AMCS ACTIVITIES NEWSLETTER

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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@mexicancaves.org. Exceptional color photographs for the covers or other full-page applications 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 Oscar Berrones, Yvonne Droms, Rodolfo "Fofo" Gonzalez, Fernando Hernandez, and Mark Minton

All previous issues of the *Activities Newsletter* are available in print, as PDF files, or both, as are various other publications on the caves of Mexico. Contact sales@mexicancaves.org, see http://www.mexicancaves.org, or write the address below.

ASSOCIATION FOR
MEXICAN CAVE STUDIES
BOX 7672
AUSTIN, TEXAS 78713
www.mexicancaves.org

Front cover

Sabrina Simon recording survey data in the Mystic Monkey section of Sistema Chango Místico, Quintana Roo. Photo by Nathan Williams and Sabrina Simon.

Back cover

The Space Drop in the Sótano de San Agustín section of Sistema Huautla, Oaxaca. Photo by Chris Higgins.

CONTENTS

* Bill Steele, Gilly Elor, Bill Stone and Vickie Siegel, Katie Graham and Zeb Lilly, Fernando Hernández, Mark Minton and Yvonne Droms, Tommy Shifflett. Sidebars: Jorge Mendoza (biology), Jim Smith (geology).

NEWS

Camp 3 in the Sótano de San Agustín part of Sistema Huautla, Oaxaca, lies on the floor of the Sala Grande de la Sierra Mazateca, a huge room with a domed ceiling and a conspicuous fault in the wall. *Stephen Eginoire*.

MEXICO NEWS

Compiled by Bill Mixon

CHIAPAS

Peculiar bumpy cave pearls have been observed in Cueva los Bordos. In an article in *Kur* 21, Paolo Forti theorizes that the lumps form because the pearls spend most of the time partly submerged in water, so that capillary action draws water up to the tips of the bumps, where calcite is deposited. Occasional rapid flows submerge and rotate the cave pearls, so that the bumps cover their surfaces. *Source*: https://issuu.com/laventaesplorazionigeografiche/docs/kur21eng.

At the request of the national park containing the Cañón del Sumidero, cavers from the La Venta group removed a flowstone dam in the Cueva del Arbol de Navidad that was blocking for much of the year the flow that nourishes the Arbol de Navidad, an attractive travertine deposit on the wall of the canyon. To do this it was necessary to rig the entire height of the canyon wall, about 800 meters. *Source*: article "Arbol de Navidad: Il Salvataggio di un Simbolo," by Tullio Bernabei and Alessio Romeo, *Speleologia* 72, June 2015, pp. 53–55.

The following summary by Natalina Russo of the La Venta Esplorazione Geografiche group's 2014 expedition to their area in Chiapas is edited from the English version of *Kur* magazine number 21, pages 27 and 28. The Italian edition was published in December 2014. The issue is on-line at https://issuu.com/laventaesplorazionigeografiche/docs/kur21eng. Unfortunately the traditional PDF files of issues of KUR are no longer available, just silly Flash things that are difficult to deal with.—

April 2014. The explorations in the Río La Venta Canyon and in the Selva El Ocote continue. Nearly twenty-five years of work have led to the discovery of more than three hundred caves, for a total length of over 80 kilometers. The most important cave of this area is Cueva del Río La Venta, a tunnel 13 kilometers long connecting the plateau on the orographic left of the canyon with its bottom, where flows the river, four hundred meters below. [See map in *AMCS Activities Newsletter* 23, p. 17, and article in number 34 starting on p. 65.] It is a magical place, one of the richest collections of underground morphologies in the world. But in other places, just beneath the tangled vegetation of the forest, open thousands of caves. Expedition after expedition, we keep on mapping this treasure, along with dozens of speleologists not only Italian, and especially thanks to the collaboration of the local people.

During the last expedition we flew over the forest, thanks to a helicopter provided by the Protección Civil de Chiapas. We have come into the western area of El Ocote, where ridges of huge sharp karren poke out from the dense vegetation. Here, among the shadows and the deep green of the forest, we have identified a large portal still unvisited. We have named it Macondo, in tribute to Gabriel Garcia Marquez. It is located in a remote area accessible only with difficulty, and unfortunately a week of storms prevented us from reaching it. But it is on top of our list of future goals.

A second group was to have worked in the forest, inside caves already identified in the past, but when it rains the forest is inaccessible, so the group dedicated itself to finding new entrances around the village of Monte Bonito. Here has begun the exploration of a new cave over 200 meters deep, with internal pitches lashed by waterfalls. In the surrounding area some speleo-diving in the big resurgence of Pajalaná, near the Aguaclara colony, has been done, and also in the clear siphon of the Chute Redondo.

A large group has worked in the area of La Conchuda, on the orographic right of the canyon, ascending the spectacular waterfalls of Los Bordos. The water comes from a huge conduit penetrating the mountain for over 3 kilometers. It had been explored by the French at the end of the '80s, and a La Venta expedition went there in 2013, beginning new explorations and redoing part of the topographic survey. In addition to completing this work, our most recent expedition has

Cave Pearls in Cueva Los Bordos, Chiapas. *Natalina Russo*.

focused on video and photographic documentation. The cave is beautiful and opens on a landscape of great charm, among travertine pools in a bend of the canyon at the foot of high walls, where from the dense vegetation poke out the ruins of a Zoque settlement, previously visited by one of our expeditions in 2001, when it was mapped and named—perhaps with not much imagination—La Conchuda. Just a few hundred meters away are other large and inactive caves, rich of rock paintings, tombs, and altars, like the Cueva del Porche de Los Bordos, unfortunately sacked in the '40s.

After a few days spent in the Reserva La Venta to rerig and make safer the Cueva del Naranjo, many participants in the expedition moved to the La Pera area, invited by the municipality of Berriozábal. It is a nature reserve halfway between El Ocote and the plateaus of Tuxtla Gutiérrez. It is a beautiful place, with dense forests and deep, unknown pitches. Here in a few days we explored several kilometers of caves, especially in Cueva de El Amate, where locals have long known the entrance passage, but there are also two active and very wide lower levels previously unknown.

CHIHUAHUA

On October 2015, Industrias Peñoles, operator of the mine in Naica that contained the Cave of the Crystals, announced it was suspending operation of the mine. The mine had reached a depth of 900 meters, from which fifteen thousand gallons per minute of hot water were pumped to the surface at a cost of about one million dollars a month in electricity. This was supported by annual production of some fifty thousand tons of lead, fifteen thousand tons of zinc, and 170 tons of silver. In January 2015, major flooding began in the depths of the mine, and months of effort failed to control the situation. Now the cave of the crystals is back under 200 meters of water. The much less spectacular Cave of the Swords, discovered early in the last century, should remain above the natural water level. *Sources*: Industrias Peñoles press release, Reuters dispatch dated October 13.

The AMCS was privileged to scan slides by Carlos Lazcano, some of the very first photographs from the Cave of the Crystals. Some of them were published in black-and-white in *AMC Activities Newsletter* 25 for 2002. The color cover on that issue was also among the scans. Some of Lazcano's photographs are printed here in color.

Abstract: The Caves of Naica: a Decade of Research, by F. Gázquez, J. M. Calaforra, P. Forti, and G. Badino.

The caves of the Naica Mine have been the subject of study by scientists from up to seven counties over the past decade. Up to fifty research works have been published to date, most relating to the origin of the giant selenite crystals of the Cueva de los Cristales. Nevertheless, a great deal of knowledge has been generated about other relevant aspects of the Naica system. This paper puts together the vast information available about the Naica caves, from the discovery of the Cueva de los Cristales in 2000 to the more recent investigations addressing mineralogy, microclimatology, and the use of gypsum speleothems as a paleo-environmental proxy. Special attention has been paid to novel research lines that have started to use the speleothems of Naica as a study case, particularly in fields such as astrobiology and planetary geology. Moreover, the conservation challenges that these caves will face in the near future as consequence of the end of mining activities have also been addressed in this article.

Source: *Boletín Geológico y Minero*, v. 127, no. 1, pp. 147–163. This important review paper may be downloaded from https://www.researchgate.net/publication/301682192_The_Caves_of_Naica_a_decade_of_research.

COAHUILA

Issue number 8, one of three 2015 issues, of the Spanish caving magazine *Gota a Gota* by the Grupo de Espeleología de Villacarrillo contains on pages 94–96 an interview with Mónica Ponce. Material from all of the issues of the nicely produced journal is free to download at https://sites.google.com/site/espeleovillacarrillo/home. *Source*: Mark Minton.

HIDALGO

Sótano El Encanto was explored and mapped in March 2013 by the Asociación de Excursionismo y Montañismo del Institute Politéctnico Nacional. *Source*: *Mundos Subterráneos* 24, pages 96–102, 2013.

NUEVO LEÓN

During practice dive in Pozo de Gavilán in the *municipio* of Galeana, firefighters discovered a body in a vehicle in the lake at the bottom in the cenote. It was reported to local officials on May 30, who then handed it off to the state on the assumption a criminal act was involved. The state attorney general will be responsible for releasing additional information. *Source*: www.zocalo.com.mx/seccion/articulo/encuentran-auto-y-cadaver-al-fondo-del-pozo-del-gavilan-1464701049, called to our attention by Peter Sprouse.

OAXACA

Abstract: Proyecto Espeleológico Sistema Huautla (PESH) 2015 Expedition, by Bill Steele.

The caves of the Huautla de Jiménez, Oaxaca, area were discovered by cavers in 1965. From 1966 to 1970, two caves, S6tano de San Agustfn and Sótano del Río Iglesia, were explored and surveyed as the first and second deepest caves in the Western Hemisphere. Caving resumed in 1976, and until 1994 expeditions were held most years as a NSS official project. In 1988 the Project was awarded a NSS Certificate of Merit. Two books have been published about the caves, *Beyond the Deep* and *Huautla: Thirty Years in One of the World's Deepest Caves*. A chapter about Sistema Huautla is included in the *Encyclopedia of Caves*. From 1994 to 2013 a handful of expeditions were conducted.

In 2013 Tommy Shifflett and Bill Steele started PESH with the goal of conducting annual expeditions and continuing the work in Sistema Huautla and other caves in its drainage basin. PESH is an official project of both the NSS and the U.S. Deep Caving Team. It also carries the flag of the Explorers Club on its

RIP
Cave of the Crystals
2000–2015

Photos by Carlos Lazcano

expeditions.

This presentation will be on the results of the 2015 expedition, which took place in April.

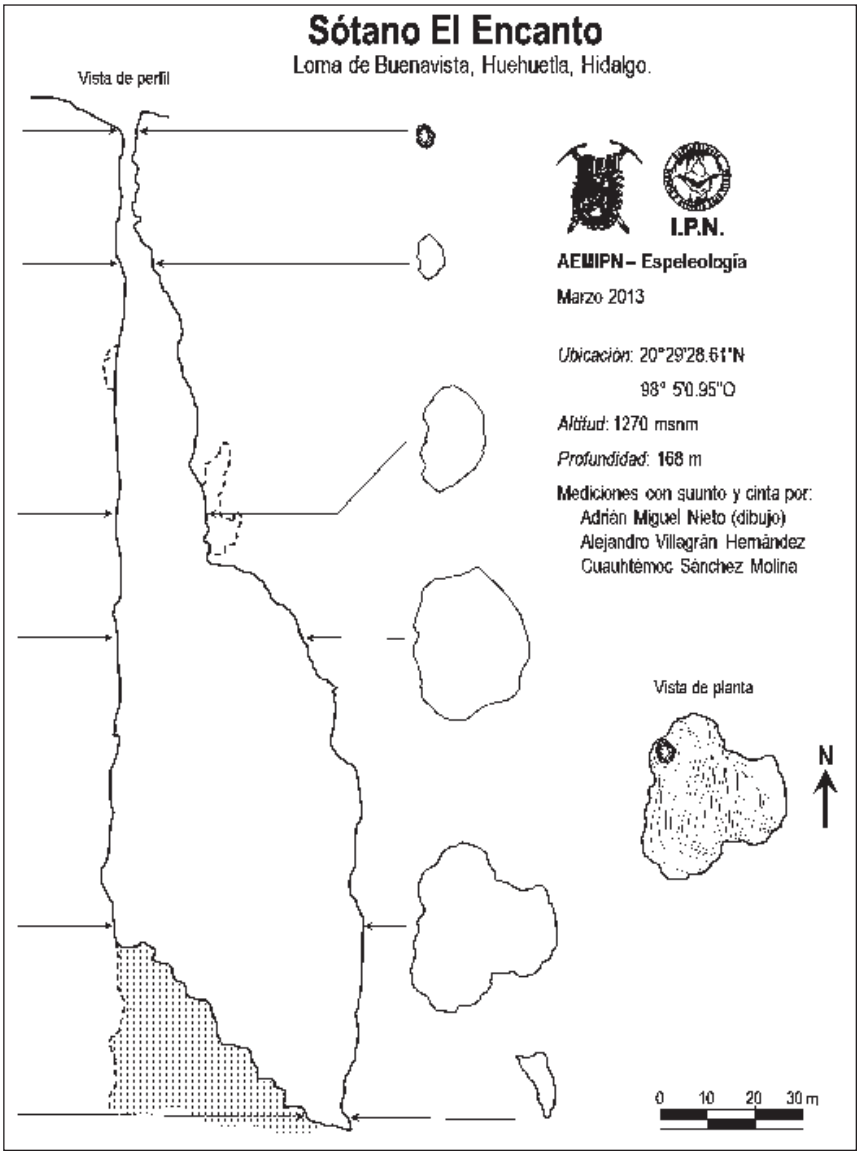
Source: 2015 NSS Convention Program Guide, p. 151.

Abstract: Proyecto Sierra Mazateca 2015—Caving from Another Angle in the Sierra Mazateca, by Tony and Marion Akers.

The Sierra Mazateca, a cloud-forest tropical region in Oaxaca, Mexico, is filled with amazing karst-limestone plateaus and sinkholes. We continued another year of cave exploration and conservation efforts, based out of Cafetal Carlota in the municipality of San Bartolome Ayaulta, during the month of January, 2015. The major part of our expedition was spent in the wilderness at Rancho Arco Iris, south of Río Santiago in the municipality of Huautla de Jiménez. Daily we worked on pit leads in the high-altitude valley, at elevations of over 1400 meters up to 1770 meters. We explored eleven pits around the valley and above it onto the plateau, with depths ranging from 15 to 80 meters, and five more pits in other areas. The total vertical depth of pits explored and surveyed equaled 603 meters, with over 357 meters of horizontal passage. We accomplished the expedition with the help of various donors and our Mazatec friends.

We also gave supplies to the elementary schools in Río Santiago and Cafetal Carlota. Permission was obtained from two different municipal regions, with some challenges faced along the way, and we were steeped in the complex political and social environment of the Mazatec people. Cave and cultural exploration are combined in the Sierra Mazateca, where the experience of food, traditions, and people is as much of an adventure as the caves themselves.

Source: 2015 NSS Convention Program Guide, p. 152.



Mike Boon's booklet *The Great San Agustín Rescue* about his participation in the rescue of a Polish caver from deep in Sótano de San Agustín in 1980 has been scanned and put on the web at www.caving.ab.ca/system/files/the_great_san_agustin_rescue.pdf. The text was reprinted with Mike's permission in *AMCS Activities Newsletter* 37 (2014). Translations of articles on the rescue written in French or Spanish at the time appear in number 38.

The September 2015 issue (v. 1, no. 4) of *Ripcord Adventure Journal* contains an eighteen-page article by Bill Steele, "50 Years of Continuous Exploration: Sistema Huautla, the Deepest Cave in the Western Hemisphere." The issue is free on-line at www.ripcordadventurejournal.com/#!issue-4-digital-edition/ymjaf. The uncredited cover photo appears to be the Space Drop in Sótano de San Agustín. Printed copies are available: http://

www.ripcordadventurejournal.com/#!bookstore/rmfos. *Source*: Bill Steele.

A thirty-minute video talk by Bill Steele on the 2015 Proyecto Espeleológico Sistema Huautla expedition is at https://vimeo.com/135992593. The video, prepared by sponsor Whole Earth Provision Company, is illustrated by photographs and occasional video clips. *Source*: Mark Minton.

There is a gallery of maps of mostly small caves in the Sierra Mazateca at www.proyectosierramazateca.org/Exploration.php#Cave_Map_Gallery. *Source*: Mark Minton.

An international team of cave divers explored the Sistema Huautla resurgence cave this spring for the first time since 2001 (see the article in *AMCS Activities Newsletter* 25). Very little information has been forthcoming, aside from a sketchy and incomplete Facebook blog at https://www.facebook.com/CaveDive. The divers set up camp in Santa Ana Cuautémoc across the Río Santo Domingo from the resurgence, wading the river to do the dives. The end of the previous exploration was reached beyond 600-meter Sump 2 with a maximum depth at an elbow of 65 meters. Plans to possibly climb out of the water there if nothing better was found were made, but a careful search of the underwater passages turned up a new route at –30 meters. That route led 200 meters at a maximum depth of 38 meters to a large lake. There is no flow there, but it was easy to climb out of the lake, and 600 meters of dry cave were explored "with more to come."

Despite the lack of information in the blog, there are over two hundred photos at https://www.facebook.com/CaveDive/photos/.

PUEBLA

The Proyecto Karstológico Nacional, led by Dr. Rafael A. López Martínez from the Institute of Geology at UNAM and Hugo Salgado, held its first expedition from April 4–28, 2016, in the Sierra Negra, Puebla. The purpose of the project was to begin speleological studies and explore various sumps in the area of Zoquitlán. The caves explored, Sumidero de Xocotlat, Cueva de Xocotlat, and Topitzatl, had been previously explored in the 1980s by Americans and the Groupe Spéléo Alpin Belge.

The most important outcome was diving the sump in Topitzatl. German Yañez and Rafael López mapped the flooded passage, 380 meters long and 5 in depth, to its end. The group went to –250 meters in Sumidero de Xocotlat, but found the way on blocked, so they couldn't reach the sump at –316 meters. In Cueva de Xocotlat, the sump at –340 meters was found to be only 3 meters long and was free-dove to find that the cave continues.

The project will continue in 2017. Eighteen cavers from Mexico, one from Cuba, and two from Poland participated.—*Source*: Gustavo Vela.

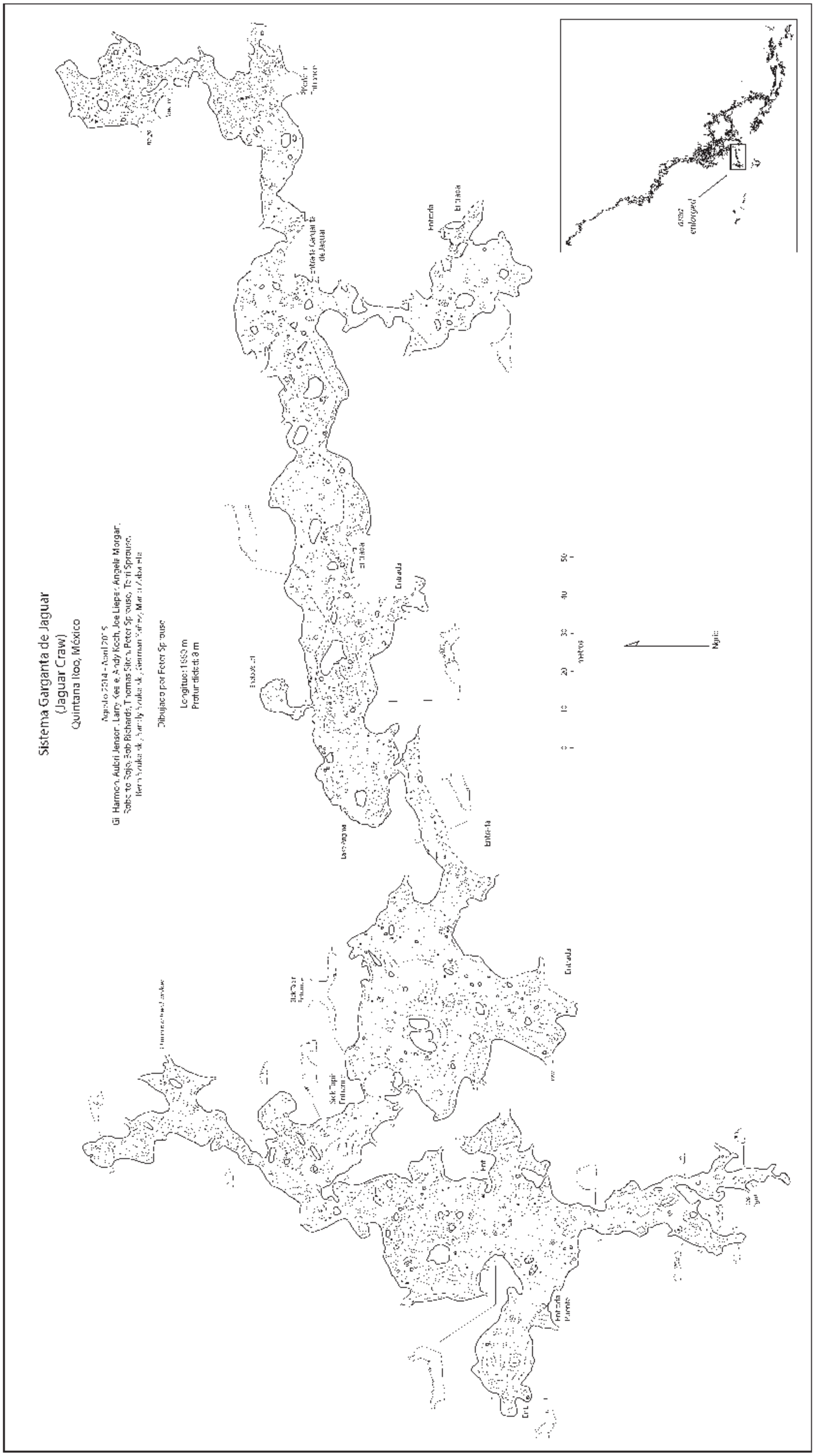
Claudio Cruz descending in Xocotlat 2 during Proyecto Karstológico Nacional. *Gustavo Vela.*

Mexican caver Gustavo Vela spent several weeks over two years exploring and photographing Cueva Piedra Rosetta near Zoquitlán. His work appears in an article in *México Desconocido* number 471 in May, beginning on page 72. The jewel in the jungle was explored with the Groupe Spéléo Alpin Belge. *Source*: Gustavo Vela.

