos and Ethan would search the debris cone and the rest of the cave, marking significant artifacts by dropping hardware-store bolts with numbered flagging tape tied to them. These could later be added to the map to make an imprecise map of artifact locations. Tami was tasked with assisting in finding artifacts and pointing them out to Memo and, more importantly, photographing significant artifacts found during the dive and taking high-resolution pictures of as many artifacts as possible to be studied later in the lab. Keith would be carrying the Woods Hole untethered 3D-HD video camera, Mini Bee, and swimming around recording all of the work for later compilation into a video documenting the project. Evan would be driving WHOI’s massive, vertically oriented 3D-HD camera array, Bumble Bee, that would create a photo mosaic of the floor of the cave, eventually creating a single panoramic image of the floor of the cave with high enough resolution to visually pick out significant artifacts. This starship is so large that it has an underwater dive-propulsion vehicle, or scooter, built into it. The scooter can move the apparatus around the cave under its own power at a slow and steady rate, dragging the operator behind it. With the duties divvied up, the divers rappelled into the darkness, ready to don their equipment and get started.

Dropping through the entrance was a little like being on a game show. With Katie and a second videographer, Canadian Morey San, pointing cameras at my face, it was a little like making my final descent. Quickly all of that disappeared as I dropped below the edge of the shaft and noticed hand-carved footsteps cut into its walls. Not really understanding why one might have climbed down with an 18-meter pit below, I continued past the Africanized killer-bee hive, careful not to tap the walls or make a lot of noise, because they will follow you down to the water, stinging you the entire way down. A few feet later the walls drop away, and my bright dive light revealed a huge bell. The entire ceiling curves away and is covered with massive stalactites—some stretching the full 14 meters to the water, the whole ceiling covered with them. In between the stalactites a group of bats flitted about, upset by our passing and bright lights. As I continued my slow rappel, amazed by the sights, Evan turned on the lights attached to the starship, four extremely bright lights, one at each corner, and the whole cave suddenly lit up. Now I, 9 meters above him, could see the deep, sapphire-blue water contrasting with the stark white walls of the cave and the rust-colored stalactites and cave bacon descending down into the water. I could just barely see the top of the debris cone, nearly 30 meters deep below him. I was finally hooked—excited to start our dive and see the rest of the cave.

The next twenty minutes were frantic, with everyone crowded around the boat, taking off climbing gear, adding diving gear, checking rebreathers, and noisily testing regulators, but with very little talking, as everyone receded into their pre-dive rituals. When Chrissy and I finally gave each other the OK hand signal, we began to descend into the crystal-clear water, our rebreathers silently cycling our breathing gas, the only noise the tiny hiss of oxygen being added by the machines. I brought out the first of our reels of dive line and led the way down to the top of the debris cone. From the top of this mountain of blocks, sticks, and

Jason Richards adds data to the survey book while Christina Richards prepares to run the tape to the next station. *Tamara Thomsen.*

other debris, I still could not see the floor of the cave. The cone sloped downward in every direction, but my dive light was not powerful enough to illuminate the 9-meter distance to the floor of the cave. We swam down the slope, placing the guideline as we went, to the soft, silted floor at 40 meters depth. My first indication that this was probably going to be a worthwhile dive was a large, handled pot, partially buried in the silt, with paint still visible on its sides. I tied off the line and continued outward towards the wall of the cave, a little disappointed that the cave was so shallow, but also a little relieved, as extra depth meant extra decompression, and my rebreather's scrubber was limited to four total hours, to be split between bottom time working in the cave and decompression time, at shallower depths, getting cold. I began to get into the exploration groove, as we were now in virgin cave; no diver had ever looked beyond the debris cone in this cave, and there was a very real possibility that there could be a side passage that might lead to adjacent chambers. Chrissy and I continued around the perimeter of the cave, perpetually in a slow left turn. As our first reel spooled to its end, we tied on the second reel and continued around, my hope for going passage dropping as the knotted line vanished from the metal frame. Soon, it became obvious that this would be a single-chamber cenote, as our virgin white guideline reappeared in the distance, stretching out of the darkness from the debris cone, which was just out of our range of visibility, to meet the outer wall of the cave. We closed the loop, and Chrissy brought out the 100-foot tape and I the survey book, and we began our second circuit of the cave, this time surveying the line we had just installed. Careful placement of the line and searching behind every rock against the wall for going passage had taken a long time, despite the loop being only 350 meters long, and our first circumnavigation



had taken nearly sixty minutes. As we watched our computers, I was already showing a decompression obligation starting at 15 meters, with 41 minutes of decompression in all. Doing the quick math in my head told me that we had to make the surveying loop in under an hour if I was to finish the dive before my rebreather scrubber quit absorbing poisonous carbon dioxide. We got a rhythm going, with Chrissy swimming out to the next station, sometimes 18 meters distant, while I marked the distance, depth, and azimuth on my waterproof paper. Soon enough, we were back at the line leading to the debris cone. Surveying had taken another hour, but our decompression obligation had accumulated more slowly. We had only increased to an 18-meter first stop and 102 minutes of total decompression.

During our first loop, there had been plenty of lights and other people in the water. Occasionally Keith had swum over with his video camera to film us surveying, nearly blinding us with his extremely bright video lights and giving the impression that an underwater bus was about to run over us. But as time went on, more and more people ascended to the surface and their lights winked out; the constant bubble of their regulators in the distance became quiet. The cave became noticeably darker and more foreboding. By the time we were ready to start decompression, the cave was

feeling quite lonely. The debris cone was ensconced in the blackness of depth and distance, and Chrissy and I stayed close to the guideline as we moved our way back across the large room. As we approached the debris cone, we noticed a colorful pattern of pink flagging streamers dotting its rocky sloped sides. Each streamer, a foot-long piece of flagging tape, was attached to the markers the Memos and Ethan had left at significant artifacts to be added to the map. There were so many that the task of adding them to the map seemed increasingly daunting as we ascended up the side of the slope, counting the number of streamers in sight. We quickly reached the top of the cone at 30 meters depth and began slowly sliding up the line to our first decompression stops, pausing every 3 meters until we reached 6 meters of depth. Here the cave became significantly narrower, and we saw Tami finishing her decompression, swimming around a shelf that ran almost completely around the cave. As Chrissy and I had nearly an hour of decompression left at this point and not much else to do, we wandered around the shelf and quickly noticed that the streamers marking artifacts were as prolific, if not more so, than those on the debris pile. They were marking small artifacts I could not decipher, longer bones which looked vaguely human, and, most ominously, small stalagmites above a group of skulls staring out from the ledge into the pit into which

they had been deposited. I quickly decided that we would need to install a perimeter line here as well if we were to accurately depict the locations of artifacts and remains on the shelf. I ran the line and Chrissy and I surveyed it, she being happy to have a reason to swim around, as the combination of a thin wetsuit and helium in her breathing mix was making her extremely cold. Soon enough we completed the survey, and three hours and thirty minutes after dropping into the azure water we were at the surface. Looking at Ethan sitting in the boat, waiting to haul our dive gear out of the water, I tried not to think of the empty eye sockets staring at us from below.

On the surface, the excitement was palpable. Tami, Ethan, and the Memos had found a significant number of very important artifacts, items that would later indicate to Memo de Anda that this cave had once been the site of sacrificial offerings. Many items had been thrown into this portal to the underworld or purposefully placed on its ledges before rulers or religious practices on the surface had changed. Chrissy and I completed the initial survey of the cave to the surface and talked with Memo about how we would go about adding his many artifacts to the survey on the next dive, in addition to making the scaled sketches in the cave that would produce a map, once we got back to the states, accurate enough to navigate by and use for archaeological reference grids to

A knife blade found on the ledge near a human femur. *Tamara Thomsen.*



be emplaced later. Keith, Evan, and Katie reviewed small pieces of video and broke down their equipment, making their plans on how to best video the next day of diving. With the gear packed up, a tentative plan established for the next day, and our goodbyes said to the hard-working locals, we headed back into Pisté for the quintessential Mexican dinner, pizza.

The sun set on the evening's festivities: pumping tanks, repacking rebreather scrubbers, putting all of the various batteries on charge, plotting survey data for sketches to be completed the next day, and reviewing hours of video. The work stretched on into the night, until finally everyone snored fitfully in their hammocks, watched over by the scorpions on the floor and the eyes of Maya gods, leering at us from their carved positions on the artifacts around us.

The next morning would be cold as well. As everyone wandered back from their individual visits to the corner OXXO, the Mexican equivalent of 7-11, for breakfast, it was obvious that motivation was not as high as the day before. The cold, combined with the nutritionally lacking quick-mart food, lack of sleep, and the anticipation of another cold four-hour dive made everyone cranky and irritable. Being three weeks into the expedition, we knew that silence was the best prevention for irritable flare ups,

and everyone worked quietly packing gear into the vehicles and readying for the day. As the sun came up and the temperature rose, the mood elevated with it, and by the time we arrived at the cenote, everyone was ready to start work for the day. The locals met us with a wave, ready to see what new idiocy the gringos had in store for them. We quickly maneuvered the mountain of equipment to the boat, and once again Chrissy and I descended below the surface. Our first task was to swim the circumference of the room, this time at an

altitude of 6 meters above the floor, so that I could sketch the rocks and floor details between the survey stations while Chrissy swam back and forth lighting up significant details. Every time we passed a flagged artifact, we surveyed from a station to the artifact and added it to the data. Once we completed the outer perimeter, we started at the debris pile. The field of flags was so thick that it became obvious that the only way to get all of them on the survey would be to add a new line around the base of the debris pile and survey up to each one from stations on it. Chrissy and I laid the line and began adding the artifacts, watchful of the decompression building up on our dive computers. We could see the others disappearing one by one as they completed their tasks and left the cave, their lights disappearing from the water. Eventually, it was just Chrissy and I once again, and we had managed to spend over two hours sketching the cave and surveying the many fantastic artifacts, including completely intact bowls with intricately painted patterns still visible on them. Once again, we started our decompression, and when we reached the 6-meter ledge we again found Tami there, completing her decompression. As we swam around the smaller perimeter, Tami pointed out artifacts lying on the ledge: jade ceremonial knife blades, jade ocular rings from ceremonial masks, jade beads, and the remains of several humans whose skulls and bones indicated a combination of purposeful burials and human sacrifices. We added all of these to the map, and with all of our data collected, Chrissy and I swam to the boat for the last time.

Professor Guillermo de Anda studied and analyzed the maps, pictures, and video from this expedition to form his conclusions and reinforce his theory that the Maya culture made use of caves for sacrifices and offerings to Maya gods. The work completed during our expedition would set the stage for further dives by Professor de Anda and his underwater-archaeology students, studying the underwater collection of artifacts and adding to

the understanding of the Maya civilization and the rich cultural history of the people of Mexico.

My teammates and I would like to extend our thanks to the organizations involved and to our sponsors, first and foremost the Proyecto del Culto al Cenote at the Universidad Autonoma de Yucatán in Mérida, of

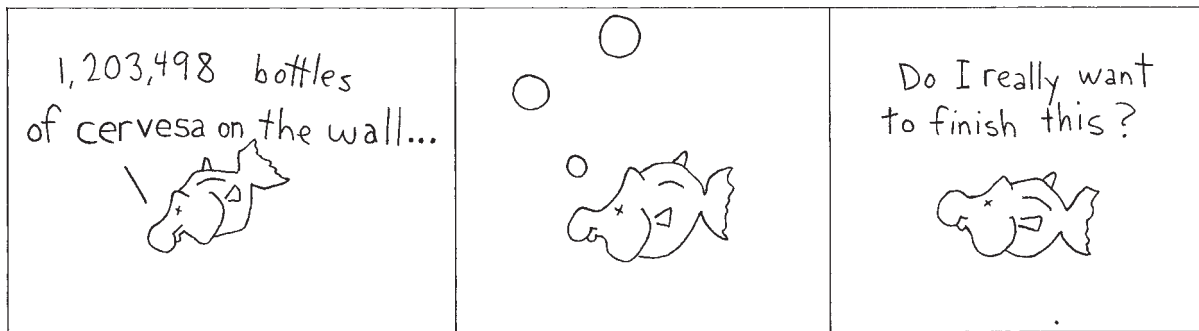
which Professor Guillermo de Anda is director, and also the Instituto Nacional de Antropología e Historia, which granted access to protected potential archaeological sites, the Woods Hole Oceanographic Institution for providing the extremely talented Evan Kovacs and his amazing video camera equipment to document and help with the project, the

Wisconsin Historical Society for supporting Tamara Thomsen and Keith Meverden while traveling away from the Great Lakes shipwrecks that form their charter, the National Speleological Society for providing a financial grant to support international exploration, and ESRI Inc. for providing complimentary use of their ArcGIS software.

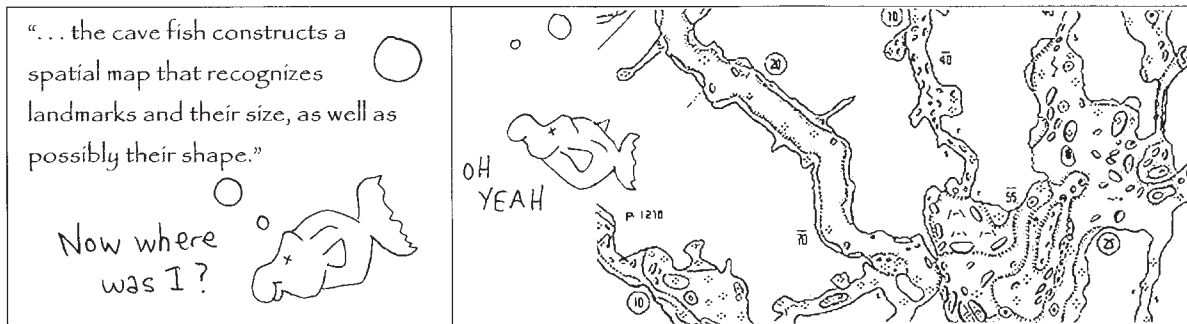
Arqueología submarina en un cenote cerca de Chichén Itzá

Después de pasar dos semanas en Quintana Roo, buzos visitaron el poblado de Pisté, Yucatán, para realizar la evaluación inicial del potencial arqueológico del Cenote Holtun, con el fin de ayudar al Proyecto del Culto al Cenote de Guillermo de Anda, de la Universidad Autónoma de Yucatán en Mérida. Después de un descenso de 20 metros hasta el nivel del agua, se requirió descender casi otros 40 metros por debajo de la superficie para llegar al fondo del cenote. Se ubicaron y documentaron varios huesos y objetos de cerámica para su estudio posterior.

STEVE KARP



ajk 2012



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QUINTANA ROO CAVING

18–30 NOVEMBER 2011

Ray Keeler

Our project area is 70 kilometers south of Cancún, on both sides of and underneath the coastal highway just south of Playa del Carmen. [See *AMCS Activities Newsletter 34*, pages 91–97.] During eleven days, we surveyed over 9 kilometers and connected some smaller caves into the larger ones. Exploration concentrated on Sistema Sac Mul, into which Fuera de Lugar was joined. Cueva Abejas and Cueva Picadura de Hormiga were connected into the Fuera de Lugar part, and Cueva de Elvis was connected directly to Sac Mul. Significant work was done in Sistema Kana Kiwi, Sistema Dos Árboles, and Cueva Última Vista. See the table for a complete list. [Sac Mul is the spelling given by the original discoverers. Muul appears to be the more popular spelling of the Mayan word.]

The primary participants were Peter Sprouse, Charley Savvas, Saj and Matt Zappitello, and Ryan Reid from Austin, Katie Graham and Colin Massey from Calgary, Ray Keeler from Phoenix, Gil Harmon from Paamul, and Liliana Viola from Puerto Aventuras. Others who helped out were Gavin Elsley, Gustavo Vela, Roberto “Chibebo” Rojo, Aida Ferreira, Dario Ferreira, Linda Matthews, Fátima Tec Pool, Elsi Lara, Raúl Manzanilla, Pia McManus, and a few folks from the Río Secreto staff.

I met up with the Austin cavers in the Dallas airport. We hopped on the plane to Cancún and then hopped back off so another security

rckeeler@cox.net

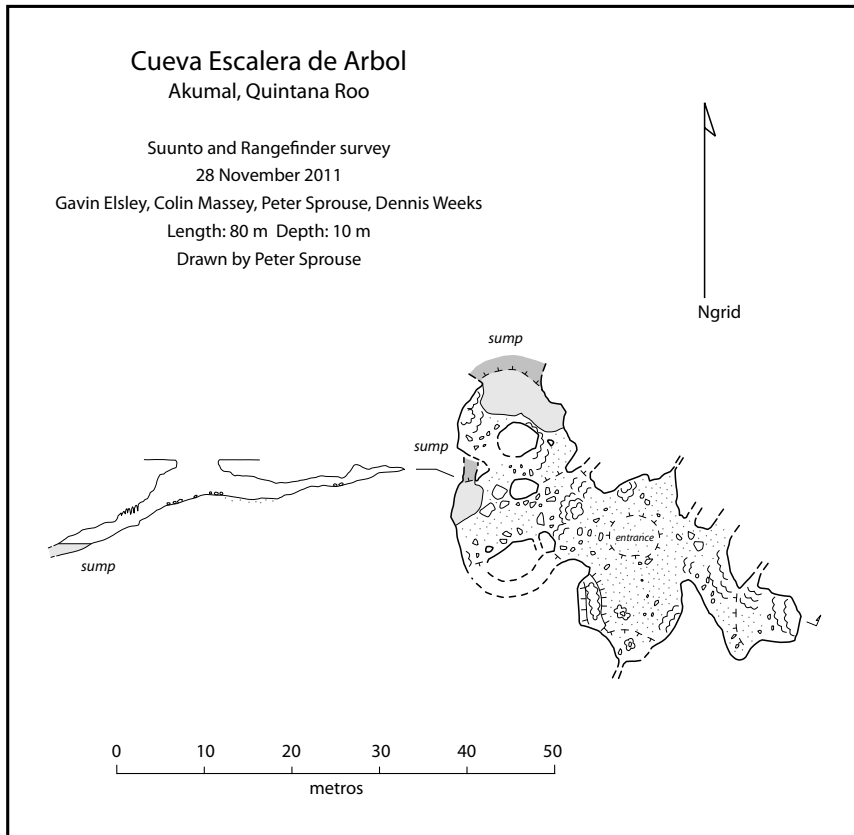
check could be made because a passenger found a wallet that had been left on the plane. While we were waiting to reboard, a text came in saying the Calgary cavers were stuck for a while for engine repairs. A caving trip was on. Everyone made it to Cancún that evening, and made the 105-kilometer drive south to the Centro Ecológico Akumal and checked into two of the dorm rooms. CEA is a non-profit facility for sea turtles. The sea turtle sanctuary is very nice, and researchers, volunteers, and ecotourists visit.

On November 19 we met up with Gil Harmon, an Idaho snowbird who has been living in the Paamul community with his wife Pat in the winters for the last twenty-eight years. Gil has been “ridge walking” and finding caves in the jungle south of Playa del Carmen for the last twenty years, and he founded the Paamul Grotto of the NSS in 1999. We also were joined by Liliana Viola, a local caver whose husband Alan is a cave diver. We got a late start, splitting into four teams in Sistema Sac Mul, Sistema Fuera de Lugar, and Cueva Abejas, mapping 427 meters in a short day. The route for two of the teams (Matt and Saj, and Ray, Charley, and Gil) going to Fuera de Lugar involved going up the Shimmy Tree out of the west entrance of Abejas that is overhung on all sides. Then there was an overland trek for 80 meters to the eastern entrance to Fuera de Lugar, a cave whose large eastern half had not yet been surveyed. The two teams in Lugar went through the cave to find the last station of a survey that had come in from the west side in

March 2011. We started surveying back toward our entrance, then rendezvoused with the others and made it out of the jungle just after dark. Dinner was at a nice restaurant in Puerto Aventuras, and then we returned to CEA to enter data.

The next day saw more survey in the same caves by the same teams. The Fuera de Lugar teams continued closing the gap toward the Shimmy Tree, surveying the side passages along the way. This was not a trivial effort. Both teams kept finding side passages that went. Saj and Matt found another entrance after Matt made it through a squeeze that took his pants off, so the entrance was named *Entrada Sin Pantalones*. Gil, Charley, and Ray ended up with 290 meters for the day. Peter and team were able to find a connection between Sistema Sac Mul and Cueva Abejas. The other teams were out mapping, but I don’t know where. We had dinner with divers Alan Formstone and Dennis Weeks at Leo’s Pizza in Chemuyil, a favorite of the cave divers, and then returned to the dorms for entering data. Some went night snorkeling with dive lights and saw turtles and rays.

On the twenty-first there was more survey in the same caves, with almost the same teams. Peter and Katie went to survey in the Sac Mul column maze. This is a series of large rooms and passages that have “walls” of large columns. Several of the rooms are more than 40 meters across, with sandy and calcite floors and warm walking. Sac Mul grew to 4765 confusing meters. Ryan and Matt pushed west from the Shimmy Tree entrance from Sac Mul and



three leads left going on the other side. My team got 203 meters. Saj and Colin finished the survey to Maya Steps Lake, and we headed out with them.

Peter and Liliana completed three short digs and connected Cueva Picadura de Hormiga into Fuera de Lugar, making it just over 4 kilometers. Gil, Ryan, and Linda mapped in Sistema Pulpo (Octopus Cave) in the morning and in the afternoon went into Not Duke's Cave, which turned out to be yet another entrance to Sac Mul. Linda wandered off by herself, and it took quite awhile to relocate her.

Katie continued the survey in the Sac Mul column maze—four days there and three teams had made full 360-degree circles back to where they started by mistake. Great fun.

Matt had a foothold come out and fell 2 meters. He was okay but had a good-size bar code on his side. Ryan had a rash starting on his side. The *cheché*n tree was suspected. After dinner, Charley went to a local dentist, who repaired his tooth for \$60. The rest of the team went to a nearby watering hole to wait. Then back to the dorm to log data. The teams had mapped over 4 kilometers so far.

On our fifth caving day, Gustavo Vela and Roberto "Chibebo" Rojo came in from Mexico City. Gustavo has been surveying Río Secreto, which is now over 14 kilometers long and the longest dry cave in the state of Quintana Roo.

Colin had led an expedition six

spent the day pushing every crawlway and squeeze they could, trying to connect to Fuera de Lugar. Saj and Colin started at the eastern Fuera de Lugar entrance our teams were using and pushed the survey east to seek a connection with Sac Mul and then went west to try and tie in with Gil, Charley, and me, who were still surveying toward the Shimmy Tree, but the side passages kept going, and we did not connect. Our team picked up 411 meters including the White Floor Room and the Pearl Necklace Corridor. The passages were beautiful.

At dinner, Charley broke a tooth. Back at CEA we entered data and discovered that Saj's survey in Lugar and Ryan's survey in Sac Mul were only 5 meters apart. An enthusiastic discussion followed about how to connect. Beer was involved. Sistema Fuera de Lugar was now over 2600 meters long.

On November 22, Gil, Liliana, and Linda, a Río Secreto tour guide, joined the eight non-locals. A lot happened that day.

Fuera de Lugar had two teams to try to complete the survey. Saj found Maya steps that led down to a permanent lake near an entrance. Charley found another lake beyond a crawlway. It had calcite ice over 75 percent of the surface, a six-inch surface fish swimming in it, and



Liliana Viola in Cueva Picadura de Hormiga, now part of Sistema Sac Mul. Peter Sprouse.



Ryan Reid's rash medicated with *chaká* and beer. Peter Sprouse.

years earlier to map Sac Mul, but the survey needed additional work. They had been moving fast and had generated around 3 kilometers on the trip. Peter put four teams into Sac Mul to add floor detail and passages that had been missed or not completed. Peter started a resurvey of the southern, main entrance. Katie and Gustavo were tag-team surveying with Charley and me. My team added 250 meters. We found a large,

black scorpion on the way out.

Matt and Saj had a beach day and rested.

Ryan's *chechén* rash went to a full bloom. After leaving the cave we stopped by the house of Cleofas, who owns the land over Río Secreto. Cleofas went out to get an antidote plant, *chaká*, cut several leaves off and mixed them up in a blender. Ryan smeared the goop all over his side and arms. A couple of hours later the rash looked and felt much better. But he should have washed the oils off first, and then kept applying the mash. The rash was back the next day.

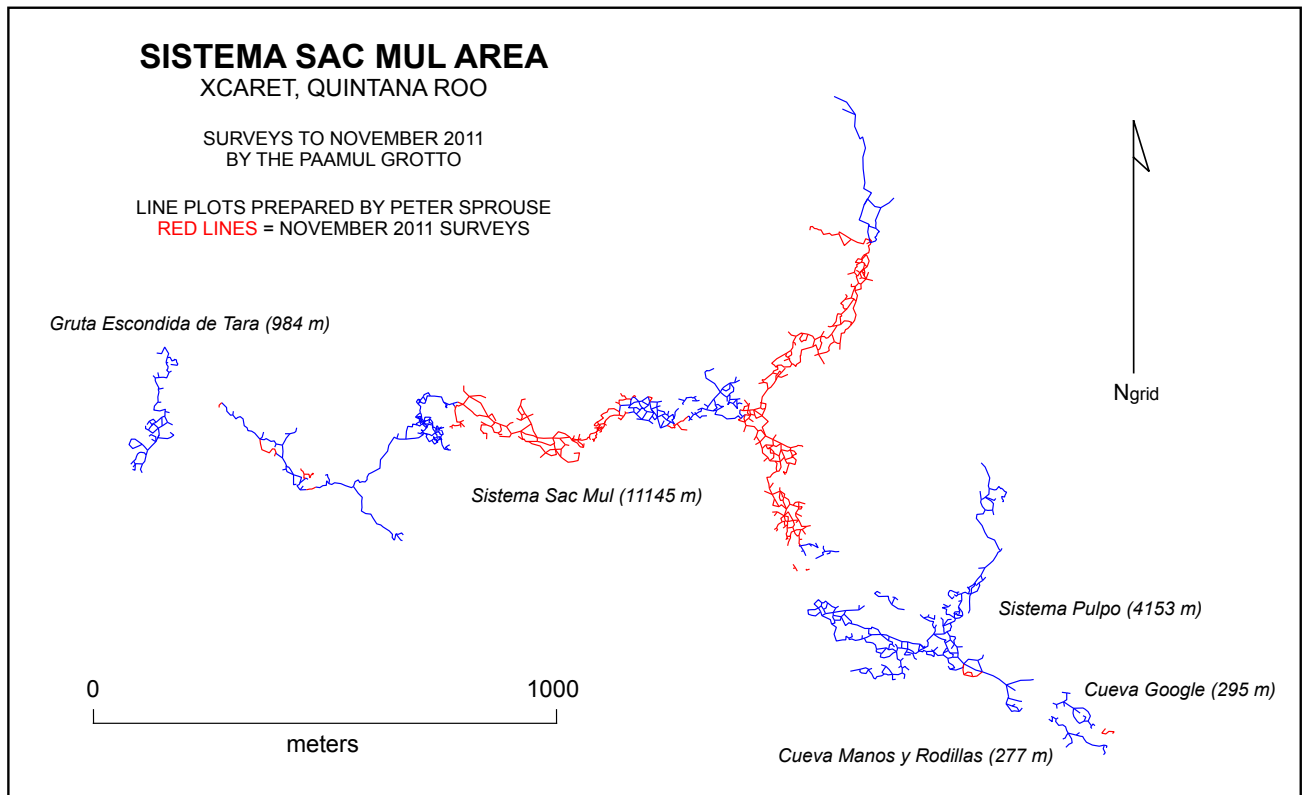
The next day was Thanksgiving, and Ryan and Colin decided to take the day off and go snorkeling (and drinking). We had three teams in Sac Mul. Gustavo and his friend Chibebo were on my team. Chibebo received his master's degree in arachnology, studying tarantulas. We picked up 252 meters. There were also two associated with Río Secreto along with us, Aida Ferreira and her brother Dario. Both were very helpful. Katie's team went through a flowstone crawlway and ended up in a large, stal-infested room. They spent the rest of the day working their way

through it, but did not finish it.

Peter went to the ATV park with Charley and Gil to map at the north end of Sistema Dos Árboles. They started where the survey had previously ended at an entrance. They crossed a jungle-filled collapse and got back into water passage. This crossed under the highway (again) and continued, but Gil had to leave for Thanksgiving dinner. Saj and Liliana were also in Dos Árboles, mapping to the southeast in a series of large rooms that had been left by Barbara Luke on the March expedition. There were no real walls, just areas that were separated by large columns.

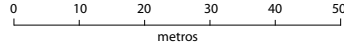
We all had Thanksgiving dinner at Simon and Donna Richards's home in Puerto Aventuras. They are friends of Liliana. Simon is heavily into the Quintana Roo cave-diving scene and was crunching data with the Compass program when we arrived. It was a wonderful dinner; Donna did an awesome job.

On the twenty-fifth Gavin Elsley arrived from Calgary to join the crew, ending up on a Sac Mul team. Divers Alex Alvarez and Danny Riordan were going to try to connect Río Secreto and Sistema Río Escondido



Sistema Kana Kiwi
Xcaret, Quintana Roo

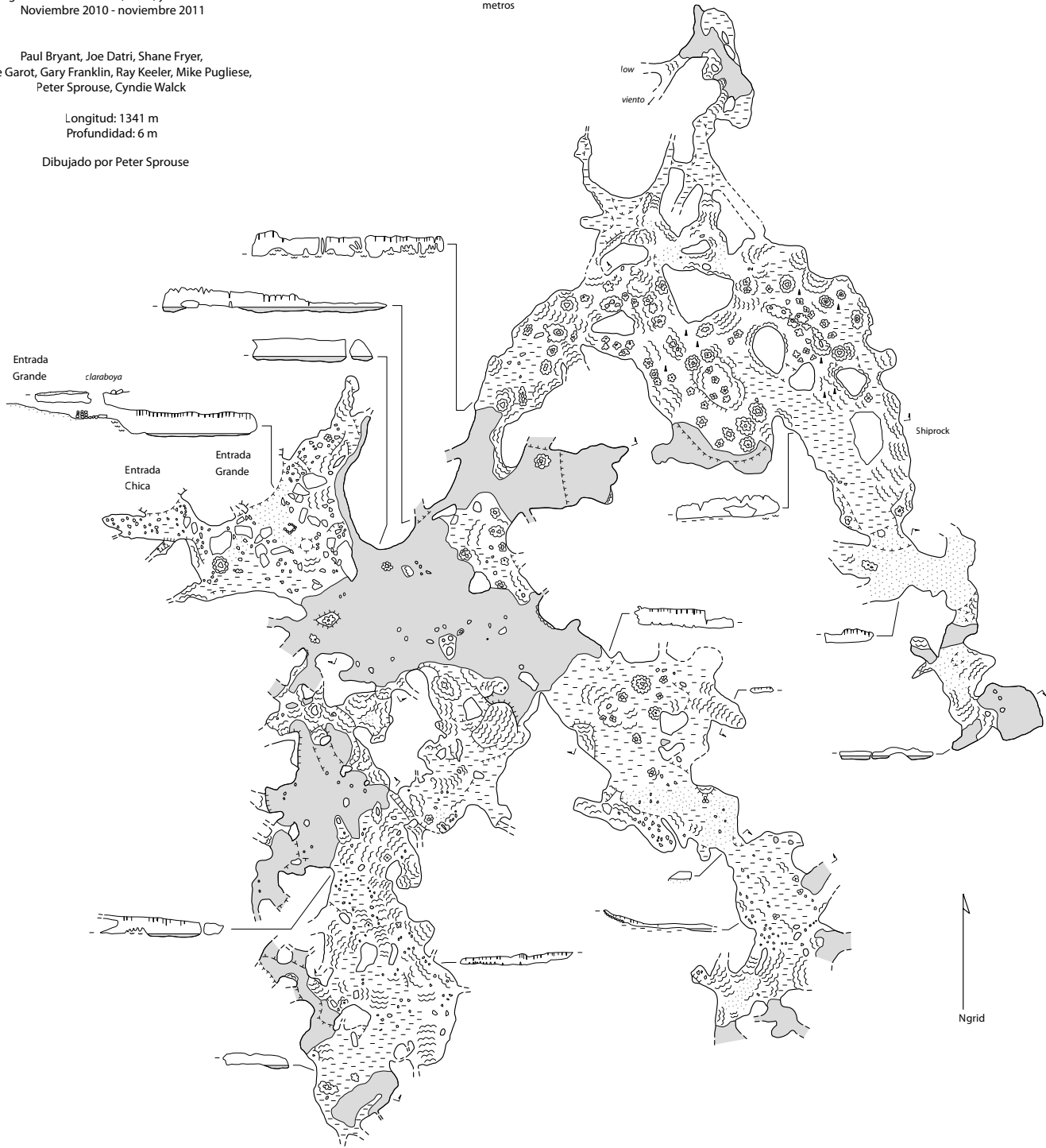
Topografiado con Suuntos, cinta, y medidor láser
Noviembre 2010 - noviembre 2011



Paul Bryant, Joe Datri, Shane Fryer,
Tone Garot, Gary Franklin, Ray Keeler, Mike Pugliese,
Peter Sprouse, Cyndie Walck

Longitud: 1341 m
Profundidad: 6 m

Dibujado por Peter Sprouse



(Cueva Dino), and they needed sherpas to haul gear. Gustavo, Aida, Chibebo, and Colin were drafted. It was a 2-kilometer trek. Colin's load on the way back was 110 pounds. The divers succeeded in mapping 374 meters in a 2.5-hour dive and reached air-filled passage, but they did not proceed into the dry passage due to the heavy gear they were carrying. They left their last station about a meter below the water line.

Katie's team went back to finish the room in Sac Mul. Peter and I went to the ATV park to map in Sistema Kana Kiwi. Over half of our 243 meters was in low water crawls. Saj and Charley went back to Dos Árboles and spent the day surveying and trying to find a real wall. They were unsuccessful, but will try again.

The nightly data entry was a marathon session to catch up. We started while waiting for dinner, and it lasted until after 10:30 p.m. Sac Mul was now 6.3 kilometers long, and Kana Kiwi was 1.3 kilometers, with few leads remaining.

On November 26, Colin, Gavin, Ryan, and Matt went on a digging trip to try to connect Fuera de Lugar to Sac Mul; two went in from each side. They pounded rocks, heard each other, and then spent two hours searching for where the other side's sound was coming from. Just before lunch they made voice contact, followed by digging to lower the floor. Finally Ryan was able to stretch his hand out enough that the other team saw it, and immediately it became

a survey station. Total survey for the four cavers for the day was 8 meters. Fuera de Lugar added about 4 kilometers to Sac Mul.

Katie, Liliana, and a Playa del Carmen caver, Raúl Manzanilla, went with Gil and me to form two teams to continue the Sac Mul survey. My team added 207 meters. Some repeated survey needed to be subtracted, but even with the redundant survey removal, we will still had a length of over 11 kilometers, in fact 11,145 meters. Elsi Lara from Mérida, Saj, and Charley continued the Dos Árboles survey and found some walls, finally. Peter was also in Dos Árboles with two other cavers from the Ajau caving group in Mérida, Fátima Tec Pool and Pia McManus. They left a lead in chest-deep water that was headed southwest and had blind fish in it.

November 27 started out as a giant mob scene. Everybody, like everybody, met at the Río Secreto. We started with a five-vehicle caravan of twenty cavers, with another group heading over to Sistema Río Escondido, also known as Cueva Dino. Tanya, the Río Secreto operations manager, was taking the caravan to a large cave farther down one of the jungle roads. From there, someone was to take them to other caves. Matt, Joan Burgos, Olivia Resendiz, and I were sink checking. At the first sink, we were looking under overhangs when Matt suddenly started yelling "bees!" and running back down the cut trail. No one was stung, but it

was exciting. The second sink was blind.