See also the note about Tlaloc 2014 under Veracruz.

QUINTANA ROO

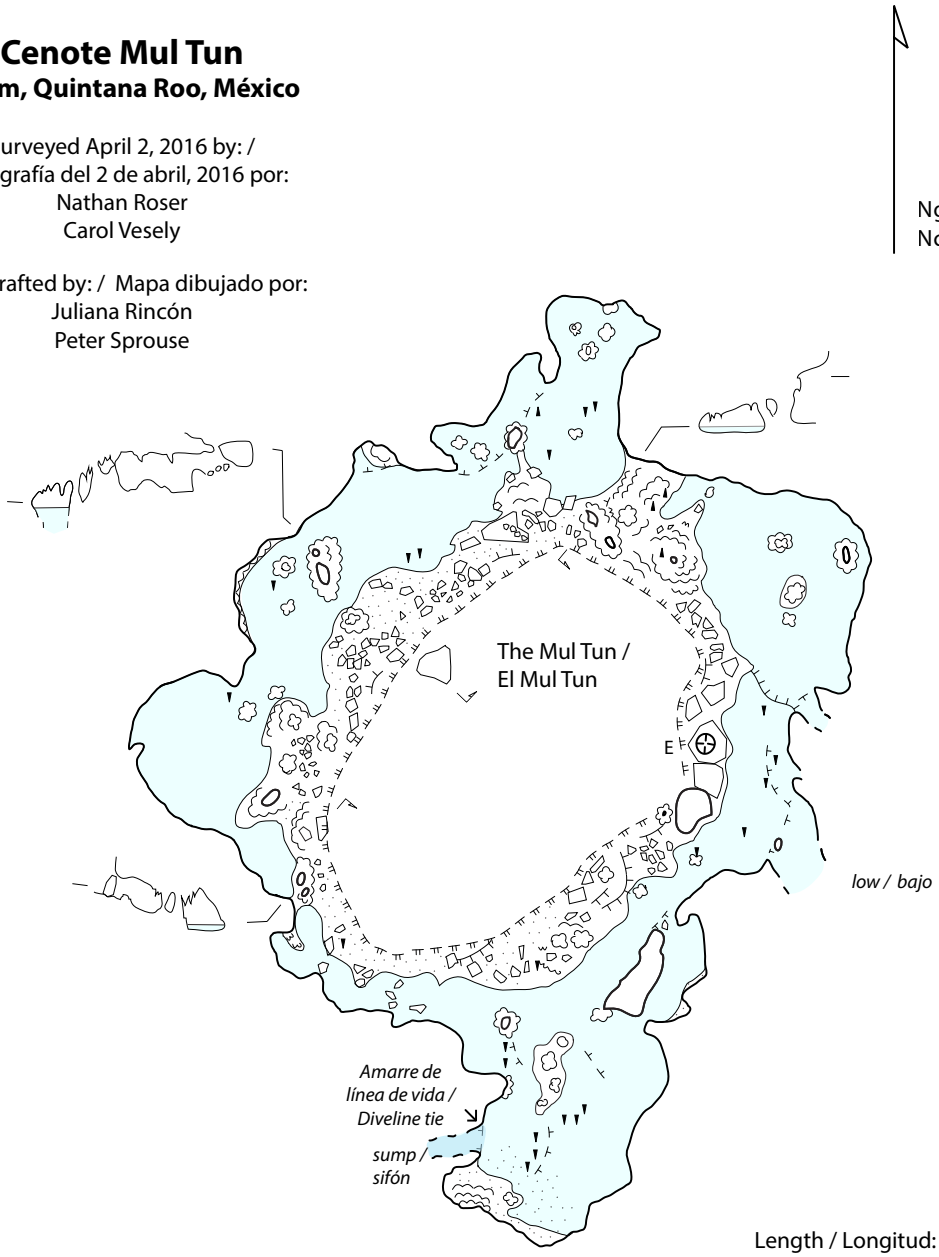
Beginning in December 2013, massive exploration in the Paamul collapse system resulted in the mapping of the Jaguar Complex, a series of barely disconnected caves with rhyming names. An area off of the southwest edge of Jaguar Claw was


Sistema Garganta de Jaguar
(Jaguar Craw)
Quintana Roo, México
Dibujado por Peter Sprouse
Entrada
area enlarged

Cenote Mul Tun
Tulum, Quintana Roo, México

Surveyed April 2, 2016 by: /
Topografía del 2 de abril, 2016 por:
Nathan Roser
Carol Vesely

Map drafted by: / Mapa dibujado por:
Juliana Rincón
Peter Sprouse



Length / Longitud: 180 m
Depth / Profundidad: 6 m

Dry survey tie-in to dive line in Cenote Mul Tun. *Nathan Roser.*

particularly interesting, since a series of sinks could be seen extending to the west. A handful of caves have been mapped along these sinks thus far, the longest of which is Sistema Garganta de Jaguar (Jaguar Craw). In August 2014, Andy Koch, Peter Sprouse, and Monica Torre were mapping in the southwest corner of Jaguar Claw, and Monica was able to push through a low blowing crawlway that opened up into larger passage with several entrances. Ultimately this section of Claw ended at an entrance (Thorn Entrance) with no underground continuation, the only way on being across a collapse on the surface. Forty meters to the northwest they were able to get underground again into a new cave via the Phone In Entrance. After trying to connect it back southeast to Jaguar Claw without success, they did a few shots to the west, where the cave continued.

In December 2014, two teams continued the survey to the west to Lake Angmar, getting 471 meters of survey to make the cave 601 meters long. In April 2015, several teams were able to extend the cave by staying under a drip-line along the northwest edge of a collapse sinkhole, and got back into large passage leading to the Sick Tapir Entrance. Beyond that the passage headed north to a pinch with airflow, but determined hunting led to the discovery of a crawlway heading south back into open passage. No further ways on could be found in that area, so progress to the west is halted for now. *Source*: Peter Sprouse.

In April 2016, Nathan Roser and Carol Vesely surveyed the dry portion of Cenote Mul Tun, located northeast of Tulum. It has a vertical entrance measuring 25 by 40 meters, and is undercut all the way around. Access is gained by climbing down a large boulder, or *Mul Tun* in Mayan. A boulder-slope leads down to water along all sides. There are sumps going off in upstream and downstream directions; these are being explored by divers Alessandro Reato and Luis Leal. Cenote Mul Tun is strategically located in the middle of the 2-kilometer gap that separates 337-kilometer-long Sistema Sac Actun (Dos Ojos section) and Sistema Koox Baal, which is 79.7 kilometers long. *Source*: Peter Sprouse.

Divers with the Centro Investigador del Sistema Aquífero de Quintana Roo (CINDAQ) and the Mexican Cave Exploration Project (MCEP) have been exploring large underwater cave from the Cenote Cooper entrance to Sistema Ox Bel Ha, including a room 150 meters wide where the connection to Ox Bel Ha was made. Improved technology has made possible finds in other parts of Ox Bel Ha, including saltwater tunnels at a depth of 21 meters.

Really deep underwater pits are rare in the area. CINDAQ and MCEP divers have discovered a pit reaching a water depth of 52 meters. It is unclear whether this is also in Ox Bel Ha. In any case, passage continuing from the bottom of the pit seems unlikely, but further diving will be done to understand the new find. *Source*: CINDAQ/MCEP March 2014 exploration report at www.mcep.org.mx/march-2016.html.

In February 2014, members of the Czech Speleological Society continued their project for exploration and documentation of underwater cave systems in the Yucatan Peninsula that has been running since 2003. During fourteen days they discovered three new cenotes to the northwest and southwest of the known parts of Sistema K'oox Baal, which is now the fourth longest underwater cave in the world, 75 kilometers [see article in *AMCS Activities Newsletter* 37]. They discovered 589 meters of new passages in the new Shoot's Hool Cenote and a total of 1176 meters of new corridors in the Wa Ba'ax Yan Cenote. During an inspection dive in the Chak Ha Cenote, they discovered 354 meters of new passages and connected Chak Ha with Zebra Cenote, which reached a total length of 2443 meters. In cooperation with cavers from the Slovak Speleological Society they discovered eight new cenotes at a distance of about 4 kilometers northeast of the surveyed area. These cenotes have a total of 2 kilometers of new corridors, with a potential for their continuation and interconnection with a larger system. *Source*: English summary of article "Xibalba 2014—New Challenges," by Zdeněk Motyčka and Daniel Hutňan, *Speleofórum* 34, 2015, pp. 50–52, 109–110.

Bernard Reeves (48) of Montreal, Quebec, Canada, died February 11, 2013, near the Cenote Calimba exit of the Sac Actun Cave System near Tulum. The cause of death was drowning due to running out of air before reaching the surface.

The Sac Actun Cave System is highly complex, with guidelines leading to a number of passages. There are three exits in close proximity: Cenote Calimba, Cenote Box Chen, and Cenote Ho Tul. Another line, the Paso de Lagarto line, can be followed all the way to the more distant Grand Cenote exit. Some of the guidelines begin as T intersections, with the two directions connected, and some are jumps. In a jump, the line leading through the side passage

is not connected, and the divers are supposed to make a connection using a jump reel to maintain a temporary continuous guideline to the surface. In a complex system such as this, markings can be very confusing. Line arrows are supposed to point to an exit, but multiple exit points create confusion as to which exit an arrow may be pointing. Cave divers use personal markers at potential points of confusion to ensure that they follow the correct path on the way out.

Reeves was an experienced and trained cave diver. He was part of a group of seven, but he elected to do his dive as a solo diver while the rest of his group operated as two teams of three. They entered through Cenote Calimba. Before the dive, he was observed listening to another team talking about diving in the direction of Cenote Box Chen, and he told the rest of his group that he was going to follow that plan as well. He had never been in that section of the cave before. He entered the cave shortly ahead of the rest of the group.

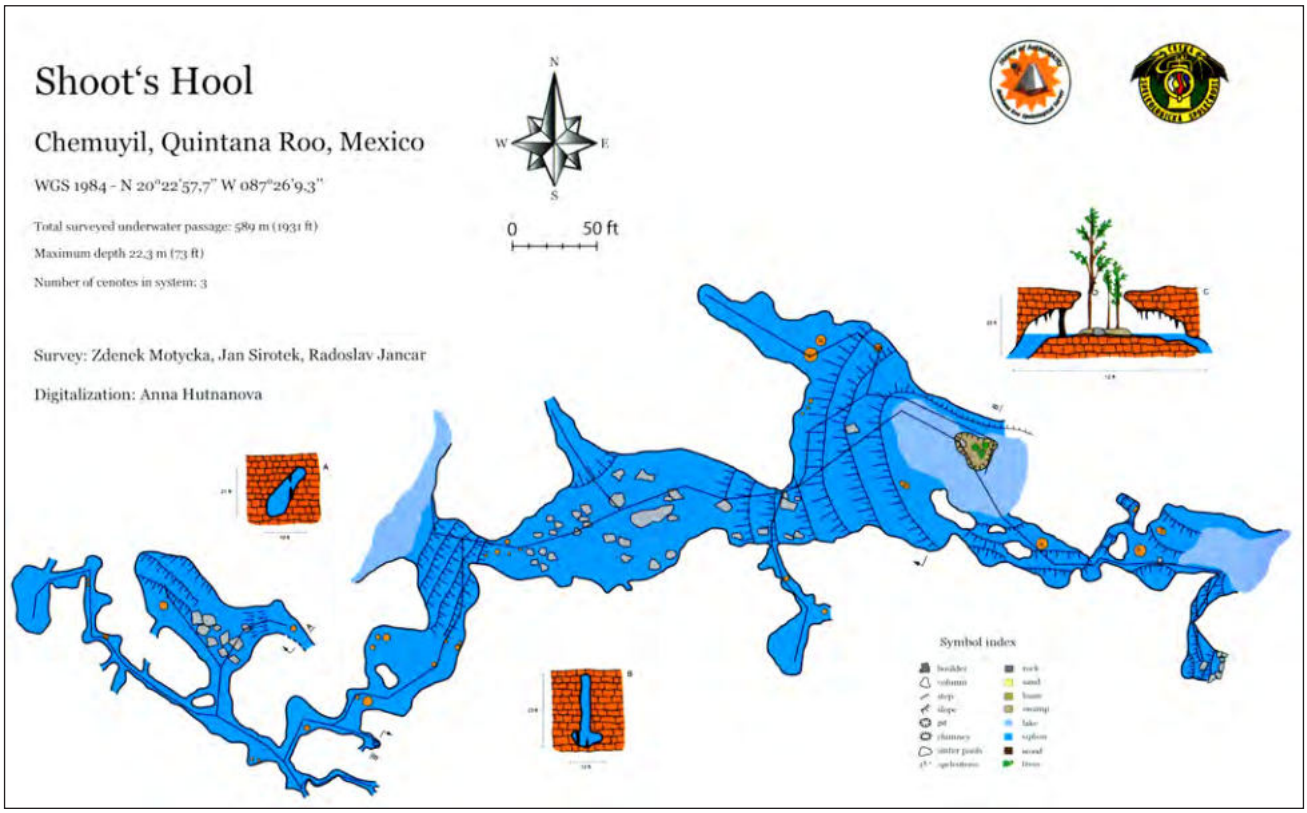
During their dive, one of the groups observed the equipment that Reeves used to mark his path, and after the recovery it was noted that he had picked up that equipment during his attempted exit. His computer was also analyzed. Consequently, even though he was diving alone, it is possible to determine his complete path accurately. At the T intersection for the Paso de Lagarto line, he placed a personal marker (wooden clothes pin) on the Cenote Calimba side of the intersection to mark his exit direction, and continued on the Paso de Lagarto line. At the jump intersection leading to Cenote Box Chen, he used a jump reel to connect to that line, but he did not put a personal marker on the Cenote Calimba side to mark his exit direction. At that point, there is a permanent line arrow pointing toward the distant Grand Cenote exit.

Reeves continued toward Cenote Box Chen until his turning point at 40 minutes, at which point he headed back the way he had come. He pulled out his jump reel and reached the Paso de Largarto line, but he mistakenly followed the line in the wrong direction, heading toward Grand Cenote. He continued in that direction for 800 feet, realized his mistake, and turned around. His unexpected detour used too much of his air to allow him to reach his exit, and he was found in 19 feet of water only 200 feet from the Cenote Calimba exit, his air completely consumed.

Source: *NSS News*, June 2015 (American Caving Accidents 2013–2014), p.18, based on accident report by Bil Phillips.

Brent Cooper (44) of Missouri died while diving in Jailhouse Cenote near Tulum. Cooper was diving with three friends, and they were just beginning the second dive of the day, with Cooper in the third position on the team. One hundred feet into the cave at a depth of 35 feet, Cooper stopped swimming and sank to the bottom of the cave. His team members evacuated him immediately and began CPR. After 50 minutes, paramedics arrived and determined that he could not be revived. Cooper's rebreather and other gear were examined and found to be in good working order. The cause of death was determined to be a medical disorder. *Source*: *NSS News*, June 2015 (American Caving Accidents 2013–2014), p.19, based on an incident report by Paul Heinerth.

Abstract: Overview of the Controls on Eogenetic Cave and Karst



Development in Quintana Roo, Mexico, by Patricia Kambesis and James Coke IV.

The northeast coast of the state of Quintana Roo, Mexico, is known for its vast underwater cave systems, numerous cenotes, and unusual coast-line features that are all expressions of the coastal hydrology of an eogenetic karst region. Variations in geological and hydrological controls and boundary conditions have resulted in the formation of extensive linear phreatic caves located in the phreatic and vadose zones, and relict flank margin caves in the vadose zone. A significant number of the region's cenotes are portals into underwater cave systems. Dry sinkholes provide access to caves currently located in the vadose zone. A combination of karstification and littoral processes have affected the northeast coastline of Quintana Roo resulting in the formation of features such as coastal and off-shore springs, *caletas*, and crescent-shaped beaches. The juxtaposition of extensive inland recharge, diagenetically immature carbonates, intersection of regional fault, fracture, and lineament trends, and mixing zone dynamics, all within a glacioeustatic-driven fresh/saline water regime, have resulted in a density-stratified coastal karst aquifer drained by an extensive network of conduits. Sea-level change has stranded the higher elevation conduit networks and the flank margin caves in the vadose zone. The conduits, indicative of turbulent flow, and flank margin caves formed from laminar flow, are both the result of mixing-zone dissolution. Surface and littoral erosion facilitate the continued karstification of the inland and coastal areas of Quintana Roo.

Source: chapter 16 in *Coastal Karst Landforms*, pages 347–373, Springer Science+Business Media Dordrecht, 2013.

Abstract: The Jaguar Chronicles: Claw, Jaw, Maw, Paw, and Craw, by Pat Kambesis and Peter Sprouse.

The incredibly porous and permeable limestones of the coastal Yucatan peninsula hold some of the world's longest cave systems. The dense tropical forest covering the limestone does a pretty good job of hiding the many portals into these vast systems. Before the days of Google Earth and LIDAR, it was only when sections of jungle were cleared for development that these entryways became visible. In December 2013, an interesting linear feature on lidar images inspired Pamuul Grotto cavers to venture into the remote jungle to find the source of that linearity, which turned out to be the tip of a series of new discoveries now known as the Jaguar Caves, Jaguar Claw (31,491m), Jaw (10,015 m), Maw (3,257 m), Paw (2,717 m) and Craw (1,678 m). Named after one of their largest and most frequent visitors, the Jaguar Caves formed along a distinct linear feature that cuts into the underlying limestone. Large, decorated boreholes intertwine along and through this feature. Three annual excursions (since we are not really roughing it) attract a large contingent of local, US, and international cavers who have been trying to find the limits of the Jaguar Caves, but so far with no success. The myriad of passages that head off into unknown territories are a major distraction to actually trying to connect the caves. But when they are finally joined (and undoubtedly they will be), the total meterage of the Jaguar Caves will be at least 53 kilometers, though that number changes every three or four months.

Source: 2015 NSS Convention Program Guide, pp. 150–151.

Abstract: Recent Underwater Cave Explorations in Quintana Roo, Mexico, by James G. Coke IV.

The Quintana Roo Speleological Survey (QRSS) supports safe exploration, conservation, and survey documentation of the underwater and dry caves in Quintana Roo, Mexico. Our present study area incorporates 6300 square kilometers in northeastern Quintana Roo. At this time we archive over 1274 kilometers of confirmed underwater survey data for 327 underwater caves and cave systems.

Underwater cave explorations continue in the Muyil and José María Pino Suárez areas south of Tulum. These relatively unexplored areas continue to produce a number of significant underwater caves. We will review the progress that several groups of explorers have made in their latest studies. Their cave-surveying efforts support a contemporary hydrological drainage hypothesis for the northeastern coastal drainage zone of Quintana Roo.

Explorations continue in the Actun Hu and Lab Nah Ha regions of Sistema Sac Actun. A new area of exploration south of the Sac Actun system may provide a new direction for growth of Sistema Sac Actun.

Source: 2015 NSS Convention Program Guide, p. 151.

The underwater videography company Green Collar Productions is working on a documentary film "The Future of the Riviera Maya" about the threat to the environment caused by the commercial development in the area. A trailer is at https://vimeo.com/123817034. *Source*: *NSS News*, April 2016, pages 16–18.

On March 1 Spanish tourist Mauricio Muller entered Cenote Calavera near Tulum with two German women and a guide for a cave dive. Not long after they entered, the other three noticed that Muller was no longer with them. The unnamed guide (some reporters are not doing their jobs) left the cave with the two women and then went back in, but could not find the stray. His body was recovered the next day by police divers. This is suspected to be yet another case of commercial cave-diving taking inexperienced divers beyond safe limits. Authorities have closed the cenote until the safety situation can be assessed. *Sources*: www.riviera-maya-news.com/diving-tourist-strays-from-group-drowns/2016.html and other web sources.

There is a three-minute video of the strange underwater formations in Cenote Zapote at https://vimeo.com/129939066. It gives the best view so far of them. One theory about their formation is in "Mexico News" of number 38. *Source*: videographer Darryl Jensen.

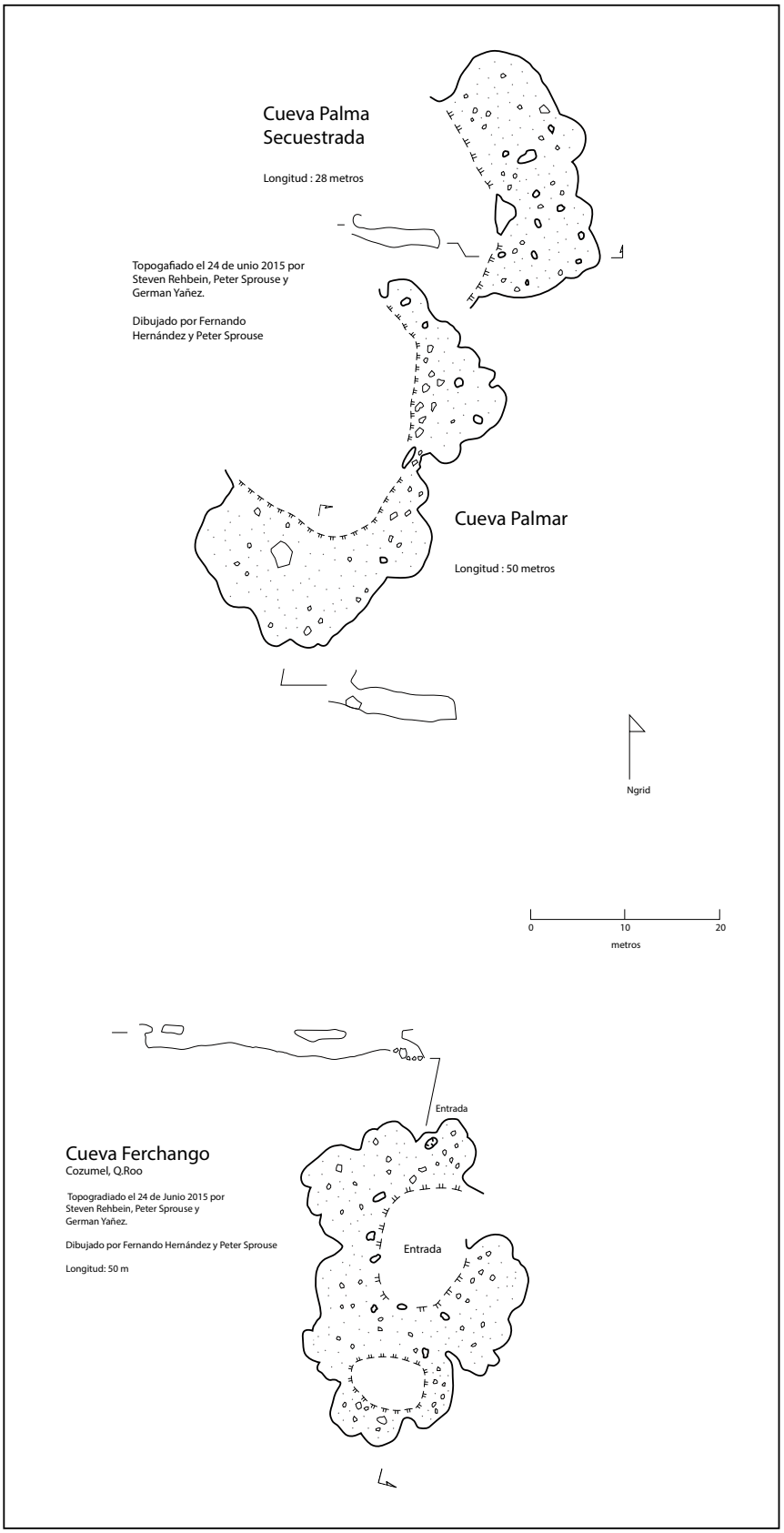
Fernando Hernández, Stephen

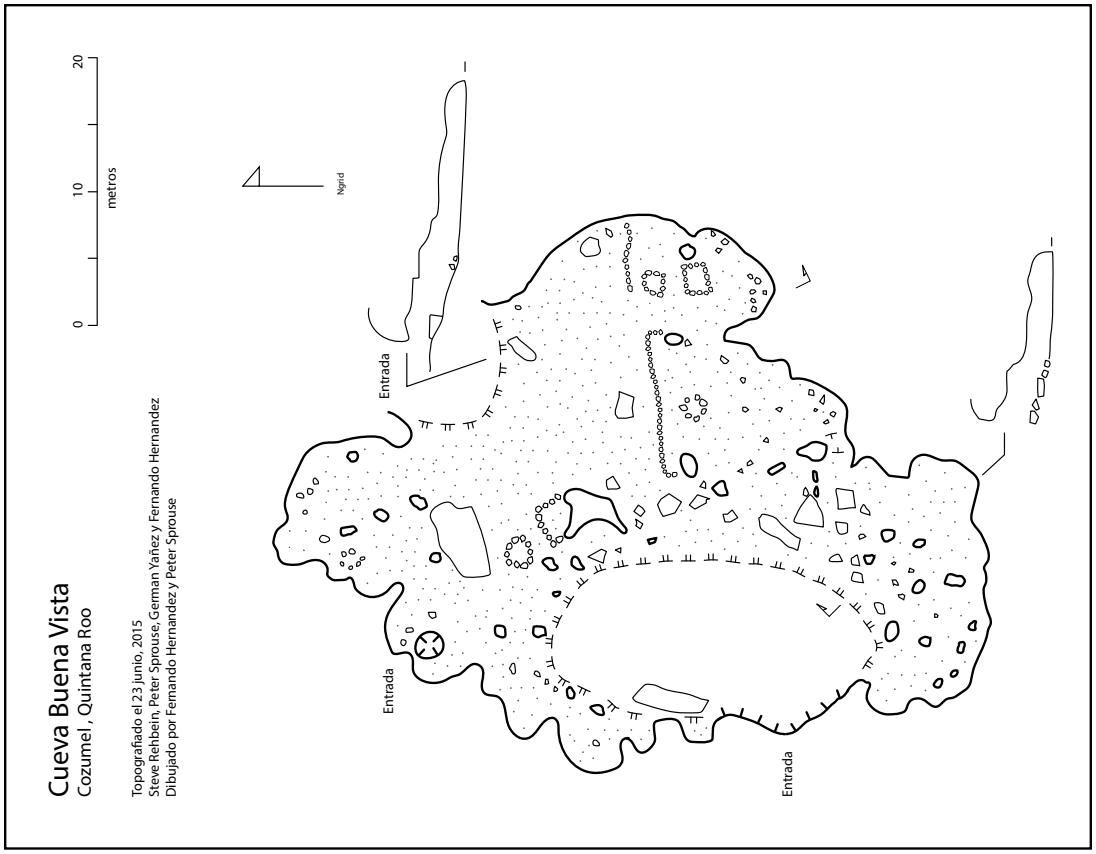
Rehbein, and Peter Sprouse joined Cozumel resident German Yañez for a week of cave-hunting in June 2015. They mapped nineteen dry caves and located a number of others, many of which were previously unreported. On the southeast coast of the island, they visited twelve caves on Rancho Buena Vista, largely situated on a relatively high area of ancient beach ridges. The largest of these was Cueva Buena Vista, which had previously been visited by archeologists. It contains a number of artifacts, many of which appear to have been placed for tourism. Cueva Buena Vista and nearby caves exhibited flank-margin-cave morphology, characterized by smooth bedrock columns, globular shapes in plan view with lobed alcoves, and lack of passage continuations. Similar passage morphology was found in three caves mapped in the southeast part of the island at Cedral, Cueva Ferchango, Cueva Palmar, and Cueva Palma Secuestrada.

In contrast, Cenote Chempita was more akin to typical caves on the Quintana Roo mainland. This cave is a fairly well known tourist snorkeling site. Stairs lead down to the water's edge under the dripline. German reports that there were no known underwater leads in the cenote until a couple of years ago, when a friend of his dropped a piece of his diving gear down a hole in the floor. When he went to retrieve it, he saw a passage going off. German and his team have mapped 725 meters of passage in this south-trending lead so far, and report some of the largest passage and cave formations seen on the island. *Source*: Peter Sprouse.

The volume 16, number 3 issue of *Quest* (2015) contains an article "Mapping the Caves of Quintana Roo" by Peter Sprouse on pages 19–21. It describes collaboration between underwater and dry-cave surveyors.

The April 2016 conservation issue of the *NSS News* contains an article on the challenges facing the caves and groundwater in the Riviera Maya. The article, on pages 16–18, is by Stacey Chilcott. The conservation issue is available to all at https://




Cueva Buena Vista
Cozumel , Quintana Roo
Topografiado el 23 junio, 2015
Steve Rehbein, Peter Sprouse, German Yañez y Fernando Hernandez
Dibujado por Fernando Hernandez y Peter Sprouse
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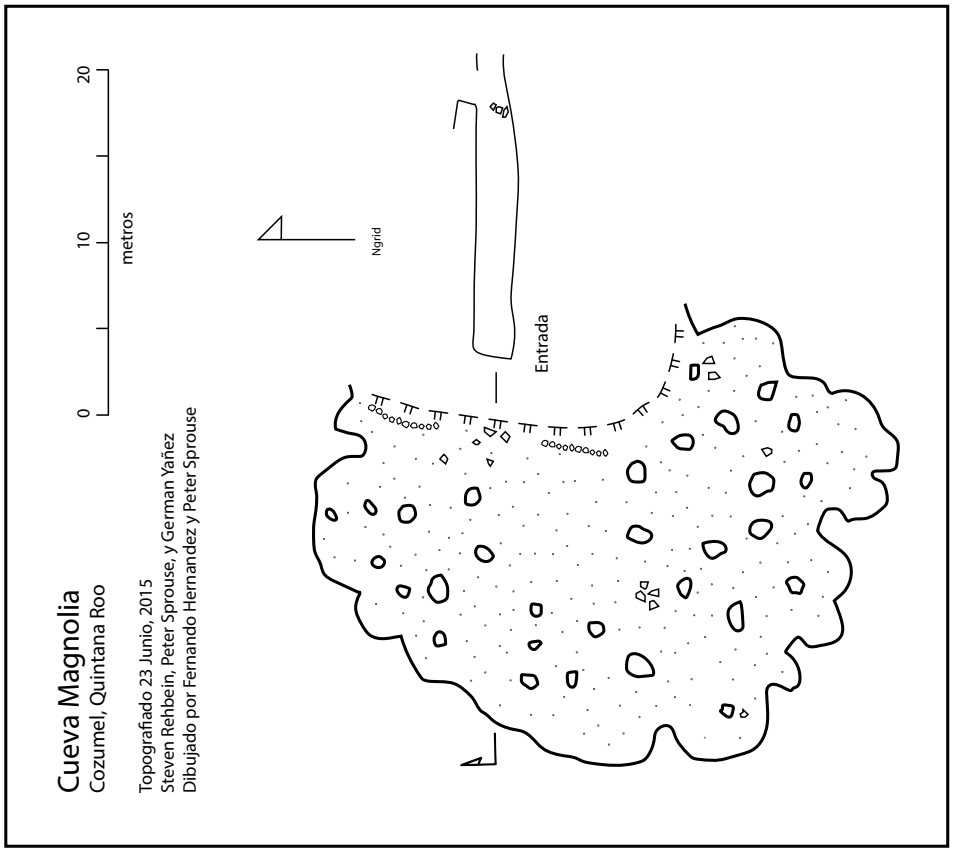
Cueva Magnolia
Cozumel, Quintana Roo
Topografiado 23 Junio, 2015
Steven Rehbein, Peter Sprouse, y German Yañez
Dibujado por Fernando Hernandez y Peter Sprouse
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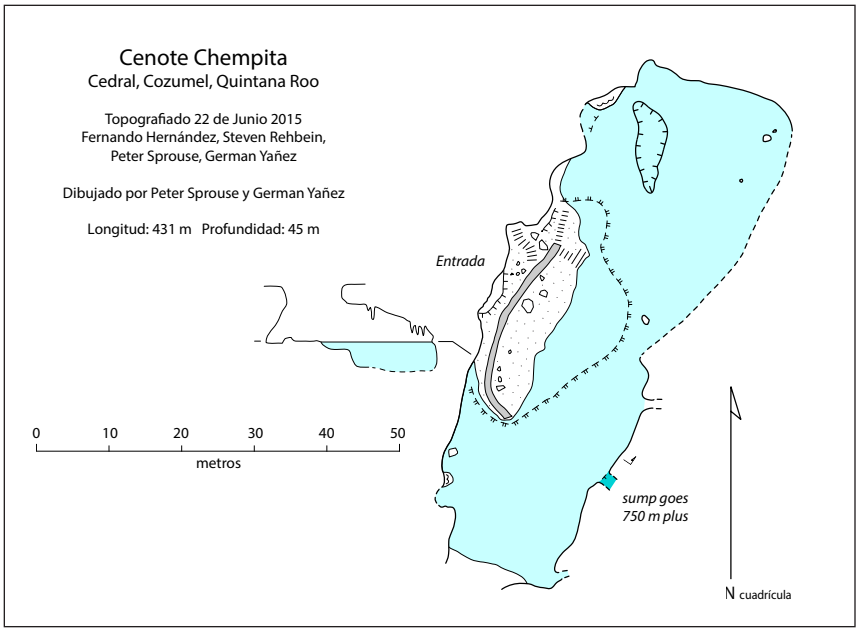

caves.org/April_16_News.pdf.

SAN LUIS POTOSÍ

The third cave-rescue simulation exercise of the Asociación de Montañismo of UNAM was held in November 2015 at Resumidero de la Joya Jonda in San Luis Potosí (see article in *AMCS Activities Newsletter* 37). A group of thirty-five people, twenty-five of them underground and the rest on the surface, accomplished the removal of a stretcher from 200 meters deep in five hours and twenty minutes, coordinated by instructor Dante Salomo. *Source*: Gustavo Vela.

Abstract: Ecology of the Mexican Cavefish *Astyanax*, by William R. Elliott.

Since their discovery in 1936 knowledge of *Astyanax mexicanus*, the Mexican cavefish, was advanced by biologists, geologists, and cavers. Hundreds of caves in the Sierra de El Abra region were discovered on the ground or from the air, then explored, mapped, and studied by many teams participating in the Association for Mexican Cave Studies (AMCS) and academia. *Astyanax* cavefish are known from twenty-nine sites in Tamaulipas and San Luis Potosí states in northeastern Mexico. Another cavefish population, derived from *A . aeneus*, is known from two caves in Guerrero.

The literature about these cavefishes includes descriptions, maps, hydrogeology, anatomy, development, physiology, behavior, ecology, biodiversity, and many genetics papers. Cave mapping and recent GIS cartography aid our understanding of the caves and where they may drain to, informing genetics work.

I shall discuss the ecology and biodiversity of these fish caves with details about several cave types. The cavefish's prey may include swimming crustaceans, but several authors reported that the cavefish subsists mainly on bat guano, other fishes, floating animals, and flood debris. Large populations of cavefishes thrive in some of the semi-isolated caves, while small populations subsist in shallow pools. Some large cavefish populations have large bat colonies close by, but they are not clearly dependent on bats.

Two works about these cavefishes will appear in 2015, one multi-author book with a genetics emphasis from Elsevier Science and an AMCS Bulletin with a speleological emphasis. The author is involved in both books.

Source: 2015 NSS Convention Program Guide, pp. 117–118. (The AMCS bulletin is still pending.)

Abstract: Anesthesia Tolerance in Cave-Adapted and Surface Conspecific Populations of *Astyanax mexicanus*, by Lindsey Martin and William Jeffery.

The cave adapted fish *Astyanax mexicanus* has numerous morphological, physiological, and behavioral changes in comparison to its surface conspecifics. It is not clear how they evolved and whether they are linked to some of the other features via pleiotrophy. This research is to test the hypothesis that anesthesia tolerance is negatively correlated with pigmentation in this species. The study groups include albino cave and pigmented surface populations.

Anesthesia tolerance was initially tested by exposing the fry to ice water and calculating average time to unconsciousness; it was determined that the albino population remained conscious significantly longer than the surface population. The hypothesis was retested using chemical anesthetic MS-222. It was determined that the populations from two different caves, Pachon and Tinaja, remained conscious significantly longer. Additionally, it was discovered that the difference in tolerance does not arise until four days post-fertilization and persists through adulthood in Pachon. In addition, the lengths and masses of the adult fish were measured and compared to their respective times to unconsciousness. It was determined that there is no significant correlation between body mass or length and time to unconsciousness.

Genetic results showed linkage between anesthesia tolerance and the loss of pigmentation, which together segregated independently of eye loss. Future experiments will aim to understand the relationship between this phenomenon and the development of the nervous system in *Astyanax*.

Source: 2015 NSS Convention Program Guide, pp. 125–126.

See also abstract on Sierra de El Abra and Sierra de Guatemala under Tamaulipas.

TABASCO

An extended abstract, too long to reproduce here, by Laura Rosales and Penelope Boston in the proceedings of a 2014 conference on hypogene cave morphologies discussed speleogenesis by sulfidic springs in the northern Sierra de Chiapas. Most of the material is from Rosales's PhD dissertation, published as AMCS bulletin 24. The entire volume, *Hypogene Cave Morphologies*, Karst Waters Institute special publication 18, can be downloaded free from http://karstwaters.org/wp-content/uploads/2015/04/SP18_Hypogene1.pdf (or just go to karstwaters.org and look for the list of publications). The abstract is on page 101.

TAMAULIPAS

Abstract: DNA Sequences of Troglobitic Nicoletiid Insects Support Sierra de El Abra and the Sierra de Guatemala as a Single Biogeographical Area: Implications for Astyanax, by Luis Espinasa, Nicole Bartolo, and Catherine Newkink.

The blind Mexican tetra fish, *Astyanax mexicanus*, has become the most influential model for research of cave-adapted organisms. Many authors assume that the Sierra de Guatemala populations and the Sierra de El Abra populations are derived from two independent colonizations. This assumption arises in part from biogeography. The100-meter-high, 100-meter-wide Servilleta Canyon of the Boquillas River separates both mountain ranges and is an apparent barrier for troglobite dispersion. *Anelpistina quinterensis* (Nicoletiidae, Zygentoma, Insecta) is one of the most troglomorphic nicoletiid silverfish insects ever described. 16S rRNA sequences support that this species migrated underground to reach both mountain ranges within less than 12,000 years. Furthermore, literature shows a plethora of aquatic and terrestrial cave-restricted species that inhabit both mountain ranges. Thus, the Servilleta canyon has not been an effective biological barrier that prevented underground migration of troglobites between the Sierra de Guatemala and the Sierra de El Abra. The Boquillas River has changed its course throughout time. Caves that in the past connected the two Sierras were only recently geologically truncated by the erosion of the new river-course. It is likely that, with the geological changes of the area and throughout the 2-8 million years of evolutionary history of cave *Astyanax*, there have been opportunities to migrate across the Servilleta canyon.

Source: *Subterranean Biology*, vol. 13, p. 35–44, 2014. Free PDF file is at http://subtbiol.pensoft.net/browse_journal_issue_documents.php?issue_id=58.

See also abstracts on *Astyanax* cave fish under San Luis Potosí.

VERACRUZ

In May 2014 the Italian-Mexican expedition named Tlaloc 2014 took place. In the karst area of Zongolica, Veracruz, close to the Acontla village, a little shaft 130 meters deep was explored, and in the Texhuachan area the Resumidero de Huelikapa, with a total depth of 311 meters, was discovered. Also, in the interesting karst area of Hueytamalco, Puebla, 1000 meters of new passages have been discovered and surveyed in Cueva de Don Alfredo, with other branches still to be explored. *Source*: "Tlaloc 2014," by Giorgio Pann, *Speleologia* 72, June 2015, p. 14.

The night of March 6, local residents heard a large collapse and woke up to discover that the Río Atoyac was dry downstream from a sinkhole that had formed in its bed. Local media reported that the crack was 30 meters long. The river supplies water to many families and businesses along its banks downstream of the collapse. Authorities are planning to divert the flow of the river around the collapse. Source: https://www.rt.com/news/334531-mexican-river-disappears-sinkhole/ and other web reports; Google Atoyac sinkhole.