I had heard Gil say that a cave called Última Vista was about 100 meters north of the road, so we went looking. We found a small entrance that did not resemble the description of the Última Vista entrance, but after an easy crawl in, we were in a walking-size room with a couple of nice crawling leads. After one short crawl we were in a walking and crouching maze passage. Beyond 204 meters of large, dry, level passage we found the Última Vista entrance and had to leave to meet everyone else. We left walking leads in going in two directions, a fine day indeed.

It looks like the cave that Tanya took the larger group to, Cueva Caraveo, will be substantial. Gil and Raúl did at least a 300-meter recon, and it was still going. Saj and her team mapped about 80 meters. This cave is 8.7 kilometers from the coast, farther than any we had done.

Meanwhile Peter, Aida, Ryan, Chibebo, Gustavo, and Gabriela Medrano went to Sistema Río Escondido and did some surveying at the southeast end of the cave around the Shangri-la and Shamán entrances. They also tried to find the final station of the 374-meter dive from Río Secreto, but it was nowhere to be found. Further examination of the survey data showed that instead of connecting to Dino the divers' survey just went sub-parallel to other passage in Río Secreto. While swimming around in the clear water, Peter found an old machete in a rotting leather sheath. Some days later I passed this on to Gil, who immediately recognized it as a favorite of his friend Duke's. Gil was thrilled and swore to clean the machete up and give it back to Duke. The story of how the machete got lost was pretty harrowing, and both Gil and Duke were really tired when they came in. Gil had lost a Brunton compass on the same trip.

The day had been a great one for everyone, and a moving party started. Beer at the cars was followed by margaritas at dinner, then tequila, and back to beer. There was



Rat Keeler in the entrance lake, Sistema Kana Kiwi. Peter Sprouse.



The Shangri-La entrance to Sistema Río Escondido. *Ryan Reid.*

leg wrestling, and then several tried to see if they could lick their own nipples. Two were successful, and one passed out at the table.

Some cavers missed breakfast the next morning due to hangovers. Some went to visit the Maya pyramids at Cobá. On the way, they were pulled over by the police for speeding (10 kilometers over) and

an illegal pass. They could pay the ticket for 500 pesos to the officer, or it would be 1000 pesos at the police station. Hmm. They bargained the “fine” down to 200 pesos.

Peter, Colin, and Gavin met up with diver Dennis Weeks, also from Calgary, to look at a cave system he wanted to show them. This turned out to be the Tatich system previously mapped by French cavers led by Christian Thomas, as well as by Aaron Addison’s group. Looking for something to survey, Peter took them to an entrance near Akumal that he had been shown a year before. Cueva Escalera de Árbol has an overhung collapse

entrance requiring a climb down a tree. It has 80 meters of passage leading to a sump.

Charley, Gil, Dario, and I went to Cueva Última Vista to continue the survey. It turned out that the two walking leads were actually the same passage, seen by two people coming from opposite directions. Crud! The team finished mapping Last Look

with another 186 meters. There were pot shards and a nice metate and a sculpted rock nearby.

The Cobá group got back, and Ryan climbed a palm tree to get a few coconuts. Those with juice were opened on one end and enough coconut juice was drunk to allow room for rum. Then there was much drinking while standing in the ocean. Ryan displayed a growing two-inch red circle behind his shoulder and thought it was a spider bite. Katie drew a smiley face on the round, red circle with a marker. The consensus was that we should just wrap Ryan in Saran Wrap before each trip.

On the last caving day, Ray stayed out, went snorkeling, and played tourist around the Centro Ecológico Akumal. The other seven plus Gustavo, Linda, Dario, and Liliana made up two teams into Sac Mul and two teams into Dos Árboles. The Sac Mul survey was approaching a fairly nice long swimming passage, and the cave continues a long way from the other side. The interesting story that came out for the trip was about repeated encounters with a very large tarantula-hawk wasp. There are tarantulas in this part of the cave, and the wasp’s black body was more than 10 centimeters long,

	November 2011 survey (m)	Total Length (m)	Depth (m)	Number of Entrances
SISTEMA SAC MUL* (or MUUL)	5300	11145	21	31
SISTEMA PULPO	97	4153	15	14
SISTEMA RÍO ESCONDIDO (CUEVA DINO)	1027	3712	12	11
SISTEMA DOS ÁRBOLES	1866	3027	8	16
SISTEMA KANA KIWI	245	1341	6	2
GRUTA ESCONDIDA DE TARA	40	984	12	5
CUEVA ÚLTIMA VISTA	391	391	3	2
CUEVA CARAVEO	136	136	12	2
CUEVA ESCALERA DE ÁRBOL	80	80	10	1
CUEVA AVISPA	48	48	4	2
CUEVA FANTA	24	24	3	1
CUEVA METOPIUM	14	14	6	1
CUEVA VIOLINISTA	<u>11</u>	11	3	1
expedition total		9279		

* Now includes Cueva de Elvis, Sistema Fuera de Lugar, Cueva Abejas, and Cueva Picadura de Hormiga.

with big red wings. They could hear it as it flew by, and it kept aiming for the cavers' lights. The survey will continue in this area at a later date. In Dos Árboles, Charley came out of a new entrance right next to the main highway, and he hung flagging on a tree. When we were leaving the next day, we saw the flagging as we were headed toward the airport.

On our last day, we had breakfast at a resort on the beach. Some went snorkeling. The plane was a bit late, so our connections in Dallas were interesting, with customs and all.

All-in-all, everyone had a fine time indeed. There is a lot of cave still to map, and the area is much safer than along the U.S.-Mexico border to the north. Paul, the director of the CEA,

says there are plans for creating a community of some 200,000 people just west of Akumal. This would include a thirty-six-hole golf course and support the rapidly growing tourist industry. Our goal is to find and map as many caves as possible to get them to change their plans. How many caves can we map in how short a time period?

Espeleología en Quintana Roo: 18-30 de noviembre de 2011

Continuando con el proyecto en las cuevas no inundadas en los alrededores de la autopista al sur de Playa del Carmen, espeleólogos exploraron más de 9 kilómetros de cuevas laberínticas. Varias cuevas, incluyendo Fuera de Lugar, fueron conectadas al Sistema Sac Mul, con lo que el sistema sobrepasó los 11 kilómetros de longitud.

CITY FOUND IN HUGE CAVERN

Petrified Bodies Strewn about Marble Floors of Mile-Deep Prehistoric Mexican Town

MEXICO CITY, August 13. (Exclusive)—Details of the discovery near Juxtlahuaca, in the State of Guerrero, of an ancient buried city built on the floor of a tremendous cavern are published today in *El Universal*. The cavern, as so far explored, consists of fifteen distinct major underground openings in which whole communities could take refuge. The caverns were recently discovered by Isauro Silva, a farmer in the district, who conducted a party led by Senator Miguel F. Ortega.

Senator Ortega has just returned to Mexico City from the buried city with photographs of superb examples of stalactite and stalagmite structures.

His vivid description of the caverns has aroused the greatest interest in scientific circles here. The caverns are described as rivaling in beauty and extent those at Cacahuamilpa in the State of Morelos [sic].

A half-dozen persons accompanied Senator Ortega to the caves.

They remained there for more than a week, according to *El Universal*, exploring and attempting to measure their extent.

The fifteen chambers are described as having solid white marble flooring as smooth as the surface of a mirror. Petrified remains of human beings were found strewn about.

Other objects found in the caves were utensils, bead collars, crude axes and knives made of stone, earthen jars, fragments of plates and all manner of implements used in ancient times.

The largest of the caves was found by the explorers about a mile underground. The floor of this cave was also covered with white marble. In this cave the explorers, aided by electric torches, discovered the remains of an entire family overtaken by death while eating.

In the pyramid-shaped fireplace, which apparently had been used for cooking, the explorers found utensils and bits of petrified wood.

"All but the actual food and life of this group, buried for unknown centuries in the black retreat in mid-earth, was exposed to our gaze," Senator Ortega said. "One of the jars discovered was unbroken and had a handle shaped like a curved lizard, beautifully designed. Twenty skulls were counted around this interrupted meal."

Senator Ortega said that all of the caves were literally covered with skulls, and near one group of skeletons were found the remains of a dog.

The impression he obtained, he said, was that the entire community had been overtaken by a sudden upheaval of nature.

The smoothness of the flooring in many of the caves led the party to believe that the caves had been traversed by streets.

—From a photocopy of a newspaper clipping sent to the AMCS in 1975. The actual date and place of publication are unknown.



EXPEDITION TZONTZECUICULI 2012

Gustavo Vela Turcott

“Exploring here is as hard as hell! If you don’t get skewered by a maguay spine, a rock moves or falls on top of you. The vegetation is so thick that you can’t see the entrances, and if that isn’t enough, if you don’t pay attention, you step on a rattlesnake. Just what’s so great about this exploration that we’re willing to suffer so much?” Such were some of the comments from expedition member Aitor Lotina. What could I say? Reconnaissance days are bound to be a little hard, but if we want to find a cave that goes we’ll have to cover a lot of territory.

For the fifth time we were in the Sierra Negra in the south of Puebla, to continue our project in the Tzontzecuiculi massif. Once again Franco Attolini, Al Warild, and I have invited our friends for a month of finding and exploring new caves.

In 2011 we left Olbastl Koltik at 565 meters deep where it slipped into a tight Z-shaped meander. [See *AMCS Activities Newsletter 34*, pages 81–86.] Even though there wasn’t much airflow, one of the party threw some rocks down the next pitch and estimated the drop was 10 to 15 meters. Knowing this, we made Koltik our second major objective. The first objective, as always, was to have a good time with a group of like-minded cavers. Our third objective was to continue prospecting on the plateaus, some close, some a long way, a very long way away.

As we planned to be four weeks on the mountain, we stopped in

turmalinero@yahoo.com
Translated by Al Warild.

Tehuacán to buy the necessary provisions for our fourteen-person team. Once we had everything, we drove up to Huizmaloc in two pickups and the biscuitmobile (biscuits was all the cargo it could carry). Once there, we rented eight mules to take part of the gear and food up to the campsite that we had used last year, up on the plateau at 2300 meters. Seven of us went with the gear to start building the camp, while the remaining four stayed below and got bored waiting for the next day’s eleven mules.

Once everybody arrived, the construction rate increased, and within two days it was done: roof, food, gear, hi-tech toys. The only thing we didn’t have was caves. Even though we had a –500-meter cave to look at, we organized several prospecting parties to widen our range of objectives. While some went west to around 2400 meters, others went to the central part of the plateau, where we found a few sótanos, but nothing over 40 meters. The days began to slip by, and the rerigging of Koltik began. Groups went down each day and returned the same evening. At the same time, groups walked and walked through scrub, maguays, and loose lapiaz to find caves between 10 and 50 meters deep, but nothing more.

At the beginning of the second week we had a bit of luck on the 2400-meter plateau, finding an area with several sótanos. The next

day there was no shortage of volunteers to descend them. The deepest was Sótano María Juana, 80 meters deep. The other three bottomed out at 70, 50, and 40 meters. Still no luck. Next day another group tried. One pair bottomed a 40-meter pit, while the others took a ramp and 20-meter pit that would surely connect with the first group’s pit. Surprisingly, it instead went down a series of small drops to a meander so full of rocky spikes that we had to call it Olbastl Tevitzle (Spike Cave).

Meanwhile Team Basque worked on widening Meandro Z at the bottom of Koltik, moving rocks here and hammering there. After a few days of hard work they managed to bottom the 15-meter drop, but they didn’t

Marta Candel in the MeandraSutra in Tevitzle.
Gustavo Vela.



The gear tent in the fog. Al Warild and Alejandra Lopez on a ridgewalking trip. *Gustavo Vela.*

have enough rope for the next one, where the cave bifurcated. On the next trip, more bad, bad luck: both routes closed off. Only 20 more meters for all that effort. No amount of looking was going to find a passage that wasn't there. Olbastl Koltik was dead at -587 meters deep.

All our hopes now hung on Tevitzle. A two-person team reached -130 meters after passing a particularly tight meander, not quite tight enough to actually be impossible or even filter out all but the smallest, but narrow enough to cause suffering and some interesting positions, hence MeandraSutra. By the third trip we were on our way down an 80-meter pitch, and the cave continued. By the end of the week we were tackling a 105-meter pitch. It ended in a large collapse. The bottoming group looked and looked, but found nothing. Just to make sure, we organized a team of five barbarians, who spent hours looking in every corner and under every rock. Still nothing. They began the derig.

Midway through the expedition three new people arrived, new blood for new caves, if only we could find new caves. Two of them started with a derig of Koltik, while



the other (the largest, of course) got to continue down from a window lead at -130 meters in Tevitzle. The window led to a meander that was equally uncomfortable as the first

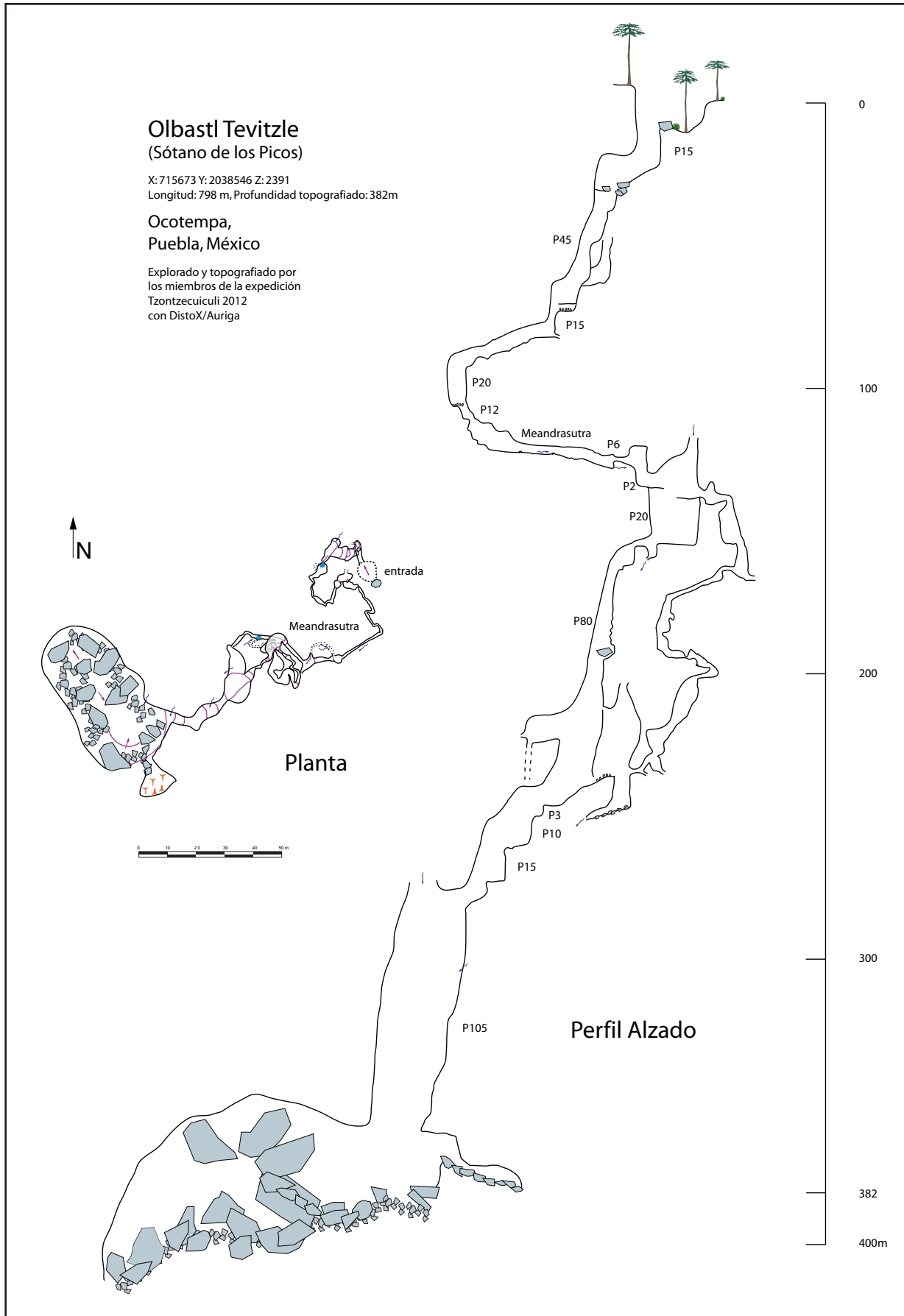
and eventually connected to known cave below. It took us neither farther nor deeper. Tevitzle too was dead.

At the beginning of week three all we had was dying caves, but rather than sit around, we expanded our prospecting range to plateaus at 2500, 2600, and 2700 meters. The results were many, many more maguey spikes, more scrub, more rocks that broke or rolled only after you put all your weight on them, countless bruises on the legs of all participants, scrapes and scratches from the briars and sharp branches, half a dozen rattlers, and, oh yes, a few 50-meter pits as well.

By the fourth week, the groups working at 2500 meters had made some good finds that were so far away they hadn't carried rope to check them. One was a 100-hundred shaft and the other a walk-in entrance that led straight to a nice pit. It took three trips to reach the



Marta Candel descending at -280 meters in Tevitzle. *Gustavo Vela.*

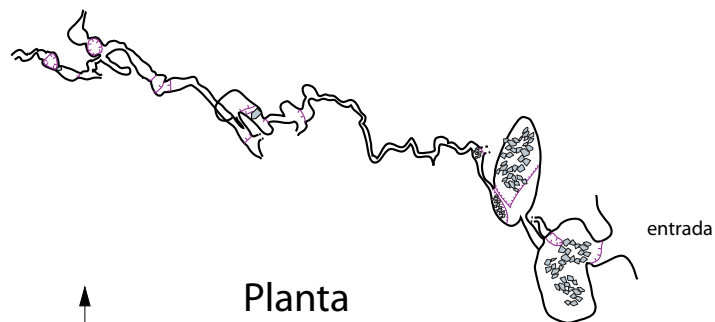
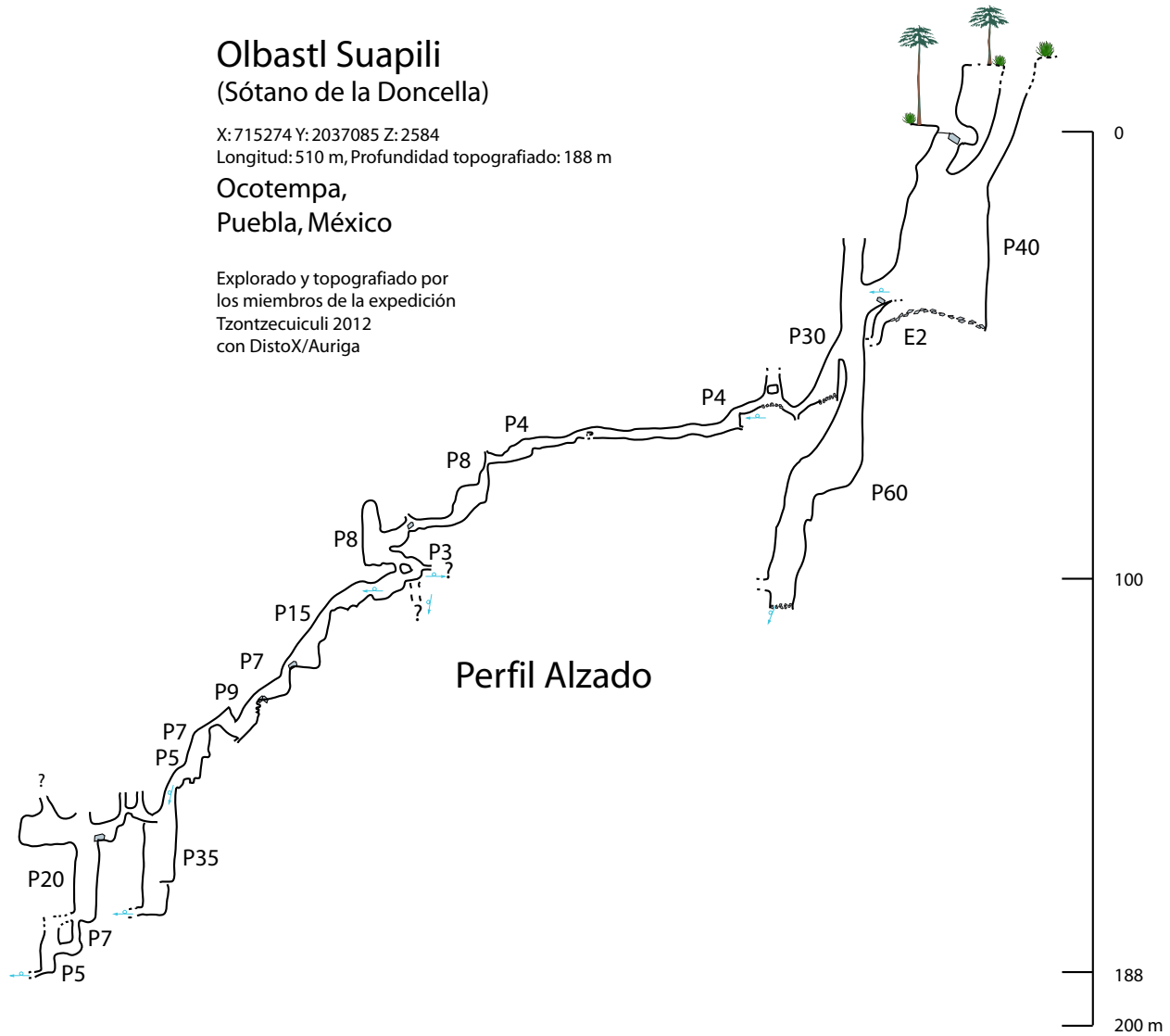


Olbastl Suapili (Sótano de la Doncella)

X: 715274 Y: 2037085 Z: 2584
Longitud: 510 m, Profundidad topografiado: 188 m

Ocotempa,
Puebla, México

Explorado y topografiado por
los miembros de la expedición
Tzontzeuciculi 2012
con DistoX/Auriga





Enrique "Zape" Orgando preparing a group meal in the dining tent. *Gustavo Vela.*

bottom of the 100-meter shaft. The first attempt started on the wrong side, where the loose rock was too dangerous. Try two tried the 'safe' side, where fewer rocks fell, but they ran short of rope. Day three hit bottom at -85 meters.

The other groups that hiked even farther had a little more luck. That is, if you call luck starting to walk by 8 a.m. (it is only just light at 7), walking two or three hours, watching the clock all the way through the cave in order to get out by 6:00 and cross the chaotic lapiaz covered with scratchy bushes and the ever-present magueys in time to make it back to the rudimentary track by nightfall for the remaining hours' walk back to camp. This far-off cave we called Olbastl Suapili (Damsel Cave). The entrance is indeed inviting, with an ample walk-in entrance straight onto a 40-meter pitch that was first bottomed on minimal gear. The damsel bottomed it to find a meander and another, bigger pitch that choked in a drafting rock blockage, but the climb up to a meander looked hopeful. It went nowhere, but a swing to a parallel shaft did, to tight meander cave with a very strong draft, some

Left to right, back to front: Gustavo Vela, Angeles Verde, Ramsés Miranda, Alfonso Calvo, Al Warild, Enrique Orgando, Roberto Legaspi, Franco Attolini, José Gambino, Aitor Lotina, David Tirado, Marta Candel, Javier García. Not shown: Alejandra López. *Gustavo Vela.*

'interesting' tight spots, and numerous small pitches and so dry that inhaling dust was a problem at times. Two push trips later the bottom was too tight, and the breeze goes somewhere else. We just have to find it, and we left the cave rigged for another look next year.

After four weeks on the slopes of Tzontzeuculi, fourteen of us had explored some sixty pits between 10 and 84 meters deep, as well as reaching -382 meters in Olbastl Tevitzle, reaching -188 in Olbastl Suapili, and extending Olbastl Koltik all of 20 meters to -587. Of the

five years we've been going to the area, this was by far the wettest, with days of rain and mist and some impressive storms to soak us on our way home through the scrub.

After all those days wrestling the vegetation, we started asking ourselves if there are any more deep caves high on this mountain. Were the two good caves (Altepetlacac

at -638 and Koltik at -587) the only two up there? Thinking of parallels, in the 1980s an Australian group spent two weeks on Zizintépetl, 20 kilometers to the southeast in the same range, and got nothing more than 80 meters deep. In 2004 cavers from Quebec also spent time high on Zizintépetl and only got as deep as 250 meters. Could it be that we've finished off all the deep caves and won't ever find anything else as good as Altepetlacac? Maybe we'll never know, but with hope and the knowledge that a lot of water flows out from under this mountain, we'll be back for another season in this land of loose karst and sharp bushes to see if Tzontze does have one more deep cave in it.

Participants: Franco Attolini (MEX), Alfonso Calvo (SP), Marta Candel (SP), José Gambino (SP), Javier García (SP), Roberto Legaspi (MEX), Aitor Loitna (SP), Alejandra López (MEX), Ramsés Miranda (MEX), Enrique Ogando (SP), David Tirado (MEX), Ángeles Verde (MEX), Gustavo Vela (MEX), Al Warild (AUS).

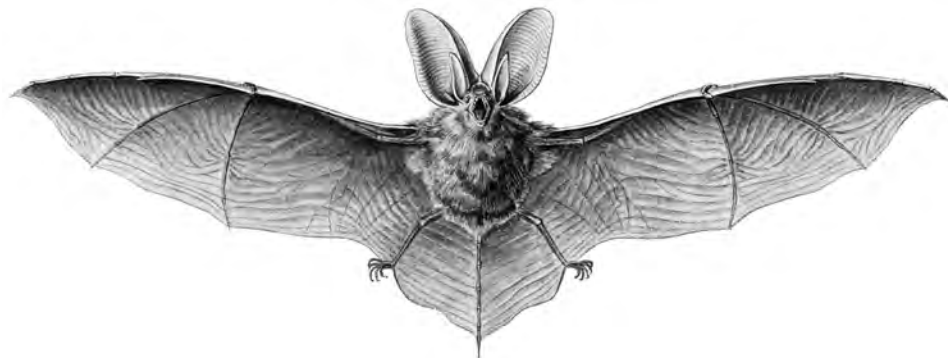




Marta Candel in the entrance drop to Olbastl Teviztle. *Gustavo Vela.*

Expedición Tzontzeuciculi 2012

Nuevamente un grupo de 14 espeleólogos de España, Australia y México se dieron cita durante un mes en la Sierra Negra, al sur del estado de Puebla para continuar con la quinta temporada de exploración de cuevas en las cercanías de Ocotempa. El principal objetivo era explorar y encontrar nuevas cuevas en las mesetas de 2400, 2500 y 2600 msnm y también, era empujar las exploraciones en Olbastl Koltik que se habían detenido el año pasado a -565 m. La cueva mas profunda encontrada y explorada este año fue Olbastl Teviztle (Sótano Picos) de -382 metros, después, Olbastl Suapili de -188 metros, a Koltik se exploraron 20 metros mas para que finalmente quedara en -587 metros. A parte de estas exploraciones se encontraron alrededor de unos 60 pozos desde 10 hasta 84 metros pero todos estos cerraron. Cabe mencionar que la búsqueda de cuevas en la zona es bastante dura y complicada debido al terreno; lleno de maleza, espinas, un lapiaz muy fracturado, todas las rocas de mueven y por si fuera poco vieron 12 víboras de cascabel, por fortuna nadie fue mordido. Continuaran con las exploraciones en la zona.



Drawing by Ernst Haeckel, plate 67 in *Kunst-Formen der Natur*, 1904.

HISTORY

THE DISCOVERY AND DESCENT
OF SÓTANO DE EL BARRO

Craig Bittinger and Terry Raines

Pete Strickland and Logan McNatt pointed out that this January was the fortieth anniversary of the discovery and first descents of El Sótano de El Barro, Querétaro. The trips were described in reports in the Association for Mexican Cave Studies Newsletter, volume 3, number 5, pages 92–95 and 106–112, July 1972. They are reprinted here, lightly edited and with new illustrations. The simplified map of the cave is from Carlos Lazcano's book Los Grandes Abismos de México (1987), page 39. A highly detailed map of the pit, based on the survey data collected in 1972 and photographs of the pit, was drafted by Orion Knox and published in 1979 as a foldout in AMCS Activities Newsletter 9.

On January 17, 1972, Logan McNatt and Craig Bittinger caught a second-class bus out of Ciudad Valles headed toward Ahuacatlán. We had just finished twenty days of Mexican caving in the Ciudad Valles area, and we were looking forward to several more weeks of adventure. John Fish and the rest of our caving companions had just left for the U.S., so we felt that we were on our own. Logan had been in on the exploration of Sotanito de Ahuacatlán and knew of several unchecked pits in the Ahuacatlán area, along with rumors of a huge pit twelve hours away over the mountains, so we had decided to return to the area.

The bus slowly worked its way south, stopping innumerable times to pick up every Mexican along the road. Finally, around 3:00 p.m., after five hours of twisting mountainous

roads, we arrived at Jalpan, where we were informed we had a three-hour layover. We bought a meal at a local restaurant and then sat around the town square waiting for the next bus to arrive. We heard the bus coming two minutes before it burst into view, and soon we were under way again. Twenty-five minutes later we arrived in Ahuacatlán and proceeded to hike up the arroyo toward the Sotanito de Ahuacatlán. Our entire day of bus riding had cost us two dollars each and nearly exhausted our energy. We set up camp on a flat spot above the arroyo and were lulled to sleep by the barking of the local dogs. We woke up around six the next morning, and, after a quick breakfast, hit the trail. After about an hour of hiking, we arrived at a local store and the end of the fairly level part of the trail. Logan bought a can of Mexican sardines that we proceeded to eat in order to stave off our hunger. After two sardines, Logan noted something strange in the bottom of the can and proceeded to pull out a large chunk of fish net from in between the remaining sardines. After mumbling a few words about Mexican canning factories, we proceeded on up the trail.

Two hours of steep climbing brought us to the vicinity of the *sotanito*, where we hired two Mexican kids to watch our packs in return

for a few handfuls of animal crackers. We hiked over to the *sotanito*, where we did the 70-foot entrance drop, threw rocks down the 946-foot drop, and then returned to our packs. Thirty minutes later we arrived at the Montoyas' house, where we were welcomed with open arms and a hearty "*Mi casa es su casa.*" The Montoya family has given us a place to stay, food, and a guide to more virgin pits than we could possibly explore. The Southwest Texas Grotto had done such a good job of public relations on previous trips that their house was like a second home where we were honored guests. That afternoon we went to what we thought was a 120-foot pit. Unfortunately,

Peter Sprouse



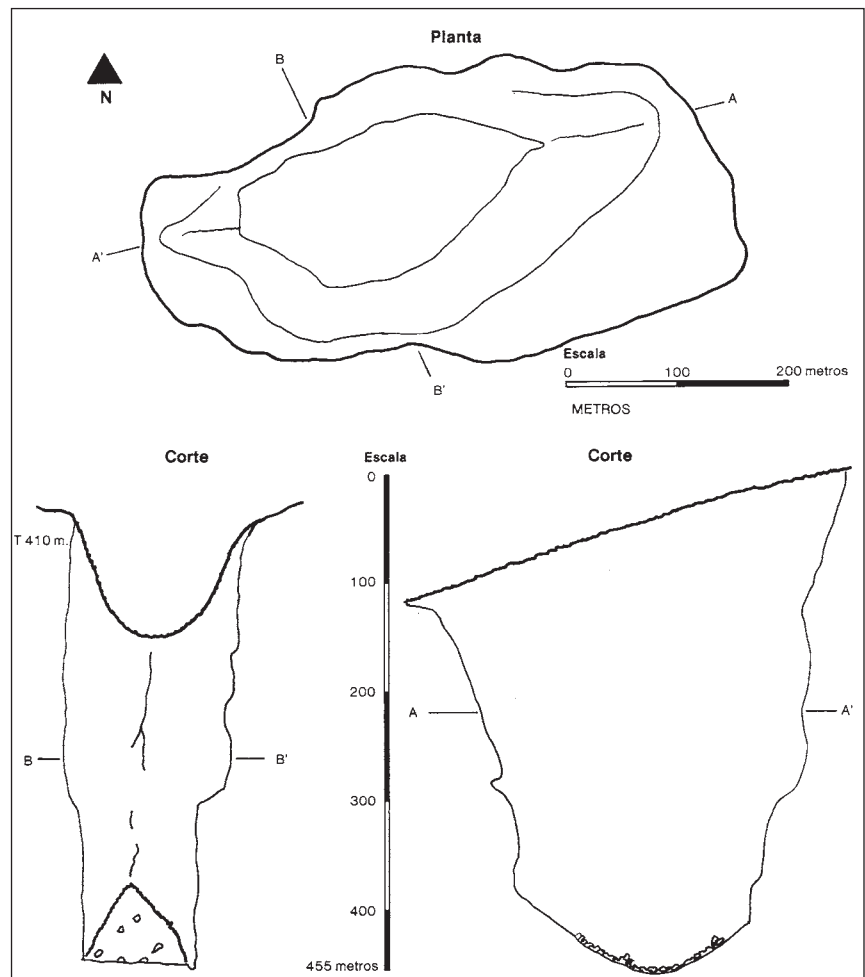
after Logan descended to the end of our 150-foot rope he realized that the pit was closer to 300 feet deep, so we decided to wait until the next day to bottom it. While we were coiling the rope, Craig asked our guide if he knew of any deep pits in the area. He proceeded to point at a white spot visible on the side of a mountain in the far distance. That night the Montoyas gave us more beans and tortillas than we could possibly eat; in return we gave them one of our dehydrated dinners, so it turned out to be an unusual meal for all.

In the morning we were awakened by the sounds of dogs, chickens, burros, pigs, and roosters all trying to drown out each other. The Montoyas pointed out the white spot on the side of the mountain again, and through our binoculars we could see the curve of the entrance of what we knew must be a huge pit. The entrance intrigued us, so we decided to hike over and have a look at the pit. The Montoyas had never been to the pit, but they assured us that no one could possibly throw a rock across the entrance of the pit and that it was fairly deep. About 10:00 a.m. we left their house carrying only our day packs and about twenty-five pesos between us. We assured them that we would be back late that night and asked them to watch our equipment. At six o'clock that evening we arrived at the base of the mountain containing the pit. We had been hiking at a steady 2½- to 3-miles-an-hour pace all day long, and we were totally exhausted. The local people told us that we should go to Rancho El Barro to talk to the local judge, who could give us permission to go into the pit. Eventually we arrived at the judge's house, and after explaining who we were and that we would like to see the pit, we were once again welcomed with open arms. The judge, Gregorio Rodriguez, gave us a bed to sleep on, two serapes, and a meal of beans and tortillas. We went to bed almost immediately, but couldn't fall asleep due to the judge playing his radio over the local loudspeaker system.

We woke up about 6:00 a.m., shivering with cold and eager to get to the pit. After giving the judge one of our canteens to express our

gratitude for everything he had done for us, we headed up toward the pit. Unfortunately, there was a dense forest in between us and the pit, and there were no obvious trails. Soon we heard shouts from below telling us that we were lost. Before long the judge's son, Ramón, appeared to guide us to the pit. After two and a half hours of hiking, we arrived at a grassy meadow, and five minutes later we burst through the jungle, and there in front of us was the largest pit either one of us had ever seen. We quickly picked up a rock and threw it into the pit. After what seemed like an interminable wait, we heard a tremendous noise from below. Neither of us had a watch, so we had to resort to timing the rocks by slowly counting thousand-one, . . . until we reached thousand-eleven. Ramón was totally mystified as to why these two crazy gringos were jumping up and down, screaming and excitedly shaking hands. We

proceeded to jungle-crash approximately half of the way around the pit to a cave located on one wall of the pit. The cave was apparently inhabited by javelinas, as their tracks and dung almost completely covered the floor of the entrance. Unfortunately, the cave was only a rock-shelter, so we decided to leave the pit and return with rope and a well-equipped caving group. As we hiked back down the mountain we started to consider our situation. The Montoyas were expecting us back any minute, we were virtually out of food and money, and we were totally exhausted. Luckily, Ramón knew of a closer way to get back to the highway where we could catch a bus back to Ahuacatlán and our equipment. We gave Ramón a pocket knife in payment for his services as a guide, said goodbye, and then set out toward the canyon that he assured us would take us directly to the paved highway. After an hour and a half



of jungle-crashing, we reached the canyon, only to find Ramón sitting patiently at the edge of the stream waiting to guide us out through the canyon.

We followed the small stream for four and a half hours as it wound its way between 1,000-foot-tall cliffs. We finally emerged upon an ancient aqueduct that led us directly to the town of Ayutla. The local people informed us that the last bus of the day would be by in a half-hour, so we sat down to enjoy a *refresco* and rest our weary bodies. Suddenly someone yelled, "Here comes the bus," so we started moving straight uphill toward the road, only to see the headlights flash by and vanish in the distance. Fortunately, it was only a car, but the bus appeared two minutes later and took us back to Jalpan. We were then informed that no more buses went to Ahuacatlán that night, so we would have to spend the night in town. A hotel room would definitely cost more than the five pesos we had left; it appeared that we would have to sit in the town square all night, but we asked a young man with a fancy pickup truck if we could have a ride to Ahuacatlán. He said if we could wait for half an hour he would take us up there. Three hours later we climbed in the back of his truck and watched him accelerate up the mountainous road. The truck continued accelerating as we started down the far side. We both hung on for our lives and watched the truck stay on the wrong side of the road for nearly half the trip. Fifteen minutes later we were in Ahuacatlán, marveling that we were still alive. We lit up our carbide lights and started the three-hour hike to the Montoyas' house. Two and a half hours later we were totally lost in the pitch-black night, virtually on top of a mountain and shivering with cold. We decided to build a fire and wait for morning instead of wandering aimlessly through the night. Five hours and a lot of wood-gathering later, the sun came up, and we discovered the main trail 20 yards away. The Montoyas were surprised to see us, and when we left two hours later there were twenty people waving goodbye and telling us to come back

soon. From Ahuacatlán we caught a bus to Valles, and then straight on through to the U.S. Our conversation kept centering on the pit and how we were going to break the news to the people back in Austin.

—Craig Bittinger

Although the existence of a large pit in the Jalpan Region was a known fact, none of the earlier cavers visiting the area had the persistence to continue on to the entrance until Logan and Craig's hike in January of this year. Once news of a definite sighting reached Austin, two days elapsed before an "expedition" of fourteen members headed south. Equipped with over 4000 feet of rope, backpacks, and provisions for up to a week, the group traveled in three vehicles to a rendezvous in Ayutla, Querétaro. From this small town a mountain trail climbs to Cerro de la Tinaja, descends to Río de la Atrejea, then climbs again to the entrance of El Sótano. The activities of this five-day adventure are recorded below.

January 27, 1972, hike to Rancho El Barro from Ayutla. Two vehicles had arrived late the previous evening containing Logan McNatt, Terry Raines, John Fish, Jan Lewis, Craig Bittinger, Frank Binney, Blake Harrison, Craig Sainsott, and Peter Strickland. At that time arrangements were made for three burros to carry six duffel bags to the pit at a cost of twelve pesos per burro per day. These arrangements fell through the following morning, and we had to seek out another driver-guide. By 9:40 a.m. another truck had arrived with Donna Atkins, Steve Bittinger, David Honea, Roy Jameson, and Tom Wright, and the hike was begun. Leaving the upper edge of town, the trail follows a small arroyo for a short distance then cuts up onto a river terrace. The crossing of the gently sloping terrace required one hour, after which the trail began climbing steeply up the east flank of the Cerro de la Tinaja. This particular *cerro* is the first of a series of linear



Pete Strickland

ranges that characterize the region. It is approximately 20 kilometers long and 5 to 6 kilometers wide, and the trail between Ayutla and El Limón crosses at a point 3160 feet above Ayutla. From the pass we hiked down to El Limón, located on a low plateau formed by a rock formation change. Another hour's hike brought us to the Río de la Atrejea, only 612 feet above our beginning point at Ayutla. This is the primary drainage course in the area. As is frequently true throughout Mexico, its name changes from area to area. Below Limón it is the Atrejea, while only a few kilometers away, below the town of Ayutla, the river is the Río Ayutla. The last leg of the day's hike took us back up again, to Rancho El Barro, located on a small plateau corresponding to that of El Limón. The elevation here above Ayutla was 1557 feet, and arrival time was 6:30 p.m. The people living at the ranch were very friendly and generous and allowed our group to spend the night in the schoolhouse.

January 28, hike to El Sótano and descent. Arrangements were made with Ramón, son of a local official, for burros to carry the equipment to the pit entrance. The population of El Barro was on hand to watch us reload our packs and wander off in groups of two and three. From the ranch, located on the lower east flank of the second range, it is a continuous

hike upward to the entrance. This mountain has been referred to by local sources as Cerro de la Mesa and Cerro del Charcos. It required two hours and forty-five minutes over a network of muddy paths to reach the cave. Fortunately, Craig and Logan had been guided to the pit earlier and were now able to mark the way accurately for the stragglers. About 1000 feet above the ranch the trail angles toward the south, but we still could not see the entrance and had no idea where it was located. In fact, it would be hidden until the last moment. The Mexicans continually advised us as to the pit's proximity. The last stretch led up a linear valley carved by Arroyo del Ojo de Agua. At a nondescript point the stream bed was crossed and a short hike led us to La Joya de Los Nogales. Here a depression has been filled to form a level, grassy surface, perfect for camping. And nearby, only seven minutes away, is El Sótano. Hastily abandoning our packs, we climbed the low ridge above the *joya* and suddenly found ourselves on the edge of a true precipice. We could not contain our excitement. People were carefully running from one vantage point to another, exclaiming at the voluminous, wonderful pit, but not really comprehending the immensity—not at first anyway.

The first trip to descend El Sótano. Standing, from left: Logan McNatt, Tom Wright, David Honea, Terry Raines, Pete Strickland, Frank Binney, Craig Sansott, and Craig Bittinger. In front: Blake Harrison, John Fish, Jan Lewis, Roy Jameson, Steve Bittinger, and Donna Akins. *Photo by Terry Raines.*



Dropping rocks was first. The watch was ready, the rock was ready, and when the first thirteen-second free-fall resounded previous excitement seemed minor.

One hour later it was noon, a bright, sunny day, temperature 57° F, and the burros still hadn't arrived. We were anxious to get on with the rigging but also grateful for the rest. Shortly, Ramón did appear with burros and equipment, and activity resumed. Each person organized personal gear and made general preparations. Then the main lines, still in the duffel bags, were carried to the pit's edge. Two points would be rigged, which would allow Logan McNatt and Craig Bittinger to make initial, simultaneous rappels. On the north wall an area protrudes inward, providing the only practical rigging points around the whole perimeter. Here work was begun clearing vegetation and dislodging loose rocks. Handlines were rigged for safety. When all was ready, with rope pads in place, the lowering process was begun. To the west descended a continuous length of 11 millimeter braided nylon, while to the east three lengths of Bluewater, 600 feet, 600 feet, and 300 feet, were rigged. By this time it was 3:00 p.m., and Logan and Craig were eager to descend.

As they dropped over the edge, everyone waited with anticipation. For the first 60 feet the ropes hung against the wall and were on either side of a bulge. Then the drop became completely free, with the ropes mutually visible and 65 feet apart. Logan rappelled 1181 ft and Craig 1239 feet. The difference was due to their landing points on the bottom. Logan arrived at the very top, western-most end of a talus slope, while Craig landed in a tree downslope. We were in contact via walkie-talkie throughout most of the rappel. What had appeared to be a smooth, even covering of vegetation from above turned out to be a rugged topography of rocks, ferns, and trees. From the landing point at the far western end of the pit, the explorers saw a steeply dipping floor descending to a linear trench and then climbing up again to approximately the same level, 700 feet away. The width was 350 feet. Further exploration produced a cave on the south wall that was 150 feet long. There were no other leads showing any promise.

The radio gave us the details and the go-ahead for more of the group to enter. Frank, Roy, Stephen, Tom, and Donna descended and further checked the bottom, but found no continuations.

As most of the bottom group had carried sleeping bags, they spent the night on the flat floor of the 150-foot cave. Meanwhile, back on top, John, David, Terry, Jan, Blake, and Craig Sansott surveyed about two-thirds of the north half of the entrance before dark. Very early in the morning all prusiked out except Logan and Craig B., who remained to survey the north edge of the bottom. This survey was completed as Blake reached bottom. He was the first to rappel in on the second day of exploration, and he was followed by Peter, Terry, David, Craig S., and John. Terry and



Frank Binney, Blake Harrison, and Logan McNatt begin their rappels. *Pete Strickland.*

David photographed the pit as the others entered, and upon John's arrival surveying began. Proceeding east along the south wall, only a few hours elapsed before we connected to Logan's and Craig's earlier survey. With information-gathering activities completed, the cavers still on the bottom climbed out in turn. While this was going on, other members topside were lowering a calibrated wire to record the pit's depth. Readings were taken at two points, one at the eastern rigging point and the second one farther to the east. Results were 1239 and 1345 feet respectively. The second point is located where the lip is still at the top of a sheer drop and immediately before it recedes from the pit. It is here that a plumb line intersects the talus floor farthest downslope. All other approaches to the pit, except the rigging area, are characterized by densely overgrown

slopes of increasing magnitude. For this reason, it is only practical to rig the pit in that one area.

January 30, survey of entrance completed and hike to El Barro. On the morning of the thirtieth the only task remaining was the completion of the entrance survey. Frank, Steve, Roy, Donna, and Tom had left the previous day for Austin, which left nine cavers at El Sótano to finish this last part of the survey. Beginning at the last station, the remaining third of the north half was completed and triangulation stations established. It was then possible to survey the heavily overgrown south half of the entrance perimeter by sighting on persons perched above the pit at closely spaced intervals. All was completed by noon, camp was broken, and that afternoon everyone arrived in Rancho El Barro, where the night was spent again in the

schoolhouse.

January 31, hike to Ayutla. At 9:00 a.m. hiking began; down to Río de la Atrejea, up to Cerro de la Tinaja, and down to Ayutla, with arrival at 4:40 p.m. A quick return to Austin was made.

Statistics. To reach the entrance from Ayutla would require a nearly continuous hike of nine hours, assuming a pack of twenty to thirty pounds was carried. This hike would involve changes in elevation totaling 9021 feet. Elevations measured by altimeter: Ayutla 2699 feet, trail pass 5859 feet, Río de la Atrejea 3311 feet, upper edge of El Sótano 6624 Feet. The entrance measures 700 by 1400 feet, while the pit floor measures 300 by 700 feet. The longest drop is 1345 feet [410 meters]. No other pit in the world is presently known to be deeper.

—Terry Raines

Descubrimiento y exploración del Sótano del Barro

El Sótano del Barro, en Querétaro, fue descubierto por espeleólogos y descendido por primera vez en enero de 1972, hace cuarenta años. Estos artículos que tratan sobre la aproximación inicial y los primeros descensos un par de días después aparecieron en la *Association for Mexican Cave Studies Newsletter*, volumen 3, número 5, julio de 1972. Los dos descubridores descendieron simultáneamente usando dos cuerdas, con tiros de 360 y 377 metros. El tiro de mayor longitud posible es de 410 metros.



SIERRA NEGRA 2010–2011 FROM LA CUMBRE TO OJO DE AGUA

Omar Hernández

In March 2007, after two trips more than 500 meters deep to the place the Canadians called La Faille, we had not been successful in finding bolt anchors to continue on. So I decided to try a traverse along a wall to avoid a collapse and find a good place to install an anchor. Using several rebelayes, I was able to descend another 50 meters to a ledge on a large block. This was my third and last day trying to pass the collapse in the company of José Guerrero at just over 500 meters depth, and after several hours we decided to take no further risks and headed out. Several years later, I still wonder where the first explorers had reached a depth of 694 meters in Sótano de los Planos [see *AMCS Activities Newsletter 17*, pages 122–124]. At La Faille they reported a 105-meter drop, which we had not encountered. In 2009 I wrote to one of the original explorers, sending photos and describing the place, but never received an answer. This was our first encounter with the Sierra Negra of Puebla.

Twelve of us returned in Easter 2008 to the Sierra Negra, exploring various caves and pits, the most significant being Sótano GA05 and Cueva Cocohuastli, with the latter proving to be part of a traverse that connected to the Gran Colector in La Cumbre in 2011.

In February 2009 six cavers returned to La Cumbre to investigate some caves that the locals had promised to show to us. Six pits were located,

Pozos 1–6. I descended pits 3 and 4 for a little more than 50 meters, with number 4 being the most promising.

A fourteen-day expedition in April 2009 had the goal of exploring Pozo 4. Some participants stayed for one week and then others arrived, with a total of eight cavers for the expedition. The first push was made by Mike Barragán, David Téllez, and me, and from the start the cave was very vertical. It took us six hours to work our way through the Gargoyle Fault, a horizontal squeeze with a muddy sideways slope of 60 to 70 degrees and many loose rocks. At a

Omar Hernández in the resurgence of Cueva Cocohuastli. *Omar Hernández.*



depth of 206 meters we reached a collapse below a dome, where it looked like only the water could continue on. After a careful look, David tossed some stones into some holes between the blocks, and they could be heard to fall farther. Mike and David dug for several hours to open up a drop of 24 meters, which we named the Window to Heaven. Once they had descended this shaft and pointed their lights upward, they could see that this chamber was formed by large blocks puzzled together. From there we came to a collapsed zone, where unblocking several passages and descending a few pitches took up several days. The rock was of poor quality, making our wedge anchors unreliable and forcing us to tie slings around boulders for anchors. Once we passed the collapsed zone, we regained the main route, a passage of large dimensions. On the right side a 30-meter waterfall entered, indicating another cave connecting in—perhaps Pozo 3?

After more than a week exploring Pozo 4, the survey was not complete and the cave was still going. We left the cave rigged with plans to return the following season. We headed home, but not before stopping in Coxcatlán for delicious pork *carnitas*.

In late 2009 Mike Barragán, José L. Godoy, and I returned to La Cumbre to give a presentation on our expedition results. We trained a member of the community in vertical techniques and invited him to descend a pit in order to help answer the typical questions: Why do you go into these caves? What is inside? Are you going to remove

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Grupo Espeleológico Chicomóztoc



José Godoy in the meander in Babi's Passage at -420 meters in Sistema Ixtololo Atl. *Mike Barragán.*

gold? On this visit we also had planned to do some prospecting in the community of Ojo de Agua, since we had been told about various caves and pits there. Our expectations were exceeded when we found a large *resumidero* that we named Resumidero Ixtololo Atl (Ojo de Agua in Nahuatl). We explored this to just over 100 meters deep, but the remaining exploration would have to wait for another expedition.

Mike Barragán in Babi's Passage in Sistema Ixtololo Atl. *Omar Hernández.*

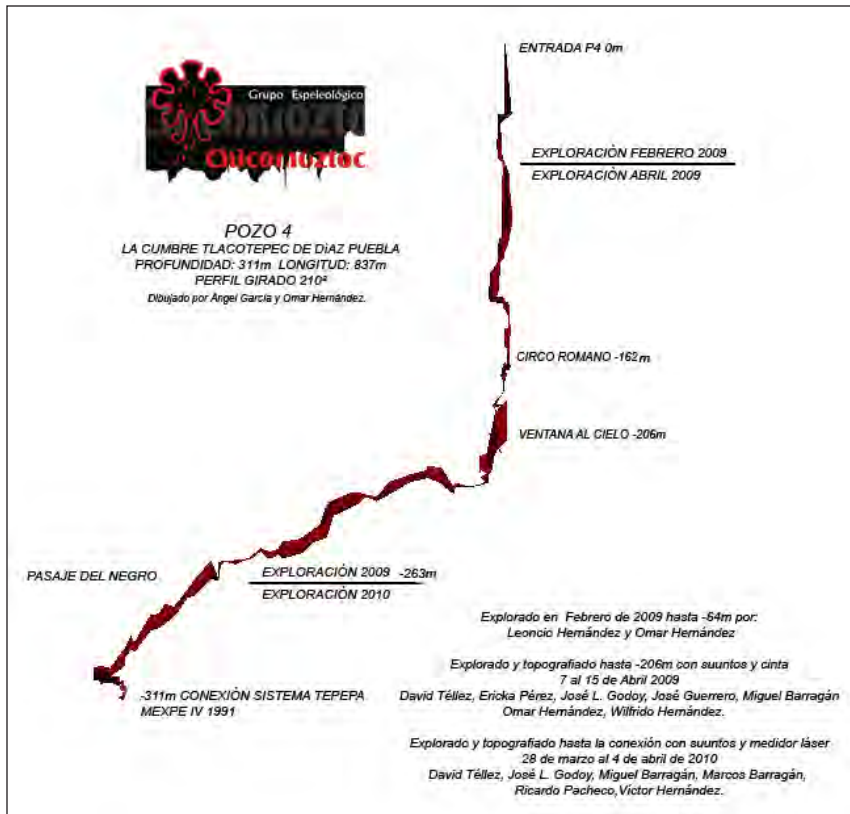


The main entrance to Sistema Ixtololo Atl. *Omar Hernández.*

Campaign 2010 was significant and consolidated our group's work, with excellent results due to better planning and improved equipment. Two weeks were allotted to achieve the goal of bottoming Pozo 4. Mike Barragán, David Téllez, José L. Godoy, Victor Hernández, Ricardo Pacheco, Mark Barragán, Willie Hernández, and José Montiel, all members of Grupo Chicomóztoc, were the participants in the expedition. We continued the exploration of Pozo 4 to more than 300 meters deep, where our survey

David Téllez in the cave GA05. *Omar Hernández.*





connected into a survey station set by the Canadian MEXPÉ Project IV. They had reached this point by climbing an inlet and had left it as a climbing lead. After analyzing the results and information obtained in collaboration with the Société Québécoise de Spéléologie, we found that Pozo 4 had connected with Sistema Tepepa at a depth of 311 meters, causing Tepepa to increase in length from 28.5 to 29.4 kilometers. The depth of the system remained the same, 900 meters, because the entrance to Pozo 4 is not the highest part of the system.

The 2011 trip lasted eighteen days and focused on two objectives, Cueva Cocohuastli, which had been discovered and explored partially in 2008, and Resumidero Ixtololo Atl. The first two days were spent getting the permit for exploration in Ojo de Agua, and a third for the Cocohuastli.

In order to finish up the exploration of Pozo 4 at -311 meters, we had

Cocina de Doña Vero at -237 meters in Ixtololo. From left, Angel García, Omar Hernández, Vicky Galán, and Víctor Hernández.

left Cueva Cocohuastli uncompleted. Mike Barragán, Mark Barragán, and José Godoy now pushed Cocohuastli to a depth of 124 meters and 711 meters in length, to where it connected into the Gran Colector in La Cumbre. During this exploration we discovered a new passage that extended for a kilometer in an interesting direction, with possibilities of connecting to other caves.

Obtaining permission to continue the exploration of Resumidero Ixtololo Atl was not easy, with a day

of negotiation with the community and one more with the owner of the land, for whom we searched all the way from Zacatilihuic to Tlacotepec. Finally we got his permission and he lent us a small house in the community of Ojo de Agua for two weeks. Two people went in to push the limit of exploration, entering the cave at 11:00 in the morning and returning at 3 or 4 the next morning, around seventeen hours altogether. After a day of rest the team was ready to continue the mapping. The months of March and April are the driest in this part of the Sierra Negra, and water is encountered beginning at a depth of 145 meters. From there all drops are alongside waterfalls, the most spectacular being a cascade into a deep pool.

After several days of exploration to more than 400 meters deep, we decided to establish a bivouac where we could prepare food and rest after long hours of mapping, before the trip out. The driest place we could find, located at -237 meters, we named the Cocina de Doña Vero. The menu consisted of chocolate and hot coffee with oatmeal. The exploration required the use of all sorts of techniques: handlines, Tyroleans to avoid pools, pendulums, and rebelayes around the waterfalls. The cave had large galleries up to 20 meters average height, with occasional areas lowering to 1 meter. Trash was omnipresent. The cave is nearly devoid of speleothems, with only a few located in some ascending side passages. After surveying for several days, we returned to



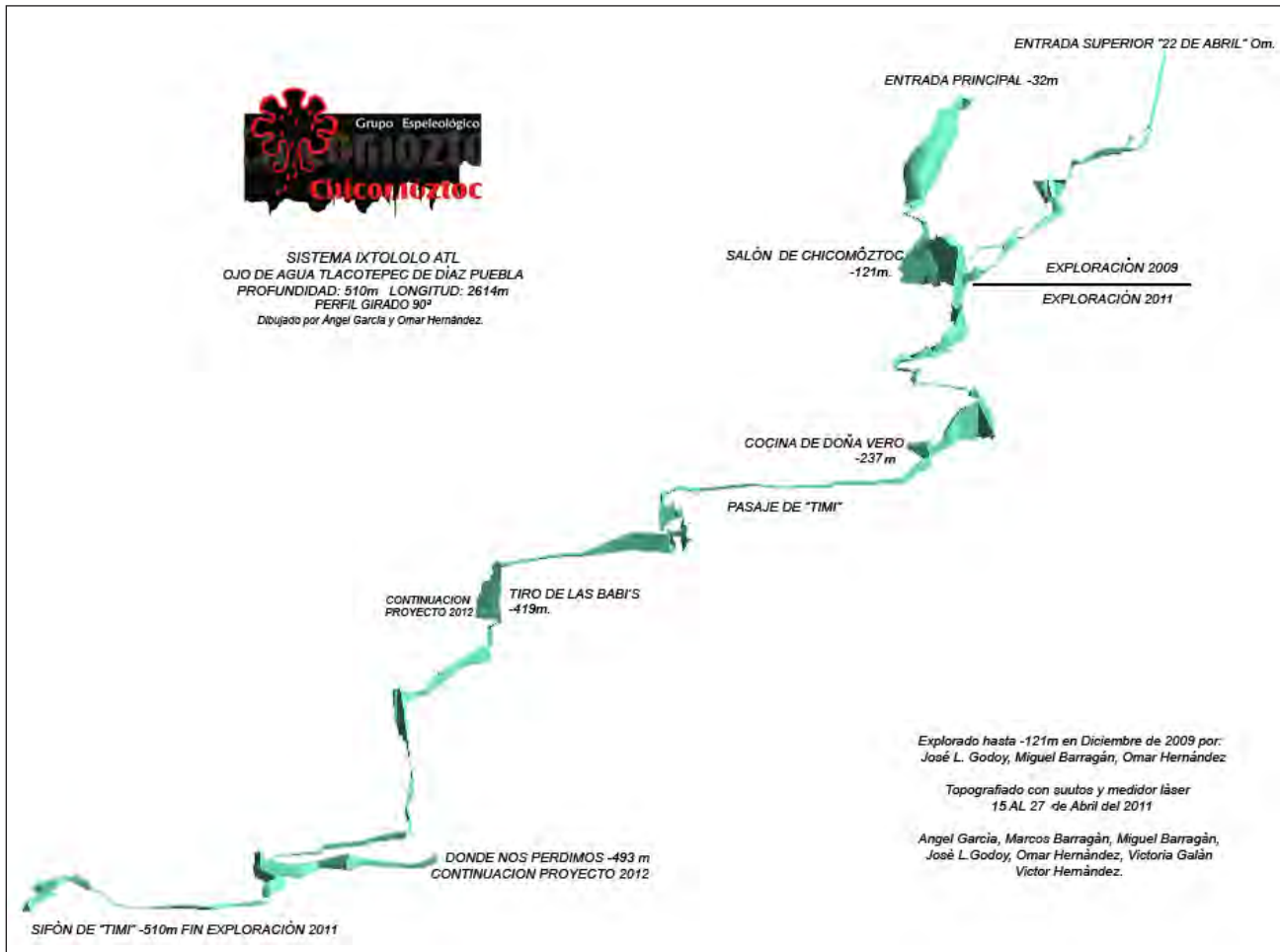


Mike Barragán, Aura Montiel, José Guerrero, and Omar Hernández in Cueva Cocohuastli. Omar Hernández.

our surface base camp to enter data into the Walls program to see our progress, the first time on our expeditions we had been able to do this in the field.

During one of the pushes a sudden storm caused a new waterfall to form at -120 meters, prompting Mike, Mark, and Godoy to investigate an upstream side passage. They climbed up a number of pitches and squeezed through tight, muddy spots. After eighteen hours and 132 meters of ascent, they could see daylight through a narrow opening. They had found another entrance to the cave, and plotting it out the next day they found that they had added 32 meters of depth to what was now Sistema Ixtololo Atl.

While we were mapping the cave, a number of other ascending side passages that had strong airflow were identified. Two of these intrigued me, but since they both required lead-climbing techniques, we only mapped them up to where



Pasaje del Negro at -263 meters in Pozo 4. *David Téllez.*

they became technical. The survey data would be used to search for related openings on the surface.

This expedition was composed of seven members of Grupo Chicomóztoc: Angel García, José L. Godoy, Mike Barragán, Mark Barragán, Vicky Galán, Víctor Hernández and me. The last week we were only four people, and the last push trip included just Mike and me. We were stopped by a sump at -510 meters and began mapping out, rather discouraged, emerging after twenty hours. An amusing incident occurred while we were mapping, when we walked under a climb we had come down on the way in and soon found ourselves at a dead end. We realized we were in a new passage, and it took us a while to relocate the climb to the exit.

Sistema Ixtololo Atl is now 510 meters deep and 2614 meters long. At -419 meters we have located a fossil gallery that we were able to only partly explore. It trends the same way as the main passage, but



at a higher level, so we have hopes that it will bypass the sump. We will find out during the 2012 expedition. The system trends southeast, with all of the water likely resurging near the Río Petlapa.

Acknowledgments: To all of the members of Grupo Espeleológico

Chicomóztoc who have explored in the Sierra Negra since 2008 but who were not on this expedition, because our results were due to all of their efforts, to Peter Sprouse for his selfless support of the group, and to the Vertical Sport Shop and Petrel for mountain-climbing clothing.

Sierra Negra 2010–2011

Cuando en 2009 exploramos hasta -121 metros el resumidero Ixtololo Atl, solo dijimos entre nosotros que era una gran cueva con alto potencial de desarrollo, durante la campaña 2011 y a medida que íbamos explorando nuevos pasajes, nos dimos cuenta que se trataba del colector principal de la zona, varios pasajes ascendentes con cascadas quedaron pendientes por explorar. La campaña 2012 se enfocará en tres pasajes dentro de Sistema Ixtololo Atl, y en un sótano que se encuentra en las montañas que rodean la comunidad de Ojo de Agua, el cual se exploró parcialmente hasta poco más de 100 metros profundidad, si logramos la conexión de este sótano el sistema rebasaría los -700 metros.

La campaña 2011 representó un gran avance para el grupo, desde la implementación del software de topografía en campo, la organización de las puntas de exploración y topografía, hasta la optimización del equipo para la exploración.

HISTORY

SOLO LEW IN MEXICO

Lew Bicking

Reprinted from the Baltimore Grotto News 9(5)150–153, February 1967. I was reminded of this trip report when I saw it reprinted in David Hughes's compilation Lew Bicking: A Legendary American Cave Explorer (NSS, 2011). The NSS's annual award for cave exploration is named after Lew Bicking. The photo of Lew at the entrance to Tlamaya is not from the original article. Other reports on this trip to Tlamaya appear in the Association for Mexican Cave Studies Newsletter 2(4)73–80 (1966) and Squire Lewis's delightful book Chronicles of the Old Reading Grotto (1990).—ed.

Late in the afternoon I found Terry Raines preparing his truck for another Mexican adventure. That evening the Reading Grotto arrived, also ready to head south, and offered me a ride. We tired of waiting for Ken Laidlaw and Rick Rigg, due to arrive in another vehicle, and left without them, only to meet them later in Mexico. Terry took Rune Burnett and Sam and Diane Young in his truck. I went with Charlie Lewis, Bob Thren, and Joe Pendleton of Reading. Mark Blumenstein and Stan Spencer tagged along in their own car.

At last we were through customs and in Mexico. Two days of driving brought us to the fabulous Xilitla area, fabled for its deep sótanos, or pits. Just as we arrived, Rune fell out of the truck, cutting up his knees badly. Charlie Lewis ferried him back to Texas for proper medical treatment while the rest of us started exploring sótanos, pausing more than once to contemplate the difficulties that would be involved if

there were a serious caving accident in this remote area.

The first task was to finish mapping and photographing the deepest known sótano in all the Americas, Sótano de Tlamaya. Terry, Rick, Bob, and Joe went in for this job, down into the earth almost 1500 feet. Sam and Diane went in the first 500 feet, and Mark went in 300 feet just to see the cave. I begged off by saying I didn't have enough vertical experience. After all, the first drop is 300 feet, followed by two 100-foot drops in 30 horizontal feet.

"Well, you could go just a little way in," said Terry.

With that kind of entrance drop it was hard to see how I could go "just a little way in." But then I saw the entrance and I knew it was a cave that I wanted to see. So I found out about a nearby 80-foot pit from Ken and went there by myself to practice.

When Terry and Bob went in to bring out the ropes the next day, I went in with Stan to the 500-foot level to help them. I am running out of words to describe strange and wonderful experiences, but I can certainly say that this was a deeply moving experience—an experience of challenge, of accomplishment, and of beauty. The water-worn walls of the sótano plunged and twisted 300 feet down into the twilight, encircling but not quite touching the rope. A stream of daylight was visible from a second entrance not far from the first. Tree roots groped their way down into the darkness nearly 100 feet searching for the moisture that gently dripped upon us in the twilight zone at the bottom of the first

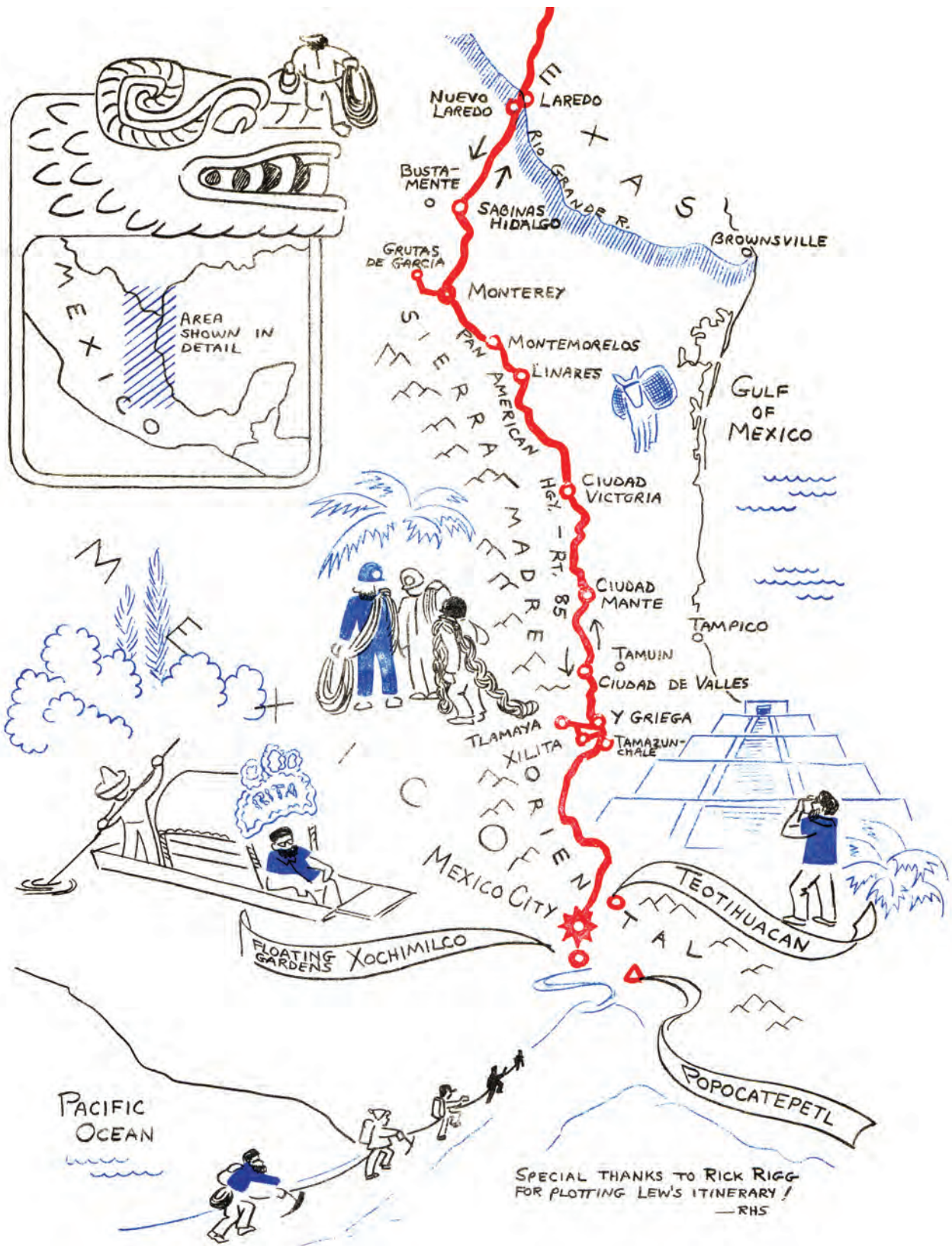
drop. Beyond this point the plunging tube of limestone that was the cave made its way downward in darkness, gradually becoming wetter and wetter. Mexican caves are warmer than those in the Appalachians, and exposure to cold and water is not the problem here it is to us.

Finishing the exploration of Tlamaya was not our only accomplishment. We checked out a couple of small horizontal caves, one of which was located in a dense forest alleged to be the home of *cuatro narices*, a deadly pit viper. A local gentleman by the name of Antonio showed us eight sótanos, and we checked them out—all dead-end pits. We took turns going down and checking them out. I got three pits, about 200, 100, and 50 feet. The checking was uneventful except for Rick's 200-footer. A rotten log fell in while Rick was down there. Fortunately it missed him.

We also did some surface surveying and got to see some of the country from topside. The local people were very friendly, and we spent many evenings talking and drinking with them in the little store in the village of Tlamaya.

At last we left Xilitla. But I was not through with Mexico. I took the bus to Mexico City and got a room in a cheap hotel. From this base I took in all the tourist sights. I visited museums and parks on foot and by bus and climbed the ancient pyramids of the sun and moon in Teotihuacán.

I got in touch with a local group of climbers, the Club Exploración de México, and got to see some of their wild back country. One weekend we





Lew Bicking at the entrance to Sótano de Tlamaya. *Sam Young.*

climbed Cerro Viejo de Apulco—the old hill of Apulco—led by the venerable founder of the club, Otis McAllister, now in his 70s. This was about a 10-mile hike with a couple-thousand-foot elevation gain to reach the top of the 8000-foot hill.