YUCATÁN

According to an article in the Cultura section of the Mexican City newspaper *Reforma* on August 14, 2015, researchers performed an electrical-resistivity survey around the base of the Kukulkán pyramid, also called El Castillo, at Chichén Itzá and detected a large void partly filled with water under one corner. It appears to be about 20 meters high under a roof 3 to 5 meters thick and has a maximum width of about 30 meters. Special electrodes for the survey that did not penetrate the ground, but just lay on it, were required by INAH. It is not known

The Río Atoyac disappears into the new sinkhole in its bed. *Protección Civil Veracruz*.

whether there was ever access to the water from inside the pyramid. *Source*: newspaper clipping sent by Philip Russell.

The web site of the Secretaría de Desorrollo Urbano y Medio Ambiente (SEDUMA) for the state of Yucatán has information about caves and cenotes on its web site at http://www.seduma.yucatan.gob.mx/cenotes-grutas/index.php. Included are a list of commercially operated cenotes and tables of the numbers of features in each region or *municipio*, classified as caves or open, semi-open, or closed cenotes. There are 2241 features in all.

The *Yucatan Living* on-line magazine for January 17, 24, and 31, 2016, contained a three part article on the discovery of the main ceremonial chamber in Gruta de Balankanche. The article by Evan J. Albright is based on interviews with the discoverer of the chamber. Besides the discovery and subsequent archaeological investigation, the purification ritual performed by the local Maya is described. The parts of the article can be seen at http://www.yucatanliving.com/history/balankanche-cavern-part-one, -two, and -three.

According to a La Reforma news item dated September 6, 2015, authorities in Yucatán are studying the possibility of proposing jointly with INAH that the Chicxulub Crater with its ring of cenotes be designated a World Heritage Site by UNESCO.

GENERAL

Abstract: New Species of Campodeidae (Diplura) from Mexican Caves, by Alberto Sendra, José Palacios, Arturo Garcia, and Maira Montejo.

Six new taxa of Campodeidae (Diplura) are described in the genera *Litocampa*, *Juxtlacampa*, *Oncinocampa*, and *Tachycampa*. We also redescribe the interesting species *Juxtlacampa juxtlahucensis* Wygodzinsky, 1944 from Juxtlahuaca cave in Guerrero, Mexico. All of these taxa are cave-dwelling species with more or less noticeable troglobiomorphic features They inhabit the subterranean ecosystems in six limestone massifs and one lava tube cave in the central states of Mexico. Four of these species are included in the "tachycampoide" group and one species in the "podocampoide" group (*sensu* Bareth & Conde). Nine species are already known in Central and South America of the "tachycampoide" group, in such poorly-sampled regions compared with the eight species in the well-sampled Mediterranean region (Ibero-Sardinia and north Africa), suggest an American origin for this group. *Source*: *Zootaxa* 4072(5)540-558, 2016.

The book *Geología de Cuevas*, a translation into Spanish of Art Palmer's excellent introduction *Cave Geology* (2007) is available from Speleo Projects in Switzerland for €30 plus shipping (www.speleoprojects.com). The translation was done in Cuba by Javier Mugica Jerónimo, and the book is labeled a joint publication of Cave Books, which published the English original, and the International Union of Speleology. ISBN 978-0-939748-79-2, 502 pages, softbound. We don't know of any more convenient source, but inquires to the Sociedad Espeleológica de Cuba (speleossp@gmail.com) might produce one for Mexicans. It does not appear to be available in the U.S.

There is a fifteen-minute video interview about Mike Boon (see obituaries in *AMCS Activities Newsletter* 38) at https://www.youtube.com/watch?v=oumQ5NmrH1U.

A Semana de Montaña de la UNAM was held at that university September 1–6, 2015. Sessions related to caving included an introduction to UNAM's caving activities by Iván González, a lecture by caver Ramón Espinasa, and a talk on the descent to –1000 meters in Li Lita by Ramsés Miranda. The full program is available at semanademontanaunam.org/programa.

EL ABRA HUNTER RESCUE

Over Christmas–New Year 1970–71 I partook in a jungle chop in the Sierra de El Abra range of northern Mexico. In those days a common way to find big pits was to fly over the jungle and take photos. Then using those aerial photos we would calculate bearings to chop trails to the black spots that appeared, which were usually large, deep pits. That year we took the unusual step of chopping up the east face of the range, which is very steep, because the black holes we were after were too far from any reasonable approach to the west. We found two significant entrances, Sótano de los Loros and the spectacular Hoya de Zimapán.

In April 1971 we were back to bottom the two caves, which we had not had time to explore before. Everyone had gone down Loros, and Peggy Cox, a rather short, slight woman, was just reaching the lip on the way back out. When she poked her head up she was greeted by the sight of a burly Mexican with a rifle, gesticulating wildly and speaking rapid-fire Spanish, which she did not understand, and pointing to her pack. He was probably as surprised to see her as she was to see him, because Mexican women didn't do such things. He seemed to feel as though he should help her over the lip, but he didn't know how and she was doing fine without him, so he waited impatiently. She yelled back down the 60-meter drop and said somebody else needed to get up there right away. Meanwhile the hunter finally conveyed his need for water, and promptly downed her entire canteen.

The next person up spoke Spanish and learned that our guest was a hunter who had been lost for two days without food or water. He normally navigated by the sun and stars, but it had been uncharacteristically cloudy and he had become disoriented. The El Abra is a dense thorn forest that is fairly level on top with no obvious landmarks. Although only about 15 kilometers wide, it runs for nearly 70 kilometers north-south, the direction he unwittingly ended up going, and there were essentially no roads or paths across it. He happened upon our trail, a tunnel literally carved out of the jungle, and randomly chose a direction to follow it, ending up at the pit. After polishing off a second canteen of water and some food, he asked how we happened to be in such an ungodly place, and we told him about our jungle chops and caving. He was astonished, all the more so because he said he didn't think it was possible to climb the east face of the range.

It turned out our hunter was a local boy who had made it big. He was originally from the tiny village of Los Sabinos on the other side of the mountains, although now he was a petroleum engineer who lived in Valles. Los Sabinos had long been a caver hangout, where we had a campsite just off of the Inter-American Highway in the thorn scrub outside of town. There was nothing to recommend this spot except convenience, but it was not uncommon in those days for fifty people to show up there at Christmas. The hunter's local roots explained the distant shouts we had heard the last couple of days. He had set out from the town on his hunt, and now every able-bodied man in Los Sabinos had been scouring the jungle looking for him after he failed to return. After everyone was out of the pit we escorted our guest back down the trail. When we reached the drop-off of the east crest there were plenty of *chinga madres* as he slipped and slid down our route. In order to stay on course on those long jungle chops we would follow as straight a path as possible, which in this case meant going essentially straight up. There were places where short sections of cliff had to be negotiated while hanging onto trees and dropping from ledge to ledge, all the while dodging cactus and other spiny plants, which in the El Abra is just about everything. He was impressed! At the bottom of the mountain we broke camp and drove back to Valles, where we delivered the hunter into the arms of his tearful wife, who had thought him dead. The rest of us proceeded on to the Los Sabinos campsite.

The following day we were invited to a feast in our honor in Los Sabinos. There were tables set up for us in the dirt courtyard of the village. The crowd parted as we arrived, and they ushered us to the tables. They had killed a goat and prepared *cabrito* and roast chicken with beans and tortillas and all the cold beer we could drink. Many pictures were taken of us with the hunter and his family. At one point one of the cavers wanted to go back to our camp to get his camera. When the hunter saw him walking away, he jumped up to offer the keys to his truck so that he could drive instead of walk the half-kilometer or so. We partied into the night, having endeared ourselves with the people of Los Sabinos for years to come.

—Mark Minton, *Texas Caver*, fourth quarter 2008.

Mark Minton
May 2016
Length in meters

LONG CAVES OF MEXICO

1	Sistema Sac Actun (+Dos Ojos)	Quintana Roo	341807
2	Sistema Ox Bel Há	Quintana Roo	258825
3	Sistema Purificación	Tamaulipas	94889
4	Sistema K'oox Baal (+Tux Kupaxa)	Quintana Roo	83965
5	Sistema Huautla	Oaxaca	75602
6	Sistema Xunaan-Há (María Isabella, 3B) - Tixik K'una - Templo	Quintana Roo	60445
7	Sistema Toh Há	Quintana Roo	47072
8	Sistema Garra de Jaguar (Jaguar Claw)	Quintana Roo	41327
9	Cueva del Tecolote	Tamaulipas	40475
10	Sistema Yok Ha' Hanil (Río Cristal, Pool Tunich, Río Secreto)	Quintana Roo	40335
11	Sistema Cuetzalan (Chichicasapan+San Miguel)	Puebla	37676
12	Kijahe Xontjoa	Oaxaca	31373
13	Sistema Tepepa (Ehécatl+Niebla+Xalltégoxtli+Pozo 4)	Puebla	29401
14	Sistema Tepetzala	Puebla	28995
15	Sistema Soconusco - Aire Fresco	Chiapas	27793
16	Sistema Sand Crack	Quintana Roo	26746
17	Sistema Cheve	Oaxaca	26194
18	Sistema Nohoch Pek	Quintana Roo	25161
19	Sistema Coyolatl-Esperanza	Puebla	22221
20	Chjine Xjo (Xine Xao, Chine Xao)	Oaxaca	19515
21	Sistema PonDeRosa (Pondazul, Edén)	Quintana Roo	19300
21	Sistema Aerolito	Quintana Roo	18288
23	Entrada Caapechen (Cenote Manatí)	Quintana Roo	15638
24	Cueva de Alpazat	Puebla	15200
25	Sistema J2 (Ozto J2 (Faustino, Barbie) + Last Bash (Hija Puta))	Oaxaca	14840
26	Sistema Murena - Aak Kimin (Yal Ku Lagoon)	Quintana Roo	14269
27	Sistema Dos Pisos (Ka'p'el Nah)	Quintana Roo	14176
28	Sistema Sac Muul	Quintana Roo	13674
29	Sistema Caterpillar	Quintana Roo	13452
30	Sistema Camilo	Quintana Roo	13442
31	Sistema Zumpango (+ Sistema Texcoco)	Quintana Roo	12763
32	Sistema Doggi	Quintana Roo	12036
33	Sistema Chango Místico	Quintana Roo	12006
34	Sistema Atepetaco (Miquizco + Viento + Mama Mia)	Puebla	11876
35	Cueva Quebrada - Sistema Dos Coronas	Quintana Roo	11555
36	Entrada Boca Paila	Quintana Roo	11402
37	Sistema Cupul Ha	Quintana Roo	11153
38	Atlixicaya	Puebla	11120
39	Sistema Río La Venta	Chiapas	11020
40	Sistema San Andrés	Puebla	10988
41	Cueva de la Mano	Oaxaca	10841
41	Sistema Quijada de Jaguar (Jaguar Jaw)	Quintana Roo	10781
43	Sistema El Puente	Quintana Roo	10474
44	Actun Káua	Yucatán	10360
45	Grutas de Rancho Nuevo (San Cristóbal)	Chiapas	10218
46	Cueva del Arroyo Grande	Chiapas	10207
47	Sistema Muul Three	Quintana Roo	10053
48	Sistema Ek Be	Quintana Roo	9905
49	El Chorro Grande	Chiapas	9650
50	Sistema Tepetlaxtli	Puebla	9600

Updates and corrections: Mark Minton, mminton@illinoisalumni.org

DEEP CAVES OF MEXICO

Mark Minton
May 2016
Depth in meters

1	Sistema Huautla	Oaxaca	1560
2	Sistema Cheve	Oaxaca	1484
3	Cueva Charco	Oaxaca	1278
4	Sistema J2 (Ozto J2 (Faustino, Barbie) + Last Bash (Hija Puta))	Oaxaca	1229
5	Akemati - Akemasup	Puebla	1226
6	Kijahe Xontjoa	Oaxaca	1223
7	Sistema Nogochl (Olbastl Akemabis - El Santito)	Puebla	1182
8	Sistema Ocotempa (OC3 + OC11)	Puebla	1070
9	Soncongá	Oaxaca	1014
10	Sistema Tepepa (Ehécatl+Niebla+Xalltégoxtli+Pozo 4)	Puebla	968
11	Sistema Purificación	Tamaulipas	957
12	Guixani N'dia Kijao (Guinjao)	Oaxaca	955
13	Sistema Perrito (Nia Quien Nita + Nia Nga'co Nita)	Oaxaca	906
14	Resumidero de la Joya Jonda (Hoya Honda)	San Luis Potosí	895
15	Nita Chó	Oaxaca	894
16	Sistema Tepetzala	Puebla	849
17	Sótano de Agua de Carrizo	Oaxaca	843
18	Sótano de El Berro	Veracruz	838
19	Sótano de Trinidad	San Luis Potosí	834
20	Hard Rock Cave	Oaxaca	830
21	Resumidero El Borbollón	San Luis Potosí	821
22	Las Tres Quimeras	Puebla	815
23	X'oy Tixa Nita	Oaxaca	813
24	Nita Ka	Oaxaca	760
25	Sistema H31-H32-H35	Puebla	753
26	Sonyance	Oaxaca	740
27	Nita Xongá	Oaxaca	739
28	Yuá Nita	Oaxaca	705
29	Aztotempa	Puebla	700
30	Sótano de los Planos	Puebla	694
31	Sótano de Alfredo	Querétaro	673
32	Cueva Santo Cavernario+Tototzil Chichiltic	Puebla	667
33	Sistema de los Tres Amigos (Te Chan Xki)	Oaxaca	659
34	Sistema Cuetzalan (Chichicasapan+San Miguel)	Puebla	658
35	Cueva Tipitcli (Tipitli)	Puebla	653
36	Sótano de Tilaco	Querétaro	649
37	Nita Nashi	Oaxaca	641
38	Cuaubtempa Superior	Puebla	640
39	Oztotl Altepetlacac (Cueva Paisano)	Puebla	638
40	Sistema Soconusco - Aire Fresco	Chiapas	633
41	Sistema Atlalaquía	Veracruz	623
42	Cueva de Diamante	Tamaulipas	621
43	Sistema Coyolatl-Esperanza	Puebla	620
44	R'ja Man Kijao (Nita)	Oaxaca	611
45	Nita He	Oaxaca	594
46	Meandro Que Cruce (Meandre Qui Traverse, H54)	Puebla	588
47	Olbastl Koltik (Sótano Chueco)	Puebla	587
48	Yometa	Puebla	582
49	Sótano de las Coyotas	Guanajuato	581
50	Sistema Los Toros	Nuevo León	576

Mark Minton
May 2016
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 (Quiahua)	Entrance drop	Veracruz	330
6	Sótano de Alhuastle	P'tit Québec	Puebla	329
7	Nita Xonga	Psycho Killer	Oaxaca	310
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ARTICLES

José Guerrero in Cueva Topotzatl, Puebla, during the Proyecto Karstológico Nacional expedition. *Gustavo Vela Turcott.*

PESH 2016

Members of the Expedition

This collection of exploration narratives and a couple of short notes from the 2016 expedition of the Proyecto Espeleológico Sistema Huautla was compiled by Mark Minton and Yvonne Droms. Photographs were selected by the editor from among many excellent ones available. The reports are bracketed by expedition introduction and summary by Bill Steele. Additional articles in this issue about PESH 2016 discuss paleontology (Iván Alarcón-D. and Joaquín Arroyo-Cabrales), precision location of entrances to refine the depth of the cave (Tommy Shifflett), community outreach during the expedition (Bill Steele with Alma Rodríguez), and camp life in Plan Carlota (Diana Tomchick).

INTRODUCTION
Bill Steele

This year is the fiftieth anniversary of the discovery by U.S. cavers of what is now known as Sistema Huautla, located in the rugged Sierra Mazateca, to the east of the city of Huautla de Jiménez, Oaxaca, Mexico. On June 6, 1966, Austin cavers Ed Alexander and Bob "Rune" Burnett were the first cavers to enter an entrance of Sistema Huautla, when they rigged and rappelled the entrance shaft of Sótano de San Agustín, which today is the main, largest, and lowest of the twenty entrances integrated into a major cave system. Within two years of that day fifty years ago, Sótano de San Agustín surpassed all other caves in the Western Hemisphere in depth. Through the ensuing decades it was and then wasn't the deepest, until in 2013 when the British-led expedition to dive the sump at the lowest point in the cave system made it deepest again. At present, Sistema Huautla is the deepest cave in the Western Hemisphere, the eighth-deepest cave in the world, and the longest of the world's seventeen deepest caves. It is 1,560 meters (5,117 feet) deep and 75.5 kilometers (46.9 miles) long.

The 2016 expedition was the third annual expedition of the Proyecto Espeleológico Sistema Huautla. PESH was born when Tommy Shifflett and I joined the Brits in 2013 and decided while we were there that a lot of exploration and study remained to be done in the Huautla-area caves. As Tommy and I waited for our flights at the airport in Oaxaca City, we conceived a Spanish name for the project and planned to come up with an interesting design for a logo. We wrote down on a napkin goals of having month-long expeditions annually for a decade, conducting "full speleology" expeditions with not only exploration and mapping, but also studies in geology, biology, paleontology, and archaeology. We planned to advance gear technology and cartographic techniques, support Mexican cave scientists, and publish all results. At that time, three years ago, Sistema Huautla was 64 kilometers long and 1,554 meters deep. Now it's over 11 kilometers longer and 6 meters deeper.

MEXIGUILLA
Gilly Elor

Two major leads remained following the 2015 push in the Upstream Refresher of La Grieta: the 2014 borehole discovered by Kasia Biernacka, Gilly Elor, Corey Hackley, John Harman, and Bill Stone (see our article in the February 2015 issue of the *NSS News* or *AMCS Activities Newsletter* 38) and Mexiguilla, the highly decorated fossil passage discovered by Derek Bristol and Gilly Elor in 2015 (see our article in the November 2015 issue of the *NSS News*). With two A-quality leads, it was decided to divide our efforts in 2016 and focus on both. Derek, Andy Chapman, and I planned to spend the first part of the expedition pushing Mexiguilla, while Bill Stone would lead an initial push on the 2014 lead. Bill would be joined by Elliot Stahl and Vickie Siegel. (Two of the original explorers, John Harman and Corey Hackley, sadly had work commitments and could not join this year, but helped with logistics planning and gear). Bill predicted both leads would quickly start trending upward, towards the northern high-karst regions of the plateau, so we decided to take enough climbing gear and supplies to sustain two independent climbing teams if needed.

Derek, Andy, Kasia, Jon Lillestolen ,and I met up in Mexico City on April 1, 2016, and took the night bus to Huautla together. We arrived on the morning of April 2 to our plush surface accommodations in the village of Plan Carlota. Bill Stone and company were already in the cave and presumably on their way to establish Camp 3 at the 2014 limit of exploration. We spent the remainder of our day sorting and packing gear; we had decided to pack all underground supplies in one go and transport them as far as Camp 1.5 before heading to Mexiguilla.

On the morning of April 3, Andy reported feeling ill. Derek, Kasia, and I decided to enter ahead of Andy and start hauling gear. Jon joined us for a day-trip to help haul; he planned to lead an effort to rerig the lower levels of La Grieta and was awaiting the arrival of Scott Wahlquist to help. By the end of the day we had four bags at Camp 1 and six bags in various places between the bottom of The 200 and Camp 1.5. Jon left

La Grieta
Mexiguilla Passage
Photos by Kasia Biernacka

Clockwise from upper left:
Gilly Elor inspects a dry pool.
Cave pearls.
Snake-dancer helictites.
Crystal pool deposits.
Derek Bristol and helictite bushes.

for the surface with a message for Andy to come in when he felt better; meanwhile Kasia, Derek, and I decided to spend the night at Camp 1. The next day the three of us had an uneventful trip transporting our ten bags to Camp 1.5. We decided that we would not shuttle bags any farther for the time being; rather we would continue on with a single bag each, carrying just enough food and supplies for a two- to three-day recon and survey of Mexiguilla. About halfway up the Upstream Refresher passage we made a stop at a spot that the map indicated was a good place to look for a connection with Nita Nashi, which would add about 3.5 kilometers of length to the system. Derek and I spent about an hour cramming ourselves into narrow, airless, wet infeeders that eventually all got too tight. No go.

We arrived in Mexiguilla on the evening of April 5 and decided to establish Camp Mexiguilla at the start of the sandy borehole passage. After establishing camp, I went to get water, unfortunately a thirty-minute round trip back out to the Refresher, while Kasia and Derek prepared dinner. The following day we slept in until 4 p.m.—our schedule had already started to drift. We decided to have a quick walk around the passage near camp, let Kasia do some photography, and call it a day in hopes of getting back onto a normal schedule. [There is a map of Mexiguilla from 2015 elsewhere in this issue.]