On my last weekend I went with

some younger members of the club to climb to the lower lip of Popocatepetl. We slept in a cabin at 14,000 feet at the base of the volcano and arose early the next morning to climb up the long snow slope to the lip at a little over 17,000 feet. The sun was bright, the snow was white, and we were surrounded by a sea of clouds. We seemed to be on the very top of the world. The only other land we could see was the peaks of Iztaccíhuatl and Orizaba, two other volcanos, rising out of the clouds. On top we ate lunch in spite of the altitude and the fumes from the volcano, and life didn't really seem like such a bad deal after all.

Mexico has its commercial caves, and I saw a couple of them before I left. Just south of Mexico City are the huge Grutas de Cacahuamilpa. They are electrically lighted through half of their four-kilometer extent. The passage is essentially a huge subway tunnel averaging 50 feet high and 100

feet wide, decorated here and there with massive formations. Below the commercial cave are two huge resurgences known as Dos Bocas (Two Mouths). My friends from the Mexican Exploration Club told me that they joined a short way in and that they were completely explored. On my way out of Mexico I stopped to see Grutas de García, which is just outside of Monterrey. It is not too long, but consists of several very well decorated large rooms, one of which has a skylight in the ceiling. A good job has been done in lighting the formations. In order to reach the entrance one must ride a cable car far up the side of a steep mountain, truly an impressive experience in itself.

Then at last I left Mexico with many pleasant memories and fond hopes of return someday. As I walked across the bridge spanning the Rio Grande it seemed as though all my possessions in the world were the ones I was carrying in my pack.

“Solo” Lew Bicking did not return to Mexico. He was killed in a motor accident a few months after this July 1966 trip.

‘Solo’ Lew en México

En 1996, el famoso espeleólogo de los Estados Unidos “Solo” Lew Bicking visitó el Sótano de Tlamaya en San Luis Potosí, tan solo unos meses antes de que muriera en un accidente de motocicleta. Este es su reseña del viaje, que incluyó visitas a otros lugares en México.

IXTACXOCHITLA, PUEBLA

2008–2011

Ramsés Miranda Gamboa, Angeles Verde Ramírez, Myriam Miranda Gamboa, Edgar Soto Valdés, and Hugo Salgado Garrido



Grupo Espeleológico Universitario

Ixtacxochitla (from Náhuatl, white flowers) belongs to the *municipio* of Coyomeapan, Puebla, right in the heart of the Sierra Negra and Sierra de Zongolica, near the borders of Oaxaca and Veracruz (18°21'N, 96°54'E). It has an elevation of 1350 msl. It is bordered by Zoquitlán to the east, Coyomeapan to the southeast, Cerro Tzizintépetl to the south, and Oztapulco to the north (González et al., 2007). This information can be found on the topographic map Coyomeapan (E14B77), 1:50,000 (INEGI, 2003). Ixtacxochitla belongs to the hydrologic region named for the Río Papaloapan (INEGI, 2012), which is one of the most important in the country due to the volume of its runoff (3,116 million cubic meters per year). Annual rainfall reaches 1,500 millimeters (Servicio Meteorológico Nacional, 2012). This flow goes through an underground aquifer carved out of the calcareous rocks of the region. The weather is variable according to the season of the year. It can change in a matter of days as the hills receive moisture from the Gulf of Mexico. Relative humidity is high all year; there are also strong winds that spread the clouds. Fog rolls in constantly and obstructs visibility. Sometimes it can rain continuously for seventy-two hours or even more. Depending on elevation, there are several ecosystems in the region: rain forest, cloud forest, and pine woods (García and Remolina, 2005).

Bus service from Mexico city to

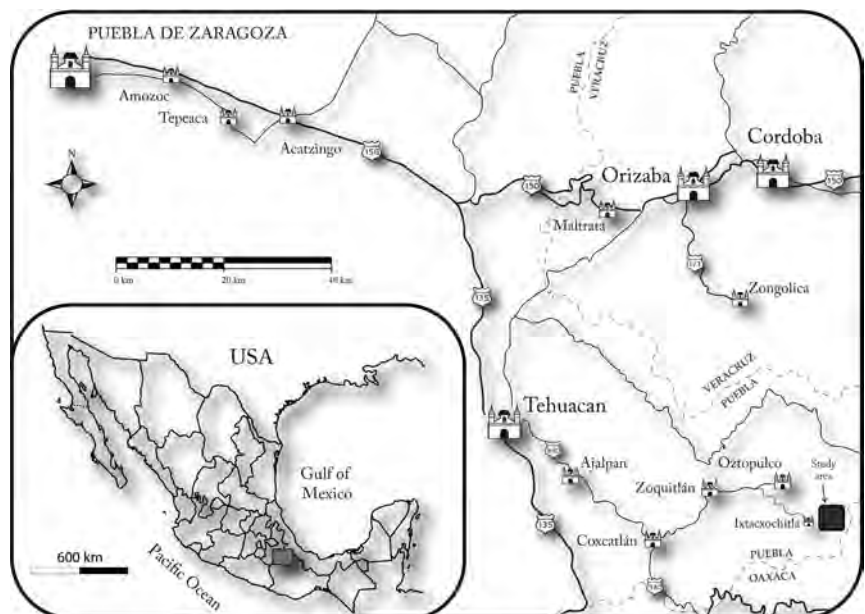
Angeles Verde: inge_angelical@yahoo.com

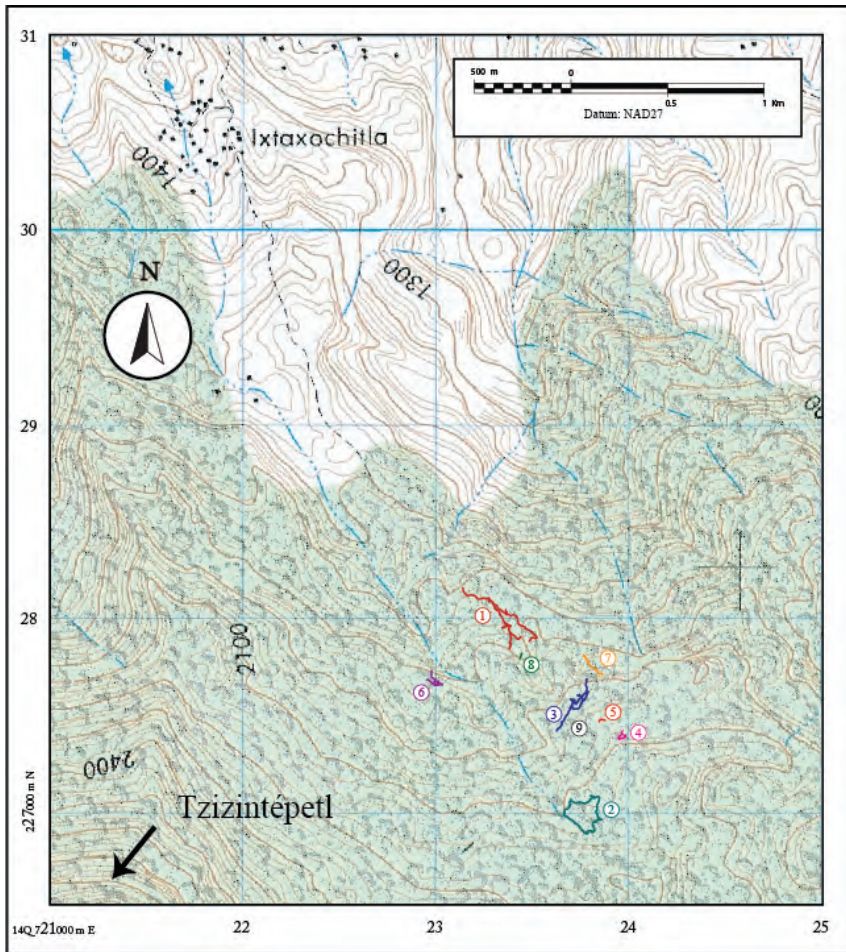
Translated by Yuruem Frías López.

Tehuacán via Highways 150 and 135 is available all year. Once in Tehuacán, the team takes Highway 980 to Coxcatlán up to the turnoff to Zoquitlán. Then we take local transportation over a dusty road to Oztapulco and Santa Cruz Temazcalco. At this point the group starts walking all the way up to the caves. Equipment and food are transported by mules. Generally, it takes two hours to get to Ixtacxochitla and another four hours to get to the base camp. Years ago, the route used to be longer, and the team spent the whole day on their way to the cave.

This region has been visited and explored by different generations of the Grupo Espeleológico Universitario. Javier Vargas Guerrero organized and led those explorations for a long time. They explored and mapped more than 120 entrances

to caves in the area, identifying a region of great karst richness. (Vargas and Remolina, 2002; Javier Vargas Guerrero, personal communication, March, 15, 2012). The team that visited the caves during our explorations has acquired the techniques and knowledge needed a members of the Asociación de Montañismo de la Universidad Nacional Autónoma de México. Most of the explorers who visited the caves during the last few years have joined the team recently, though there are some experienced cavers from the AMUNAM taking part in the current project, led by the new GEU group started in June 2008. Its purpose was to continue exploring the area. Some of the caves mentioned here were discovered on earlier trips by other GEU members, but these caves had not been mapped until now.





Topographic map of the area showing caves explored, modified from INEGI, 2003. 1. Ome Cihuanahuatin-Textuixtli. 2. Mediceos. 3. Tsopelik-Ixtli. 4. Ayau-calli. 5. Chaneques. 6. Mariano. 7. I lama Coatli. 8. Yei Cihuanahuatin. 9. Yeitenotin, Itzman, and Ahualulco.

nature and caves is part of their daily lives. It is very interesting to learn the myths and tales they have about the woods and caves. These places are considered sacred, and there are a lot of stories about some entities known as the guardians of the woods, the *chaneques*.

Due to poverty, the increase of population, and the need for land for agriculture, the woods have been strongly affected by deforestation. Forest used to cover the region and provide habitats for many species of animals and plants, as well as helping stabilize the weather and water runoff. Now inhabitants find it harder to get resources for their basic needs (García and Remolina, 2005). What was before a land covered in cycads, orchids, and bromeliads is now being destroyed.

There are no basic services such as electricity, public transportation, drains, railroads, or gas. The only transportation is on dirt roads built by the people themselves. Since exploration started, the GEU has been in touch with Gregorio Cacho (Don Goyo) and Juanita, a married couple who have lived there for more than twenty years. They gladly provide us with accommodation and food and have taken us to the entrance of many caves, as they know the place and its hidden secrets.

Cerro Tzizintépetl [or Zizintépetl] is located at 3250 meters elevation in a region of difficult access due to the geography of the area. The caves explored are located on the northeast side of the hill.

In March 2011 the group found a wide sinkhole leading to a huge underground gallery in which there was some evidence of former exploration. There are no signs or marks of any past ropework, which makes us think that it is an unknown entrance to some cave that might have been explored by the Société Québécoise de Spéléologie a while ago, because some caves in the area can be found on their Internet site. In a previous talk with the current leader of their Mexpé project, Guillaume Pelletier, we found out that it is possible, though it is difficult to say which cave this entrance belongs to.

Ixtaxochitla is a small town with around five hundred inhabitants; villagers say that the first houses were settled around thirty years ago. Villagers are getting used to the visits of the GEU, which have been occurring for twenty years. People who live here, mostly natives from the Nahua ethnic group, are modest and peaceful. Interaction with



Cerro Tzizintépetl. Eduardo Mendoza.

There have been a total of seven visits to the region in the months of March, April, and December in 2008, 2009, 2010, and 2011. The base camp had been set in the cave called Mariano because it has a wide entrance and there is enough room for the team and equipment. We established a permanent bivouac consisting of a kitchen, a place for gear, and a place for sleeping. In March 2011 the camp was resettled to the cave Tlaloc, because its entrance is wider and it is less humid. Besides being warmer and more comfortable, this place is closer to the caves, and it is easier to get drinking water. Once in the base camp the teams are assigned to explore and map different caves. The surveying is done using Suuntos and a measuring tape.

The search for new entrances on foot gets difficult and exhausting because of the terrain, the vegetation, and long distances. It is important for each team to stay together during each journey, because it is really difficult to find the way back to the camp in the dark.

Data are recorded by hand or on some electronic device. Once we have returned from the expedition, the data are processed in Visual Topo 5.03. Plans and profiles are drawn with Adobe Illustrator CS5.

The **Ome Cihuanahuatin –Tehuixtli System** (Two Witches–Tehuixtli System) has two entrances. Don Goyo took us to Ome Cihuanahuatin for the first time in March 2009; one year later he showed us Tehuixtli. We did not know they were connected until April 2011 when we found a passage between them.

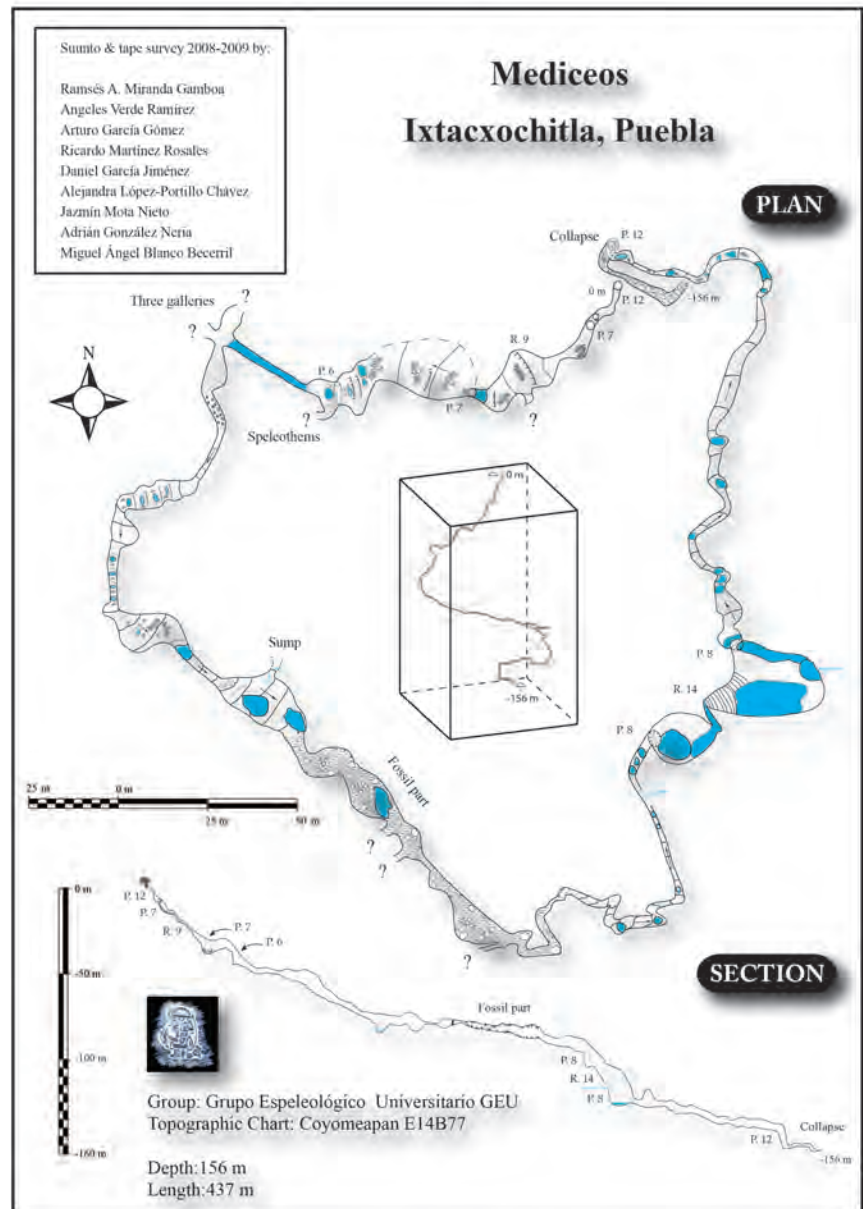
Ome Cihuanahuatin's entrance is located at UTM 14Q 0723383 E, 2027845 N, and 1895 msl. It has a total length of 1434 meters, with a horizontal length of 1208 meters and a depth of 285 meters. The cave is mostly horizontal and is located at the end of a dale along a permanent stream that goes into the cave. Entering the cave may be more difficult during the rainy season when water rushes in.

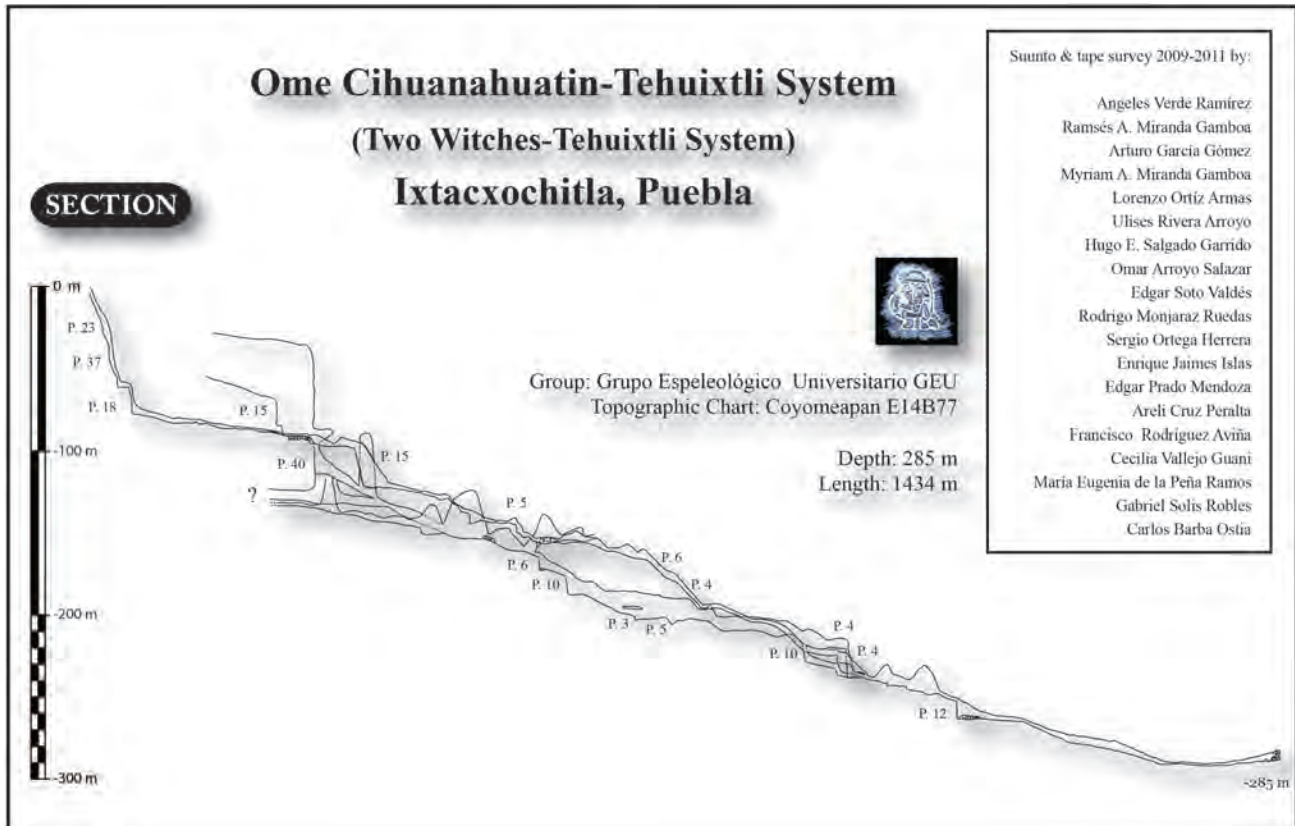
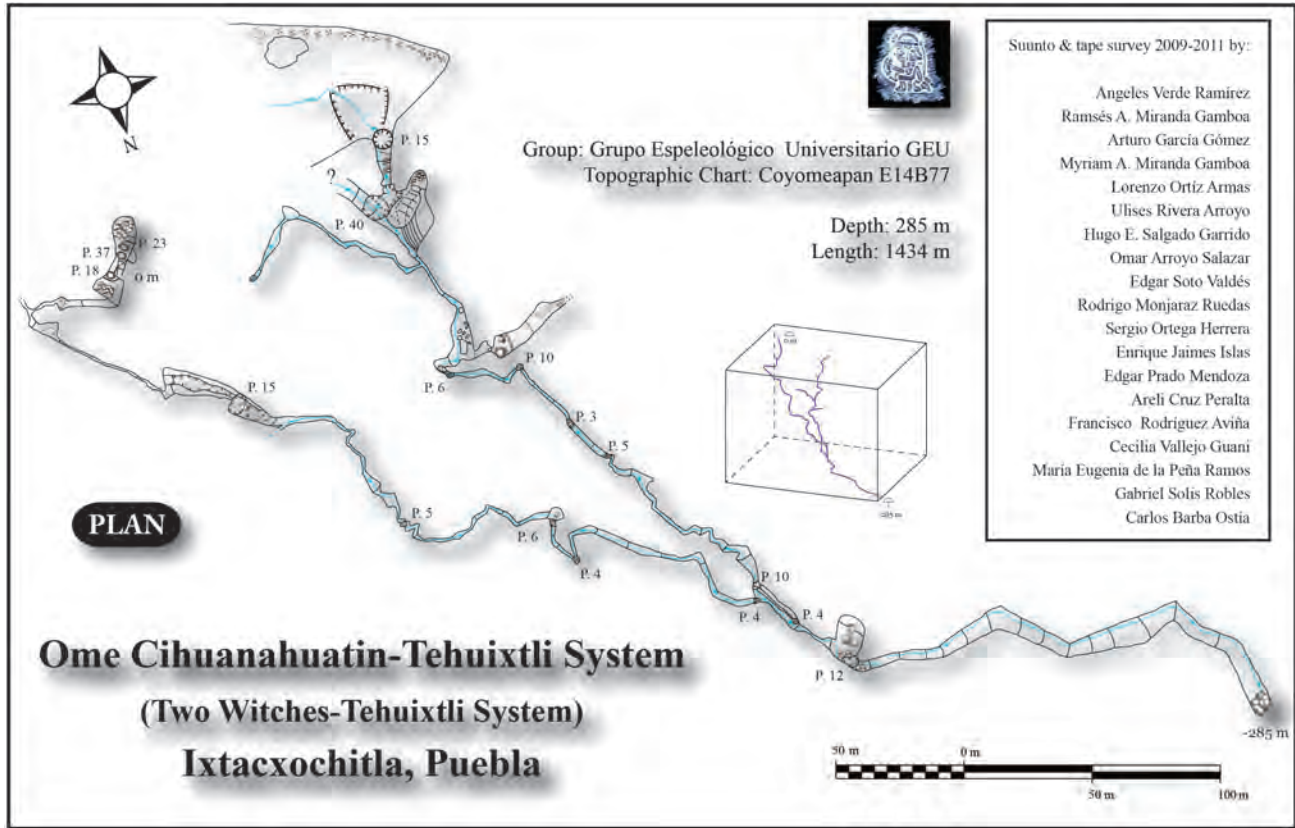
The cave begins with a 15-meter pitch followed by a small gallery and a step down to another pitch, of 40 meters. At the middle of that drop

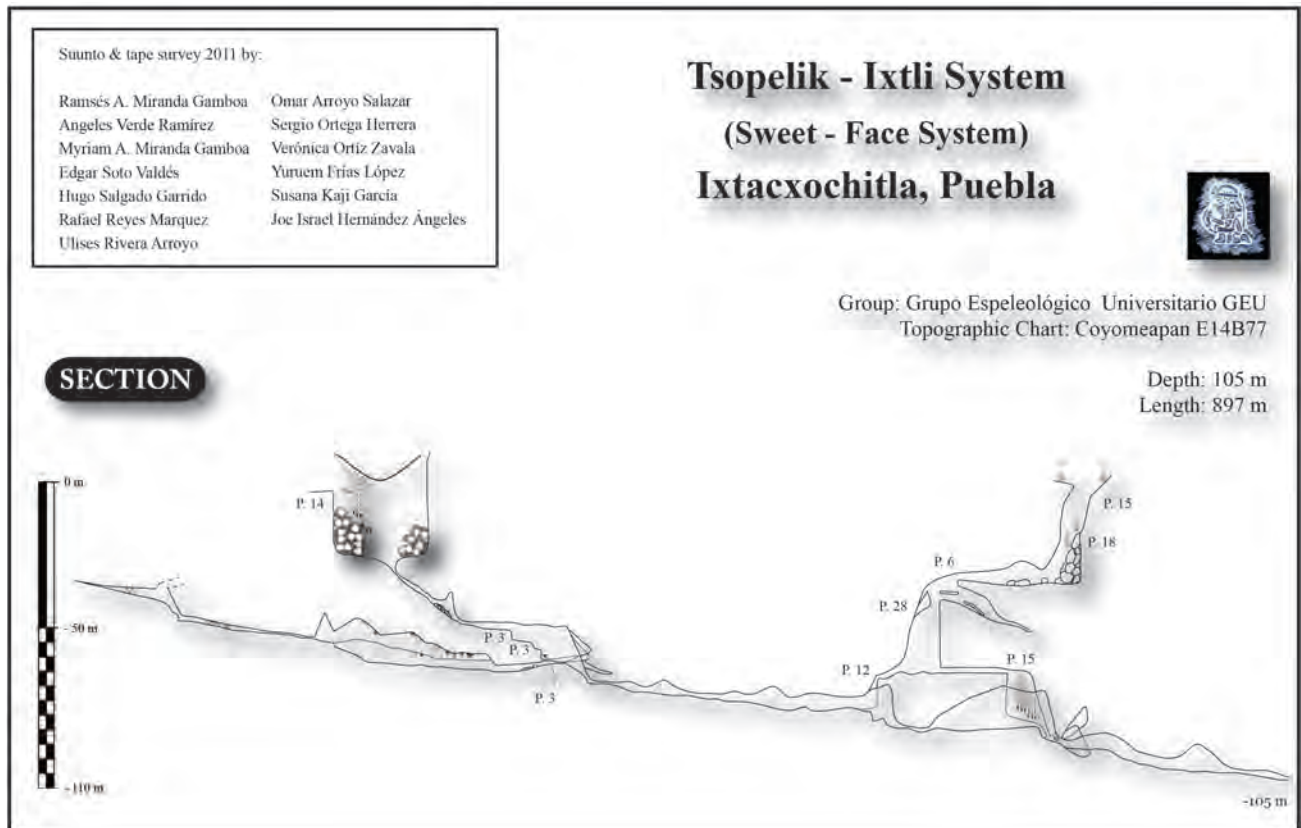
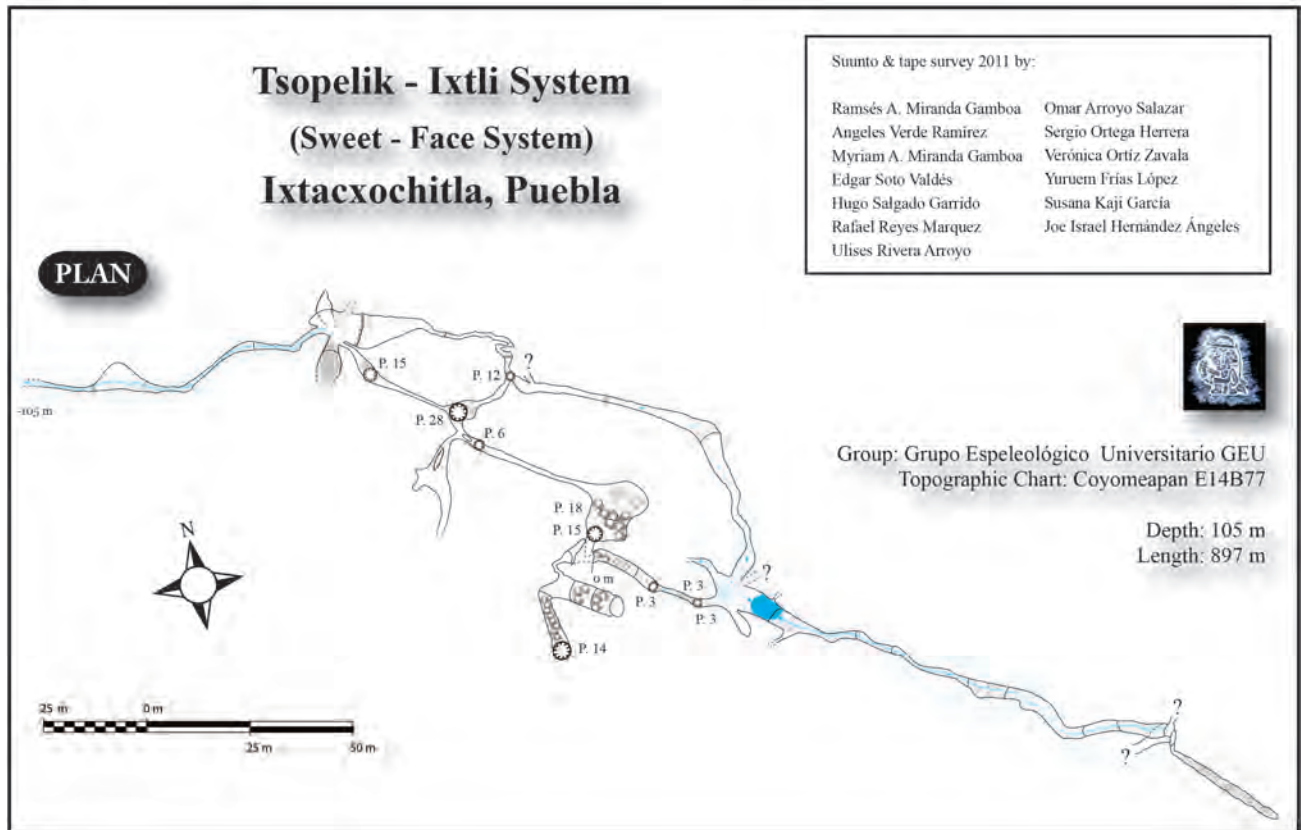
there is a ledge that leads to fossil galleries that would be suitable for a bivouac. From the base of this pitch there is a stream passage. Along this there are some pitches, meanders, and a couple of branches, the first ascending toward the northeast, the other a fossil passage to the west. Past drops of 6 and 10 meters, the cave becomes a meander, and then the cave continues in a horizontal gallery followed by two pitches, 10 and 4 meters. Both of them meet in the same chamber, the point where Ome Cihuanahuatin and Tehuixtli are connected. There is a wet "flattener" that may turn into a sump during the rainy season.

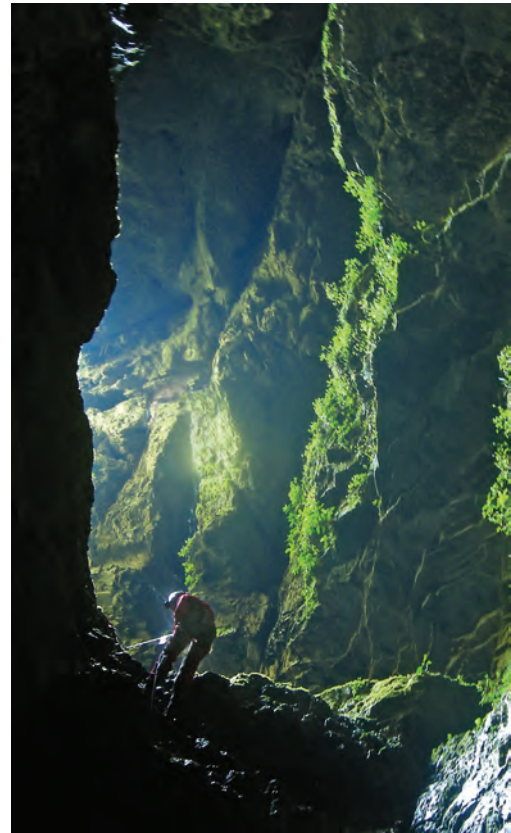
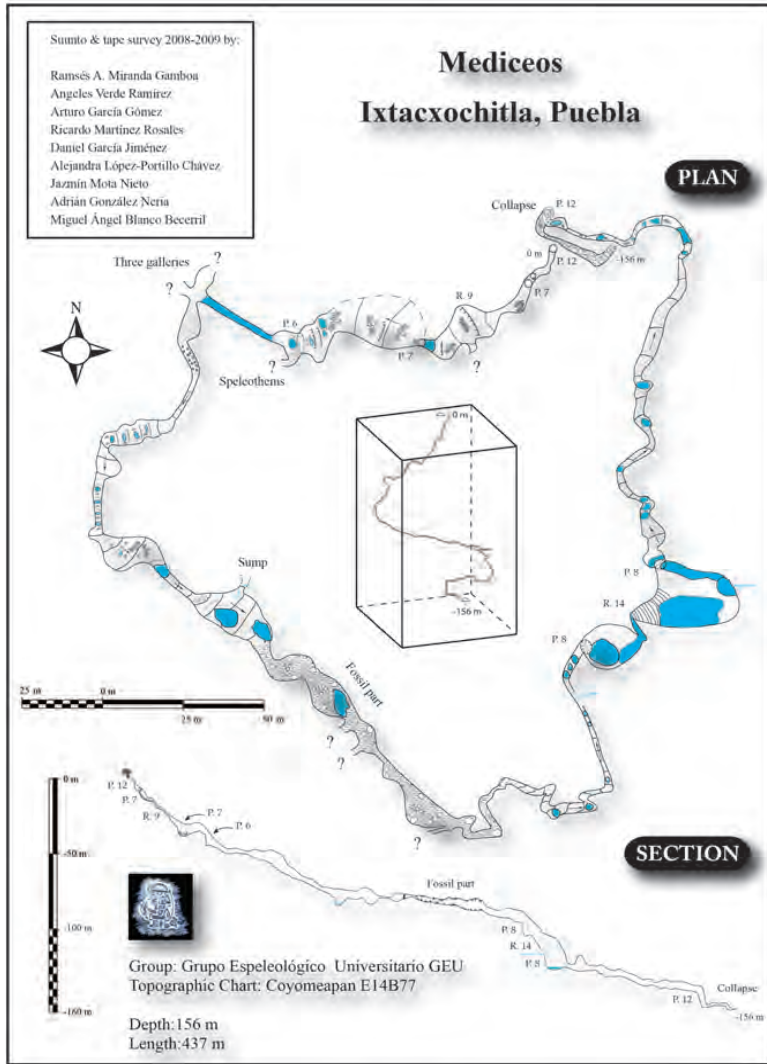
At the end of the crawl there is a passage that descends until it reaches a chamber where there is a breakdown pile. Beyond the breakdown room there is a 12-meter pitch that leads to a passage where the water flow increases. The cave ends at a breakdown that cannot be passed, but the water continues through a narrow passage.