We had left two main leads in 2015, one a lower-level passage decorated with snake-dancer formations trending northwest and the other trending west atop a 15-meter-high flowstone hill where most of the air appeared to be going. We had noted many side-leads throughout the area. On the morning of April 7 we headed to the flowstone-hill lead. I took point, with Kasia on backsights while Derek sketched. At the top of the hill we encountered a decorated crawl across a flowstone floor. Beyond this, the passage continued and started to trend downward and double back on itself in typical La Grieta fashion. After some downclimbs, we found ourselves in a canyon with several going leads, but we had lost much of the air from the original passage. We continued to survey. One lead ended in a formation choke, another in very muddy passage that degraded into an upward-going crawl. Finally we turned around, leaving one decent-looking canyon lead.

The following day we hit the northwest-trending lead. I continued to be on point, with Derek sketching and Kasia taking backsights. The passage quality quickly degenerated into unstable breakdown and started to zigzag. Soon we encountered a modest-sized breakdown room with a downward-trending lead and a few cupolas in the ceiling. Derek and I climbed up into each cupola, as it seemed possible that they would open up into tubes, but no go. One of them did contain a sizable anthodite bush, which we spent some time photographing. Back in the breakdown room we surveyed into the downward lead, which led to even sketchier breakdown and became encrusted with slippery mud. Soon the passage narrowed, and I squeezed down a muddy canyon wall to discover a room with an incredibly high concentration of pristine white snake dancers. The passage seemed to continue beyond this, but after we did some photography the hour was late and we called it a day.

At this point we were almost out of food and decided that the following morning we would return to Camp 1.5 to pick up more supplies and hopefully make contact with the crews working the lower levels; both Derek and I were keen to dedicate some time for a recon of Doo Dah Dome, as climbing it is a possible 2017 objective. However upon our arrival at Camp 1.5 on April 8 we found camp unoccupied. There were no notes, and it did not appear that anyone had used this camp since the three of us had left it on April 5. So we decided to leave the cave that evening to get an update from the surface.

We arrived back at the fieldhouse at about 10 p.m. Jon and Vico Jones were still up and joined us for some rounds of beer and mescal. From Jon we learned that Scott Wahlquist had been delayed, and as a result they had not had time to visit the lower levels yet. Jon also reported that due to various complications, only a skeleton crew had remained at Camp 3. So once Andy got better he, along with Bev Shade, went to Camp 3 to help out for a few days. Finally, the last bit of information relayed by Jon began as a question. "So—this may sound strange—did you guys see a turkey in the La Grieta entrance?" While we were underground, in a ceremony to appease the cave gods a turkey had been sacrificially dropped down the La Grieta entrance shaft. Having used the Hobbit Hole entrance, Kasia, Derek, and I had missed the slowly rotting turkey that lay at the bottom of the entrance rope; it would eerily haunt us for the remainder of the expedition.

We spent April 10 binge-eating tacos and checking e-mail in Huautla. That evening Andy and Bev returned from Camp 3. They reported that the leads out of Camp 3 appeared to be going. One lead in particular, a waterfall bolt-climb, looked promising. Despite this, Bill Stone had run out of rigging and climbing supplies, time, and manpower, so he was planning to leave the cave the following day.

While we had left leads in Mexiguilla, they weren't exactly going, breezy boreholes. We speculated that only one to three more days would be required to either kill Mexiguilla by properly cleaning up all the small leads or reestablish it as a major lead. As Derek had only a few days left before he had to leave the expedition, we decided, rather than start a climbing effort out of Camp 3, that we would spend Derek's remaining time pushing Mexiguilla *hard*. In the meantime Jon and Scott would rig the lower levels and attempt to pass the Pato Mojado, a 2-meter duck-under just beyond Mazateca Shores. Derek and I planned to spend a day or two on our way out touring the lower levels and, finally, checking out Doo Dah Dome. Meanwhile, I was already scheming a big climbing push out of Camp 3 once new crews arrived on the third week of the expedition.

Derek and I entered La Grieta the following morning, April 11. Kasia stayed behind to photograph Jon and Scott's trip to the lower levels. We traveled from the surface to

Mexiguilla in about four hours, arriving at camp at 2 p.m. The day was young and we decided to survey. In addition to the two main leads, there were many side leads off the main passage, and that afternoon we proceeded to meticulously kill every single one of them. Most leads turned out not to go at all, or to go a few meters before ending in breakdown or a flowstone choke. We finished the day with a lead right behind camp that we joked would no doubt open up into an enormous room filled with snake-dancers that we would name Snake Dancer Hall, analogously to Anthodite Hall above Camp 3 in Sótano de San Agustín. Unfortunately this lead quickly disintegrated into an airless, dry dig. I pushed it for a while before deciding that it was a fool's errand. We returned to camp and had a nice evening.

The following morning we hit the lead in the west. Unfortunately, what we thought might be a going canyon quickly connected back to the main passage. We wrapped up the survey, and with plenty of time left continued to the lower-level northwest-trending lead. We returned to the highly decorated snake-dancer room we had discovered a few days prior and picked up the survey there. The passage quickly disintegrated into a muddy, narrow, grabby canyon that continued to go on far longer than we would have liked. This prompted us to joke that the over-the-top slogan from 2015, "I've been to Mexiguilla, everything else is s$it," should be changed to "I've been to Mexiguilla, it's s$it." Ultimately the lead ended in a formation choke. We wrapped up the survey and returned to camp, arriving at the early hour of about 6 p.m. With a total of about 850 meters in the book, Mexiguilla was done.

The following morning we packed up camp, put as much gear as we could fit into our packs, and bid goodbye to Mexiguilla. Before heading back, we went upstream and checked out another area that the map indicated might connect to Nita Nashi. Again no go. We speculated that we had the wrong surface coordinates for Nita Nashi. We made a quick visit to the now-abandoned Camp 3 to check the condition of the food stash, and then made our way downstream to Camp 1.5.

At Camp 1.5 we were greeted by Jon, Scott, and Kasia, who had been camping in the cave for two days and had just completed rigging the lower levels to Mazateca Shores. Unfortunately Jon reported that the only area that matched the description of the Pato Mojado appeared truly sumped. He would not attempt to go through without a wetsuit and a dive bottle. The following morning, April 14, Jon and Scott left the cave. Derek, Kasia, and I toured the lower levels before leaving the cave as well.

Mexiguilla, while truly a remarkable place, unfortunately proved not to be the way onward, or in our case upward. Perhaps the waterfall-climb lead off of Camp 3, which Bill had named Alcan Falls, would be more fruitful. . . .

THE ROAD NORTH

Bill Stone and Vickie Siegel

Around noon on March 30 we arrived in Plan Carlota with our caravan of three expedition vehicles. The two-day drive from the border had gone surprisingly smoothly and I (Bill) again thanked the Mexican government for constructing the Arco Norte bypass around Mexico City. Plan Carlota had grown significantly since we first began working this area in 1976. A cheerful old man met us as we pulled up, and Steele (with Ana translating) negotiated a rate of 1000 pesos per month for each of three houses and 100 pesos per tank to fill the water barrel, in all a very good arrangement. The houses were relatively new, had concrete floors, block walls, and corrugated metal roofs [see the article on urban caving in this issue]. Vickie Siegel, Mike Green, Elliot Stahl, and I immediately set about unloading the entire contents of my F350 into the building closest to the road and began sorting equipment and food. We had prepackaged all of the underground dinner and breakfast mixes for three weeks in the cave and had packed it into Nalgene bottles in Texas, so the food bags were already set to go, and it was a matter of making sure we had the other items—stoves, fuel, Microdyn for water purification, and rigging gear.

We left for La Grieta around 3 p.m. with Blake Harrison riding out with us to drive the truck back once Elliot, Mike, Vickie, and I had entered the cave. We rigged a drop line for gear with a pulley and a rappel rack to control the descent, and Elliot rappelled to the Meri Fish ledge in the main entrance shaft to guide packs over that. Vickie and I headed in the Hobbit Hole entrance. It was much tighter than I had remembered, beginning with two body-tight squeezes that were covered with daddy longlegs and at least one large black spider that creeped me out. Soon I came to a solution shaft going down, and I recognized this as the place I had claimed in 2014 needed a rope. Unfortunately there was no rope there, but there was a single bolt. I undid all my vertical gear and clipped it end-to-end and used that as a safety line to do the downclimb. It was definitely a rappel and needed proper bolting and a rope—later Jon Lillestolen placed a backup bolt there. I climbed on down to the bottom of the entrance shaft, whacked off about 15 meters of rope from the gear-drop line, climbed back up to where Vickie was waiting, and sent the rope up for her to rig and rappel down. We then completed the remainder of the climb to the base of the entrance pit. It was drippy down there, and soon all the bags were down—about eight that we were to take with us (four personal, one rope, one rigging, and two food) plus an additional six containing equipment and resupply materiel that we stashed in a dry ledge to the side. Mike and Elliot came down the hole while I rigged the second drop. We then shuttled the eight bags down. There were a large number of short pitches, and they had all been stage-derigged in 2015. I did the rigging on the way down. All the ropes were in fine shape. We reached Camp 1 at –300 meters around 9:30 p.m. and, to our collective dismay, discovered that we had a) no cook pot; b) no stoves; and c) no Microdyn. I also had somehow managed to forget to bring the waterproof map of the cave I had so tediously constructed and printed in Texas—it was in my day-pack back at base camp. After

some discussion, Elliot and Mike agreed to head back to camp and return the following morning. They left around 10:30 p.m. and arrived in base camp sometime around 1 a.m. It proved to be about a half-hour hike down the road from the entrance to camp. Vickie and I leveled out a place to sleep on the second level below where the rope ended. It was drippy, and we had to set up a second space blanket as a shield to allow us to sleep and not get soaked. We were camped under a boulder pile that looked suspiciously unstable—not the first time we would do so in this cave over the next two weeks.

Though they had optimistically thought it would be a quick round trip, neither Elliot nor Mike showed up later that night, and we went to bed around midnight, awakening around 10 a.m. on March 31. Since we had no stove, we had no breakfast either, except for Power Bars, which somehow never became highly desired on this trip. Around noon Elliot and Mike joined us. For some reason they had been unable to find the MSR kit that Vickie had packed the previous afternoon with two stoves, lighter, gripper, and two bottles of Microdyn. They had grabbed another set, but it only had some sub-grade Microdyn that Steele had shown them a large bottle of the previous afternoon It looked brown rather than black like the real stuff. Mike rigged The 200 with six rebelays just below Camp 1, and then Vickie and I went down with three bags. I rigged all of the stage-derigged pitches and a new one with the leftover rope I had cut after rigging the Hobbit Hole the previous day.

We arrived at a restriction known as the Bottleneck, legendary since the Torture Chamber passage was first pushed in 1977. It is a rock that fell ages ago, chocked into the fissure passage, and then was coated with flowstone. In a few hours of effort we removed this obnoxious obstacle. The fissure passage was now plenty large to get through without a struggle, and we continued on. Vickie pointed out that the exposure in the fissure immediately beyond was dangerous—a drop of 10 meters to the floor—so I put in some bolts for a traverse line. By the end of the day we had gained an appreciation of how much of a hassle dragging eight bags was going to be; and inadvertently my personal camp pack, containing sleeping bag, pad, and clothes, ended up left back in the Torture Chamber. So I had to scrounge a bag and pad from Camp 1.5 that night, not too much of a deal, but the sleeping bag I got had a slight smell of mildew—not bad considering that it had been there since 2014.

The following morning, April 1, we were up at 12:30 p.m. at Camp 1.5. Mike went back to the Bottleneck while the rest of us were just getting up, and he brought back a food bag. Vickie made breakfast for all. She then methodically went through the mess at Camp 1.5 and marked trash to be taken out; there was a lot of mildew and fungus around and a lot of dead, fungus-covered food in cracked bottles. I rigged bolts for traverses leading to the lunch rock before Camp 1.5. Elliot went back to the base of The 200 to pick up the rope bag. I met Mike and carried two bags to the lunch rock. Elliot rigged the traverses. Everyone had lunch at Camp 1.5, then about 6:30 p.m. we started upstream. Vickie and I rigged ahead, taking the drill and three bags. I rigged a rope at the flowstone boss leading down to the Refresher stream and installed a long redirect. This had long been a scary free-climb down over that exposed boss, yet no one had ever rigged it before. Not long after that Mike and Elliot caught up, bringing five bags along behind. From there it was a tedious upstream march, slowed by the need to carry multiple bags. We had to stop in a half a dozen or more places to rig vertical access and handlines or, more often, high traverse lines. The canyon was lined with sharp, jagged rock flutes, and the ground-level route was often too narrow to traverse, so you sometimes found yourself 10 or more meters off the deck with this maze of blades below you. I had huge slabs of rock break off and fall out from under me on several occasions. On one traverse I was hanging by the bolt getting ready to drop a vertical line when the rock point I was pivoting on just rotated off into space. I yelled "rock" when I saw a light approaching below, and there was an enormous splash as it hit the plunge pool. Mike might have been within 3 meters of that impact. I was more careful after that. Mike helped with rigging the last traverse before the 1977 upstream end of Refresher. While doing this, and while I was on the far end of the traverse, I spotted something in peripheral vision and turned around. Not 1 meter behind me on the wall was a 4-centimeter-long scorpion. It was brown—not troglobitic. It had to have been washed in and was dining on isopods or other very small critters. We reached the Spikeland walking tunnel and set camp at 3 a.m. Mike had taken a short fall and gouged his forearm. Vickie, our team EMT, repaired this for Mike at camp. I went forward and got water and set up the kitchen and made dinner. This was the first time we used the 2016 dinner mix, 30% institutional powdered potatoes; 30% broccoli-cheese soup mix; 30 % ramen noodles, and a large helping of pork jerky, spices, and cashews.It proved to be quite good. Our procedure was to boil water and let everyone make the stuff in their own bowls to keep the pots clean. We got to bed at 5:30 a.m. All of us were punch-drunk groggy.

We were up at 3:30 p.m. on April 2. We were packed and on the move by 5:30 p.m. Everyone was feeling their aches. The last three days had been brutal. We kept wondering if it was just our being out of shape and whether the Camp Mexiguilla team would waltz right in and pass us. The others of course would benefit from all the rigging we had been putting in at great effort. The 200-meter bag of rope we had brought in from the entrance was dwindling. This was to have been our push rope beyond Camp 3, but the exposure and the need to carry heavy bags had changed the whole equation. Previous teams, carrying only survey pouches, had just zoomed through this passage, irrational from and blinded by booty fever. Expedition caving is a realm where cavers sometimes get into a short-sighted, ego-fueling mindset of proving themselves by traveling

too fast and free climbing obstacles that truly should be rigged, even for initial exploration. A better safety culture is warranted here, because any accident in La Grieta would result in a nightmare rescue scenario.

We had eight bags with us when we left camp, four personal camp kits plus rigging, two food, and one with drill, stoves, pots, and fuel. I installed a rope in the Spikeland fissure about 200 meters beyond our impromptu bivy, pulled bags up, and went to the Formation Corner for additional bolts and quick links—we had already run out of the substantial supply we had brought in. We had used everything we had brought plus a dozen more Vickie had picked up at Camp 1.5. I found more at the gear stash that had been left by the 2015 crew.

When I returned to the others, Vickie had scouted a route through the bottom of the fissure with the duffels, so no further rope was necessary. It took us three hours to do that one section of cave, about 300 meters of tight fissure traverse, before all eight bags were at the Formation Corner. We had found an additional 25 meters of 9-millimeter CanCord there. We decided at that point that we would never reach Camp 3 that day with all that gear, so we pared it down to four personal bags, survey kit, rope externally carried in two coils, the drill, and all of the rigging hardware at the Corner, probably fifteen sets of bolts, hangers, and quick links. It made for heavy packs. The passage beyond was tedious. A lot of the time it was packs-off and moving the bags by hand one at a time through the jagged fissures. The route was far tighter and far more jagged than I remembered. I had told everyone this was easy cave. It was not. We rigged two ropes before reaching Aspire Hall. There we found a bag of rigging kit that included about fifteen bolt sets and a new dynamic rope. Just before this room, at station ECJ51, there is a sand bank by the stream that could be used as a bivy site. I was always looking for stuff like this, since you never knew where you'd have to spend the night in this cave. At one point the passage split, and we took the higher, dry one to the east. We had to rig a rope down, and then the route entered an extremely tight fissure. I was concerned we could not get the bags through, but Vickie had the idea, brilliant given the exhausted condition we were all in, to rig a tight horizontal rope on which to slide the bags. It worked. After ten and a half hours we reached the Lunch Room and cooked a hot meal of dinner mix—about two liters of it, which everyone eagerly consumed. We rigged a rope out of the Lunch Room that bypassed the awkward, exposed climb there. Not long after that we had to rig two more pitches that somehow, amazingly, stupidly had been free-climbed in 2014 without rope. This dropped us back to the stream in a wide section of passage that I recognized. But forward progress stalled 12.5 hours out from Spikeland when we hit breakdown and there was no obvious way on. If there had been flagging marking the route, it had washed away. Mike found a way up into borehole but reported seeing survey station DAG20, which was not on our route. He went ahead and ultimately found flag KGB Start, which I recognized as being the start of the borehole leading to Camp 3. He rigged a rope down to us, and I went ahead to the KGB flag and then backtracked at stream level before coming to a breakdown squeeze through which I saw the rope. So we had missed this unobvious squeeze in the floor. We pulled the rope, but immediately

PESH 2016 Biology

Since we were invited in 2014 by Bill Steele to explore cave life in Sistema Huautla as a scientific team of the Proyecto Espeleológico Sistema Huautla, we have explored more than ten caves in search of organisms that live inside. Our biospeleology team, consisting of Jorge Mendoza, Gerardo Contreras, Jesús Cruz, and Rodrigo Monjaraz, led by Dr. Oscar Francke, has found a great diversity of arachnids in the depths of caves.

Our 2016 visit was focused on previously visited caves to try to collect material complementary to what we had collected in the last two years. We expected to find more specimens of harvestmen, schizomids, amblypigids, tarantulas, and, with a little luck, scorpions. After some debate, we eventually decided which caves had priority. First we visited Li Nita, an important one because a new troglobitic scorpion of genus *Typhlochactas* was collected there in 2014. We took with us UV lamps for looking into crevices for the scorpions, which glow under this light. Unfortunately we could not find any, but all was not lost because we did collect four more specimens of a new troglobitic tarantula, only one example of which had been collected last year. We also found a new schizomid, three more specimens of the new troglobitic harvestmen, and also two different spider species associated with caves. After three hours of collecting, we headed out for lunch.

Later the same day we headed to Plan Carlota Church Cave, where a new troglobitic tarantula had been collected. But only juveniles and females had been seen, so we tried to find a male. Unfortunately, this time it was not possible to find a single specimen of this elusive species. On the other hand, we collected a lot of specimens of an undescribed troglobitic amblypigid and an undescribed diplurid spider. We also found harvestmen and other groups of small crustaceans and millipedes. Later that afternoon we went down a small pit close to the Plan Carlota *agencia*. We could only get down about 10 meters because the way was blocked, but at the bottom we were able to collect a couple of ctenizid spiders, possibly new ones.

This was all the time we spent in the Sistema Huautla area, because we needed to focus on other locations where we needed specimens for our research.—Jorge Mendoza

had to use it to rig up to the first section of the KGB Borehole. There is a breakdown block there that spans a gap over a 10-meter drop that really should have a traverse line. But we were short on rope and needed what rope we had left for the climb up to Camp 3. I had two boulders roll out from under me in the next 100 meters of unstable breakdown; the first crunched my left leg and the second put a big scrape on my right thigh. Everything is unstable there, still.

We pressed on. Everyone was exhausted. Mike, Vickie, and Elliot napped below while I did the climb up to Camp 3 and rigged a rope on the west wall with a rebelay on the central boulder. I then did a quick recon of the chamber I had only briefly visited two years ago and was depressed to find no sandy areas, only fine breakdown that was sharp and would puncture our NeoAir sleeping pads. I set to work leveling several areas. No one wanted any cooked food, so we all went straight to bed at 11:30 a.m. on April 3.

It is one of those curiosities of underground camping that you can sleep for a long time if you are exhausted. It was not until twenty-one hours later, at 8:41 a.m. on April 4, that everyone finally got up. But we were finally set up and at Camp 3. It had been a marathon trip of 14.5 hours from Spikeland, but we were now set up for a long stay. Of course, without so much gear and rigging it would have been a few short hours.

At breakfast Elliot said he was sick, coming down with the flu ,and needed to head out immediately. He had some discussions with Mike about this, and Mike agreed to accompany him out as far as Camp 1.5, where he would pick up bolts and return with the dynamic rope. While they were heading back towards the entrance, Vickie and I took the opportunity to scout ahead. As John Harman and Corey Hackley had marked on their 2014 survey, there were two canyons that Y in front of their last station, around 80 meters beyond camp. Vickie led into the left-hand (western) canyon passage and we explored 115 meters that day. This was dry and popcorn-encrusted in places. We initially rigged our last bit of rope across a climb John and Corey had insanely done without rope and found our way under the breakdown hill at Camp 3 to their final survey station, ECJ124. Below our rope were two squeezes in unstable breakdown that could be bypassed with a longer rope by going over the hill above camp and rigging there instead. We had first seen that route in 2014, but since it pitched over into a 20-meter drop into the canyon and we had no rope, we had stopped there. A direct rappel into the canyon from the top of the hill seemed a lot safer than going under the hill, with all its loose breakdown squeezes. Late that evening Mike returned from Camp 1.5 with 60 meters of dynamic rope, bolts, and some additional food.

We were up at 9:16 a.m. on April 5. Mike had a sore back after sleeping at Elliot's campsite last night. Elliot's NeoAir pad had popped. So had Mike's and Vickie's, making it three out of four failing—not very impressive. Only mine was still working. Vickie had had the prescience to bring a pink Ultralite Thermarest from Camp 1.5 as a backup in case one of the four NeoAir's failed, and she was now using that.

The three of us left camp at 11:45 a.m. After we rigged a 30-meter dynamic rope that Mike had recovered from Aspire Hall down the main canyon on the north side of the hill above Camp 3, we were off to the front. Mike free-climbed the popcorn fissure I had mostly climbed the previous day, set a bolt with a sling backup, and dropped the rope—now all we had was 10.2-millimeter dynamic—between two massive, blade-like rocks suspended only by whim about 6 meters up. It felt creepy climbing up between them. That is the essence of how I feel about most of upper La Grieta—a collapse in progress and maybe we have arrived to trigger it. Vickie and I surveyed in, while Mike scouted ahead and rigged. I saw many places where the walls were not just fractured like slickensides on a fault, but multiply fractured like sheets stacked together vertically where a solid wall should be, with ragged edges where various pieces of layers had broken off. If you tapped any of these layers with a hammer it went *bong*, not *bang* with a *ting* like the marbleized solid bedrock around here sounds. That solid black rock with white streaks has fascinated me since my first trip into San Agustín forty years ago, and I wished mightily that we were in that layer of firm, reliable, solid rock. We had not gone 50 meters with the survey when Mike returned, having used all 30 meters of rope we had with us. The other half of the 60-meter dynamic had been used the previous day to rig the drop out of camp as a bypass to the unstable breakdown crawl. Mike went back to fetch that while we continued the survey. He had reported that he had climbed up into a large tunnel.

When he returned he rigged that pitch just as we caught up the survey. It was an exposed free-climb that he had done; I was glad we had the rope. Above this was a 9-meter-wide by 3-meter-tall breakdown tunnel, which Vickie named Room for Improvement. Our elation at this find quickly abated when the passage seemed to split up into several smaller tunnels after only 40 meters. One of these branched right (east) and led to a dome. We named it Dome of the Speleo Warrior, and it looked a lot like an incoming cave. It was dry, blocky, open, not like a waterfall-cut pit but more fault controlled, maybe an intersection of cave systems. The right-hand turn entering into this passage had actually been one of those classic La Grieta 120-degree hairpins. I had expected stuff like this, had expected to see side passages dropping into this central stream tunnel. I went and checked the continuation of the main tunnel to the north. It narrowed to a 1.5-meter-wide tall fissure and eventually, maybe 70 meters beyond the big room, stopped at a 6-meter climb. Up in the distance I could see a black window leading on. We held a protracted discussion back at the dome. Mike took the remainder of the rigging gear and rope and did the climb, while Vickie and I took the survey up to the dome. I then went back to the climb to check on Mike. He had rigged two pitches and run out of rope. Where he stopped he said there was a flowstone squeeze

and that less than 15 meters away he could hear the main stream. There was also a possible climb that might bypass the squeeze. That led into a protracted discussion on what to do; we were out of rope and the drill battery was dead. We had few options. We could derig this passage and attempt the stream passage that started where the main passages split just beyond Camp 3, get more rope, or leave. We discussed the possibility of Mike making a heroic dash to the surface for more rope and perhaps more people to come in with him. Unlike at J2, we had no phone line; a quick call to the fieldhouse would have helped—perhaps someone could have carried rope and a battery to Camp 1.5. By the time we reached Camp 3, Mike had pulled me aside and said, "I'm going out." It was then 8 p.m. We didn't even have water in camp to make him a hot meal before he left. There was a another part to this plan. I was to solo to the Formation Corner, pick up the straw kit and food and take that back to Camp 3 the next day.

The following morning, April 6 ,I was apprehensive even before getting out of bed. We had come in as a small team of four that had gradually been whittled down to two, and we had been doing a lot of solo caving in a very dangerous place. Nothing I've done matches this place for an accident opportunity every meter. Everything is jagged. Everything breaks. The passage is generally so narrow that everything catches, especially annoying little things like ascender loops, and you are constantly stopping in mid stride to reach back and unhook the loop. I put fresh batteries in my three lights and took a survey pouch with an empty one-litter bottle that had a drop of Microdyn in case I got thirsty. I assumed I'd be sweating the entire way, but still took my long-sleeve Capilene top, rolled up and tied around my waist. So at 10:30 a.m., I took off, paying attention to every move. I got past the two borehole segments and squeezed through the breakdown hole we had somehow missed on our way in.

I intentionally went slowly, studying each move before stepping, and was to the Formation Corner in 1 hour 37 minutes. It took me an hour to select and pack what we needed. It was heavy, possibly fifty pounds, as it felt significantly heavier than the eighteen liters of water I fetched yesterday. I wasn't happy about this, but this is what I had promised as part of the deal with Mike. So I resolved to go slowly and tried to keep the pack on my back as much as possible. Things went well. Only the places where we had passed packs through vertical restrictions as a group were difficult. I rested a bit after each one. I did not look at my watch the entire way. The pack seemed to grow heavier as time went on, but at 3 hours 37 minutes I reached Camp 3 and yelled up to Vickie.

We had some hot dinner mix, then decided to go do laundry. Everything I was wearing reeked of stale sweat and dirt and fungus. We got out a stove, pot, Darren drum, and a small bottle of Dr. Bronner's biodegradable soap. I boiled pots of water, we soaped and rinsed our grossest clothing, and I hung them on a clothesline across the tunnel. We then soaped and rinsed ourselves, first a hot soap-down followed by a hot rinse.We had to boil two two-liter pots of water for each person. We half expected Mike to march down the tunnel during this exercise in subterranean long-duration cleanliness. When I had originally begun planning for this trip, my thinking was to spend all of April, thirty days, at Camp 3 as a test of hygiene procedures and food, so we had intentionally brought some cleaning agents along, including the Dr. Bronner's and Steramine tablets, normally used in institutional kitchens (and by rebreather divers to kill fungus, bacteria, and viruses in rebreather loops). We used them to clean wetsuit socks and gloves, the latter of which have notoriously led to staph infections around the edges of fingernails on long-duration underground stays. This time we wanted to see if we could eliminate those problems.

So after seven days underground we had clean clothes. We had a light dinner and got to bed around 10:30 p.m. Vickie had done a lot of work around camp, flattening Mike's campsite and building a wall around the kitchen for storing food. I started to build up the other side of the kitchen, but a lot more work is needed, as the hillside there is steep. We went to sleep wondering if Mike would show up during the night. I fell asleep quickly.

The alarm went off at 9 a.m. on April 7, but I ended up lying in bed until 10. Still no sign of Mike. We started constructing possible scenarios: 1) he got hurt somewhere; 2) no one would come back in with him; 3) political problems in Plan Carlota; 4) he routed. Given the hard day yesterday, we made this a camp "gonk" day and cleaned and repaired gear and Thermarests and caught up on journal notes. At 6 p.m. we heard the unmistakable clanging of vertical gear in the distance, and Mike arrived shortly. He had reached base camp at 4:30 a.m. yesterday. He had brought in some additional rope and bolts, which would have helped a lot. However, he was out of time. We had known this was coming, as he had to leave for his return plane flight on April 9. So at 7 p.m. he packed up his and Elliot's camp kits and left for the entrance. He claimed he was going to come back into the cave the next day with Jon Lillestolen, go to the bottom to check out the Doo Dah Dome lead, and then leave for his flight on the ninth. This seemed impossibly ambitious, particularly considering that the lower cave was not yet rigged and no one had scouted the situation at the Pato Mojado sump beyond Camp 2. But we thanked him for the gear he had brought in, and off he went.

At 9:30 a.m. on April 8 I was up and making hot coffee. We planned to survey out the dry west tunnel today and continue the survey where we had left off. We left camp around 11 a.m. and proceeded to the base of the dynamic rope leading up to the Room for Improvement. There we surveyed down into a lower tunnel Mike had described earlier. We got around 60 meters of survey before it ended in a little sand-floored room. Vickie noticed a hole in the roof. It was impassable, but you could see up into passage, so she wrote a note on flagging tape

and stuck it on top of a rock through the hole. We returned to the Room for Improvement, from which we then surveyed down north into the canyon Mike had rigged. After two dynamic-rope pitches we got to his "squeeze to the sound of river." It was definitely too tight and would be a protracted dig. To the left (west) Vickie crawled up into flowstone-covered breakdown. At our station VBZ60 there was a large room or tunnel above and the sound of water was loud, but it seemed impassable to us without some enlargement, which we planned to attend to if anyone else came in to enlarge our two-person team. We made it back to camp, with dry clothes, around 7 p.m. After dinner we chatted until around 10:30 p.m. and had just fallen asleep when Vickie nudged me awake and said, "people are coming." It was 11 p.m. Then I saw lights and heard voices. I thought maybe it was Andy Chapman and Kasia Biernacka. But the female voice did not sound like Kasia. After a while Vickie said, "that's Bev Shade." And I thought, "no way, she wasn't on the team roster." But soon enough, there she was; she had come down to Huautla for one week and had to leave on Sunday the tenth They were talkative but obviously exhausted. Mike had evidently played up the situation, and they had come in with nothing but day packs with their dry camp clothes, but it had still been a nine-hour trip from the entrance.

The morning of April 9 Vickie and I got up ahead of Bev and Andy and, using new static rope thanks to Mike's heroic trip, I rigged a rope to the active stream passage just upstream from camp; this had been the second main lead from in 2014. Vickie made the first descent and took off upstream. I caught up with her after about 100 meters at a rock where she was excitedly pointing to several impressive spiral fossils in the west wall. This is now at Station BAZ10. I wished we had a camera. The spiral-shaped fossil prominently stuck out of the black bedrock and measured probably 50 by 200 millimeters. Other fossils projected from the bedrock in this area. We continued upstream, and the passage branched several times. Eventually, perhaps 400 meters upstream, we reached a big waterfall series that we named Alcan Falls, after the Alcan Highway that runs from Dawson Creek, British Columbia, to Fairbanks, Alaska—the road north. I free-climbed the first and second of these wet pitches, but the last one was an aid climb with water spray filling the chamber. The entire thing was maybe 25 meters high, and you could free-climb to within 8 meters of a 2-by-3-meter dry tunnel in the roof to the left of the falls. But we had no dynamic rope now and only six bolts. We started surveying out and ran into Bev and Andy at station BAZ27, near a big sandy-floored

Karst Geology in the Huautla Area

Several multidisciplinary scientific activities were conducted during the spring 2016 expedition to the Sistema Huautla karst groundwater basin. Among them were geological studies conducted by Jim Smith,as a continuation of his Masters of Science thesis studies from 1988 and 1989 [see AMCS bulletin 9, www.mexicancaves.org/bul/bul9.pdf].

Field studies conducted in 1988 and 1989 included dye-tracing of sinking surface streams and cave streams and geologic mapping across the karst groundwater basin. The karst groundwater basin was defined by dye tracing as far north as Nita Nashi and to the south by the Sistema Huautla Resurgence, which wells up into the Río Santo Domingo. Dye-tracing was bounded on the north by local access problems and lack of known suitable inputs into the karst aquifer. The westerly boundary of the basin was hypothesized to be the edge of the limestone at its contact with metamorphic rocks. The true western edge of the karst groundwater basin has not been defined. The eastern extent of the basin is currently defined by a dye trace from Cueva de Agua Carlota to the resurgence. The actual drainage-basin divides have not been accurately established.

In 2016 the north end of the karst groundwater basin was extended beyond Nita Nashi by following the Refresher stream passage in La Grieta, extending the basin to near Cerro Ocote.

Geologic field mapping during 1988 and 1989 included surface mapping and subsurface mapping within Sistema Huautla. Geologic mapping established the structural geology of the karst groundwater basin and its relationship to groundwater flow patterns as defined by cave surveys of both active and inactive conduits. Surface geologic mapping of the rock units determined the general dip of the strata in the basin and located structural faults where exposed. The challenge of surface geologic mapping in karst in a humid environment lies in the amount of vegetative cover and solutional modification of the outcrops.

Since the 1988 and 1989 field studies, Mexico has greatly expanded its road system in the Sistema Huautla vicinity. Road-building occurred along many ancient trails and produced many exquisite road cuts that revealed mappable bedding planes and provided a fresh look at the geology. During the 2016 expedition many of the road cuts across the Sistema Huautla karst groundwater basin were mapped. Field mapping occurred along a southwest transect from Plan Carlota to La Providencia and from San Agustín Zaragoza to San Andrés to the northwest. A second transect was mapped along a road from Plan Carlota to La Grieta and northwest to San Andrés. A third transect was mapped from San Andrés to Plan de Arena and from Plan de Arena to Agua de Huaje to the north. In all about 10 kilometers of roads and trails were mapped. All outcrops were measured with a DistoX2 to determine strike and dip, and all mapped locations were GPS-located. Cave entrances being cataloged by GPS were also mapped where the geologic exposures were suitable. Geologic cross-sections and plan-view geologic maps will be produced in the future identifying the structural features of the karst-groundwater basin.—Jim Smith

junction area. We then agreed to go check side leads.

Vickie and I went back to VBZ78 and mapped 40 meters in a small tunnel that stopped at a 3-meter drop. Neither of us wanted to attempt it free; it was overhung and the rock was crap. It needed bolts and a pair of etriers—doing it in vertical gear would have been awkward as hell. It had strong air coming out at 4 p.m. and appears to be a separate route from the Alcan Falls tunnel. It is worth investigating. We returned to BAZ27 and found a note from Andy indicating they had gone up a tunnel to the east there. They were surveying in. We caught them quickly and Bev said, "You guys should leapfrog. You carried all the gear." So we did. We got a brief stint of nice walking passage, then it split up and got complicated and much smaller. To the right Vickie went up into a 6-meter-diameter chamber with an aid-climb going up 6 to 8 meters to an overhead dry tunnel. This may be the shortest climb on the list, and it looks good above. We continued on, finding two more upclimbs that probably lead to the same upper level. The first is a very sketchy and loose silo to the east, and the second is possibly free-climbable but exposed. We surveyed out and found Bev and Andy gone. I picked up a four-liter and a six-liter bottle of water from the stream before climbing out. We reached Camp 3 around 7:00 p.m. and had dinner with Andy and Bev.

The morning of April 10 Andy made breakfast for all of us. The situation with them, like with Mike Green, was that they had no time left. They had effectively come out to Camp 3 for one day and had to leave. They left around noon, leaving us with two people again. The leads at this time all required aid-climbing, and our dynamic rope had been reduced to short segments for rigging the western dry canyon, a situation we had grimly accepted when we had arrived at Camp 3 with no static line and a desire to continue exploration with whatever resources we had. Now, thanks to Mike's supply run we had static rope but no dynamic rope. We talked of bolt climbing with static 9-millimeter rope and the immediate thought was of Joe Ivy, whose death in 2000 had triggered a major reassessment of how to safely bolt-climb. Leading on static rope was not a good idea. Although we had sent a detailed note back to base camp with Bev and Andy, the likelihood of anyone coming in the next few days seemed low. And the fact was that Camp 3 was a very remote place where an accident from a fall or a loose boulder collapse, both highly possible in this fractured place, would have left an injured party alone and someone having to solo out to initiate a rescue. A phone line might have changed our subsequent decision to head out the following day.

It took us a day to pack up and inventory Camp 3, which Vickie was now calling Camp Purple, given that all of the slickenside rock throughout the camp chamber was in fact quite colorful in dark reds and purples, and to set it up for a long-term wait. At that time my expectation was that it might not see another team until 2018. Although my original plan had been to spend the month in La Grieta, unexpected events required Vickie and me to be in Anchorage, Alaska, in a week to drive caver Nikki Green's vehicle down the Alcan Highway back to the lower US, so we would not have time for a second push this season.

Since we assumed no one would be coming back, that also meant taking out trash and things that don't survive well in the cave over long period, such as our drills, batteries, and charging systems and anything with aluminum, including all of our carabiners, which was a substantial pile. We had found a huge cluster of badly corroded quickdraws and aluminum 'biners at Camp 1.5 on the way in, so we pulled our climbing hardware. In the end we had close to forty-pound packs, so it was not a weightless departure. Transit time to Camp 1.5 was 6.5 hours with heavy duffels, and the route felt safe, although there remained a few places that could be improved with rigging. On the way out we passed Derek Bristol and Gilly Elor heading for Camp Mexiguilla for three days. They had taken a different approach upstream from Camp 1.5 and had single packs for a shorter stay. They had, however, established a pile of equipment and food at the lunch rock. We informed them of our findings and the substantial supplies now at Camp 3.

We spent a day at Camp 1.5 fixing gear and resting, largely so that we could leave the cave early the following morning. Midday on April 12 Jon Lillestolen, Kasia Biernacka, and Scott Wahlquist came in from the surface. They were going to do a recon to the lower levels beyond Mazateca Shores and scout leads and camp sites. They continued on, but were back in a few hours, having run out of rope and bolts before reaching the main galleries above Mazateca Shores. They would continue on the following day. They had also rigged and rappelled the entrance drop. Jon said they had dropped the top end of the rope down and left a belay clip-stick with a carabiner so that the first person up could clip the top bolt and climb out.

We had set the alarm for 2 a.m. at Camp 1.5. The others were still asleep when we packed out at 3 a.m. We arrived at the entrance just short of 11 a.m. and reached base camp some time before noon, where we eagerly consumed some cabbage soup that Gary Napper had on the stove. Later that afternoon Zeb Lilly arrived from the diving push at the Huautla resurgence and we had an animated discussion. Upon learning that he was not only a diver but also was proficient at bolt climbing, the talk shifted to the possibility of he and others capitalizing on the effort it had taken to set up Camp 3, which was now at the end of a well-rigged route and lying in wait with sleeping gear for four, two weeks' food, rope, and going cave. Hell, I would have been grateful for that when we had arrived. Zeb took the bait, and when we arrived back in Texas on the sixteenth, preparing to leave for Alaska, he and four others were on their way in to Camp 3. Their substantial success at extending the Alcan Falls route was a great example of why successful expeditions are a result of collaboration and team work. La Grieta now truly is "the road north," and the main extension of Sistema Huautla. It is currently

only a kilometer from being directly under the highest peak in the region, and the cave is continuing.

FROM THE BOTTOM UP

Katie Graham and Zeb Lilly

Day 12. I rip another toenail off, examine the calluses and swelling of my waterlogged feet. I'm sipping a cold Victoria, basking in the morning sun, and all I want is another day at Camp 3 pulling on my grit-encrusted neoprene socks.

Day 1, April 17, 2016. Fernando and I (Katie) rolled into Plan Carlota at 7 a.m. and pointed the taxi driver to where all the big diesel trucks were.

Gilly: "What do you want to do?"

Katie: "Whatever. I came prepared to camp."

Gilly: "Do you have batteries for nine days?"

Katie: "Yes."

Gilly: "Okay, you'll come to Camp 3. We've got some bolt climbs."

Katie: "Fernando's a climber."

Gilly: "You want to come too?"

And that casually we made up a team. Within a few hours Scott Wahlquist, Kasia Biernacka, Zeb Lilly, and I left to drop a virgin pitch to continue survey in the 'Merican Tubes and hopefully connect in with the Refresher Series. Then we'd stay at Camp 1.5 and meet the second group of Gilly Elor, Fernando Hernández, Bruce White, and Andy Chapman. If we didn't make the connection, we'd have to double back near the entrance and take the trade route to Camp. This would tack on at least six hours.

So, plan in action, we rerigged the Canadian and 'Merican Tubes, reached the beginning of survey, rigged a new pitch, and surveyed down the streamway. The walls were clean-washed, heavily scalloped, and brittle, as is most of the cave. Characteristic La Grieta bends draw out the survey. The route descended steadily; all downclimbable. The passage would get small and low, and then would open up again. I'm picking stations when I look ahead and grimace—there is a wall. Approaching the flowstone barricade, I could see half an inch of airspace between the ceiling and rippling water. I reached my feet into the tunnel and could feel the roof rise; it's not a barrier, just a bitch. I take a few breaths to psych myself up and commit to the other side. I opened my eyes to 6-meter-tall streamway. This is the Pavo Mojado. Everyone else came through, and we resigned ourselves to cold, wet survey. More climbs, tubes, rotten handholds; it kept going.