Tehuixtli starts as a large crack in a small glen. There is a small chamber where some pottery was found that amazed us, though we did not dare to touch it out of respect for the ancient inhabitants. Immediately there is a 23-meter slope that leads to the first two pitches, 37 and 18 meters

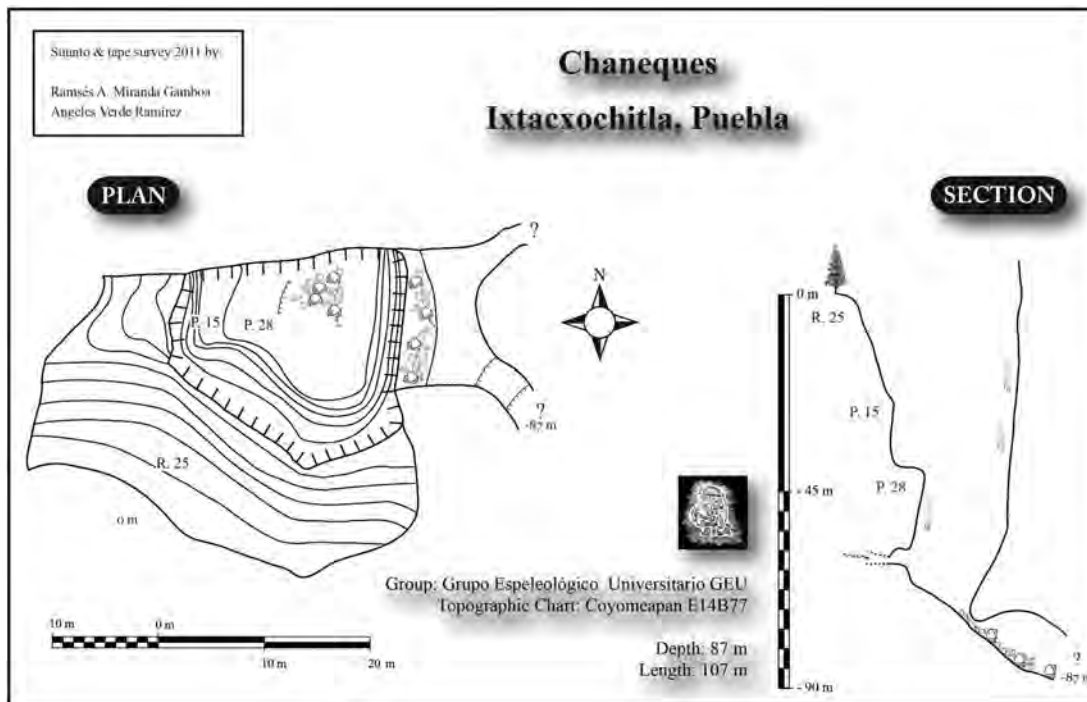


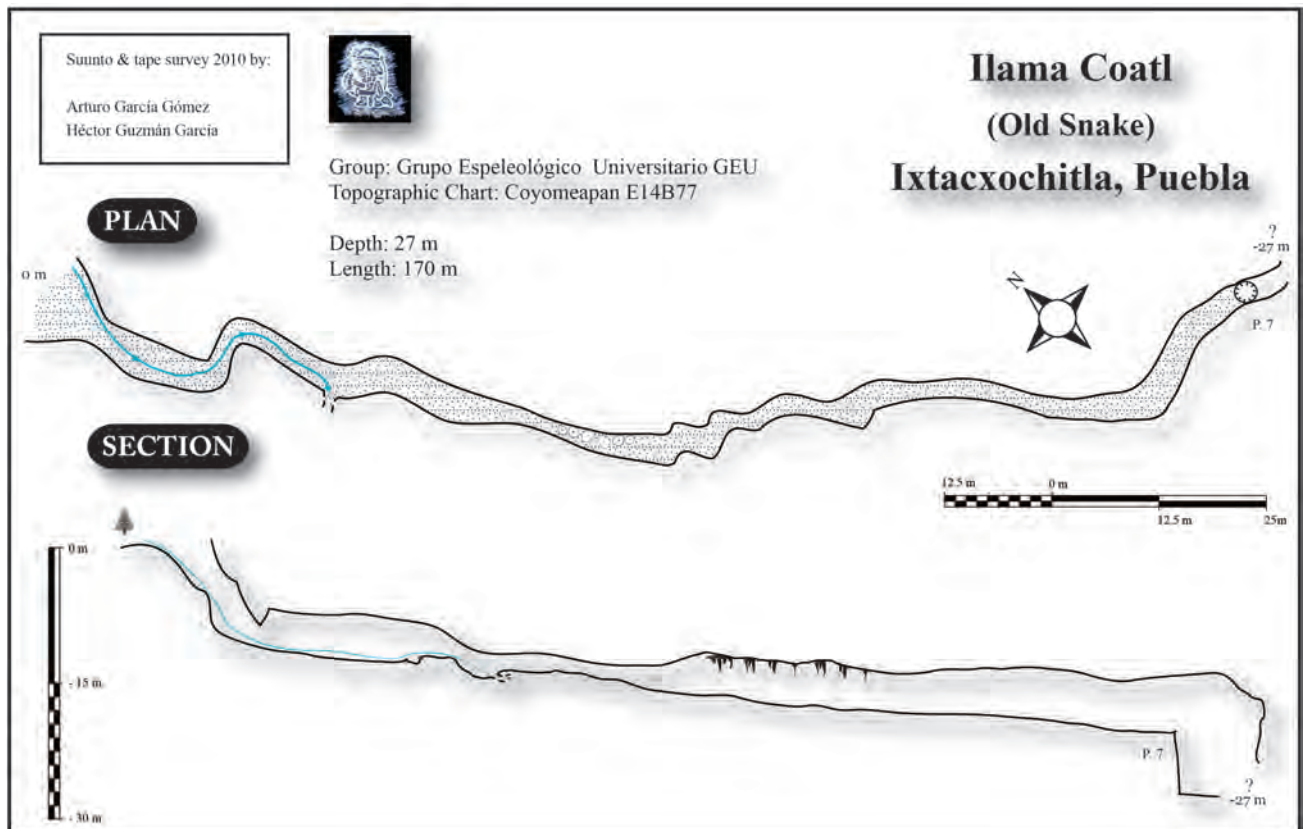
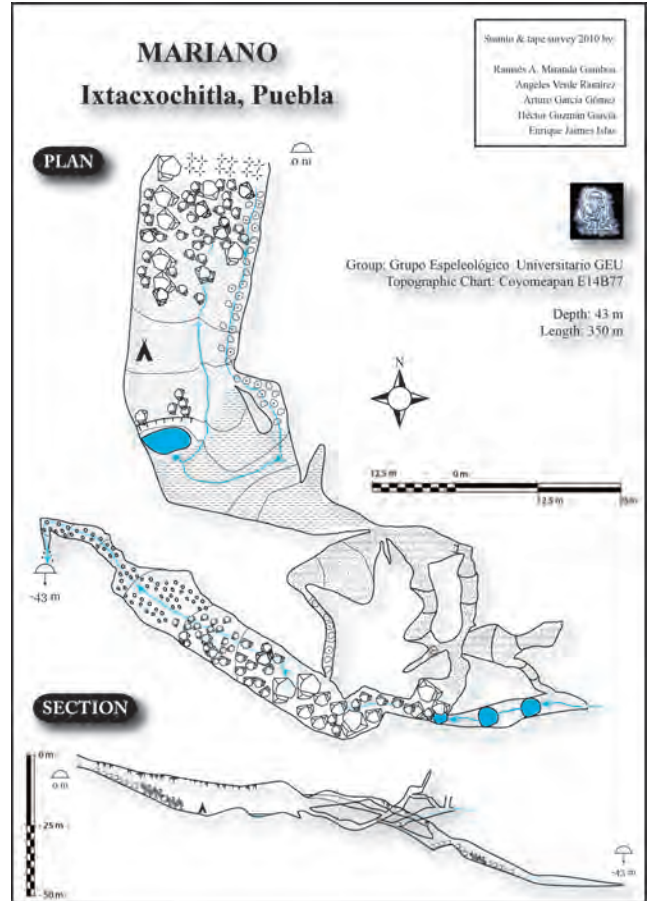
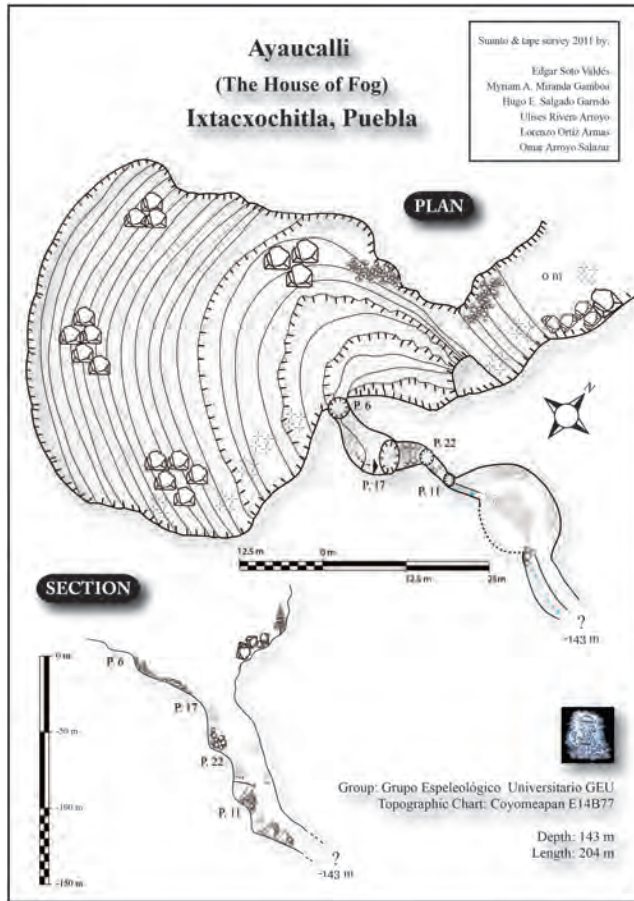


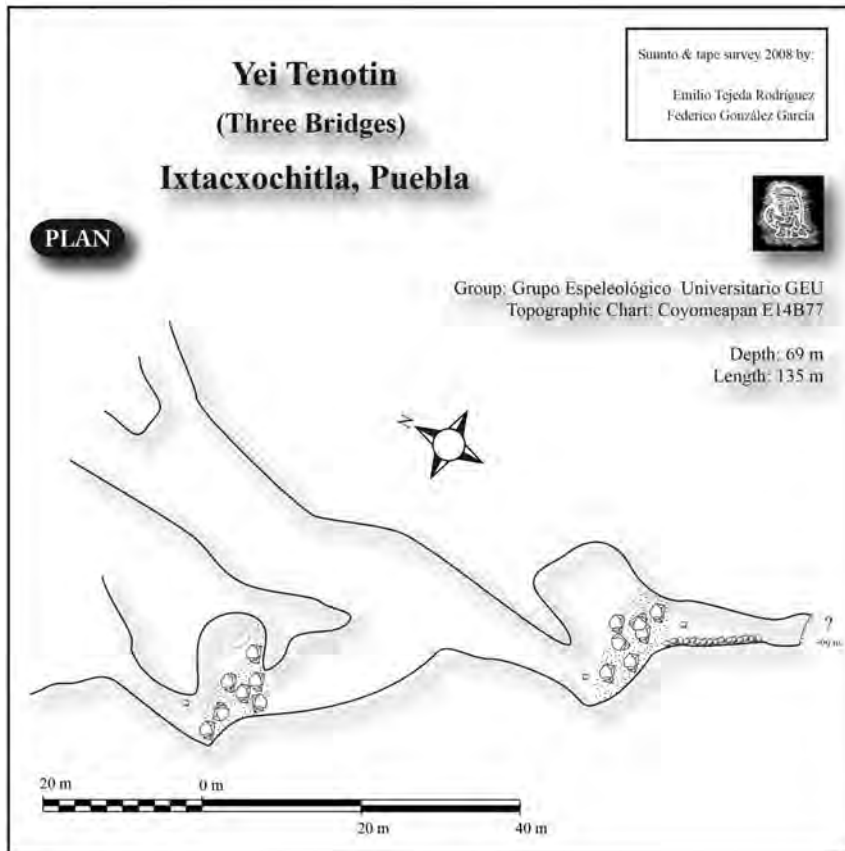




The entrance drop of the Ome Cihuanahuatin-Tehuixtli System. *Edgar Soto Valdés.*







that gives the impression, in plan view, of having both entrance and bottom at the same place. It has some dry passages and short pitches of 12, 7, 9, 6.5, 6, 7.2, 13.3, 7.4, and 11.2 meters. Right after the first pitch there is a small hole that connects to the surface on the left side. Fifty meters deeper there is a calcite pool system followed by a 6-meter pitch that connects to a meander covered with speleothems. Walking through here was difficult, as we tried not to damage or step on the formations. At the end of the passage there are two branches; one of them goes up, probably towards the surface. These branches have not been mapped yet. The main route changes direction from west to southwest, and it turns into a narrow passage with some pools and short drops. Then the cave changes direction again, heading southeast. The passage becomes active, with deep pools and a flowing stream, and it turns back to the north and ends in a collapse.

deep. Then the cave turns into a fossil gallery, narrow and uncomfortable to walk in. Then there is a drop that leads to another gallery, where rock turns into clay-like material that comes away easily. We encountered an underground stream and some flattens difficult to pass. From this point the cave becomes active, and after some climbs and pitches we reached the connection to Ome Cihuanahuatin.

Mediceos was discovered by Emilio Tejeda Rodríguez in June 2008. It was visited during the rainy season with the only objective of registering its location and wetness. It appeared that it would be dry another time and might go 100 meters deep. Mapping and exploration of this cave was finished in March 2009, during the dry season. The cave was named after Saturn's satellites, the *astros Mediceos*, named by Galileo in

honor of Cosimo II de' Medici in the seventeenth century.

The cave is located next to one of the roads on the hill, at UTM 14Q 0723808 E, 2027081 N, and 2085 msl. It has a total depth of 156 meters, a horizontal length of 407 meters, and a total length of 437 meters. Its peculiarity lies in its spiral shape

The Tsopelik-Ixtli System (Sweet-Face System) was found in March 2010 by GEU members. It has two entrances, a couple of big dolines close to each other. These caves were explored and mapped by different teams who ignored the fact that they were connected.

Tsopelik's entrance is located at UTM 14Q 0723752 E, 2027536 N, 2021 msl. The cave is 105 meters deep. It has a total length of 897 meters and

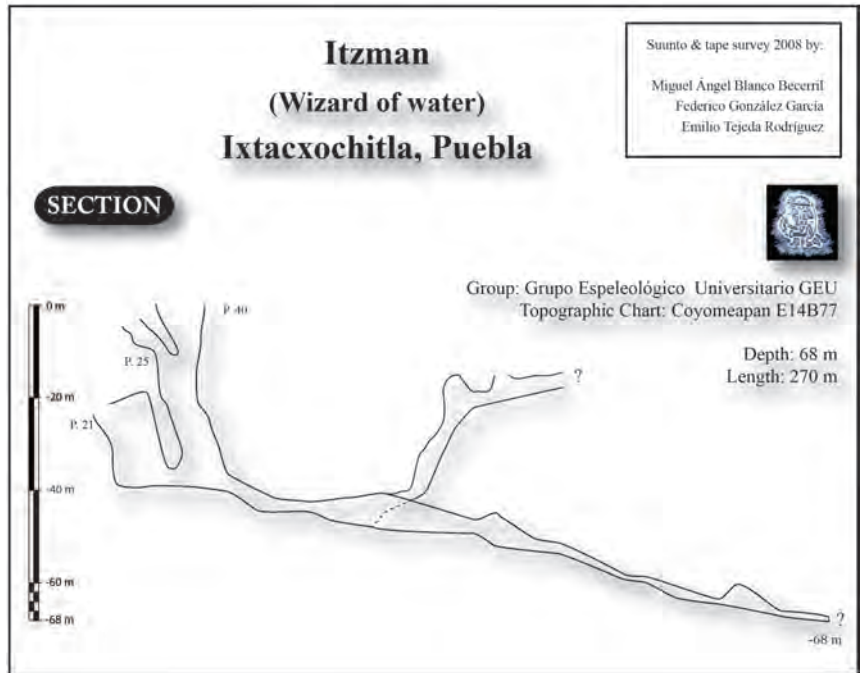
Myriam Miranda Gamboa and Rafael Reyes Marquéz surveying in the Tsopelik-Ixtli System. *David Cilia García.*





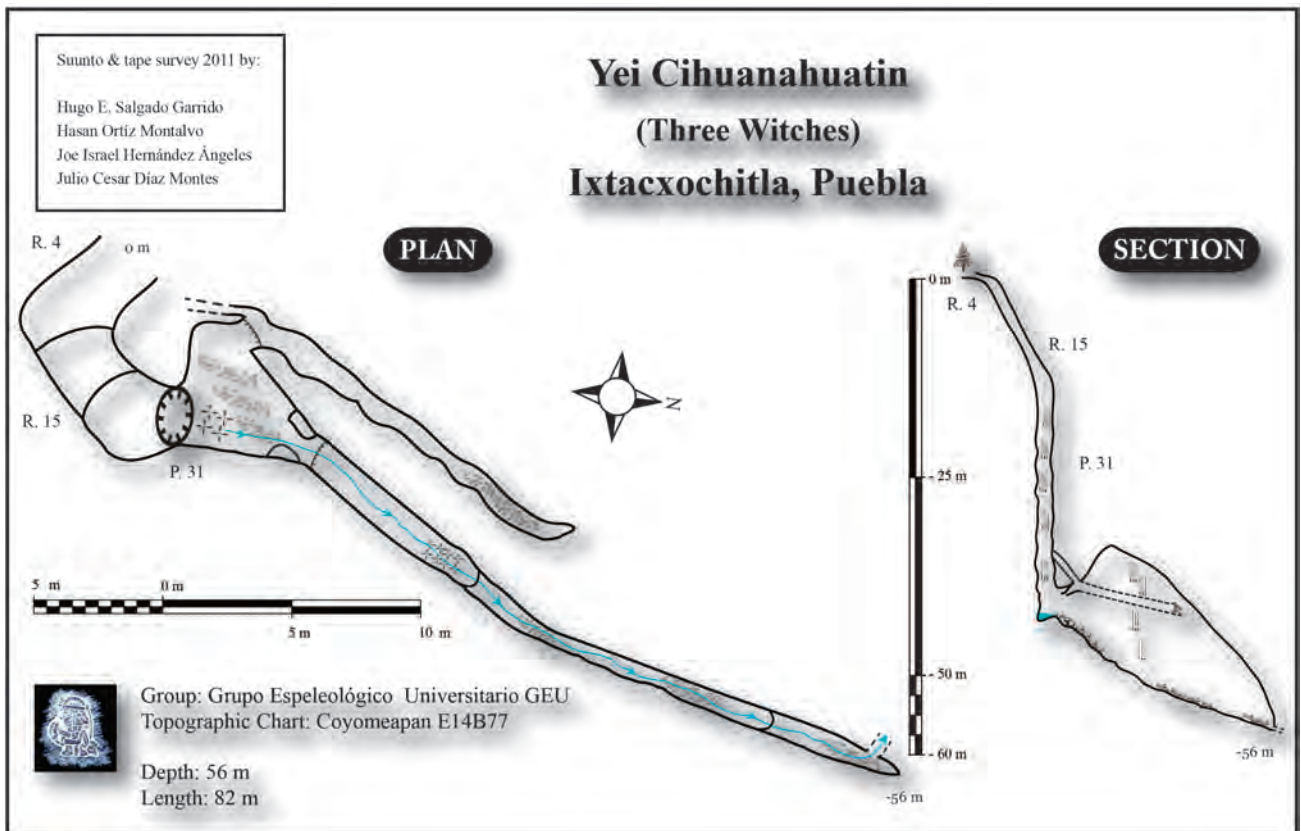
Ramsés Miranda Gamboa in the Chaneques sinkhole. *Angeles Verde Ramírez.*

a horizontal length of 746 meters. Though the cave is mainly horizontal, there are nine pitches. The cave begins with a 14-meter-deep pit. Then there is a steep, rocky slope very difficult to walk or even crawl



down. Beyond the rocks there is a passage 80 centimeters wide that leads to some crawls, climbs, and three pitches each 3 meters deep. The chamber at the bottom has five branches, including the entrance one. Two of them are really short, and one is still unexplored. The

other two continue southeast and northwest. The branch to the northwest has a 70-meter meander with water flowing below. Sometimes it is necessary to climb or go down to water level in order to advance through this narrow passage. Beyond this are the two connections to Ixtli,



one an 8-meter drop and the other a 12-meter dome. The branch to the southeast ascends beyond a crawl with some climbs up to a breakdown where the passage ends.

The entrance of Ixtli is a closed depression leading to two pitches, 15 and 18 meters deep. The cave continues as a 30-meter-long meander that can be chimneyed. It ends on a false floor with a drop that leads to a small chamber with three branches ending in sumps. There are two more pitches, of 6 and 28 meters. At the bottom of the second one there is a chamber followed by a passage of mud and speleothems. One way from it leads to a 12-meter pitch that is one of the connections to Tsopelik.

The other goes to a 15-meter pit where water falls and forms small pools. A few steps farther there is a chamber divided into an upward ramp covered in mud and a small climb that connects to Tsopelik. From that point both caves continue as a 77-meter-long meander with climbs and narrow places that make it really difficult. It is almost essential to get into the water, which is really abundant there, at some point. The system goes down to a flattener that ends in a sump where this spectacular cave ends.

On March 2011, cavers Edgar Soto Valdés, Ulises Rivera Arroyo, and Omar Arroyo Salgado found a

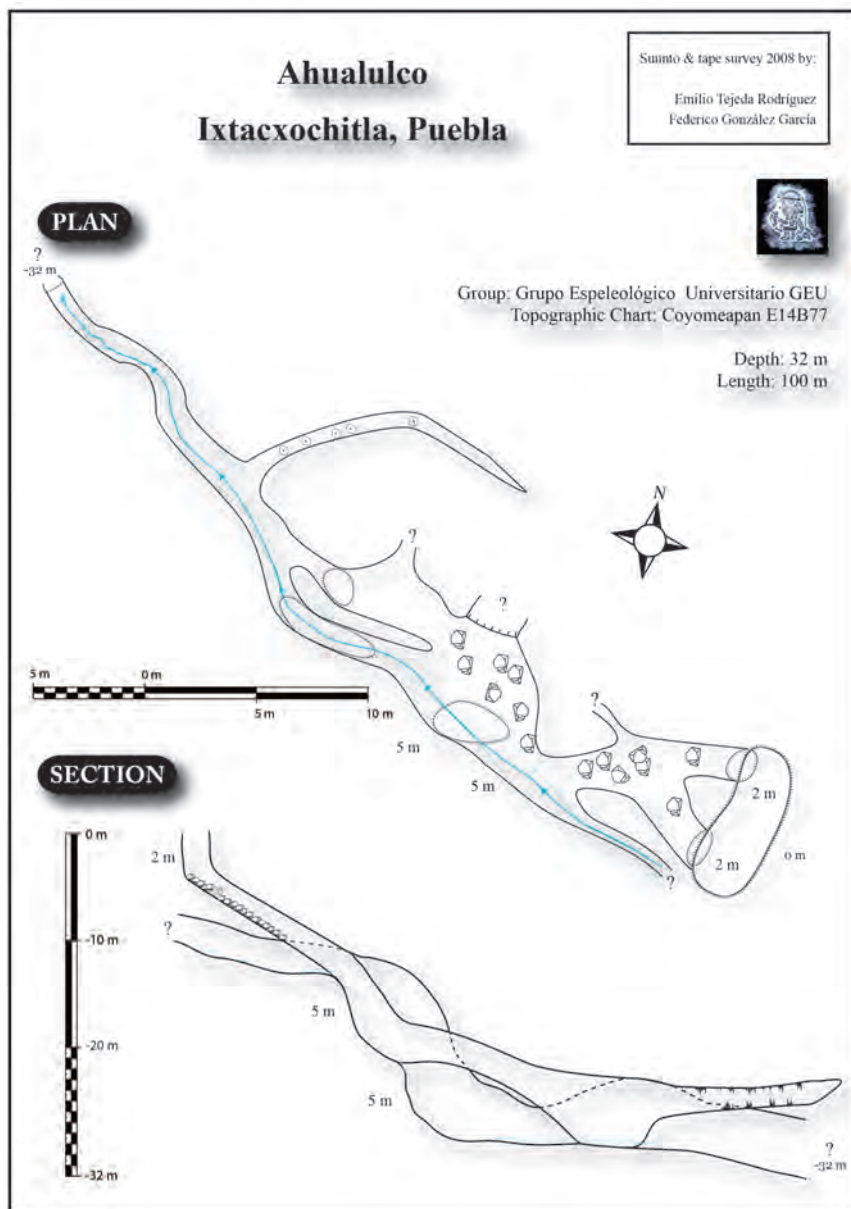
huge doline hidden in the forest. In **Ayaucalli** (The House of Fog) we can witness a spectacular phenomenon: fog coming from the woods looks for shelter inside the cave, and rises to the sinkhole as if it were its own home. It is located at UTM 14Q 0723970 E, 2027426 N, 2071 msl. The entrance consists of a big, pear-shaped sinkhole covered with trees and other plants. Its longest axis is 110 meters. There are many rocks and fallen trees that can fall into the cave.

The descent starts with an 80-meter slope down to the northeast. Right after the slope there are four pitches, of 6, 17, 22 and 11 meters. Then we had to climb down up to a huge chamber that leads to a passage covered with speleothems and sand that would be good for setting a bivouac. We found some evidence of former explorations in this place, probably carried out by the SQS. The main route turns southwest and becomes a 100-meter-long tunnel with a lot of breakdown. It ends at the top of another pitch that has not been descended.

Chanèques was found by David Tirado Hernández in 2006. We tried to find it again without success until 2011, when deforestation exposed the area. It was named after the legends told by the villagers about the guardians of the woods, the *chanèques*.

Its entrance is located at UTM 14Q 0723843 E, 2027476 N, 2097 msl. This cave is still being explored, but according to the latest calculations it is 87 meters deep and has a horizontal length of 43 meters and a total length of 107 meters. The cave starts with a 25-meter slope ramp down to a small ledge at the top of a 15-meter drop to another ledge from which a descent of 28 meters continues. There are waterfalls on the walls that create a flow entering the cave. At the base of the drops there is a ramp covered by rocks and fallen trees, beyond which are two passages that have not been surveyed yet.

Mariano was found by Emilio Tejeda Rodríguez and Gerardo Galindo Moreno. The cave was named after the Mexican speleologist Mariano Fuentes (1972–2004). It had



View in the Sirra Negra. *Israel Hernández Angeles.*

been used as base camp from 2008 to 2010 because of its flat floor and the availability of drinking water. It is located on Cerro Tzizintépetl at UTM 14Q 0722985 E, 2027739 N, 1878 msl. It has an horizontal length of 330 meters, a total length of 350 meters, and a depth of 43 meters.

The cave is mainly horizontal, so there is no need for fixing ropes. It has a wide entrance passage 26 meters long and 6 meters high, followed by a ramp covered in mud and fallen rocks. Then there is a room covered with speleothems and three narrow passages. Two of them rejoin in a wet passage with water coming from the east; it ends at a dome. While exploring it, we found some pottery and a bed-like stone that might have been used for shelter a while ago. The third passage leads to a breakdown slope, where the cave changes its direction from south to northwest. At the base of the slope there is a small passage that turns south to the end of the cave.

Ilama Coatl (Old Snake) was found by Don Goyo. It was explored in March 2010, but little of it has been surveyed. The name comes from the long, dry meander in the first section of the cave that resembles a snake. The entrance is a sinkhole located at UTM 14Q 0723720 E, 2027754 N, 1920 msl. It is still being explored, and we have just mapped the meander and a 7-meter pitch. So far it has a horizontal length of 168 meters, a total length of 170 meters, and a depth



of 27 meters. At this point, the cave becomes wet, and the stream flows down some pitches to a chamber with lots of formations.

The team was taken to **Yei Cihuanahuatin** (Three Witches) by Don Goyo in December 2011. It was named that because it is close to the entrance to Ome Cihuanahuatin (Two Witches) and we thought there would be a connection.

It is located at UTM 14Q 0723390 E, 2027800 N, 1920 msl, next to a corn field. It has a horizontal length of 39 meters, a total length of 82 meters, and a depth of 56 meters. The entrance of this small cave is pretty vertical, with slopes 4 and 15 meters long, some ledges, and a 31-meter pitch. At the end of that pitch there is a chamber and two passages. One of them is a 15-meter-high canyon that goes all the way up to the end of the cave. The other branch has not been completely mapped yet. It starts with a 1.5-meter climb on

a very unstable pile of rocks, at the top of which are two branches. One of them heads northeast and ends in a collapse; the other one heads west to a 31-meter pit where you can find insects and plant debris that may have come from another entrance.

Yei Tenotin (Three Bridges), **Itzman** (Wizard of Water), and **Ahualulco** were found and explored by Emilio Tejada Rodríguez and Federico González García in 2008. They are all located near UTM 14Q 0723744 E, 2027430 N, 2067 msl.

Yei Tenotin is 69 meters deep and 135 meters long. It has three entrances, one of which has the rock bridge after which it was named. This cave runs south and has some piles of breakdown.

Itzman is 68 meters deep and 270 meters long. Its name is due to the great amount of water present, even in the dry season. It has four entrances. Three of them join after pitches of 40, 25, and 21 meters, respectively. The main passage slopes downward until it narrows and the cave ends.

Ahualulco has a length of 100 meters and a depth of 32 meters. It starts in a doline and runs northwest. The cave has two entrances, both 2-meter pits that land on a slope. There is a stream that comes from the east. Along that stream there are two other pitches, of 5 meters each, and the cave ends 12 meters beyond. A side passage contains



Formations in Ayauacalli. *David Cilia García.*

some speleothems. A large passage, so far unexplored, heads off to the north.

The Sierra Negra consists of mountains of limestone, though there is sandstone and shale in lower regions. Rainfall and vegetation favor the karst process that creates various forms on the surface, such as lapies, as well as caves. Many of the entrances to the caves of the region are sinkholes. These caves are the most active, too, as they carry underground flows, either perennial or seasonal. Beyond their entrances, most of these caves have narrow, horizontal, descending passages, though they may include some short vertical drops.

Chaneques, Ayaucalli, Yei Cihuanahuatín, Yei Tenotín, and Tsopelik-Ixtli are located at the bottoms of dolines and capture water from the rain. Ilama Coatl, Ome Cihuanahuatín, and Ahualulco have permanent streams and are located at the bottom of a valley. Mariano and Mediceos are short horizontal caves. Both of them have dry chambers, though at some point they meet with active passages and small streams.

According to the data obtained during the exploration, it is evident that some of these caves are related, creating a net of underground cavities of similar morphology. For that reason it is very possible we will find new connections. We think that Ilama Coatl may be connected to the Tsopelik-Ixtli system. None of the caves described in this article is deeper than 300 meters. From

information on the Mexpé project web site, we think this may be due to the geologic structure here.

Surface water bodies are seldom found in this region. Water from rain flows into the caves to form underground rivers. Dolines of different sizes are the most common kinds of karst.

The information gathered during our visits allows us to set new objectives for further explorations in the region. On the one hand, we have contacted members of the Mexpé project, because we found that we are getting closer to their area and it must be useful to share information. On the other hand, pending activities include finishing the surveys of Chaneques and Ilama Coatl on our next trip, and we have located another six entrances that could be explored in further visits. We have been told by Don Goyo that there are other caves that we have not seen yet.

We would like to express our gratitude to Javier Vargas Guerrero, AMUNAM president, Arturo García Gómez, AMUNAM director of speleology, and Rafael Reyes Márquez, treasurer, for their teachings and support in the realization of this project. We would like to thank, as well, the members of the GEU for their enthusiasm and collaboration during the explorations. Special thanks to Gregorio Cacho and his wife Juanita for their hospitality and kindness, making us feel at home. To the memory of Miguel A. Blanco Becerril, our friend and colleague.

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Resultados de la exploración Ixtaxochitla 2008-2011

En este trabajo se presentan los resultados obtenidos en las exploraciones realizadas desde el 2008 hasta el 2011 por miembros del Grupo Espeleológico Universitario (GEU) en los alrededores del poblado de Ixtaxochitla y las faldas del cerro Tzizintépetl en el estado de Puebla. Como fruto de este trabajo se topografiaron un total de 11 cavernas, de las cuales 8 se exploraron hasta la sima y 3 quedaron pendientes de explorar y topografiar. Además se ubicaron 6 entradas de cavernas que quedan pendientes para futuras visitas.

MAPPING HOYO NEGRO

Roberto Chávez, Susan Bird, and Alberto Nava

In 2007 Alex Álvarez, Franco Atolini, and Alberto Nava discovered Hoyo Negro, a large sunken pit inside the Aktun Hu part of Sistema Sac Actun, located in Quintana Roo, Mexico. [See *AMCS Activities Newsletter* number 33, pages 95–98, and number 34, pages 53–58.] A few months later, as our team explored the bottom of this vast, flooded space, we located a series of animal remains belonging to the Late Pleistocene. As if this was not enough, the remains of an ancient human, most likely a Paleoindian, are scattered on a small ledge at about 140 feet (43 meters) depth. A remarkably well preserved skull rests on her humerus, watching over all of the animals that now inhabit this special place.

In addition to our quest to unveil Hoyo Negro's mysterious story, the documentation and protection of this incredible site has become a central part of our team's efforts. In 2009, we reported the site to the Instituto Nacional de Antropología e Historia, Subdirección de Arqueología Subacuática with the objective of having them take control of the site and its protection. We gave INAH all of our documentation and engaged the services of archaeologists, paleontologists, and geologists to help us on our quest. As part of the effort, we created the Hoyo Negro Consortium, a group of researchers and explorers working together toward the documentation and recording of the Hoyo Negro archaeological site. This cooperative endeavor has allowed key scientific experts to be involved while underwater tasks

Alberto Nava: betonavab@gmail.com

are undertaken by well-prepared divers under the guidance of the researchers.

As we began to interact with the researchers, it became obvious that our first task would be to produce an accurate map of the site. The map would be used to describe the structure of the pit and to mark the position of the main archaeological deposits, together with imagery collected within the site.

In this article we will present the current version of the map, and will describe the methods employed during its construction.

The first question we asked ourselves was, What kind of map should we create? Should the map be designed for paper printing, or should it be targeted toward computer viewing? Our desire to see a version of the map hanging on our living-room walls motivated us to create a 'dual mode' map. This design could be viewed on a computer screen, but also nicely printed and framed for display.

Most of the printed cave maps from Quintana Roo have scales ranging from 100 to 200 feet per inch. We found scales in this range to be too small to accurately position bones and other key features that we wanted to display on our map. For our purposes, we needed a scale in the 10 to 20 feet per inch range. We therefore collected data for the map using a scale of 10 feet per inch. This allowed us to include enough detail for a computer-generated map, but also supported a printed version of the map at 20 feet per inch. When printed on 24-by-36-inch paper, the

map displays the entire pit as well as 100 feet of each of the three tunnels entering Hoyo Negro. This scale also provides enough space to include a plan view, a main profile of the pit, and several small cross-sections of the adjacent tunnels.

One of our biggest challenges was to select the position of the main cross-section. We eventually decided to align it with the East Tunnel, even though there would be a gap in the passage leading into the pit, due to a large pillar that bends the tunnel out of its east-west direction.

Once the elements of the map were decided, we organized our work in stages in order to develop good mapping techniques and produce a working version of the map as we collected and processed the

Cenote Ich Balam. Roberto Chávez.





Alberto Nava and Kirill Egorov on the way to Hoyo Negro. *Daniel Riordan.*

data. We organized our work in the following stages: the plan view of the shallow areas, the main profile, the smaller cross sections, and the plan view of the bottom of the pit.

We have used a color scheme to depict the amount of water in the passages. Light blue shows areas where the floor-to-ceiling distance is between 5 and 50 feet, medium blue is used for floor-to-ceiling distances from 50 to 100 feet, and dark blue is used for sections with more than 100 feet of water.