Kasia scouted ahead. She came back a while later and gathered us to share the news. She had followed the streamway and then met a mud slope upward, a terrible demise. Turning back, she realized it was a switchback; downstream another 20 meters she came to rigging. We'd done it! Only 250 meters of survey to make this connection, and then only seven minutes to camp. Awesome first day.

Day 2. Kasia, Scott, and Andy headed back to the surface. Fernando, Bruce, Gilly, Zeb, and I took drills, lots and batteries, quickdraws, dynamic and static ropes, prepared straws, and food to Camp 3. A lot of camp gear was already there for us. We took a detour to check out Mexiguilla, the most over-hyped cave passage, to check the pretties. Gilly was looking for a team name. I pointed and laughed at a mushroom formation I thought looked funny. "Look at the fat turtle." Gilly: "Who, Bruce?" "No, [laughing], that." And so Team Fat Turtle was named.

Day 3. Commence The Push. We split into two teams, with Gilly and Fernando taking the active streamway to do the bolt climb of Alcan Falls and Bruce, Zeb, and I taking the paleo route to look at the upper bolt-climbs and the technical digging lead. The climbs looked marginal, so we looked for the small way. We split up to find the lead. Zeb and I didn't think our routes looked good, so we switched to see whose was worse. To the left was a nasty squirm through popcorn and then an abysmal upward squeeze. The sound of water ahead coaxed me through. I was a little surprised Zeb even attempted the squeeze; he totally showed me up when he made it through. Sweet! On to the booty. We followed the siren song of the waterfall. Much to our surprise, we could see lights at the bottom and made voice contact with Gilly and Fernando. Excited to see us, they free-climbed the falls to the level we were on. They reported checking some small leads in the active streamway and had been debating the bolt climb. We decided Gilly and Fernando would bolt the falls above where we were standing and Zeb and I would hammer the squeeze, since the dry route was the preferable commuter route, and then check on Bruce, who was nursing a fall injury. A few rounds of technical digging had the squeeze enlarged for frequent travel, and we went to look for Bruce. He was only a few stations away; he had started feeling better and found us by following the smell of our digging efforts. We began surveying, while Gilly completed the bolt climb of Upper Alcan Falls. She and Fernando explored a short distance upstream in a steep, clean-washed canyon to find a breakdown room with a waterfall coming into it. Another short bolt climb, Fernando leading, and they had found going stream passage above. We reorganized into survey teams and leapfrogged each other for a few hundred more meters of streamway surveying, ending at another waterfall.

Kasia Biernacka, Zeb Lilly, Scott Walquist, Fernando Hernández, Bruce White, and Gilly Elor sorting gear in La Grieta's Camp 1.5. *Katie Graham.*

Day 4. Zeb led the climb up really rotten rock and rigged Turkey Fell. Gilly, Bruce, and I began surveying and Fernando and Zeb jumped ahead. The passage split, with a waterfall coming in from the west and a smaller stream coming in from the east. Not having the bolting gear, they took the easy way. After 100 meters they free-climbed a waterfall and got thoroughly soaked. The passage continued to enlarge before becoming a narrow slot, making a U-turn, and leading to a large breakdown room with a tall ceiling. They began surveying back. At the point of the U-turn, there is a large flowstone formation with a stream leading in. We connected our survey with theirs near the waterfall coming in from the east, which we called Turkey Falling. Our group went back up to take a look at what Fernando and Zeb had surveyed. We climbed the flowstone formation and followed the active streamway up through a tight slot with a combination of breakdown and flowstone, some of which was re-eroded. As the passage got smaller, participants dropped off. We surveyed out, leaving two leads. One requires hammering, and the other is a 10-meter climb with an active, albeit small, streamway. In the meantime, Bruce and Zeb surveyed a big room and looped back to earlier survey.

Day 5. We had allowed our schedule to creep, and it wasn't till the afternoon that we left camp. Gilly made a run to get more static rope. Bruce endeavored to improve our camp furniture. Fernando, Zeb, and I headed to Turkey Falling, where I completed a bolt-climb/traverse to get into it. Starting from the upper-level passage that we had discovered the night before, I climbed over a flake protruding from the wall and then traversed to the top of the falls. Zeb mopped up survey and created an upper-level loop. After a short day, we headed back to try to get back on a normal twenty-four-hour schedule.

Day 6. Zeb and I started surveying from the top of Turkey Falling, and Gilly and Fernando sought the inevitable bolt climb. Just before the anticipated falls, they discovered a pair of deep pools that required a precarious traverse on crappy rock, resulting in both of them falling in. Thinking of the Glubs lower in the cave, we named the pools the Gluck Glucks for the sound a turkey makes while drowning. Gilly climbed the Gobble Gobble Falls, then she and Fernando went ahead. Zeb and I surveyed up beautifully sculpted stream passage with deep plunge pools and many tricky climbs or traverses. At the limit of my comfort zone, I stated, "We are following two monkeys upstream." They were free-climbing everything. We named the plunge pools the Deep Pools. Gilly and Fernando encountered another split in the streamway, with a larger stream from the west and a smaller stream from the east. The passage to the west was partially blocked by a breakdown choke, but a sketchy climb to the ceiling allowed passage upstream, and it continued. They started their survey at the confluence of the two streams and surveyed back to connect to us in a larger passage that we named Beyond the Deep Pools.

Day 7. We added some rigging on our way to where we'd left the survey. Fernando climbed up the breakdown pile and rigged a rope to a natural anchor, allowing the rest of us to climb up the rope and rappel on the other side back into the stream. Zeb and I followed the howling wind through the tight, stooping-height fissure. We continued through clean-washed, sculpted passage until we were stopped at an 18-meter-high falls. Based on the sound and what little we could see above, there is another waterfall directly above this one. This is Ankara.

From the breakdown pile another stream leads west, upstream, and also ends at a dome, 21 meters to the top, and appears to continue upward. Interestingly, the dome is bisected by a flowstone formation that has been re-eroded from the inside out. The climb could be done on the wall by the falls or up the dry flowstone feature. This dome is Cappadocia.

Hungry for a few more meters, Fernando, Bruce, and I cleaned up a high-level lead that continues to the south and found a beautifully decorated passage that goes a short way before being choked with formations or requiring a short climb.

We'd procrastinated all week, but the task to complete on our last day of exploration was to tie in the deluge waterfall and free-climb Gilly and Fernando had done the first day of exploration. I lost at rock, paper, scissors, so had to survey—wet and cold were the enemy by this point. The guys pulled all our gear back to camp. Our final tally was 1.5 kilometers surveyed on this trip.

Day 8. We teased ourselves with the possibility of hitting one of the climbs. We might have enough bolts, but we really didn't have enough time. We resigned ourselves to the right choice, packed up, inventoried Camp 3, and traveled to Camp 1.5.

Day 9. We went down the lower levels to check out the Pato Mojado and familiarize ourselves with the area for next year's push. We made our way into the L Room and looked at the Pato Mojado and other side passages. Task completed, we started up and out.

The team had stashed mescal at Camp 1.5, rigged the exit for us so we didn't have to diddle around on our way out, and were eagerly awaiting our return. We rolled into the fieldhouse around 10:30 p.m. to an incredibly warm welcome. Beer tasted good that night, but the lure of unfinished business was intense. Many climbs await 2017.

MY FIRST EXPEDITION

Fernando Hernández

On April 15, 2016 I traveled toward Huautla de Jiménez in Oaxaca for the PESH expedition. This was my first big expedition ever, so I did not know what to expect or what I was going to do exactly. I was über-excited, though I guess not knowing what I was getting into calmed me down a bunch. "Ignorance is bliss."

The trip started when I arrived at the Mexico City airport, where I met Katie Graham. She was really nice and humble about her caving experiences, which later I found out to be incredible. We visited the flea market and then took the overnight bus to Huautla. I was expecting to take a beauty sleep on the bus, but the driver had other plans. He decided to blast salsa music on his stereo all

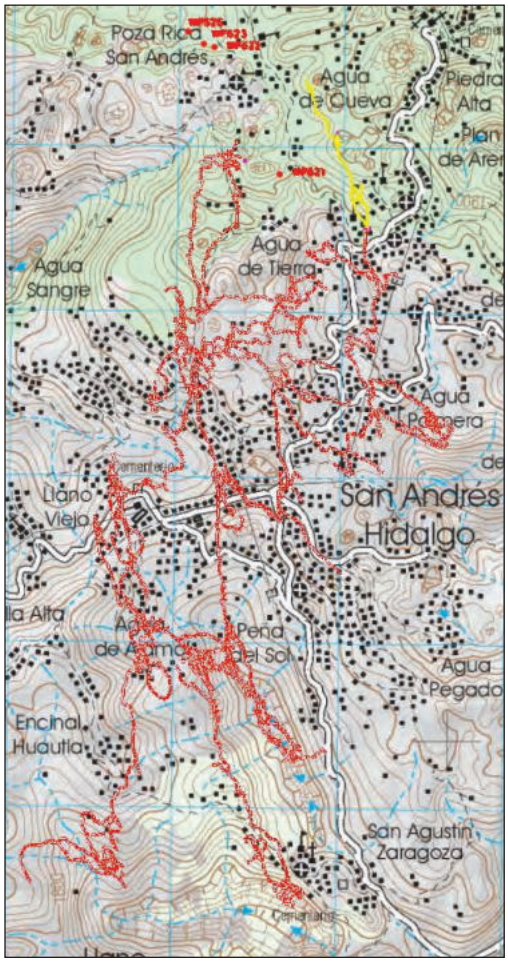
night long. So I got a few minutes of sleep to the sound of "Suavemente" by Elvis Crespo.

We arrived in Huautla at 6:00 a.m. and proceeded to take a taxi to Plan Carlota. It was still dark, so I could not see a lot. Eduardo, our taxi driver, explained to us some details about the area, like their government complexity and also about their seasonal fruits and the *milpas*. When we passed San Andrés the sunrise came, and we could fully appreciate the beauty of the area. It is truly breathtaking when you first see the valley with its intense, lush green color. Little houses spread through the hills with their corn fields next to the houses. Some locals start poking their heads though the windows to observe arrivals, but most of them just continue their daily lives, men hiking with their digging poles, women walking to the market with flowers in their hands, and dogs resting on the porches.

Plan Carlota is a little town on the side of the mountain with no more than fifteen to twenty visible houses. Katie and I arrived at the main field-house, which was next to the local school. The accommodations were pretty nice: three houses on the side of the hill with a spectacular view. One was the main cooking and gear-storage building, with a little room on the roof. Another had three rooms where people set up camp, with others camping on the roof. The third was our computer room, which also contained a bathroom [see article on urban caving in this issue].

My logical question to Bill Steele was, "Hey Bill, so what am I going to do here?" He just told me to talk to Gilly Elor. I approached Gilly, and she asked me if I wanted to go underground, to which I responded, "Yes." My bags were still outside the house, and I started getting ready to go caving. I asked what exactly I needed to prepare for. She just casually said, "Prepare for seven to nine days." That is when it became real, because I had never been on a proper cave-camp trip before.

That afternoon I was on my way to La Grieta. The early team consisted of Katie Graham, Zeb Lilly, Scott Wahlquist, and Kasia Biernacka. They were going to survey the 'Merican and Canadian Tubes, hoping to connect into the Refresher and go downstream to Camp 1.5. The late team consisted of Gilly Elor, Bruce White, Andrew Chapman, and me. We would carry dive gear for the Pato Mojado and go directly to Camp 1.5. We went down the first drop, and the first thing we noticed was a putrid smell. That was the turkey that had been sacrificed in a Mazatec ritual a few days earlier. We avoided staying in that room for too long. We continued through the series of drops and rebelays until we arrived at the stream passage. The cave itself is not particularly difficult, but the heavy backpacks make it quite a challenge. Lots of climbing up and down on brittle rock made it a thrill. We passed thought the Torture Chamber and the Bottleneck before we arrived at our destination.



Map overlay of Sistema Huautla with the new discoveries to the north shown in yellow.

We regrouped with the rest of the team at Camp 1.5. They arrived very excited because they had made the connection that everyone was hoping for. The Canadian Tubes were connected with the Refresher. I heard the conversation half-asleep, fighting an annoying little drip in my face. Here I started getting to better know the people I was caving with. I never felt so out-caved on any trip. Everyone was so strong and had an impressive caving resume. People were talking about Croatia, Slovenia, France, China, Lechuguilla, San Agustín, Castleguard, and here I was talking about Whirlpool, Punkin, and Deep in Texas. They made me feel eager to cave with them and learn from them.

Day 2. The next morning we parted ways with Scott, Kasia, and Andrew. We loaded up our gear and headed on our way toward Camp 3. On the way we took a detour to Mexiguilla. It was given that name on the previous expedition, due to its nice-looking formations. I would recommend looking for the pictures Kasia took of this place, because it is hard to describe in words. I was amazed by the formations called snake-dancers. This area was also the birth-place of our team name, when Katie called a formation a Fat Turtle and Gilly thought she was saying that to Bruce. We lost a member of the team for some minutes, which made me hyper-aware about the seriousness of this cave. Any turn can be deceiving, and you never know where you are going to end up. We continued on our way and arrived at Camp 3. This room had big, reddish breakdown, and some platforms had been built using mud and rocks. It was fairly big, and you could faintly hear the waterfall. It sounded just soothing enough to act like a lullaby for sleeping. We needed to get on rope to go for water, which turned out to be a pain when all our gear was wet. The whole area was unstable and on a slope; that made moving through camp part

Gilly Elor, Fernando Hernández, and Katie Graham in the formation-choked old, dry passage in La Grieta. *Zeb Lilly*.

of the adventure. The toilet was a nice crack in the floor that could be smelled throughout the camp.

Day 3. I woke up super-excited, because it was the day of the first push. We had been informed that there were two leads; one was a tight lead and the other one was a technical climb. We arrived at the intersection, split the team, and attacked both leads. Zeb, Katie, and Bruce went to the dry passage, and Gilly and I went to do the climb. We followed bend after bend of endless stream passage on fragile protrusions of rock. After checking some of the passages, we found Alcan Falls. Gilly and I were on the bottom discussing how to avoid the waterfall when all of a sudden we saw lights near the top of the waterfall. My first thought was, "Who the hell is up there." But we recognized their voices; it was Zeb and Katie. Gilly and I looked at each other and just started free-climbing the waterfall. It was not as bad as we first thought, but now we were thoroughly wet. We met up with Katie and Zeb, and it was decided that Gilly and I would continue the climb and they would go back to expand the tight passage, which became the commuter route, and check on Bruce, who, we were informed, had taken a small fall. Gilly took the lead, and I belayed. She effortlessly climbed Alcan Falls, and in no time she was setting a rope for us to use. We continued in free-climbable and up-trending stream passages until we hit a small breakdown. After finding a way through it, we ended up in a *huge* room—well at least for me. (Remember, I cave in Texas.) In this room there were a waterfall and yet another small climb. I led the two-bolt wonder and got into more stream passage. We did some leapfrogging to maximize the survey, and stopped at another waterfall.

Day 4. We headed straight to the waterfall where we had left the survey the day before. It was eventually named Turkey Fell. Zeb led the climb, which turned out to be more complicated than at first sight due to crappy rock. Zeb and I proceeded to go ahead and scout and survey back. We followed the stream passage until we found a waterfall heading to the west and a passage to the east. Since we did not have any climbing gear, we went east, even though most of the water came from the west. We followed the stream until we got to a constriction, which I went through. To my surprise, it was tight, and I was trying not to get stuck with a cold waterfall blasting in my face. I managed to pass, then had to get the water out of my ears. Then Zeb took a better approach and with a sling we moved some rocks to make it easier. We then continued to a U-turn that led to a room with a high ceiling and a big mud and breakdown mountain. We stopped our booty-scooping and proceeded to survey back. On the way back, we were able to find a way to avoid the waterfall squeeze altogether through an upper passage. We met with the rest of the group at the previous waterfall and decided to go back to the big room. We then checked the waterfall on the flowstone, which led to a free-climbable waterfall that became tighter and tighter. Here I used my Texas cave skills and managed to squeeze through a slot. Not everyone was able to pass through this. The rest of us continued heading up. The passage ended in two leads. One was like a small culvert with water flowing and trash. It ended at a constriction impossible to pass without some modification. The other lead was a 10-meter climb on loose and crappy rock. We surveyed back and returned to the rest of the team. Meanwhile, Bruce and Zeb had found a way to tie in a loop from the big room to a previous station.

Day 5. We had a late start. We really tried to maintain a twenty-four-hour schedule, but the days started slipping little by little. We were almost going to call it a rest day, probably just because of the thought of putting on wet clothes . . . again. We conquered our laziness, and Zeb, Katie, and I proceeded to climb the waterfall that leads west. Gilly went to retrieve more ropes from Camp 1.5. We approached the waterfall and thought about our plan of attack. Zeb had identified a ledge in the middle of the waterfall, and we proceeded to climb from there. Katie took the lead and I took the belay. Katie showed her impressive climbing skills and disappeared from view, crossed a ledge, and rigged the waterfall. We explored a couple of meters upstream before we decided to leave the lead for tomorrow.

One good thing to mention is that camp life was pretty cheerful. We bonded very well, and that was a huge contribution to the success of the trip. We all shared duties, laughed out loud every night, and every decision was a group decision.

Day 6. We went directly to where we had left off. Again we divided into two groups. Gilly and I planned to scoop ahead until we found an obstacle and survey back. Zeb and Katie surveyed from the waterfall onward to us. We followed the stream up until we found a section of deep pools. We had to make a couple of traverses across the rock to pass. There was one pool that seemed wider and more challenging than the others. Gilly went first and crossed successfully. I was so confident in my climbing skills

that I went full-climbing mode and did a bouldering traverse. To my surprise a rock decided it did not want to be on the wall anymore and dislodged in my hand. The broken handhold sent me plunging down into the deep pool, getting wet up to my neck. This pool got named the Gluck Gluck, supposedly the sound a turkey makes while drowning and a reference of the Glubs in the lower levels of the cave. After some cursing and laughing we continued onward. We came to another waterfall, Gobble Gobble Falls, which Gilly climbed. Beyond that we leapfrogged again, and Gilly and I took the lead. We encountered a series of the Deep Pools, which reminded me of my fun bouldering. We then found ourselves in a big upstream passage that blew cold air. This was named Beyond the Deep Pools. Beyond we found a split: a large stream partially blocked by breakdown to the west and a smaller stream to the east. We surveyed back to the rest of the team and called it a day.

Day 7. We returned to the split we had left the previous day. The waterfall seemed more powerful, which we later found out was caused by a brief but heavy shower on the surface. We were prepared for the pools and had some rope, and Zeb rigged a traverse line. This kept us . . . well, I wouldn't say super dry, but less wet.

We got to the breakdown pile that blocked the western stream. I free-climbed it carefully, trying to avoid the rolling boulders that were coming down. I rigged some ropes, and the rest of the team came up. We divided into two groups. Zeb and Katie went ahead, and Bruce, Gilly, and I surveyed from the top of the climb. We continued in big, flat passage. We were really excited by the ongoing passage. It was unbelievable that it continued that big. Moments after that thought came to my head, I saw lights coming our way. The other team was coming back. They had been stopped by a little obstacle, an 18-meter fall of roaring water that marked the end of our exploration. This waterfall is named Ankara. The rest of the team ran to see this thing. It was really impressive and invited a climb.

The passage to the west continued as a meandering, tighter passage and ended up at a 21-meter waterfall. This is Cappadocia.

The best news is that the cave continues upward. We returned excited. On this trip someone told me, "always leave the leads better than they were," or something like that. I think Team Fat Turtles achieved that goal.

On the way back, we stopped at a side passage that Katie had identified while trying to bypass the Turkey Fell waterfall. This led to a heavily decorated paleo passage. It was full of soda straws and flowstone; it was very beautiful, and it was hard to move and not break anything. We left that passage as a lead for a future trip. I particularly enjoyed that last trip back to camp. We had done it so many times, but I knew I was not going to be back there—until next year, hopefully. We returned to camp, knowing that we still had things to do. We still needed to inventory Camp 3 and look for the Pato Mojado, which leads to a whole other section of the cave.