Our previous experience with mapping was very limited, and had been largely restricted to the production of annotated stick-maps of different sections of Aktun Hu. For that reason we started with the shallow tunnels so that we could learn the techniques for creating more detailed maps in a less demanding environment. In doing so we developed a capable team that could then move into the deeper section once the procedures and techniques had been refined.

We started by collecting information to describe the outer walls. Our initial exploration lines were not appropriate for getting accurate wall measurements, so the first task was to lay a series of lines that were relatively close to and somewhat parallel to the different walls. These lines were placed to form small loops, so that survey errors could be

calculated and if necessary the area could be resurveyed to reduce errors.

Once the lines were in place, the perpendicular distances to the walls were measured in 5-foot increments along each line. Data from both the survey lines and the side measurements were entered into a drawing program called Inkscape, similar to Adobe Illustrator, and a first map was produced, giving us a sense of the shapes and sizes of the passages. Soon after that, we laid a line around the edge of the Hoyo Negro itself and collected measurements from it to the edge of the pit.

After entering all of these data we finally had a pictorial view of the walls and shape of the pit.

The next task was to record details of the floors, boulders, stalagmites, columns, and other features of interest in the tunnels. We started by creating a set of symbols to describe each type of object and used that to create our legend. Working on a small section at a time, we selected a group of features to survey. For each feature, we collected dimensional measurements, positioned the feature relative to our survey lines, drew a small sketch, and took photos of the feature from top and side views. This procedure was used on the East Tunnel and the Southwest Tunnel. The process was repetitive and time-consuming, but provided the opportunity to record excellent details of features within the tunnels.

The photos were loaded into our drawing software and used as templates or drawing aids to create a series of objects corresponding to the cave features. These were then scaled using the measurements and positioned on the map by using the location data we had gathered. After many days, the tunnel details began to appear on our computer map.

We used a different

underwater sketching technique to record the Northwest Tunnel and to fill in some of the missing data from locations within the site. For a few small parts of the cave, we printed waterproof maps that included the outer walls and survey lines. To enhance the accuracy of the sketch, we installed temporary markers on the lines spaced at 5-foot increments so that the surveyor could find the corresponding positions on the printed maps. The surveyor was then able to move along the line with clear visual references while sketching the main features on the floor. Predetermined symbols were used to draw the objects as the surveyor placed their estimated dimensions and locations onto the map. This technique proved to be ten times faster than our more precise method, but it introduced a source of variability. The level of accuracy depended on the surveyor's ability to draw underwater with a good sense of scale. As we became more confident and proficient in our sketching techniques, this method was more regularly applied.

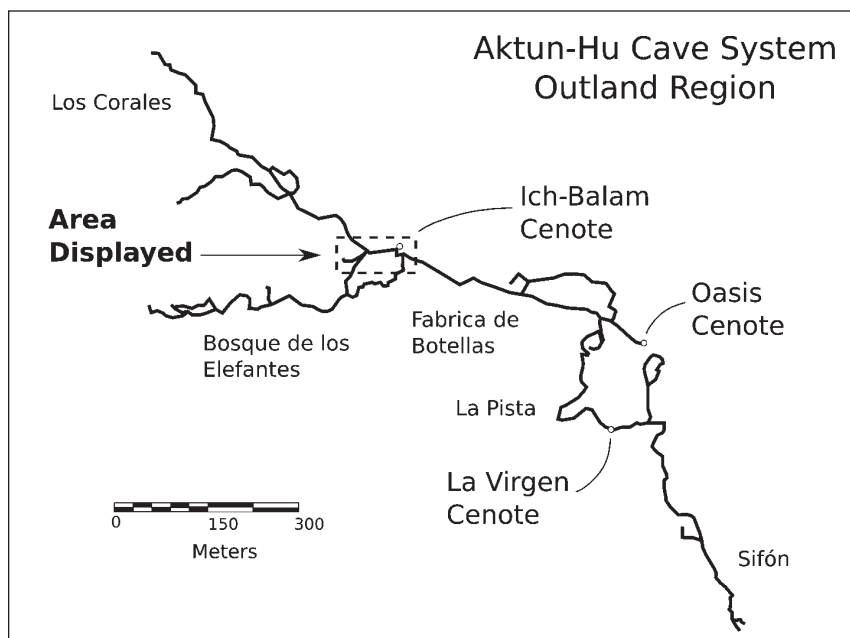
The underwater sketching was particularly useful when we conducted second passes of the same area. After the original method was used to create the preliminary map, it was printed and taken underwater. More details were then sketched onto the map. We found that the combination of approaches offered the "best of both worlds."

Susan Bird and Alberto Nava working on the survey. *Roberto Chávez.*



To complement the shallow plan view we drew a profile in the east-west direction. This view originates at the Ich Balam Cenote located 200 feet away from the Hoyo Negro and runs all the way to the far west end of the pit. In order to create the profile we used the original exploration line coming from Ich Balam, which happened to match the desired direction. We extended the line eastward past the Ich Balam Cenote, and then followed it to the west across the pit. Along the way, we had to contend with a large pillar that blocks the direct path from the East Tunnel to the pit. Once the extended line was in place as our reference point, we took distance measurements to the floor and ceiling every 5 feet along the line. We were able to collect approximately 80 percent of the data we needed to draw the profile with this technique.

The remaining areas were more challenging to survey. They included the side walls under the east and west overhangs of the pit, the floors under the overhangs, the debris cone at the Ich Balam Cenote, and the air dome and small entrance at the top of dome. We utilized a combination of tools and methods to collect these measurements, depending on the situation. We found that a depth sounder worked well across the pit, a Disto was successful in the air dome, and a measuring tape was used in situations where the devices got confused.



Once all of the data were collected and entered into Inkscape, we created a nicely aligned plan and profile, providing an excellent overview of the system.

Once the plan and profile were completed, we decided to construct three cross-sections of the tunnels. We started with one view at the half-way point in the East Tunnel, and then created two more views looking into the Southwest and Northwest Tunnels. These vantage points allowed the viewer to get a sense of what to expect as he traversed from Ich Balam toward the pit and then traveled around its perimeter.

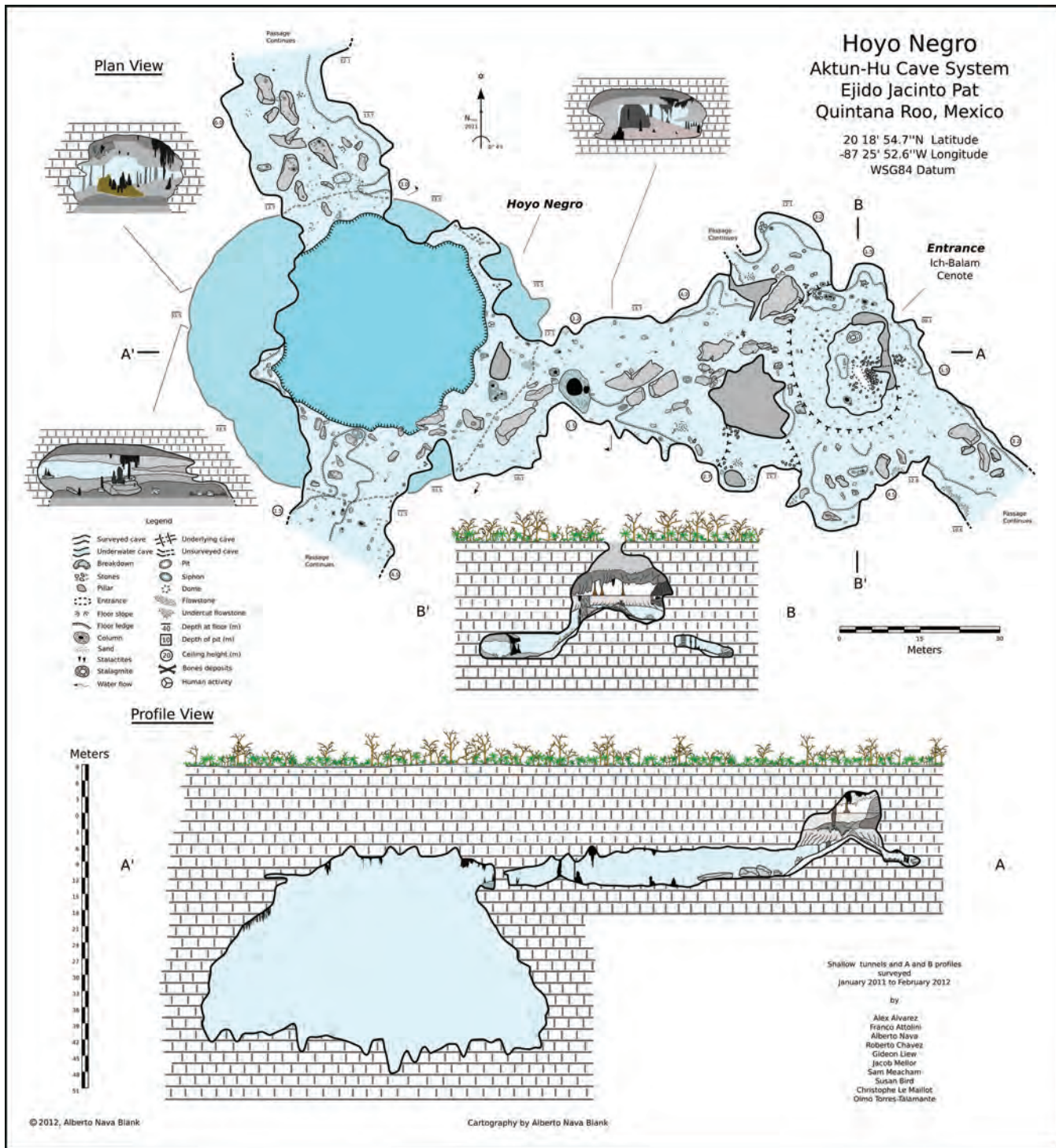
In order to build each cross section, we created a photo mosaic of the desired view. We installed a line perpendicular to the tunnel, placed markers every 5 feet on the line, and took one image at each marker. After studying these images, we selected the main objects to be drawn on the map and returned to the site to measure their heights and widths, as well as the dimensions of the passage.

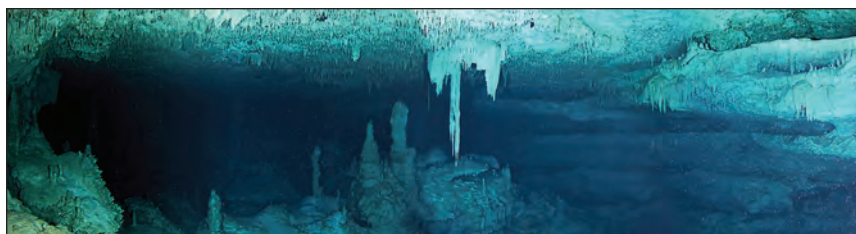
Once the mosaic was manually stitched in the computer, the selected objects within the mosaic were drawn using the image as a reference. These were placed on the map and scaled to match.

When the plan view and the tunnel cross-sections were completed, we realized that the Ich Balam Cenote entrance had not been adequately documented. We considered this an important feature, so we created another cross-section of the cenote that displayed the small entrance at the top of the air dome. This cross section was oriented in a north-south direction.

The first version of our map does not include details of the bottom of Hoyo Negro. We wanted to develop our mapping capacity in the shallows before attempting to work

Susan Bird, Jacob Mallor, and Alberto Nava. *Roberto Chávez.*





Panoramas assembled to aid in drawing the cross sections of the Southwest Tunnel (top) and the Northwest Tunnel.

at the bottom of the pit, where gas logistics and decompression become limiting factors. Nevertheless, we worked to provide a general sense of the dimensions of the bottom section.

We placed four survey lines around the circumferences of the Pit, at depths of 60, 80, 110, and 150 feet. The first three lines went all the way around the pit, while the 150-foot line covered only half of the bottom, as the northern section is shallower than the south end. We experimented with adding data from all four survey lines to the map, but

concluded that data from only the 110-foot depth would provide the best sense of shape of the bottom section. We collected distances to the wall at 5-foot increments along the 110-foot line, to create a depiction of the wall structure near the bottom of Hoyo Negro.

From December 2010 to February 2012 we conducted six work sessions at Hoyo Negro to create a map of the shallow sections of the site. Our team, consisting of Alex Álvarez, Franco Attolini, Alberto Nava, Susan Bird, Roberto Chávez,

Jacob Mellor, Sam Meacham, Christophe Le Maillot, Fred Devos, Daniel Riordan, Gideon Liew, and Olmo Torres-Talamante, developed a high level of skill for mapping sections of the cave system using our combination of traditional cave-survey techniques and photo-mosaic enhanced drawing. The Hoyo Negro map will be used by researchers to obtain a good sense of the morphology and dimensions of the site and will serve as a base for accurate location of specimens and images.

We are now moving into the next phase of our mapping efforts, which will include the building of an interactive version of the map that will allow computer access to over one thousand images and more than four hours of video footage. We will also be creating a plan view of the floor of the Hoyo Negro.

We would like to thank Jim Coke for his support and guidance during the construction of the Hoyo Negro map. Our mapping efforts were funded in part by a National Geographic Expeditions Council Grant. We would also like to thank the following other people and organizations for their help and support during this effort: Pilar Luna, Dominique Rissolo, Chris Underwood, Instituto Nacional de Antropología e Historia, Nautical Archaeology Society, Archaeological Institute of America, Waitt Institute, CINDAQ, Zero Gravity, BAUE, and GUE.

Topografiando el Hoyo Negro

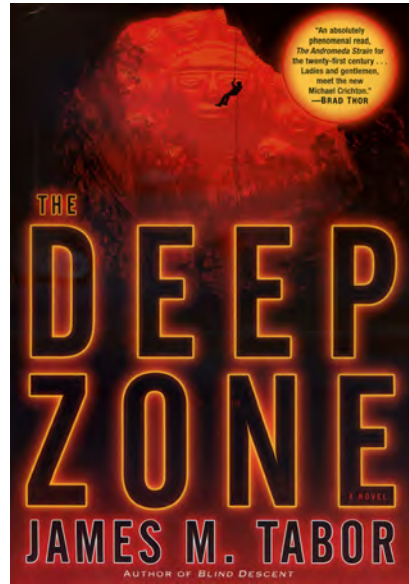
El pozo Hoyo Negro, en Aktun Hu, Quintana Roo, está siendo topografiado a detalle para ayudar en estudios científicos. Este artículo describe las técnicas usadas para producir una vista de planta detallada de las partes a menor profundidad en el Hoyo Negro así como de su perfil. Un mapa detallado del fondo del pozo, mostrando los hallazgos arqueológicos y paleontológicos, será realizado próximamente.

BOOK REVIEWS

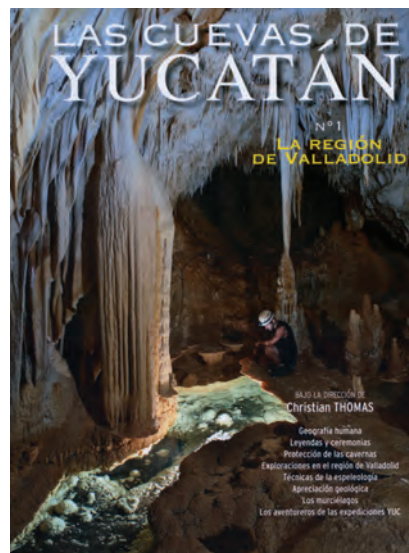
The Deep Zone. James M. Tabor. Ballantine Books, New York; 2012. ISBN 978-0-345-53061-5. 6 by 9 inches, 418 pages, hardbound. \$26.00.

In this novel, a drug-resistant variant of a bacteria has symptoms similar to that of the Ebola virus and breaks out among hospitalized U.S. troops in Afghanistan. A bioluminescent moonmilk deep in a cave in Oaxaca, Mexico, may hold the cure. A good bit of the action takes place in the cave, and the author makes use of the knowledge he gained in writing *Blind Descent* about the exploration of deep caves. Some readers will recognize Llano Cheve and the entrance to Cueva Cheve, though not the cenote in the field. The cave does resemble Cheve, augmented by lethal concentrations of hydrogen sulfide gas and a long lake of sulfuric acid. The cave is called Cueva de Luz, similar to the name of Cueva de la Villa Luz in Tabasco that does feature those chemicals, although not to that extent. At least there are no fire-breathing monsters, but I suppose some could be written in when the movie is made. The book is an action thriller, I guess, of the James Bond variety, lots of guns and bad guys, though no really big explosions.

The book might almost be called science fiction and fantasy in a few places, notably the vertical technique used, but a lot of background is based loosely on fact. Besides echos of *Blind Descent* and *The Hot Zone*, there are probably nods to other books I have not read. Sometimes I got the impression that some of the detail was included mainly to show off the author's research, but perhaps that's typical of the genre. As in *Blind Descent*, there are glitches, some of which should have been obvious to an editor without special knowledge. The thickness of 20 mils has become 20 millimeters. Can you imagine a hazmat suit made of 20-millimeter plastic?



Given the way Tabor made caving sound like the most exciting and dangerous thing in the world in his non-fiction (more or less) *Blind Descent*, I shuddered at the thought of what he might do in fiction. But that sort of thing works better, I guess, in a novel like this, where the reader does not expect realism. I'm not much of a reader of this sort of book, and I won't seek out more, but it wasn't bad.—Bill Mixon



Las Cuevas de Yucatán: La Región de Valladolid. Edited by Christian Thomas. Ediciones Xibalba, Montreuil, France; 2011. ISBN 978-2-9539564-0-5. 7 by 10 inches, 164 pages, softbound. €40.

Despite its title, much of this book is really a general discussion about the caves and cenotes of the entire peninsula, with chapters on the geography of the Yucatan (Christian Thomas), traditions and legends (Carlos Evia Cervantes), conservation (Fátima Tec Pool), caving techniques (Christian Thomas), geology (Christian Thomas), and bats (Yan Thomas). But pages 56–103 contain a survey of caves and cenotes in a rectangular region roughly centered on Valladolid, Yucatán, and encompassing Kaua and Santa Rita. There are descriptions and generally simple maps and photographs of twenty-nine caves and cenotes. Many more are labeled on a location map, which also contains dots for a very large number of additional cenotes, so the survey of the region is by no means complete. Among the better-known caves in the area are Aktun Kaua (see *AMCS Activities Newsletter* 26, pages 65–69) and Grutas de Balancanche (*Act. Nl. 27*, pages 79–83) in the west and Madre Cristalina in the east near Santa Rita.

The entire book is heavily illustrated with color photographs and maps. This is supposed to be the first of a series. I imagine when others are published they may not contain as much peninsula-wide general information. Volume 2 is supposed to cover Cancún and Playa del Carmen, Quintana Roo. There is also a French version of the Valladolid volume, titled *Les Grottes du Yucatán*. See the web site <http://xibalba-yucatan.com>. The Spanish version is available in Mexico from the Grupo Espeleológico Ajau in Mérida for Mex\$300.—Bill Mixon

ACTUN XCOCH: A WATERING PLACE FOR AN ANCIENT CITY

Eric Weaver

Actun Xcoch is one of the more well known caves in the Puuc, Yucatán, area. The first recorded visit to Xcoch was by John Lloyd Stephens in 1841 during his classic expedition through the Yucatan recorded in *Incidents in Travel in Yucatán*. At the time, the cave was actively being used by the local villagers of Nohcacab. The cave contained a pool of water, a scarce resource in the area. While Stephens was disappointed that the cave did not contain the majestic shrine described and promised by the local villagers, he was greatly impressed by evidence throughout the cave suggesting its use over the course of hundreds of years by thousands of people. There are no further records of the cave until the 1970s, when a group explored and inventoried it for invertebrates [see *AMCS Activities Newsletter* number 1, page 7, and *AMCS Bulletin* 3, *Studies on the Caves and Cave Fauna of the Yucatan Peninsula*, page 278.]. The entrance had been sealed up with debris and had to be re-opened in order to gain access. The group was denied access to the lower passage containing the water source by large boulders obstructing the connection. Most likely this had been sealed intentionally, as it was not uncommon for the Maya to do this to protect their sacred sites during times of war. As the town of Nohcacab was destroyed during the Caste War in 1849, this may have occurred very shortly after Stephens's visit to the cave.

In 2006, Michael Smyth began surface excavation of the Xcoch site.

weaverem@ucmail.uc.edu

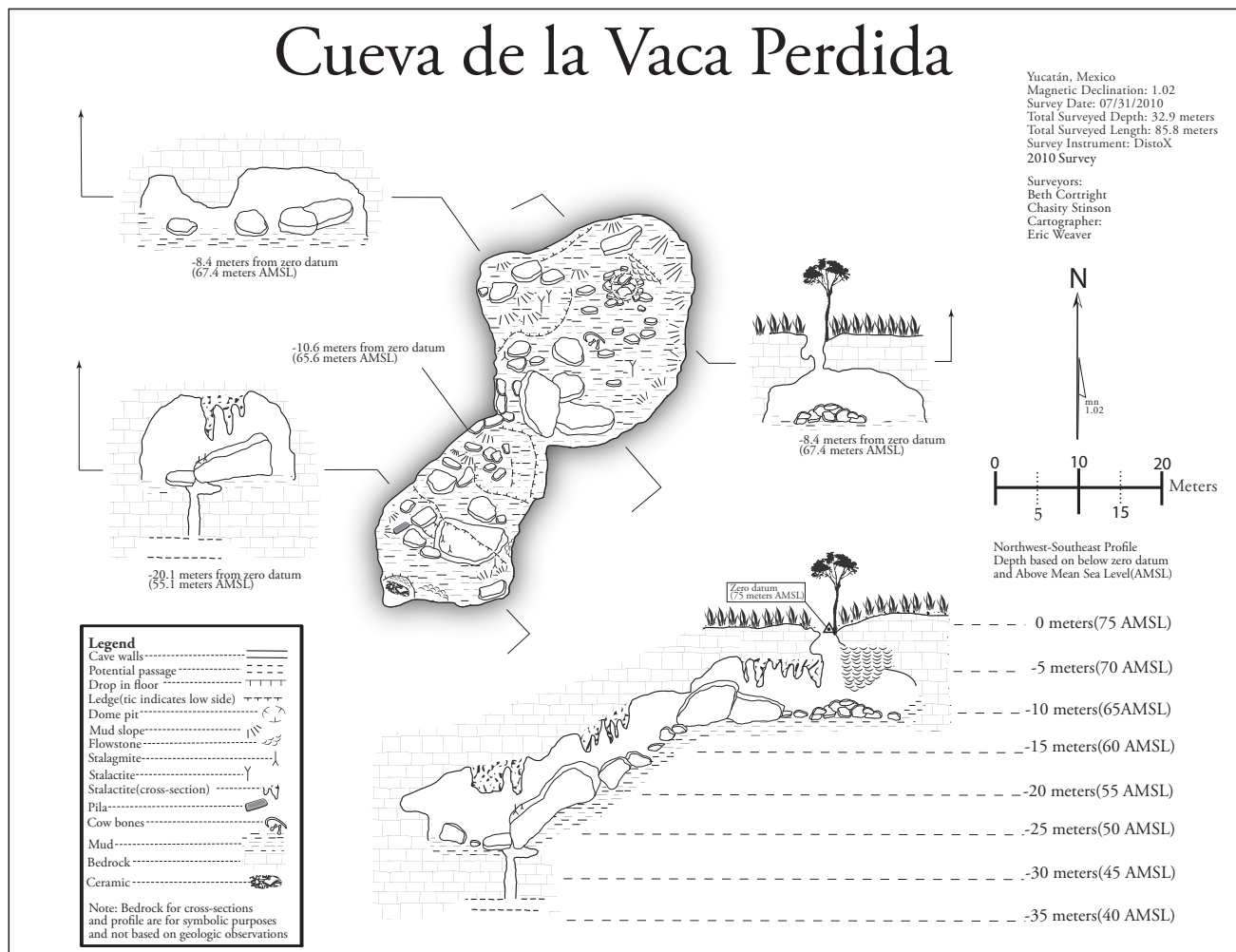
During the process, he decided to examine Actun Xcoch. The access route to the water was opened. In his exploration of Xcoch, Smyth noted that the cave contained an enormous amount of ceramic fragments strewn throughout the cave. Within the ceramic fragments Smyth located, several were of Yotolin Patterned Burnished—the oldest ceramic type known in the Yucatan, suggesting activity in the cave was occurring at least by the Middle Preclassic (about 800 BC). Smyth decided that further investigation of the cave was necessary and organized a project to focus specifically on the cave. The focus of the project was to survey the cave, including an inventory of visible archaeological items, for a future thorough excavation. Since the surface work at the Xcoch site focused on Maya adaptation to climatic conditions during almost two thousand years of the city's occupancy, a supporting objective of the cave survey project was to locate speleothems for stable-isotope analysis to further the paleoclimatic study.

The Xcoch archaeological site includes a 10-hectare acropolis that is one of the earliest locations in the Puuc to present megalithic-style architecture. Actun Xcoch is located adjacent to a pyramid close to the main plaza of the site. Stairways on each side of the pyramid suggest that this may have been a radial pyramid, a structure used for ritual purpose that may have been connected with astronomical observations. Later excavations revealed that a stairway from the pyramid had stretched down to the entrance of the cave. The

survey of the cave, made in 2009 and 2010, resulted in a surveyed length of 1.286 kilometers. The depth from the entrance of the cave to the lowest point, the water source, was 34.9 meters. [Only the 2009 survey is shown on the accompanying map.] While oxygen levels are low throughout the cave, the lowest sections revealed significantly lower levels at which lighter and matches are unable to burn, making the survey in this area extremely difficult.

An inventory of the cave provides significant evidence that it was a major source of ritual activity. Ceramic types in the cave indicate a history of use from Middle Preclassic through the late Classic. Burro bones near an altar indicate use of the cave during Colonial times. Two *pilas*, or stone troughs, one in the main chamber and the other near the water source, would most likely have been used as part of water rituals dedicated to the Maya rain god Chac. An obsidian blade was found in an area separated from the main passage, indicating that the cave was used to conduct bloodletting rituals. Human bones were located in several areas of the cave. It is unclear whether these remains were funerary or from ritual sacrifice; but many of the bones were from small children and infants that were a favored offering to the rain gods. An analysis by John G. Jones of sediment samples of the cave indicates that the vases, brought intact by the Maya and then ritualistically broken, contained offerings of maize, manioc, and cotton. The cave is also littered with torch fragments, from which charcoal samples were obtained. Carbon samples from these

Cueva de la Vaca Perdida



confirm significant activity in the cave into the Terminal Classic period (about AD 700–900).

Several of the passages at Xcoch are close to the surface, and there may have been several entrances to the cave at one time. These may have

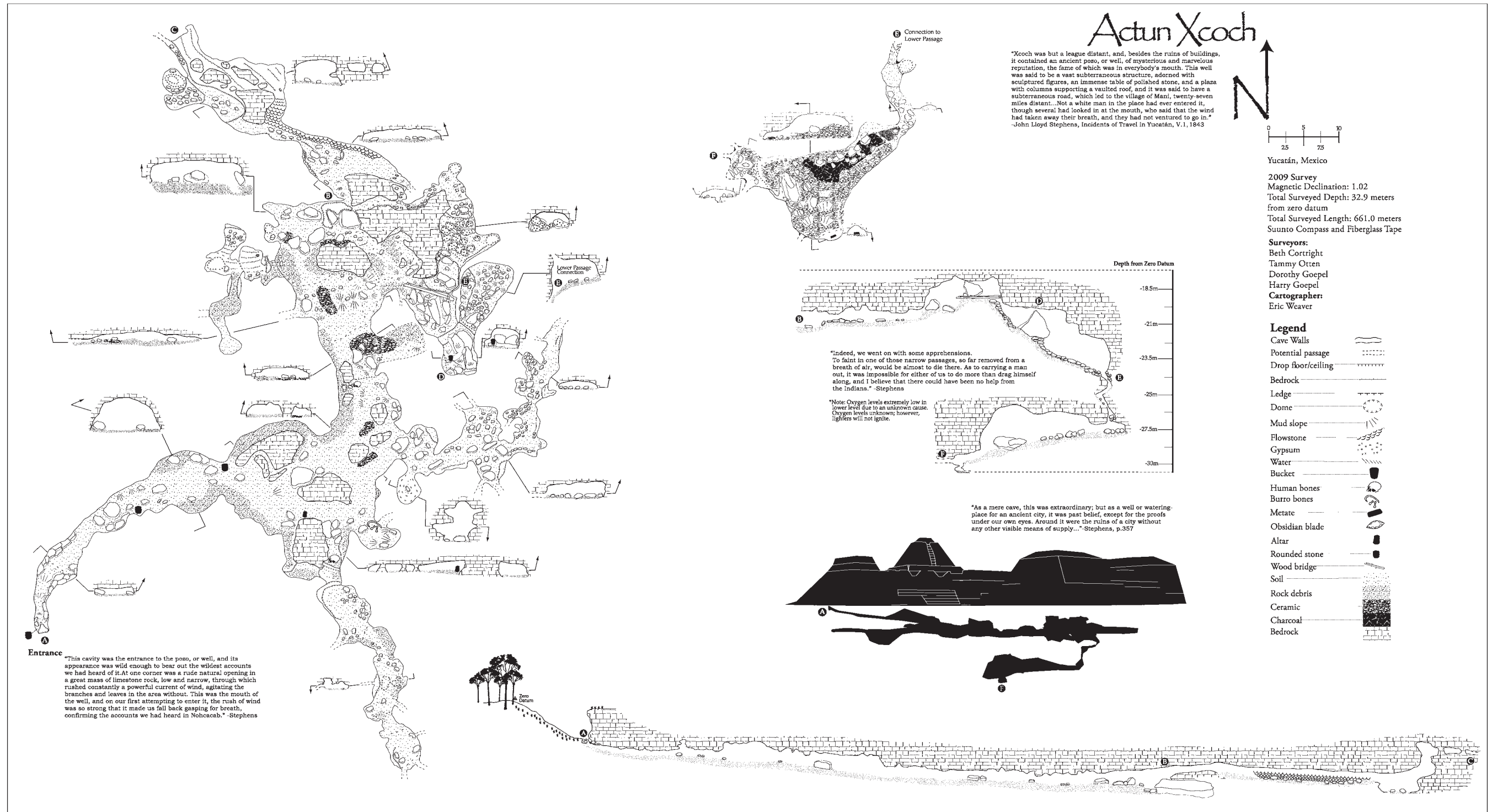
been closed intentionally, through disuse, or by additional construction. An overlay of the cave survey shows an architectural feature connected with the main plaza at the end of each passage. While this may have developed through coincidence, the

fact that Xcoch was a long-established ritual cave and that the Maya had a strong interest in geomancy—constructing architecture to represent sacred space—suggests that this was part of the early layout of the site.

Unfortunately, the search for speleothems usable for paleoclimate studies at Actun Xcoch was unsuccessful. During the second year, a small passage revealed the only known speleothems in the cave. This area had several scar marks, broken speleothems, and tools, indicating that speleothems had been extracted by the Maya. As speleothems were a

The water was in a deep, stony basin running under a shelf of overhanging rock, with a pole laid across on one side, over which the Indians leaned to dip it up. . . . The sight of it was more welcome to us than gold or rubies (Stephens 1843, p. 216). *Beth Cortright*.





In order to preserve as much detail as possible in this reduced version of the beautifully drafted 42-inch-wide original, gray shading has been eliminated so that it can be printed without halftoning. This version of the map shows only the 2009 survey.



And a strong circumstance to induce the belief that it was once used by the inhabitants of a populous city, is the deep track worn in the rock. For ages the region around has been desolate, or occupied only by a few Indians during the time of working in the milpas. Their stragglng footsteps would never have made that deep track. It could only have been made by the constant and long-continued tread of thousands. It must have been made by the population of a city (Stephens 1843, p. 217). *Beth Cortright.*

necessary part of the project, it was decided to attempt to locate other caves near Xcoch that might contain active speleothems. With perseverance and some luck another cave was found several kilometers away that appeared to offer a chance for success. The cave, referred to as Cueva de la Vaca Perdida, has a pit entrance that leads into two large chambers with active formations. Some evidence of a Maya presence was observed, including ceramic fragments in a high alcove and a *pila*. Evidence of the extraction of speleothems was also present. The cave was discovered at the end of the second (2010) field season and was not fully explored until the following year.

In 2011, work began by dropping a second pit, which resulted in a passage that was choked by rock debris. A short dig resulted in a crawl and a sudden drop into another chamber. Presence of the Maya still seemed evident at this level, as one speleothem was definitely "chopped."

From the chamber a long, wet, tight crawl led to another drop. At the bottom of the drop is a chamber that is mud-choked. While the passage may continue, it was determined that additional progress would be dangerous, time-consuming, and unlikely to further the project. The survey of Cueva de la Vaca Perdida concluded at a depth from the entrance of 61 meters (to about 17 meters above sea level) over a length of 103.3 meters. [Only the 2010 survey is shown on the accompanying map.] Several speleothems were found and brought back to be used for paleoclimate studies. The results of the analyses are in progress. In the upcoming field season we hope to continue to locate caves containing more speleothems for paleoclimate studies and to conduct a focused excavation in Actun Xcoch.

Project members have included Eric Weaver, Michael Smyth, Nicholas Dunning, Harry and Dorothy Goepel, Beth Cortright, Chasity Stinson, Tammy Otten, and Jane Slater. The project could not have been able to succeed without the support of the National Science Foundation, the National Geographic Society, the Waitt Institute, the Cleveland Ohio Grotto, the Dogwood City Grotto, and the National Speleological Society.

Actun Xcoch: Fuente de agua para una ciudad antigua

Actun Xcoch es una cueva bastante conocida en las colinas Puuc de Yucatán, descrita por primera vez en un libro de 1841. Como parte de un proyecto arqueológico en las ruinas mayas en Xcoch, la cueva fue topografiada a una longitud de 1.286 kilómetros. Una cueva pequeña en los alrededores, Cueva de la Vaca Perdida, fue topografiada también, y algunas formaciones fueron recolectadas para estudios paleoclimáticos.

HISTORICAL REPRINT

JOHN LLOYD STEPHENS
IN ACTUN XCOCH

This is the first published account of Actun Xoch, Yucatán. It appeared in Stephens's book Incidents of Travel in Yucatán, published in 1843 by Harper and Brothers. The material quoted here is from pages 211–217 of volume 1.

The first place which we proposed visiting was the ruins of Xoch, and in the very beginning of our researches in this neighborhood we found that we were upon entirely new ground. The attention of the people had never been turned to the subject of the ruins in the neighborhood. Xoch was but a league distant, and, besides the ruins of buildings, it contained an ancient *pozo*, or well, of mysterious and marvellous reputation, the fame of which was in everybody's mouth. This well was said to be a vast subterraneous structure, adorned with sculptured figures, an immense table of polished stone, and a plaza with columns supporting a vaulted roof, and it was said to have a subterraneous road, which led to the village of Maní, twenty-seven miles distant.

Notwithstanding this wondrous reputation and the publicity of the details, and although within three miles of Nohcacab, the intelligence we received was so vague and uncertain that we were at a loss to know how to make our arrangements for exploring the well. Not a white man in the place had ever entered it, though several had looked in at the mouth, who said that the wind had

taken away their breath, and they had not ventured to go in. Its fame rested entirely upon the accounts of the Indians, which, coming to us through interpreters, were very confused. By the active kindness of the *padrecito* and his brother, the new *alcalde segunda*, two men were brought to us who were considered most familiar with the place, and



they said it would be impossible to enter it except by employing several men one or two days in making ladders, and, at all events, they said it would be useless to attempt the descent after the sun had crossed the meridian; and to this all our friends and counsellors, who knew nothing about it, assented. Knowing, however, their dilatory manner of doing business, we engaged them to be on the ground at daylight.

In the meantime we got together all the spare ropes in the village, including one from the *noria*, and at eight o'clock the next morning we set out.

For a league we followed the *camino real*, at which distance we saw a little opening on the left, where one of our Indians was waiting for us. Following him by a narrow path just opened, we again found ourselves among ruins, and soon reached the foot of the high mound which towered above the plain, itself conspicuous from the House of the Dwarf at Uxmal, and which is represented in the engraving above. The ground in this neighborhood was open, and there were the remains of several buildings, but all prostrate and in utter ruin.

The great *cerro* stands alone, the only one that now rises above the plain. The sides are all fallen, though in some places the remains of steps are visible. On the south side, about halfway up, there is a large tree, which facilitates the ascent to the top. The height is about eighty or ninety feet. One corner of a building is all that is left; the rest of the top is level and overgrown with grass. The view commanded an immense wooded plain, and, rising above it, toward the southeast the great church of Nohcacab, and on the west the ruined buildings of Uxmal.

Returning in the same direction, we entered a thick grove, in which we dismounted and tied our horses.

It was the finest grove we had seen in the country, and within it was a great circular cavity or opening in the earth, twenty or thirty feet deep, with trees and bushes growing out of the bottom and sides, and rising above the level of the plain. It was a wild-looking place, and had a fanciful, mysterious, and almost fearful appearance; for while in the grove all was close and sultry and without a breath of air and every leaf was still, within this cavity the branches and leaves were violently agitated, as if shaken by an invisible hand.

This cavity was the entrance to the *pozo*, or well, and its appearance was wild enough to bear out the wildest accounts we had heard of it. We descended to the bottom. At one corner was a rude natural opening in a great mass of limestone rock, low and narrow, through which rushed constantly a powerful current of wind, agitating the branches and leaves in the area without. This was the mouth of the well, and on our first attempting to enter it, the rush of wind was so strong that it made us fall back gasping for breath, confirming the accounts we had heard in Nohcacab. Our Indians had for torches long strips of the castor-oil plant, which the wind only ignited more thoroughly, and with these they led the way. It was one of the marvels told us of this place that it was impossible to enter after twelve o'clock. This hour was already past; we had not made the preparations which were said to be necessary, and, without knowing how far we should be able to continue, we followed our guides, other Indians coming after us with coils of rope.

The entrance was about three feet high and four or five wide. It was so low that we were obliged to crawl on our hands and knees, and descended at an angle of about fifteen degrees in a northerly direction. The wind, collecting in the recesses of the cave, rushed through this passage with such force that we could scarcely breathe; and as we all had in us the seeds of fever and ague, we very much doubted the propriety of going on, but curiosity was stronger than discretion, and we proceeded. In the floor of the passage was a single track, worn two or three inches

deep by long-continued treading of feet, and the roof was incrustated with a coat of smoke from the flaring torches. The labor of crawling through this passage with the body bent and against the rush of cold air made a rather severe beginning, and, probably, if we had undertaken the enterprise alone, we should have turned back.

At the distance of 150 or 200 feet the passage enlarged to an irregular cavern, forty or fifty feet wide and ten or fifteen high. We no longer felt the rush of cold wind, and the temperature was sensibly warmer. The sides and roof were of rough, broken stone, and through the center ran the same worn path. From this passage others branched off to the right and left, and in passing along it, at one place the Indians held their torches down to a block of sculptured stone. We had, of course, already satisfied ourselves that the cave or passage, whatever it might lead to, was the work of nature, and had given up all expectation of seeing the great monuments of art which had been described to us; but the sight of this block encouraged us with the hope that the accounts might have some foundation. Very soon, however, our hopes on this head were materially abated, if not destroyed, by reaching what the Indians had described as a mesa, or table. This had been a great item in all the accounts, and was described as made by hand and highly polished. It was simply a huge block of rude stone, the top of which happened to be smooth, but entirely in a state of nature. Beyond this we passed into a large opening of an irregular circular form, being what had been described to us as a plaza. Here the Indians stopped and flared their torches. It was a great vaulted chamber of stone, with a high roof supported by enormous stalactite pillars, which were what the Indians had called the columns, and though entirely different from what we had expected, the effect under the torchlight, and heightened by the wild figures of the Indians, was grand, and almost repaid us for all our trouble. This plaza lay at one side of the regular path, and we remained in it some minutes to refresh ourselves, for the closeness of

the passage and the heat and smoke were becoming almost intolerable.

Farther on we climbed up a high, broken piece of rock, and descended again by a low, narrow opening, through which we were obliged to crawl, and which, from its own closeness and the heat and smoke of the torches and the labor of crawling through it, was so hot that we were panting with exhaustion and thirst. This brought us to a rugged, perpendicular hole, three or four feet in diameter, with steps barely large enough for a foothold, worn in the rock. We descended with some difficulty, and at the foot came out upon a ledge of rock, which ran up on the right to a great height, while on the left was a deep, yawning chasm. A few rude logs were laid along the edge of this chasm, which, with a pole for a railing, served as a bridge, and, with the torchlight thrown into the abyss below, made a wild crossing-place; the passage then turned to the right, contracting to about three feet in height and the same in width, and descending rapidly. We were again obliged to betake ourselves to crawling, and again the heat became insufferable. Indeed, we went on with some apprehensions. To faint in one of those narrow passages, so far removed from a breath of air, would be almost to die there. As to carrying a man out, it was impossible for either of us to do more than drag himself along, and I believe that there could have been no help from the Indians.

This passage continued fifty or sixty feet, when it doubled on itself, still contracted as before and still rapidly descending. It then enlarged to a rather spacious cavern and took a southwest direction, after which there was another perpendicular hole, leading, by means of a rude and rickety ladder, to a steep, low, crooked, and crawling passage, descending until it opened into a large broken chamber, at one end of which was a deep hole or basin of water.

This account may not be perfectly accurate in all the details, but it is not exaggerated. Probably some of the turnings and windings, ascents and descents, are omitted; and the truest and most faithful description

that could be given of it would be really the most extraordinary.

The water was in a deep, stony basin, running under a shelf of overhanging rock, with a pole laid across on one side, over which the Indians leaned to dip it up with their calabashes; and this alone, if we had wanted other proof, was confirmation that the place had been used as a well.

But at the moment it was a matter of very little consequence to us whether any living being had ever drunk from it before; the sight of it was more welcome to us than gold or rubies. We were dripping with sweat, black with smoke, and perishing with thirst. It lay before us in its stony basin, clear and inviting, but it was completely out of reach; the basin was so deep that we could not reach the water with our hands, and we had no vessel of any kind to dip it out with. In our entire ignorance of the character of the place, we had not made any provision, and the Indians had only brought what they were told to bring. I crawled down on one side, and dipped up a little with one hand; but it was a scanty supply, and with this water before us we were compelled to go away with our thirst unsatisfied. Fortunately, however, after crawling back through the first narrow passage, we found some fragments of a broken water jar, with which the

Indians returned and brought us enough to cool our tongues.

In going down we had scarcely noticed anything except the wild path before us; but, having now some knowledge of the place, the labor was not so great, and we inquired for the passage which the Indians had told us led to Maní. On reaching it, we turned off, and, after following it a short distance, found it completely stopped by a natural closing of the rock. From the best information we could get, although all said the passage led to Maní, we were satisfied that the Indians had never attempted to explore it. It did not lead to the water, nor out of the cave, and our guides had never entered it before. We advised them for the future to omit this and some other particulars in their stories about the well; but probably, except from the *padrecito* and others to whom we communicated what we saw, the next travelers will hear the same accounts that we did.

As we advanced, we remained a little while in the cooler atmosphere before exposing ourselves to the rush of cold air toward the mouth, and in an hour and a half from the time of entering, we emerged into the outer air.

As a mere cave, this was extraordinary; but as a well or watering-place for an ancient city, it was past belief, except for the proofs under our

own eyes. Around it were the ruins of a city without any other visible means of supply, and, what rarely happened, with the Indians it was matter of traditionary knowledge. They say that it was not discovered by them; it was used by their fathers; they did not know when it began to be used. They ascribe it to that remote people whom they refer to as the *antiguos*.

And a strong circumstance to induce the belief that it was once used by the inhabitants of a populous city is the deep track worn in the rock. For ages the region around has been desolate, or occupied only by a few Indians during the time of working in the milpas. Their straggling footsteps would never have made that deep track. It could only have been made by the constant and long-continued tread of thousands. It must have been made by the population of a city.

In the grove surrounding the entrance we found some water collected in the hollow of a stone, with which we slaked our thirst and made a partial ablution; and it was somewhat extraordinary that, though we were barely recovered from illness, had exerted ourselves greatly, and been exposed to rapid alternations of heat and cold, we never experienced any bad effects from it.

John Lloyd Stephens en Actun Xcoch

Esta reseña de una visita a Actun Xcoch apareció en el libro "Incidents of Travel in Yucatán", de Stephens, publicado en 1843.

CASA CARLOTA CAVING IN THE SIERRA MAZATECA

Marion Akers

Although our caving time had not yet begun, our travels since the beginning of November 2010 had been filled with fun days in Mexico, visiting our potters and artists and planning next year's buy. After we took care of business, we headed east towards Oaxaca. We reached Teotitlán del Valle and were stopped by various road blocks a whole day and a half before we even got to begin the drive up the mountain. The local people exercised their right to protest election results and other local political issues by using roadblocks.

The month of December found us in the Sierra Mazateca, with hand-made tortillas, fresh squash and *camote*, Mazatec language, and new friends. We enjoyed the local traditions of the region and the season, enjoying *posadas* and more fresh food. During this period, we also made a trip to Oaxaca City and obtained letters of reference for our planned exploration in the mountains. The real permission is actually given by the local *presidente municipal*, the municipal agent in the area. And lately we have had to go to the *ejidos* for authorization to explore on the communal lands.

Our rental home is in a long building on a coffee plantation in the small village of La Carlota. It's private and has a huge patio and all necessary amenities, like electricity, clean spring water, toilet, and coffee. La Carlota is located in the northern region of the state of Oaxaca, west of the large lake, Presa Miguel Alemán, and east of the largest and most

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famous mountain town, Huautla de Jiménez. One of Mexico's smaller indigenous cultures, the Mazatecs, lives in the region, and we have begun to learn their unique traditions and language. The whole area, going north into Puebla, has an important karst ecosystem, a neotropical rainforest receiving 5 to 15 meters of rainfall per year. The mountains range from 500 to 2500 meters, holding in moisture from the Gulf of Mexico, and create one of the northernmost cloud forests in the country. This region has a variety of deep cave systems up to more than 1400 meters deep that have been explored by cavers from various parts of the world, including Canada, Switzerland, the USA, Australia, Britain, Mexico, and Poland. Finally, after ten or fifteen years of coming to the Sierra Mazateca, we have more time to stay and go caving.

The end of December came quickly, and we were excited to welcome our first set of new friends, Jason Ballensky and Tamara Tatreau from California. We were happy to share our first lead with them, a pit in the Río Santiago region called Sótano Agua de Pluma. The day was December 28, 2010, and we arrived at the house of Rufino García Pereda in the morning. Rufino is one of the authorities in Río Santiago, in the *municipio* of Huautla de Jiménez, and a brother-in-law to our friend and teacher, Antonio Jiménez Figueroa. We met with the landowner, Roberto Zamora, and went to the pit.

Tony rigged the pit with two rebelayes, and Jason and I followed with the survey. The pit was 90 meters deep, a great first find of the

expedition. Meanwhile Tamara had been lizard hunting and had found another pit, slightly lower but very close to Sótano Agua del Pluma.

Jason and Tamara did a couple of caves around La Carlota during their time there. And we tried another lead, in the *municipio* of San Miguel Huautepéc, on the last day of December. We should have known the last day of the year would not be easy. A day before an election was definitely the wrong time to begin a dialogue about caving, much less go caving. We separated after that, and they went touring and we went to Oaxaca City to prepare for the next stage of our caving adventures.

Our next set of friends to arrive was from Indiana, Brian Grubb and Cathy Sacilowski. We went to explore another lead on our list, this one in the *municipio* of Santa María Chilchotla. Again, the cave, called Cueva Santa Rosa, was one that had been shown to us by Antonio Jiménez two years ago. Antonio met us in Huautla in the morning, and we drove to the cave together. Antonio went to check in with the municipal government while we began our exploration. The cave has two large entrances, one walk-in entrance within 15 or 20 meters of the road and a skylight entrance just 5 meters inside. The passage slopes down at a 30-degree angle throughout almost the whole cave, and it has three large rooms that reach heights of 25 to 30 meters. In certain areas this beautiful cave has some interesting speleothems, such as popcorn, stalagmites, stalactites, and flowstone. There was one area with a flowstone wall with

Cueva Santa Rosa

Topographical Quadrant: E14B87
 Municipal Region: Santa Maria Chilchotla
 Oaxaca, Mexico

Horizontal Length: 352.0 m

Cave Depth: 155.2 m

Proyecto Sierra Mazateca
 Director: Antonio Jiménez Figueroa
 Surveyed January 9, 2011 by:
 Marion Akers
 Tony Akers
 Simon Akers
 Brian Grubb
 Cathy Sacilowski

Antonio
at Entrance



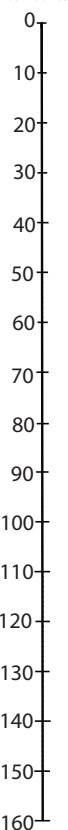
Entrance

Dotted line shows the worn trail that winds down the steep slope of the entrance chamber.



Flowstone wall with black crust

Altar at Entrance



Looking up and down the entrance slope



Large troglomorphic tarantulas were found in the final room



Marion, Simon, Cathy, & Brian



Popcorn-encrusted breakdown, walls, and ceiling

LEGEND

0 datum	plants	25 ceiling height	change in ceiling	breakdown	climbdown depth 7
E pit or	climbdown	channel	ledge	flowstone	invertebrate remains
depth below datum 74	dome	undercut	soo tight ledge	bedrock	cobbles
flowstone	stalagmites	helectite	calcite floor	1/2 bolt	underlying
stalagmites	column	soda straw	coralloids	re-direct	intermittent stream

-UTM 14 732132E, 2018846 N, North American Datum 27
 -Suunto, Tape, and Disto Survey
 -Data reduced using Compass software
 -Digital map produced with Adobe Illustrator software
 -Cartography: Marion Akers 2011
 -Photos: Marion Akers

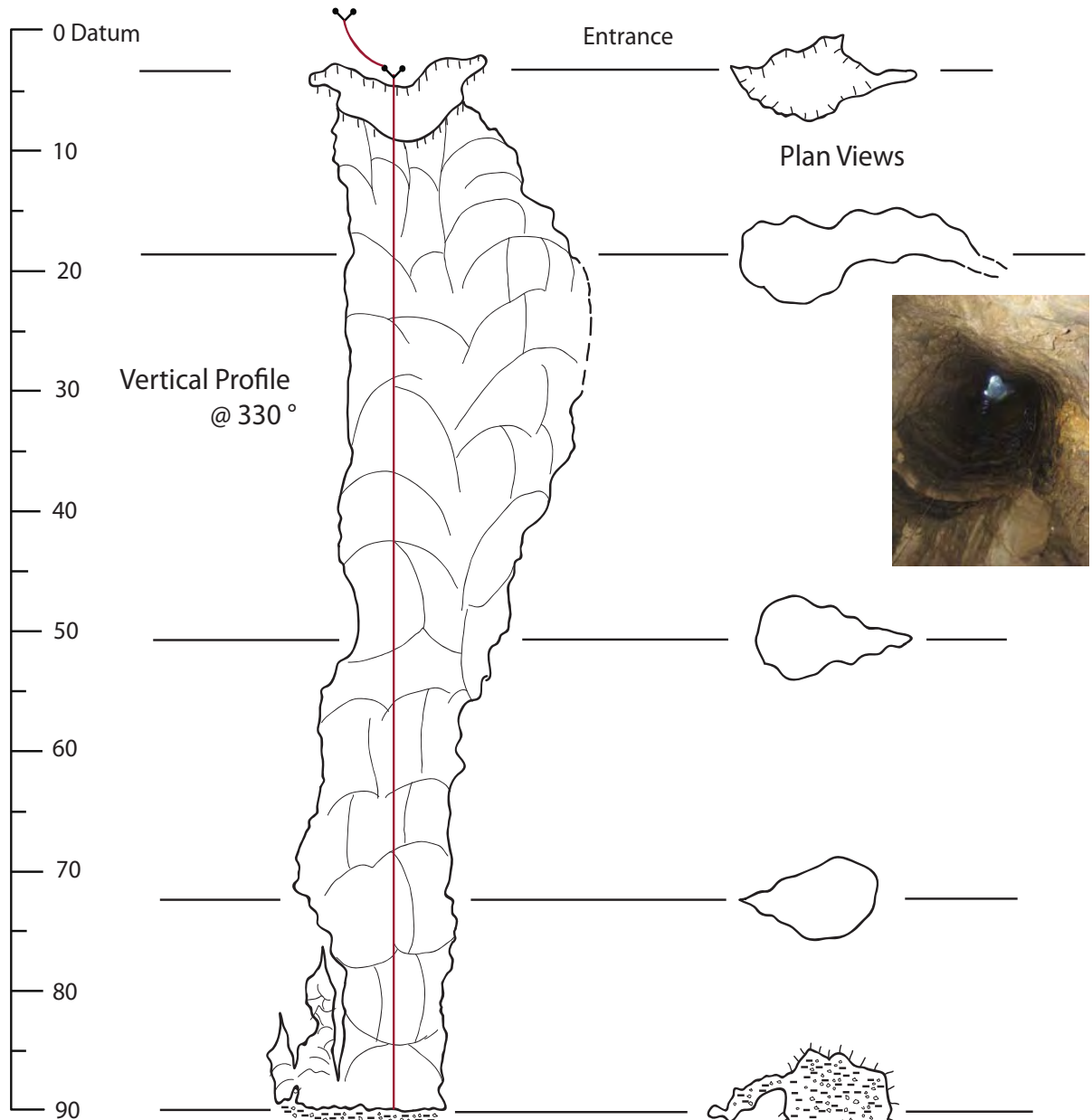
Sotano Agua de Pluma

Topographical Map: E14B87
 Municipal Region: Huautla de Jiménez
 Oaxaca, Mexico
 Horizontal Length: 20.4 m
 Cave Depth: 89.9 m



Proyecto Sierra Mazateca
 Director: Antonio Jiménez Figueroa
 Surveyed December 28, 2010 by:
 Marion Akers
 Tony Akers
 Jason Ballensky

Jason on rope



-UTM 14 738028E, 2005345 N, North American Datum 27
 -Suunto, Tape, and Disto Survey
 -Data reduced using Compass software
 -Digital map produced with Adobe Illustrator software
 -Photos by: Ron Adams & Marion Akers
 -Cartography: Marion Akers 2011

LEGEND

- 0 datum
- dome
- unknown passage -dotted line
- pit or climbdown
- mud and cobbles
- two rig bolts and rope





Donna Renee and Ron Adams in Cueva Rancho del Oro. *Paul Mozal.*

an unusual black ferromanganese crust. We saw cave crickets and, in the very last big room of the cave, cave tarantulas. The cave ended there, the lowest point being a floor of dried mud. This impressive cave has a length of 352 meters and a total depth of 155 meters.

Cathy and Grubby enjoyed their stay until the rain and mist settled in for a couple of days. Their freshly washed clothes stayed damp for three days. They finally dried them one night with a fan on the way back to Oaxaca City. Ron Adams, Greg McNamara, and Pat Mudd arrived by plane the night of January 13, 2011, and Brian and Cathy left the next morning, back to the land of snow. We toured Oaxaca City, the square, and a cultural museum, the Museo Regional de Oaxaca. Saturday morning we picked up supplies and headed north. We ate another great meal and made it to Huautla in the fog, visiting our friend Waldo García. Then we headed back to La Carlota, hoping that Ernie Garza had arrived. We were wondering where and when Mike Frazier and his friends would arrive as well. We arrived in Carlota to a full house of cavers: Ernie Garza, Mike Frazier, Donna Renee, Patricia Malone, Randy Macan, Janis

Mankovs, Coeli Velki, Rick Anderson, Paul Mozal, and Mark Bell. We had a fun night and spent Sunday packing and reorganizing food and other gear.

The next day, Monday, January 17, Tony and Mike went to the *presidente* of Ayautla to get permission for caving. Our first goal was Sistema Tres Amigos [see *AMCS Activities Newsletters* 27, pp. 31–37; 29, pages 60–63; and 32, pages 105–115]. They took with them to the office the Swiss *Proyecto Cerro Rabón 1990–1994* book, our map collection going back to 1995, and another book about the Sierra Mazateca. The *presidente* basically put us on hold, requesting time to speak with the *ejido*. We had been preparing ourselves

for the group of *ejido* leaders who have in recent years been negative toward outsiders, including cavers. In recent years, political tension between various groups and political parties has complicated permission negotiations, not to mention those road blocks that kept cropping up in different areas.

We tried to stay busy while we were waiting. Greg McNamara surveyed a small pit beyond the base camp. We called the gnarly thing Cueva de la Malangar. They surveyed 35 meters to 12.5 meters depth in muddy passage with organic waste and broken glass. Not really what Greg had in mind when he thought of caving in Mexico. The girls, my son Simon, and I went to help our neighbors clean, shell, and roast dried coffee beans. It was a great experience, and we got to take some home. Some in the group explored a known pit, Sótano de la Milpa.

Thursday came and we went down to another known cave, Cueva la Sorpresa Sección Mariano, which needed the survey

completed. Unfortunately, the landowner was not available, and no one else would let us go to it. Oh well, a trip to the lake and a meal of fresh fish was a pleasant trade.

During this time, we all enjoyed the company and some *cervezas*. Great food was cooked, and fun was had by all. We had a special visit from an American, Benjamin Feinberg, who had written a book about the region, *The Devil's Book of Culture: History, Mushrooms, and Caves in Southern Mexico*. Tony had been corresponding with him after we read his book. He is a professor of cultural anthropology and Latin American studies at Warren Wilson College in Asheville, North Carolina. We were excited to have him visit us, and I am sure he thought our diverse group was a study in itself. [Feinberg's book was reviewed in *AMCS Activities Newsletter* 27, page 67.]

Mike and Randy went to another village, La Loma Capital, and gave some school supplies there. They were taken to a cave and showed the students how they surveyed the cave. Cueva de Loma Capital turned out to have 82 meters of passage and 8.8 meters of depth.

Friday brought us no news regarding permission for Sistema

Randy Macon, Mike Frazier, and Mark Bell surveying at Cueva de Loma Capital. *Paul Mozal.*



Proyecto Sierra Mazateca 2010–2011						
name	municipio	topo	UTM		horiz. extent	depth
			NAD 27 zone 14			
Sótano Trampa de Pluma	Huautla de Jiménez	E14B87	2005357N	737879E	15	52.6
Cueva Rancho la Cuevita	San Bartolomé Ayautla	E14B87	1995872N	744860E	2.1	0.3
Sótano Cerro Abierto	Huautla de Jiménez	E14B87	2005389N	739284E	116.3	72.9
Sótano del Panadero	Huautla de Jiménez	E14B87	2005283N	737946E	16.5	70.3
Cueva de Loma Capital	Loma del Naranjo				81.3	8.8
Cueva Rancho del Oro	Santa María Chilchotla	E14B77	2020817N	732402E	125.1	16.2
Cueva de la Malangar	San Bartolomé Ayautla	E14B87	1996443N	744321E	35.1	12.5
Cueva Santa Rosa	Santa María Chilchotla	E14B87	2018846N	732132E	352	155.2
Sótano Agua de Pluma	Huautla de Jiménez	E14B87	2005345N	738028E	20.4	89.9

Tres Amigos, which, although not unexpected, was very disappointing for us all, especially our Colorado friends. Flexible plans are a necessity here. Ron, Greg, Pat, and I hiked up from La Carlota to the top of the ridge, led by our local guide and friend Marciel and his son Juan Carlos. *Allano* about a third of the way up is on a well-used trail. From there, Marciel led us with his machete, angling east up the cliffside.

Simon on rope in Sótano del Panadero. *Marion Akers.*



It was a brutal hike, but very beautiful, with thick jungle vines and other plants and increasingly large trees. We went through a stretch of Begonias Grandes, more than you could count, with pink, white, and red flowers everywhere. Then, closer to the top, the terrain changed to more pine and cedar trees. We hauled up a combined volume of thirty liters of water—Ron, Greg, and Pat carrying the most—and cleared an area at the top. We hope to establish a camp on top in the future for further exploration of the plateau to the north. Six hours up and a fast one and a half hours down. What an incredible ride, even for my little dog, Jetta, whose rust-colored coat turned dark brown from the mountainside mud.

On Saturday, January 22, a caving day was planned for us by Antonio Jiménez, and we were taking the whole group with us, sixteen cavers plus Benjamin and his friend John. Antonio had told us about this cave, although he did not have a good description. After stopping in Santa María Chilchotla to obtain permission, we headed north. It turned out to be a scenic shelter cave with two entrances. Just after we began to survey it, the landowner, Alfonso Amadeo García Contreras, came down. Antonio had gotten permission from the village, but was unaware of the landowner situation. We talked with him for several minutes, apologizing for our ignorance. He agreed to let us finish the survey. Quickly, we took photos and completed the survey. The cave, Cueva

Rancho del Oro, is 125 meters long and 16 meters deep. Antonio took us back to Chilchotla, in search of another lead. Nothing panned out, so we ended up all heading back to Rancho La Carlota or Huautla.

One group, Ernie, Marc, and I, was stopped on the way back by a political blockade in Santa María Ascunción. Luckily, we arrived close to the end of the protest and only had to wait forty-five minutes. We enjoyed coffee, sweet bread, and a fire while we waited. The local people were friendly to us, and they were not used to people being agreeable about having to wait, especially gringos. Considering that I had been stopped for way longer at previous roadblocks, forty-five minutes was nothing.

When in December we had explored Sótano Agua de Pluma with Jason Ballensky, Tamara Tatreau had been off lizard hunting and had found another cave entrance farther down, right off the trail. On Sunday, January 23, we planned to let our friends Ron, Greg, Ernie, and Pat do Sótano Agua de Pluma, while Tony, Simon, and I explored the little entrance that Tamara had found. After Tony helped rig Agua de Pluma, he came and set some bolts at the top of the new pit, and we backed up the bolts to a large rock. Tony was the first one to descend, setting a redirect close to the top. The pit turned out to be deeper than the estimated 25 meters, and Tony was short-rope 10 meters

Proyecto Sierra Mazateca

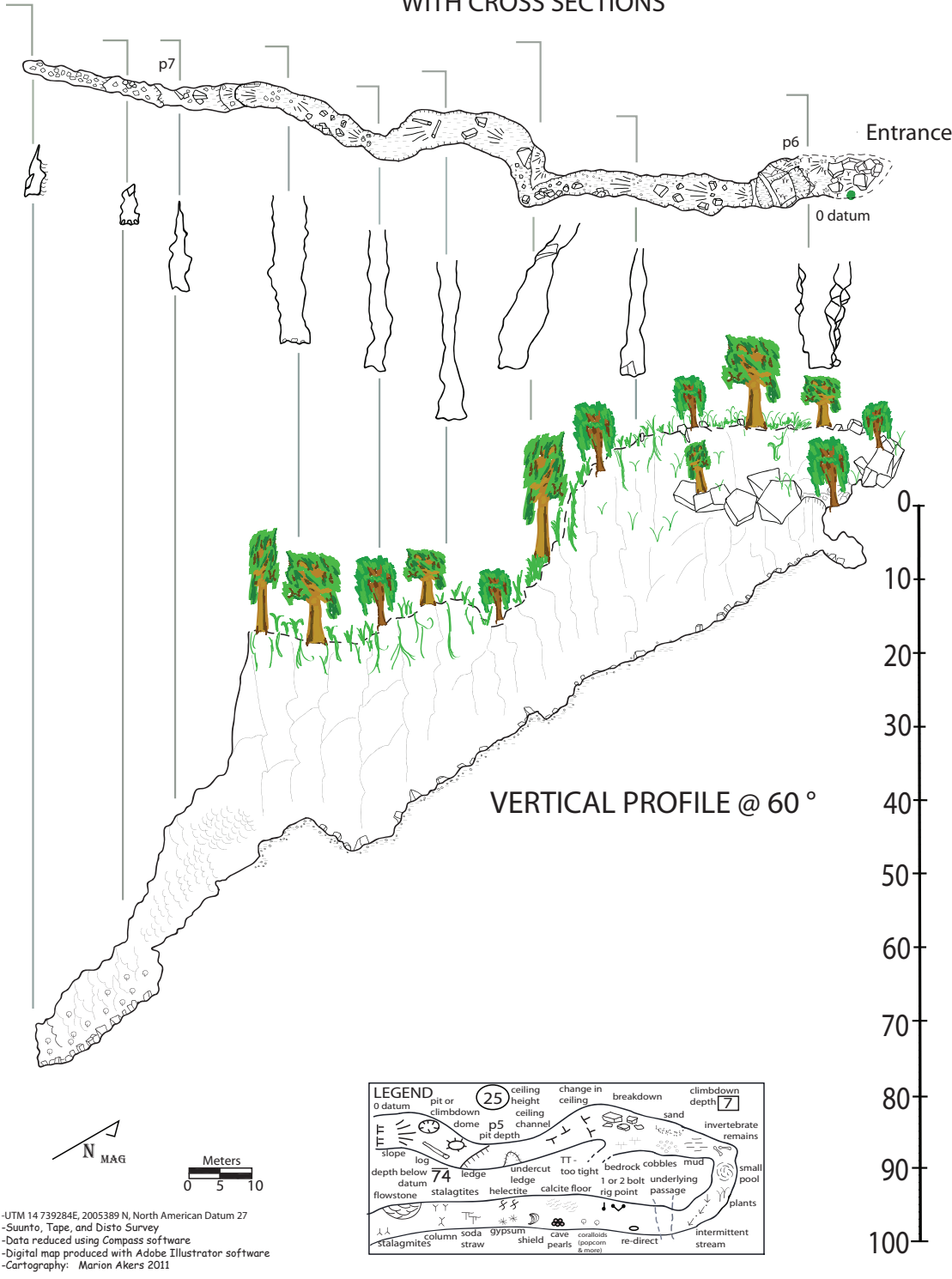
Director: Antonio Jimenez Figueroa
 Surveyed January 27, 2011 by:

Ron Adams	Mark Bell
Marion Akers	Mike Frazier
Tony Akers	Greg McNamara
Simon Akers	Pat Mudd
Rick Anderson	Donna Reese

Sotano Cerro Abierto

Topographical Quadrant: E14B87
 Municipal Region: Huautla, Oaxaca, Mexico
 Horizontal Length: 116.3 m
 Cave Depth: 72.9 m

**PLAN VIEW
 WITH CROSS SECTIONS**



from the bottom. He ascended, and we thought about waiting for the long rope that was hanging in Agua de Pluma, but we decided to change the rigging to hang the entire 45-meter rope just from the bolts. We did back it up with another short rope, and I descended to move on with the survey. The first pit was 37 meters. The rope did reach the bottom, which turned out to be just a ledge about 10 meters long and 1 meter wide. At that point, I could see another drop. We knew then that we needed the longer rope to continue. Tony went back to check on our friends' progress with the deeper pit, and Greg followed me down. We surveyed it, took some photos, and waited. Simon came down, on top and bottom belay. This was the nine-year-old's deepest pit. He inched his way down the drop and got off rope safely. Then Tony came down, followed by Pat and Ron. Tony set two bolts at the top of the next drop, and Greg went down first. I followed, continuing the survey. Tony and Simon climbed tandem out of the first drop, and because it was now late in the afternoon, Pat climbed out as well. Greg and I finished the survey, which ended at two too-tight cracks continuing downward to another drop, possibly 30 meters by the sound of rocks falling through the crack. Due to time constraints, Ron did not do the last drop, but waited while we surveyed and derigged the cave.

The owner of this cave was different than the owner of Agua de Pluma, and during the day he and some of his children had come by. They were very friendly and accepted our apology for not understanding the ownership situation. The father, Fausto Martínez Maldonado, and two of his sons were there when we all reached the surface. I showed him my map and some photos, and when we all were ready to leave he invited us to his house. Really he did this because he was stuck out there in the dark without a light, but we were all happy to go with them and visit his family. Ernie gave him a small flashlight to keep, and we made it to his house in five minutes or so. It

was located farther down from the main road. He proceeded to show us his large brick oven, telling us he was a bread-maker and also grew various trees and coffee. They offered us their delicious *café de olla*, and we sat and talked for a little while. He told us there were more pits on his property and that we were welcome to come back at any time. I decided to call this pit Sótano del Panadero, in honor of our new friend, Fausto the Baker. It currently has a horizontal extent of 16.5 meters and a depth of 70.3 meters.

On Tuesday, January 25, we had planned to go back to Río Santiago for more pits, but a roadblock forced our retreat, so we attempted a trip back to Cueva La Sorpresa Sección Mariano, the horizontal cave that needed the survey completed. Well, our landowner, Hortencia, was still not there. We drove back and crafted a plan to get ready for a hike up the mountain to continue our exploration on the top of the plateau. We were getting ready, and a most terrible thing happened to our dog, Jetta, that stopped us in our tracks. She died in about thirty minutes from an apparent snake bite, probably from a coral snake. Our only relief was that our son Simon had not been the victim. The next day, it began to rain and further ruined our chances of going to the top.

This trip was close to the end, and some of the group were already returning to the USA. Tony, Simon, Mike, Donna, Mark, Rick, Ron, Greg, Pat, and I gathered in Río Santiago at the home of Fausto

Martínez Maldonado on the morning of Thursday, January 27. It was baking day for him, and we got to see him work a huge mass of sweet dough and build a fire in the oven in preparation for a day's baking. He told us that his two sons could take us to a pit nearby, only five minutes away. We began our walk down the main road away from Río Santiago, and five minutes later we were still on the road wondering when the pit would magically appear. We headed off the road up a nice trail to the right. Another ten minutes, and the brothers forked off the trail to look for the pit. We stopped and waited while they looked in the brush-covered limestone. They found it within the next thirty minutes, and off we went, climbing the hillside. We came to a long, narrow canyon that could be entered from both the east side, climbing down the rocks, or from the north, a tricky down-climb. We let the mountain climbers, Rick and Mark, go ahead and rig the first drop, a 6-meter nuisance drop, and then scout ahead to see what was next. Tony, Mike, and I began the survey from the top of the drop. There was a point where a hand-line was necessary to get down a steep pitch. The steeply sloping canyon continued, open to the sky, until the last drop, a 7-meter pit. The cave ended in the room below, with some pretty popcorn on the walls and a breakdown floor. Rick, Mark, and I finished this section, and we all headed out of the cave. Sótano Cerro Abierto means *pit of the open hill*, and this is true. The depth of the cave is 72.9 meters and the horizontal extent is 116.3 meters.



Hidden treasure. Ron Adams.

The day ended with wonderful sweet bread and *café de olla* from Fausto's generous and kind family.

On Friday, January 28, by request of the landowner, we went to visit a horizontal cave in the *municipio* of San Bartolomé Ayautla. Cueva Rancho La Cuevita is a small, one-room cave whose entrance was hidden by the landowner because of the archaeology contained within it. Indeed, the small cave could barely hold two people, and one had to be very careful not to damage the old pottery. Greg surveyed this cave, sketching the archaeology in great detail.

Our Colorado friends were leaving, heading back to Veracruz for their flight back home. We had one more day, and we decided to take Fausto up on his offer of further exploration. Tony, Simon, Greg, Ron, Pat, and I took a people truck this time to get to Río Santiago.

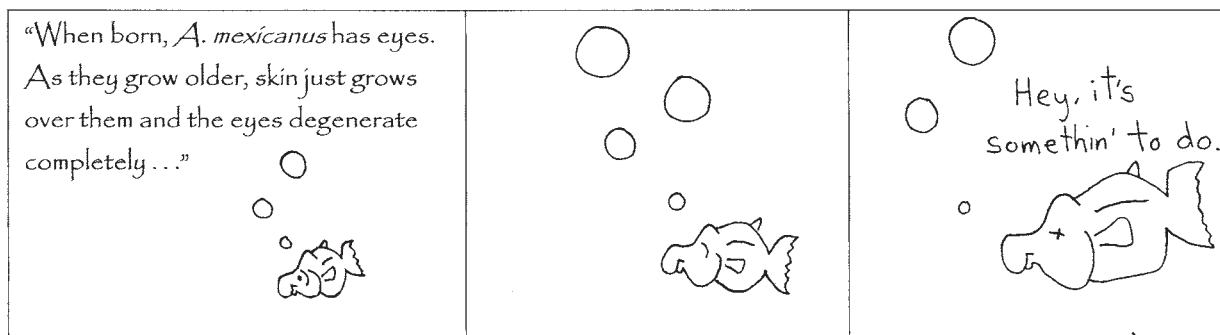
Sótano Trampa de Pluma was the last pit to be explored, on Saturday, January 29. Also on Fausto's property, it was a short hike from his house. Tony rigged the pit with two rebelayes and one redirect. Greg and Ron followed, with Ron sketching the pit. There was some trash on the ledges and several bags of

trash on the bottom. After the pit was surveyed and derigged, Fausto told us that there were more holes on his property, and he showed us a number of other pits as the afternoon faded away. He told us that he had shown us the biggest holes first, thinking the biggest entrances would obviously be the biggest pits. We all looked at each other, knowing that it could very well be quite the opposite and that we would have to wait another year to find out. A great expedition was ending and our hopes and dreams for the next had just begun.

Espelología en la Casa Carlota, en la Sierra Mazateca

Espeleólogos hospedándose en La Carlota, Oaxaca, exploraron y topografiaron varias cuevas pequeñas en la Sierra Mazateca en diciembre de 2010 y enero de 2011.

STEVE KARP



sjk 2012

PUERTO AVENTURAS CAVING

FEBRUARY 2012

Peter Sprouse and Aaron Addison

This was the fourth in Peter's series of cave-mapping expeditions to the Caribbean coast, and the area of emphasis shifted slightly south from the Río Secreto area where most of our previous work had been. Flying in this time were Brad Hacker and Joel Despain (California), Rolland Moore (Virginia), Pat Kambesis (Mississippi), Aaron Addison (Missouri), Chris Omura (Alberta), and Devra Heyer and Peter Sprouse from Texas. As usual we were joined by local Paamul Grotto members Aida Ferreira, Gil Harmon, Rick Nelson, Alan Formstone, and Liliana Viola. Germán Yañez, a cave-diving instructor from Cozumel, joined us for the whole expedition and arranged access to a number of caves for us. Local cave divers H. P. Hartmann, Natalie Gibb, and Michel Vásquez also joined us at various times.

We had been told about some dry caves at the outskirts of Puerto Aventuras by Fred Devos of the Zero Gravity dive shop. While there are two well-known systems underneath the town of Puerto Aventuras known as Aluxes north and south, these have become contaminated as the town has grown, so exploring beyond the town into the jungle had more appeal. Following Fred's detailed directions, Gil and Peter had no trouble locating the caves he had described. They were arrayed along a *mensura* (survey cut) through the Rancho Belfast, and our short recon logged around nine entrances. This was enough to keep plenty of folks busy, so we returned

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with four teams. Joel and Devra took the first entrance to what became known as Sistema Belfast, and it headed northwest along the typical upstream trend away from the coast. Farther along the *mensura* were two entrances divided by a collapse. Pat and Germán surveyed southeast and tied their cave into Joel's to form the new system. Aaron and Chris surveyed a detached cave out of the collapse, Cueva Poste de Cerca, on a continuing trend to the northwest. Both of these caves have continuing leads, and hopefully a way will be found to connect them.

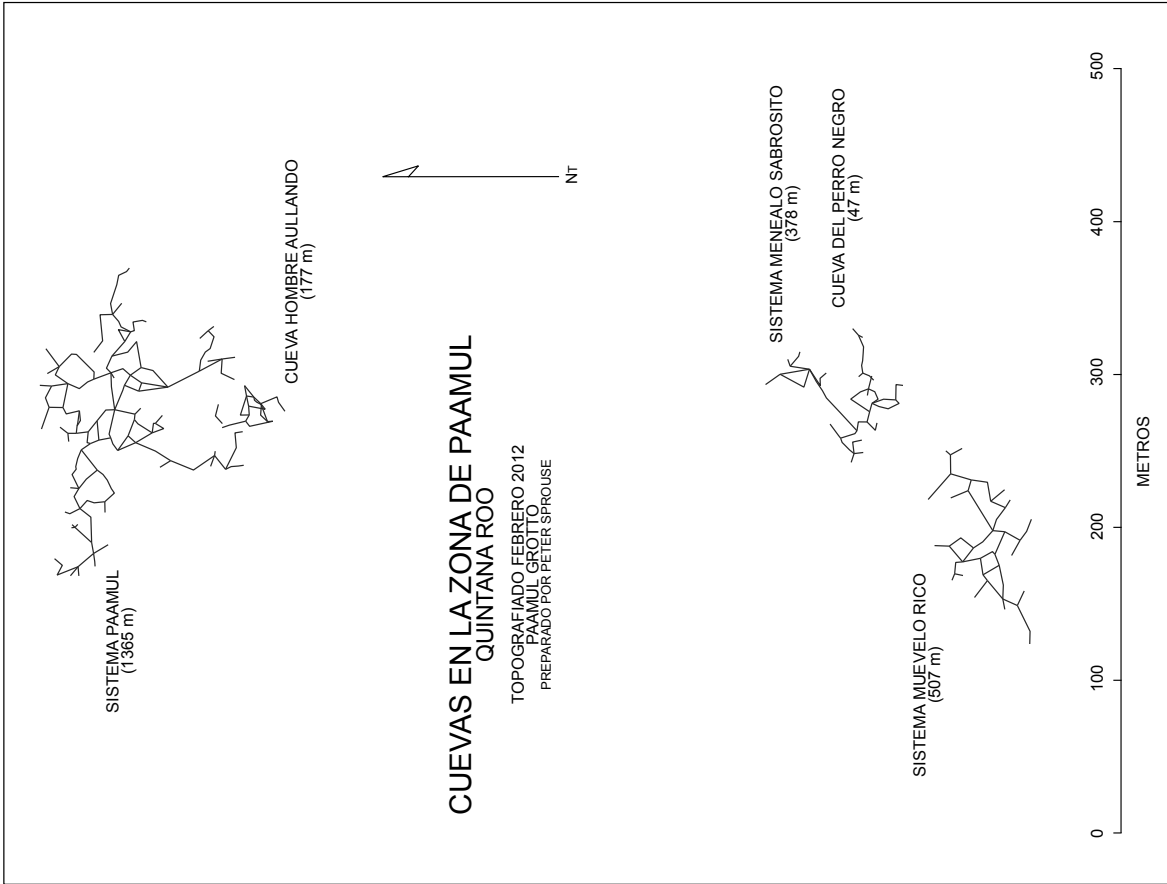
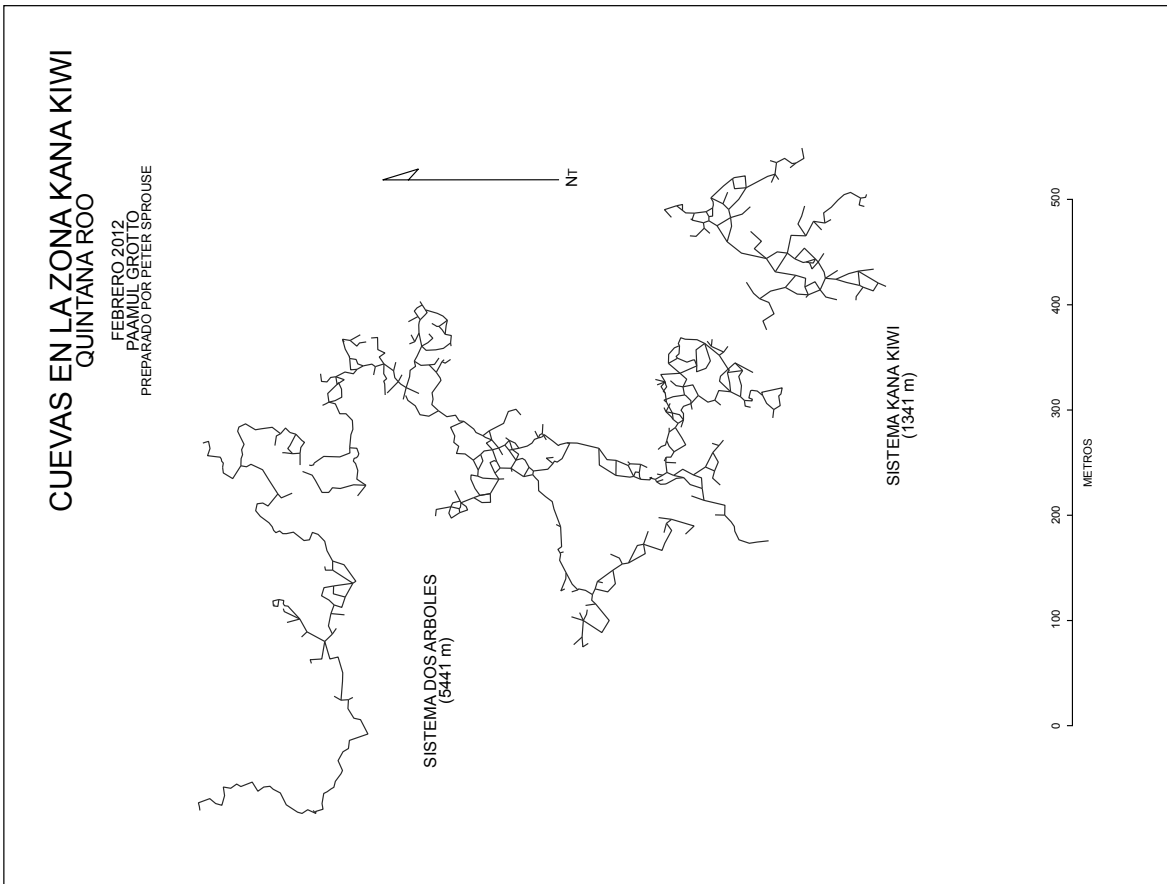
A bit farther out the *mensura*, Alan, Gil, and Peter mapped four caves along the edges of a very large collapse. Cueva Lagan, named for the river that flows through Belfast, Ireland, was a short bit of cave off the edge of the collapse. The next three caves were all along its northern edge. Cueva Finn McCool (the Irish giant) had a large entrance opening into a wide lake. Alan scoped out the back wall with a dive mask, but could not find an obvious way on. Cueva Típica had a smaller entrance with a similar lake, but underwater inspection also revealed no way on. The last cave, Cueva del Enano, was largely dry, but did have a water crawl that got too tight.

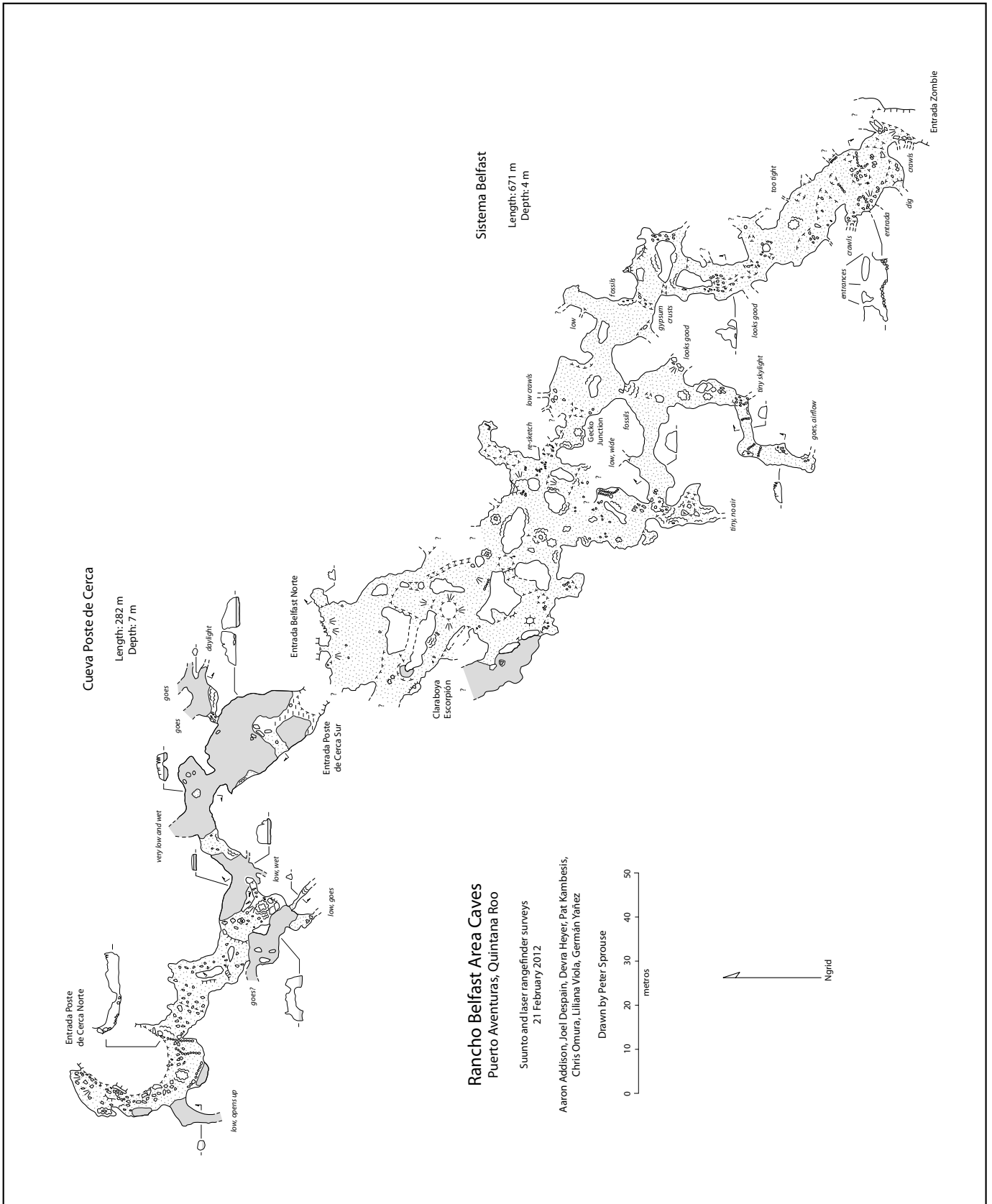
Gil had seen several caves on a large industrial property across the highway from Paamul, and he arranged access with the

owner for us to map them. Over the course of two days we surveyed six caves, the largest and most complex of which we named Sistema Paamul. This cave had at least fifteen entrances. It came very close to connecting to Cueva Hombre Aullando, but a collapse prevented it. That cave was named for a petroglyph of a face, the Howling Man. Back toward the highway we mapped two other cave systems that were likewise separated by a collapse. With so many entrances to name, we liked to hit on a naming theme; in this case the theme was dancing. Sistema Menéalo Sabrosito had entrances named Fandango, Flamenco, Norteño, Salsa, and Tango. Just to the southwest was Sistema Muévelo Rico, which included the

Germán Yañez and his speleotruck.
Peter Sprouse.







Cueva Poste de Cerca
 Length: 282 m
 Depth: 7 m

Sistema Belfast
 Length: 671 m
 Depth: 4 m

Rancho Belfast Area Caves
 Puerto Aventuras, Quintana Roo

Suunto and laser rangefinder surveys
 21 February 2012

Aaron Addison, Joel Despain, Devra Heyer, Pat Kambesis,
 Chris Omura, Liliana Viola, Germán Yañez

Drawn by Peter Sproule



Cumbia, Merengue, and Strathspey entrances. Where we left it, this cave continued to the southwest in very wide passage supported by columns, with several skylight entrances visible in the distance.

Germán took part of the group to a ranch west of Puerto Aventuras that he had obtained access to, and

it contained two large caves, as it turned out. Sistema Panal (bee hive) ran east-west past several entrances. Germán and Michel dove sumps at the east and west ends of the cave that extended the footprint for hundreds of meters. Cueva la Bendición had an entrance that was an astonishing 120 meters wide. This expanse was covered by less than 5 meters of

bedrock in most places. Its passages were huge as well, up to 60 meters wide. Germán completed a solo dive in Bendición, extending the cave over 100 meters toward Sistema Panal. Both of these systems continue, and are much different in character from caves closer to the coast

A chance encounter along the road out to that ranch led us to

	Feb. 2012 survey m	total length m	depth m	number of entrances
Sistema Dos Árboles	2414	5441	20?	45
Sistema Paamul	1365		5	15
Sistema Panal	1362		14	2
Cueva la Bendición	1065		17	3
Cueva de Cámaras	889	1298	4	1
Sistema Belfast	671		4	6
Sistema Muévelo Rico	507		4	3
Cueva Pluma de Toh	409		8	3
Cueva Rancho Santuario de los Guerreros (Cueva Cráneo de Chivo)	400		7	1
Sistema Menéalo Sabrosito	378		4	5
Cueva Poste de Cerca	282		7	3
Sistema Pool Tunich	259	14569	26	?
Cueva por Pesos	217		8	1
Cueva Hombre Aullando	177		4	3
Cueva Perro Mordedor	158		6	2
Cueva Rancho Santuario 4 (Cueva Piscifactoría)	124		5	1
Cueva Panal Limón	93		4	1
Cueva Finn McCool	88		3	1
Cueva Huevos Podridos	78		5	1
Cueva Wilson	48		2	1
Cueva del Perro Negro	47		2	1
Cueva del Enano	42		4	1
Cueva Muchas Violinistas	41		4	1
Cueva Lagan	37		4	1
Cueva Prometeo	29		2	1
Cueva Tomb Raider	18		1	1
Cueva Mancha	17		2	1
Cueva Annie	17		1	1
Cueva Huérfano	15		2	1
Cueva Típica	14		3	1
Cueva Hormiga Atacadora	11		1	1
Cueva Zara	10		1	1
Cueva Sin Pesos	9		2	1
Cueva Tongolele	8		1	1
Cueva Picadura Doble de Avispa	6		1	1
expedition total	11305			



Chris Omura sketching in Sistema Muévelo Rico. *Peter Sprouse.*

Highway 307 it trends northwest toward Sistema Río Escondido, though it does not yet connect. On this trip we added 2414 meters to the new survey, making it 5441 meters long. These surveys trended north and west and centered around the impressive Circle Entrance.

All told we mapped 11,305 meters of passage in eight days. We are busy turning these surveys into detailed cave maps using a regional, seamless map-making approach that will make it easy to join maps as caves are connected. We wish to thank the International Exploration Fund of the National Speleological Society for partial support of expenses on this trip.

The Howling Man in Cueva Hombre Aullando. *Peter Sprouse.*



visit Rancho Santuario, where we mapped four caves. The largest of these we named Cráneo de Chivo, but we later found out that this cave was already in the Quintana Roo Speleological Survey's database as Cueva Rancho Santuario de los Guerreros. Diver Mike Bandow from New Mexico has been exploring sumps in caves in this area.

Aaron led two days of surveying in Cueva de Cámaras, located just west of Akumal. On the first day, Pat and Devra entered the cave, as well as Aaron and Chris. Cámaras is an extremely confusing maze cave, and the team spent part of the day learning a new route to the end of survey. On the second day, Aaron and Germán returned with Brad and Rolland. Overall, these surveys added 889 meters. Cámaras now stands at 1298 meters in length, extending to the northeast along a trend parallel to the coastline.

In the Río Secreto area, Gil and Rick had been scouting out an area just south of Sistema Pool Tunich, the cave that hosts the Río Secreto cave tour. When we set out to map the ten caves that they had found, we could see that they extended from a long, meandering collapse that must have once been a major continuation of Pool Tunich. The longest cave here was Cueva Pluma de Toh, a through-trip cave that was 409 meters long. The remaining "collapse orphans" were smaller, though the last one, Dos Golondrinas, turned out to not be an orphan at all; it connected to Sistema Pool Tunich at the Entrada Botella. Pat and Liliana mapped a passage off the Botella entrance that they named the White Maze.

Off to the southeast, toward the beach, we did quite a few survey trips into Sistema Dos Árboles, an extensive and complex system where the Paamul Grotto had done a line-plot survey in their early years. From

Espeleología en Puerto Aventuras, febrero de 2012

Un grupo bastante numeroso de espeleólogos locales y extranjeros topografiaron cuevas no inundadas cerca de Puerto Aventuras, Quintana Roo, y en otras áreas a lo largo de la costa. Se topografiaron más de 11 kilómetros en ocho días.

SOME SPRINGS AND CAVES IN NORTHERN MEXICO

Oliver Knab

In 1988, Oliver and Manuela Knab made an extensive cave-diving visit to Mexico. Previous articles and maps by this author resulting from that trip are "Cave Diving in Mexico," AMCS Activities Newsletter 19, pages 51–61, and "The Cenotes North of Tunkas, Yucatán," number 26, pages 84–91.

We started our Mexico trip in Tijuana on April 5, 1988. We caught a flight to the city of Chihuahua and proceeded by train to Creel. There we visited the valley of the monks and found two caves occupied by Tarahumara people. Cuevas de San Ignacio are in a side valley south of Creel. There were two artificial holes in the cave used to store food. After visiting the Valle de los Dioses, we explored Cueva de Sebastián, a large cave occupied by Tarahumara.

On April 12 we mapped the thermal spring Ojo de Dolores at Jiménez, Chihuahua. The water visibility was 45 meters and its temperature was 34°C. The main sources of the water are two holes in the rock floor at depths of 2.45 and 2.15 meters. The spring pool is 52 meters long and 31 meters wide. Flow was 165 liters per second.

The next spring visited was Ojo de Talamantes, 11 kilometers southwest of Valle de Allende, in a nice river valley with red limestone walls. The spring has an artificial pool 20 to 25 meters wide and 80 meters long. The maximum depth is 2 meters, and the water temperature was 27 to 28°C. We also mapped part of Cueva de

Diablo at Salaíces. A stop that should not be missed is Cueva de Remedios, a well-known thermal cave.

Near Cuatro Ciénegas, Coahuila, is the very important karst spring Poza de la Becerra. The water there had 30 meters visibility and the length and maximum depth of the main pool are 80 and 4 meters. Lime-green and black fish of family Percidae up to 20 centimeters long were noted. There are three pools in all, 80, 35, and 15 meters long. The place is quite nice and a good location for snorkeling. The spring is fed from a single straight crack at the maximum depth. El Churince is a bottom-fed static spring 20 meters in diameter and 2 meters deep. Laguna de la Mina is a spring lake 1.0 to 1.5 meters in depth, with visibility 10 meters. Two different species of fish inhabit it.

On April 17, Manantial de Hermanas in Coahuila was inspected. It was extremely clear and hot, about 45°C. The pool is 6 by 16 meters, with a maximum depth of 1.1 meters.

Ojo de Agua de Lampazos, Nuevo León, was flop number one for the trip, a murky green undividable soup with 0.5-meter visibility. At Bustamante, the Manantial de San Lorenzo is a spring-fed lake 6 by 12 meters and 1.2 meters deep. Its temperature was about 28°C and the visibility was 10 meters. Cueva del Cañón was mapped to BCRA grade 4C and is 18.69 meters long. Ojo de Agua Sabinas Hidalgo, at Villaldama, was visited on April 20. The maximum depth is 1.2 meters, with very prominent water plants, visibility 20 meters, and temperature

approximately 26°C.

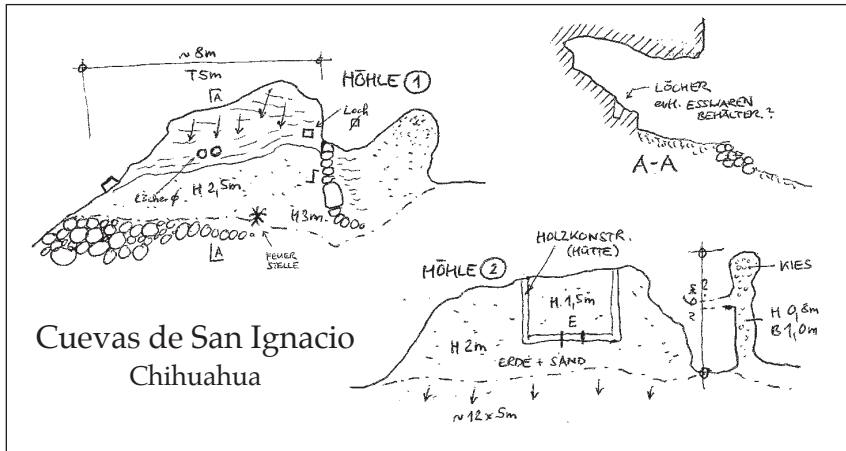
After visiting Grutas de García, we went to Ciudad Mante in Tamaulipas for swimming in the fabulous Nacimiento del Río Mante. A sketch map of the entrance was made. Visibility was 35 meters, and the temperature was measured at 26.9°C. There were no diving tanks available at Ciudad Mante, so no cave diving was possible. This was very disappointing. [For dives at Mante, see *AMCS Activities Newsletters* number 10, pages 24–25, number 17, pages 96–99, and number 31, pages 87–96.]

Our next spring was the Nacimiento del Río Sabinas, Tamaulipas, which I free-dove to –12 meters, a fantastic and quiet place. The visibility was 25 meters, and the water temperature was 19°C. [For dives at Río Sabinas, see *AMCS Activities Newsletters* number 8, pages 61–62, and number 10, pages 23–24.] At Nacimiento de Riachuelo, we found a green soup with 2 meters of visibility and a large water snake with long stripes on a green and black body.

The Nacimiento del Río Choy in San Luis Potosí is a magic place under an old railway bridge. I free-dove it to –14 meters. Water temperature was 26.8°C. A hummingbird was seen. Visibility was 9 meters on April 27. On the way back to the road from the cave we found a little cave, Cueva del Puente Choy, a room 3 meters in diameter and 2 to 4 meters high. [For dives at Río Choy, see *AMCS Activities Newsletters* number 10, pages 28–30, and number 23, pages 19–20.]

Sótano de las Golondrinas at

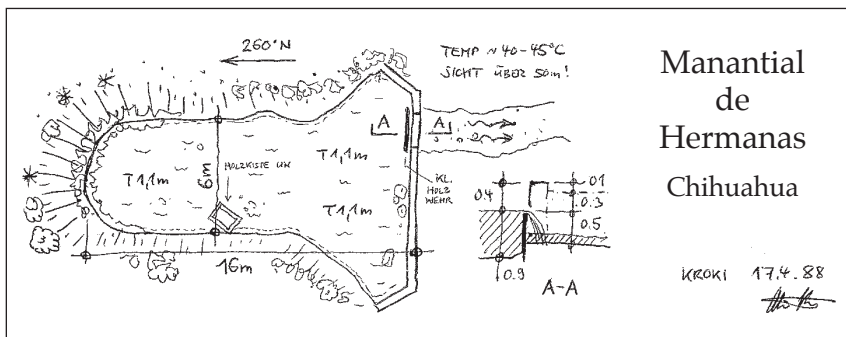
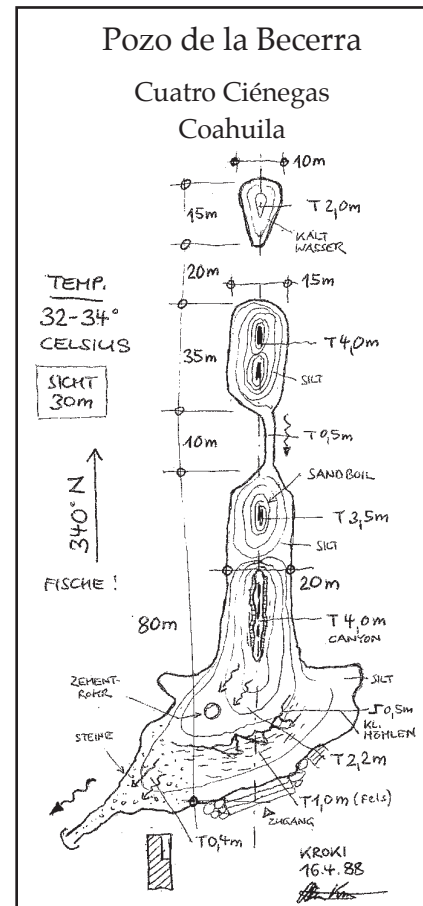
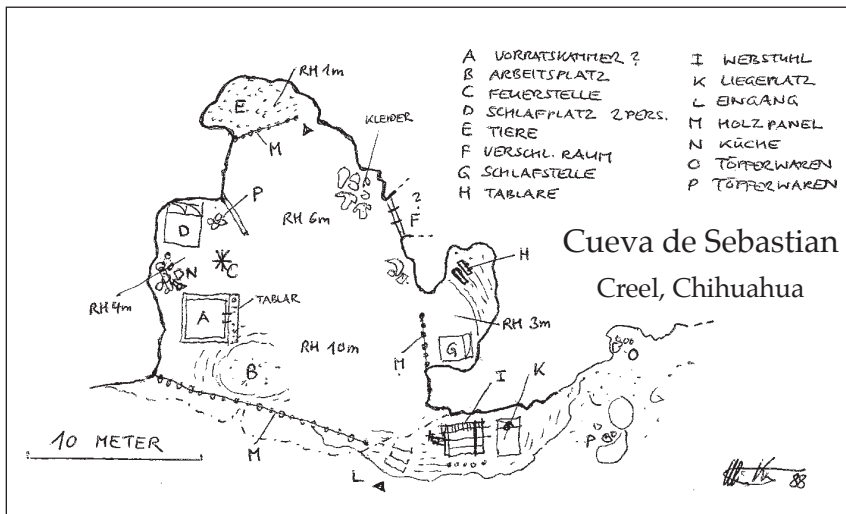
oliverknab@freesurf.ch



Aquismón, San Luis Potosí, was viewed from the top on April 28. On the way to Golondrinas a pit named Sótano del Prado was found. After a 3-meter climb down a rope is required. Rubbish was seen at -8 meters. On the way back, I noticed a small cave close to the road, Cueva del Vaso, 8 meters deep, with a room 3 by 4 meters and a 2-meter-long horizontal crack.

Los Anteojitos near Río Verde are two pools with visibility 15 meters, free-dove to -9 meters to sand boils in the conical pools; temperature 29.7°C.

The Manantial de la Media Luna was carefully inspected with diving gear. The maximum depth reached was 46 meters in the main vent; a high-flow restriction at -48 meters cannot be passed. Sheck Exley had reached the same point a few years earlier. [See *AMCS Activities Newsletter* 10, pages 25-26. Oliver Knab's map is in number 19, page 53.] Three tanks were used during the 59-minute dive. Water temperature

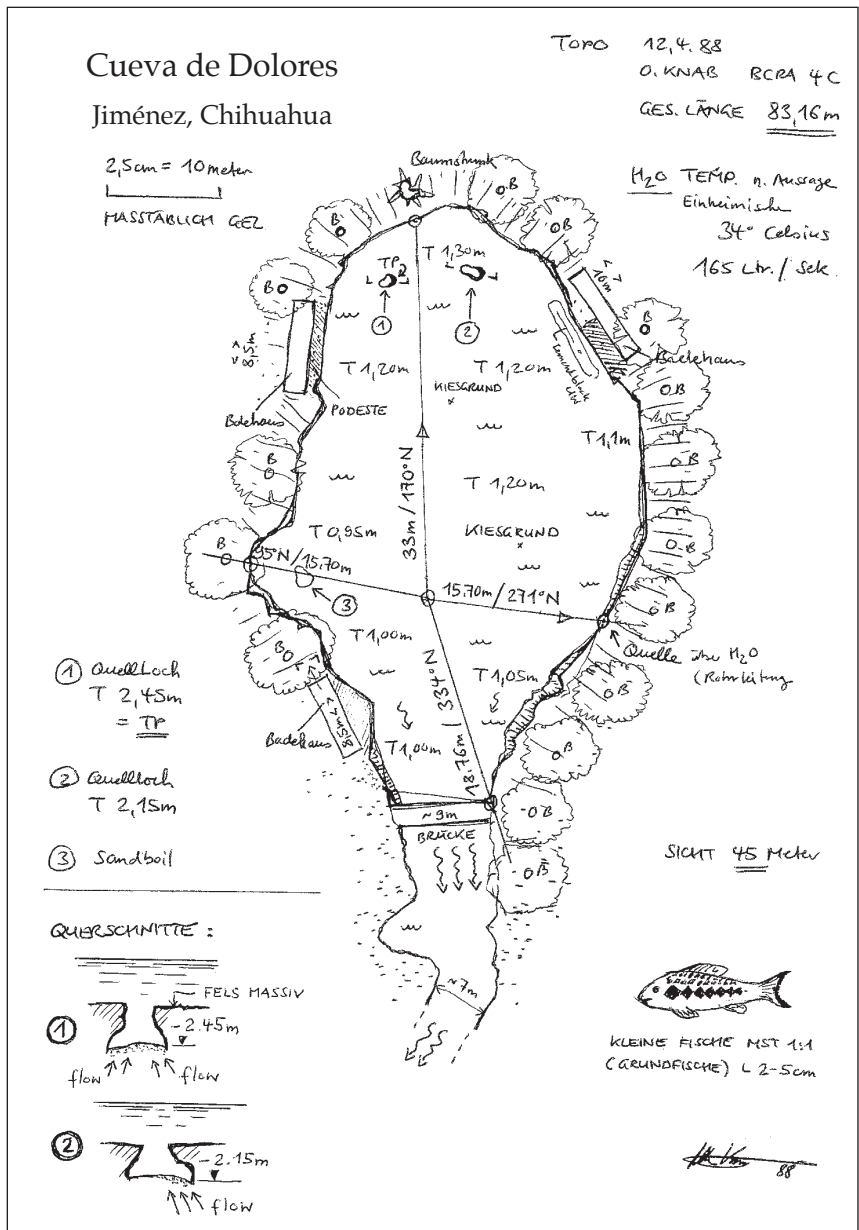




Oliver Knab at Media Luna in 1988.

was 30.2°C on April 30, 1988.

At Jalpan, Querétaro, we caved in Sumidero del Río Escanelilla to a distance of 350 meters. From there, we traveled on to many more Mexican springs and caves. We crossed the border to Guatemala on May 24 and proceeded from Guatemala to Yucatán for diving some of the deepest cenotes known at the time, including Cenote Timul, 72 meters, and Cenote Ucil, 70 meters.



Algunos manantiales y cuevas en el norte de México

En 1988 Oliver Knab visitó México con la intención de bucear intensivamente. Estos son algunos de los mapas de la primera parte de su viaje. Hay otros artículos y mapas de su viaje en las AMCS Activities Newsletter 19 y 26.



Road signs near the cave Vulcán de los Murciélagos in Campeche. Needless to say, nobody actually drives that slowly, according to photographer Gustavo Vela.