Day 8. We did the inventory of Camp 3 and I took my last poop in the crack. We left for Camp 1.5, and in my eagerness I got off course. I took the turn into the Super Awesome Die-in-a-Flood Passage. I realized it eventually and caught up in the Formation Room. Some would claim I got lost; I was just exploring more of the cave, of course. We got back to Camp 1.5 and found the most awesome surprise. Paul and Eric had come down and left a water bottle full of mescal from Vico. It was a very happy moment for the crew. We drank it cheerfully, and even though it didn't give us a buzz, it

PESH 2016 Expedition Participants

Iván Alarcón-Durán	Mexico	Jason Lavender	USA/TN
Joaquín Arroyo-Cabrales	Mexico	Jon Lillestolen	USA/VA
Diego A. Bernales Alcalá	Mexico	Zeb Lilly	USA/VA
Kasia Biernacka	Poland	Jorge I. Mendoza	Mexico
Frank Bogle	USA/TN	Adrian Miguel-Nieto	Mexico
Derek Bristol	USA/CO	Mark Minton	USA/VA
Andy Chapman	United Kingdom	Rodrigo Monjaraz-Ruedas	Mexico
Gerardo Contreras	Mexico	Gary Napper	USA/TX
Jesús Alberto Cruz López	Mexico	Eric Pelkey	USA/PA
Virginia del Rosario	USA/VA	Alma Rodríguez	Mexico
Ana Diaz	Spain/Mexico/USA/TX	Bev Shade	USA/TX
Yvonne Droms	Switzerland/USA/VA	Tommy Shifflett	USA/VA
Gilly Elor	Israel/USA/MA	Vickie Siegel	USA/TX
Katie Graham	Canada	Jim Smith	USA/GA
Mike Green	USA/TN	Elliot Stahl	USA/GA
Blake Harrison	USA/NM	Bill Steele	USA/TX
Adam Haydock	USA/UT	Bill Stone	USA/TX
Fernando Hernández	Mexico/USA/TX	Diana Tomchick	USA/TX
Chris Higgins	USA/TN	Matt Tomlinson	USA/TN
Vico Jones	Mexico/USA/TX	Scott Wahlquist	USA/VA
Pat Kambesis	USA/KY	Bruce White	USA/CA

was a good pre-party for the surface.

Day 9. It was the last day in the cave. After eight days, part of me was ready to get out, but another part was feeling nostalgic. It had been such an awesome trip, and it was coming to an end. What could have been happening on the surface? But the cave had one more jaw-dropping moment to give us. We went to the lower levels to look for the Pato Mojado. Before this expedition, the lower levels had not been visited for a long time. Another team had already rigged the way, so it was a cruise for us. The Refresher, or what I think was the Refresher, consisted of a rappel with a roaring waterfall beside you. After that, the rooms start getting bigger and bigger. There are very fun traverses along the stream passage, but you can't avoid getting in the water. There were some impressive boulder-fields before we got to the famous Camp 2, a.k.a. Mazateca Shores. This was very nice to see, because I had read about it and seen pictures. There is still no comparison to seeing it in person. We spent a short time on the "sandy shores" and kept going toward the L Room. The map doesn't do justice to how complicated it is to navigate through that section. It was great that the earlier team had placed some tape. We searched for the Pato Mojado, but Zeb ended up not diving it, because we were not sure which was the correct spot. We took some mental notes about the possible Patos Mojados and headed back to the surface.

The way back up not as hard as I expected. The prospect of beer and food made me float my way up. I used a foot ascender for the first time. That thing is magical. I was running through those ropes, or at least so it seemed in my head. I got ahead of the group, and I thought I had gotten lost until a peculiar smell came to my nose. The putrid smell of the turkey was still lingering, and in a weird way I was happy for the awful smell. It meant surface. So I went ahead and got on rope. On that last stretch of rope, my mind went through all the events of the week. I was really grateful for the awesome team that I was with and the friends I made. I felt blessed for the opportunity that the expedition gave me to explore this beautiful cave. A tarantula came close to my face and even that, I thought, was beautiful. When I got to the surface, I lay down against a tree and turned off my light. To my surprise, nature had a treat for me. All the hills were shining with lightning bugs. It was nothing I had seen before. Thousands of them swirling and dancing just for us. After a couple of minutes I saw another light emerge from the pit.

We ran down the hill and got back to the fieldhouse around 10:30 p.m. We were welcomed by the whole crew with food and beer. We swapped stories all around. Nothing incredible had happened on the surface, except Prince. I had never listened to his music anyway. Everything was merry and cheerful—success. I was supposed to feel satisfied and accomplished, but the only things in my head was Ankara and Cappadocia; 2017 is going to be an exciting year for Huautla I am sure.

This story is just about one group that explored underground, but this whole exploration could not have happened without the joint efforts of everyone inside and outside the cave. That was a thing I learned on this expedition. The leaders, cooks, riggers, haulers, public relations, locals, interpreters all matter. Many people focus completely on the high end of the exploration, but it all starts from the base. It is all part of a big team.

On this trip, I met wonderful people and cavers. I experienced the happiness of the local people, and got humbled by the immense cave that is Sistema Huautla. I am grateful to have been part of PESH 2016. Caving is not going to be the same for me again. It gave me a bigger perspective and bigger goals.

POZO DEL PAVO

Mark Minton and
Yvonne Droms

Pozo del Pavo (Turkey Pit) in La Grieta was an interesting bit of exploration that had been overlooked for forty years. While we were helping Bill Stone and Vickie Siegel pull camp packs out of the 60-meter entrance shaft, I (Mark) noticed a potential lead in the wall partway down. I was able to free-climb to the lead from the Meri Fish Ledge, where there is a rebelay roughly halfway down the pit.

To my surprise, at the top of the climb I found walking passage with no footprints. Even more surprising, there was a side passage that sloped steeply down to a deep drop with airflow. Zeb Lilly had just climbed up from the bottom of the entrance shaft, so I asked him to listen as I threw rocks down the new pit. It was so close to the entrance shaft that I figured it would most likely drop back into the large room at its base, but Zeb heard nothing. Suddenly I had dreams of finding a new parallel route down, similar to those in other parts of Sistema Huautla, such as the Fools' Day Extension in Sótano de San Agustín or the Naranja Passage in Nita Nanta.

In the lower levels of La Grieta.
Kasia Biernacka.

A few days later Blake Harrison, Yvonne Droms, Diana Tomchick, and I were back at the lead. Blake had been one of the early explorers in Huautla, but this was his first real caving trip there in almost forty years. We rigged a nice drop that stair-stepped down to a small ledge. While I was assessing where to put a rebelay, Yvonne spied a rope in the distance. Damn! Our rope turned out to be too short to rig the rebelay, but by skipping it and going straight down, we just managed to reach the floor as the rope slipped out of our racks. We had come back in at the bottom of the second drop in the known cave. So much for a new deep route. We surveyed out but left a couple of leads on an upper ledge.

A week later Yvonne, Adrian Miguel, and I returned to Turkey Pit to check leads on the ledge. We dug open a tight pit that went down two pitches and reconnected above where we had earlier wanted to put a rebelay. The other lead on the ledge quickly became too tight. We surveyed out and derigged.

Although it didn't turn out to be very exciting, Turkey Pit adds a new 60-meter-deep route into La Grieta, increasing the complexity of the already extremely complicated upper section of the cave.

HOBBIT HOLE SURVEY

Tommy Shifflett

Survey of the Hobbit Hole in La Grieta continued during the PESH 2016 expedition. The last survey, from 2015 by Paul Winter, Scott Wahlquist, and David Ochel, had left a great lead, with two separate short pits leading into what appeared to be a 4-by-8-meter canyon passage, and that was the main focus for 2016.

The first return trip, by Jon Lillestolen, Scott Wahlquist, and Andy Chapman, headed straight for those pits. Unfortunately, these dropped down into not a canyon passage, but instead an elongated room, with a lower-level fissure and no way on. A return trip was made by Paul Winter, Eric Pelkey, and Tommy Shifflett to recheck the end for any airflow. The team could not find any way on, nor could they detect any airflow, which indicated this end of the cave is pretty much terminal. However on the way out they stopped to check the White Spider Lead and noticed good airflow. The passage started out as a low, dry crawl, but soon intersected the top of a sizable canyon with breakdown. They were able to follow this passage for 172 meters to where it connected into the known trade route. Another lead off the White Spider Lead also reconnected back to the trade route, but one rope drop farther down.

The next trip to the area was made by Paul Winter, Eric Pelkey, Matt Tomlinson, and Tommy Shifflett to check out an air-blowing canyon discovered by Tommy in 2015. This lead is located at the top of an offset canyon just off the drop leading out of the Breakdown Room ,not that far into the Hobbit Hole. A rope was rigged for descending down into the canyon using one wedge anchor and one Powers screw. Powers Fasteners donated five boxes of stainless steel 3/8-inch screws for testing as replacements for wedge anchors in certain situations. The screw anchors are removable and reusable, and so offer the ability to clean a cave of rope anchors. Only two were used, so more testing is needed to verify their use for caving, but they seemed to work fine.

Cave Pearls in the Hank Rose Dome in the Hobbit Hole section of La Grieta. *Matt Tomlinson.*

The canyon ended at both ends. The air was found to come from an extension of the canyon several meters up from the floor and an opening too narrow for a caver to pass through, though a plan was made to return on a later trip. The survey then focused on a lead farther into the cave in a sizable chamber at the bottom of a second drop from this location. Up on the left wall, as one travels in, a sizable lead was detected that would need a short aid-climb to access. Climbing gear was brought in to do just that, but then a lower, tighter opening was also noticed below the larger opening on the wall. With some hammering, this was soon made large enough for Matt to climb through, and after he had explored a little bit, we could hear his voice coming from the end of the chamber where a squeeze connected with the passage he was following. We soon began surveying through this into his passage, first up into tighter canyon that led back to where Matt had squeezed through, then downward into much bigger canyon, eventually stopping at a pit.

The next Hobbit Hole trip, by Paul Winter, Eric Pelkey, and Matt Tomlinson, returned to the pit. After just three survey shots they connected to the Tennessee Survey of 2015. They continued their efforts in the Tennessee Survey section of the cave, mapping an additional 168 meters of mop-up.

The next and last trip of the expedition in the Hobbit Hole was by Paul Winter, Eric Pelkey, Matt Tomlinson, and Katie Graham. Their attention was focused on the blowing lead from before. For this effort they brought along materials for widening the restriction. All were hoping for something big to happen, as a nice echo could be heard in what sounded like a large dome on the other side, but as it turned out this

lead came in at the top of the Hank Rose Room dome.

There are few, if any, memorable leads remaining in the Hobbit Hole for next year's return to La Grieta.

NEW CAVE DISCOVERIES

Mark Minton and
Yvonne Droms

In addition to our main objectives in the La Grieta section of Sistema Huautla, several other caves were discovered and surveyed during the 2016 PESH expedition. A recap of some of them is given below.

Cueva de Pared de Huesos (Bone Wall Cave). In 2014 we were shown a number of entrances east of Plan Carlota by a local guide. One of those was a hole too small to enter but blowing a lot of cold air. In 2016 we dug open the entrance and quickly came to a 13-meter pit. Passage at the bottom of the drop went both upslope and down to another pit 8 meters deep. The upslope passage ended in collapse with little air. At the bottom of the second drop the cave continued down a too-tight slot, also with little airflow.

Further poking around revealed some air coming from breakdown above the second drop and more coming from a small hole in a wall of mud and boulders in an alcove off of the second drop. More air may come from a ledge on the opposite side of the first drop where a passage is visible, but we never got around to traversing over to check it out.

While attempting to dig open the blowing hole in the second drop, I (Mark) realized that much of what I was digging through consisted of bones rather than rocks. Some of the bones looked unfamiliar, so I collected a few to show the Mexican paleontologists who would be visiting us soon. When INAH paleontologists Joachín Arroyo-Cabrales and Iván Alarcón-Durán arrived, they were excited about the bones. They were from a relatively rare extinct Pleistocene ground sloth, *Megalonyx jeffersonii*, that lived approximately 12,000 years ago.

The paleontologists made two trips to the cave, where Iván collected a number of bones. Extracting them from the vertical wall of fill was dangerous, as some large pieces of breakdown were precariously perched and digging undermined them. He concluded that the bones were most likely from a single individual, although they were randomly distributed and in somewhat bad shape. Nevertheless, it was the first occurrence of this species recorded in Oaxaca. (Later in the expedition a better specimen of this sloth was found in a different cave.) We also collected a live cave-adapted harvestman near the bone wall.

This cave was surveyed by Tommy Shifflett, Jim Smith, Yvonne Droms, and Mark Minton. It is currently 31 meters deep and only 53 meters long, but given the great airflow at the entrance, we'll probably give it another push next year.

Paleontologist Iván Alarcón digs bones out of the dirt. *Matt Tomlinson.*

Cueva Cementerio de Cabras (Goat Cemetery Cave). While hiking near our base camp in Plan Carlota, Tommy Shifflett and Virginia del Rosario found a cave in a small sink right beside a trail. Although we had been shown various caves by the locals, they had not shown us this one. Initial exploration revealed a small cave with at least two going leads and some airflow. Numerous goat bones near the entrance gave the cave its name.

Only a few stations from the entrance, a pit opens in the floor of the main passage. This can be chimneyed across and was not explored initially. The main passage soon led to another series of short pitches, and it looked like the cave might really take off. But hopes were dashed on the second push trip, when we descended one more drop and found ourselves in a very tall, narrow, popcorn-encrusted canyon. Tommy pushed ahead for another 12 meters or so before almost getting stuck and giving up.

Returning to the pit that had been traversed across near the entrance, we found what appeared to be an independent route going down. This takes most of the modern-day drainage, as evidenced by trash at various points. The passage becomes wide and low and slopes down steeply, although much of it can be free-climbed. Unfortunately, all routes eventually reconnect or pinch off.

Goat Cemetery Cave was surveyed by Tommy Shifflett, Jim Smith, Scott Wahlquist, and Mark Minton. It is 55 meters deep and 179 meters long. Although a couple of digs and climbs remain, prospects do not look good.

Cueva del Gran Viento (Big Wind Cave). One of the more exciting new cave discoveries of 2016 was Big Wind Cave. It was discovered while trying to relocate the main entrance to Nita Nanta so that accurate GPS coordinates could be established. No one had been to Nita Nanta for almost thirty years, and much had changed in the local landscape. There were new roads and trails, and land use had switched from farming to forest around the entrance, making it very difficult to find in spite of having a rough idea where to look.

While hiking through the forest, Bill Steele, Tommy Shifflett, and Jim Smith simultaneously exclaimed that they felt cold air. Following the air uphill brought them to a nice-looking walk-in entrance. Tommy was convinced that it was the long-lost Nanta main entrance, but when I saw it, I was sure it was not. I had discovered Nita Nanta in 1980 and spent seven years exploring it to its eventual connection with Sistema Huautla in 1987. That epic adventure took us over 1000 meters deep for the second

time in Huautla and established the highest entrance to the system. This was definitely a different cave, a fact that was verified when the actual Nanta main entrance was finally located by Tommy Shifflett and Scott Wahlquist a few days later.

Big Wind is a complex cave, with many leads at various levels along the entrance canyon. Many of them have good airflow, which, although desirable, is almost an embarrassment of riches because it makes it difficult to know which passage is the best way forward. The first survey team reached a short drop that led to an active stream passage that seemed promising. However the next survey followed this narrow streamway to a sump with no obvious way on. Surprisingly, the survey showed that the stream passage doubled back under the passage above, ending almost directly under the entrance.

The final trip into Big Wind Cave in 2016 found two upper-level passages, although only one was surveyed. This one doubled back over known cave, but at a higher level. The remaining passage appears to be heading southeast away from known cave and is an excellent lead for next year.

Big Wind Cave is located higher than any known entrance to Nita Nanta, so if it can be connected, it will add depth to Sistema Huautla. The cave is currently 38 meters deep and 369 meters long.

SUMMARY

Bill Steele

This was the third PESH expedition. We have momentum now. This one hummed nicely. For the first time in forty-eight years our surface base camp was in a village other than San Agustín Zaragoza. It was in Plan Carlota, on the other side of a mountain from San Agustín and much closer to La Grieta, the cave we focused on this year. Plan Carlota has fewer residents than San Agustín and is reached by a rougher road, but it is quieter, welcoming, and laid back. It felt good to be there.

When Tommy Shifflett and I sat in the restaurant in the airport in Oaxaca in 2013, waiting for our flights back to the States after the British expedition we had joined for a week, we conceived of PESH, making a list of goals on a napkin. One of our goals to accomplish, in ten month-long annual expeditions for a decade, was to increase the surveyed length of Sistema Huautla from 65 kilometers to 100 kilometers. Like most people, I think in terms of steps to reach a goal. Adding 35 kilometers in length in ten years means to me adding an average of 3.5 kilometers per year. Interestingly, that's exactly what's happened. We've gone from 65 to 75.5 kilometers in three years, exactly 3.5 kilometers each year. I strongly feel that one of these years, perhaps next year, we'll have a windfall year and get ahead of the average. It's there to be found.

Speleology encompasses many things: exploration and mapping, cartography, data management, leading people, gear development and testing, and studies in geology, biology, and paleontology. Supporting Mexican cave scientists has become a hallmark of PESH. Significant biological and paleontological discoveries have been made already, findings will be published, and wonderful friendships have blossomed. Hopefully next is geology. PESH caver Jim Smith did his master's thesis on the hydrogeology of the Sistema Huautla drainage basin many years ago [on the AMCS web site at www.mexicancaves.org/bul/bul9.pdf], but questions remain. How old are the caves? What are the boundaries of the drainage basin to the east, the north, and the west? We are seeking a Mexican geology graduate student to join us and do a study.

A PESH tradition is to name a Rookie of the Year. In 2014 it was Steph Davlantes, due to her design contributions and her caving drive, strength, and gung-ho attitude. Last year was Adrian Miguel-Nieto of Mexico City. He was only on the expedition for one week, but he went over 700 meters deep in Sótano de San Agustín during the last week of the expedition, the derig week, and cheerfully hauled loads to the surface, even going back in a second time. This year's Rookie of the Year is Fernando Hernández. Fernando is originally from Mexico, went to Texas A & M University, and now lives in Austin, Texas. He camped underground for nine days and rose to every challenge.

We had not left Huautla this year before we were talking about next year. We have a list of solid objectives. That's what project caving is all about: long-term and thorough, covering all aspects of speleology.

PESH 2016

Las metas principales de la expedición 2016 del Proyecto Espeleológico Sistema Huautla fueron la continuación de la exploración en la parte norte de la sección de La Grieta del sistema al topografiar el pasaje Mexiguilla y continuar la exploración hacia el norte en la extensión Refresher que había sido explorada en 2014. Mexiguilla fue completada y fotografiada. Se estableció el Campamento 3 cerca del final de la exploración de 2014, y un campamento subterráneo de nueve días continuó la exploración hacia el norte por una distancia considerable. También se exploró en las niveles inferiores en La Grieta que no habían sido visitados por varios años, y se encontraron varios pasajes complejos cerca de la entrada Hobbit Hole a La Grieta. Se encontraron y topografiaron varias cuevas pequeñas, y paleontólogos recolectaron huesos de una de ellas. Adicionalmente se realizaron estudios geológicos en la superficie, y biólogos recolectaron varios especímenes.

MAZATEC COMMUNITY OUTREACH

Bill Steele

with a contribution by Alma Rodríguez

Thirty-five years ago we named a Huautla expedition the 1981 Agua de Cerro Expedition. The prior year's expedition had gotten us over 3000 meters of vertical cave, something perhaps unprecedented anywhere, and we intended to venture a short distance farther north of this cluster of caves to where the geology told us the highest entrances of Sistema Huautla, the first thousand-meter-deep cave in the Western Hemisphere, would probably be.

Agua de Cerro is the name of a hilltop town. A drive to it on the rough, rocky road precipitously skirts steeply walled dolines, some of which appear to have pits at the bottom. Our plan in 1981 was to begin exploring them. It didn't happen that year, and it hasn't happened yet. But we seem to be making headway.

Agua de Cerro is close to being at the end of the road. Most people there don't speak Spanish. They are Mazatecos still observing the ancient beliefs. They live where there are caves, and they feel strongly that they know what is in those caves. They know that wind blows in and out of them. They know that water flows into them. Sometimes they hear noises in them. They firmly believe that cave spirits reside in them, spirits that can affect their lives; if they get upset, maybe their kids will get sick or their corn won't grow. These beliefs are difficult to counter. We've been trying to off and on for a long time.

With the birth of our Proyecto Espeleológico Sistema Huautla on our first expedition in 2014, we decided to make gaining access to all of the caves of the Sistema Huautla drainage basin a top priority. Being in my late 60s now and not as fast underground as I once was, I decided that a top personal priority of mine would be to give leadership to a community-outreach campaign to educate the local people about the caves and what we have found to be there and to convince them that we are not removing valuable things from the caves and that if there are cave spirits, they welcome us.

In 2014, at the initial meeting in Huautla with the newly elected *municipio* administration, we asked for help in dealing with the people of Agua de Cerro. Seven years prior, on the 2007 expedition when we connected Sótano del Río Iglesia to Sistema Huautla [see *AMCS Activities Newsletter* 31] , Bill Stone had gone to Agua de Cerro and was told, "We didn't want you here then, and we don't want you here now." This time the Huautla director of civil protection, a high office with the police, rescue, and more under him, said he would go there with us. He gave us a ride in a police truck, along with a few policemen. We didn't know if that was such a good idea, to roll into town with the cops, but we were along for the ride.

The ensuing meeting happened in a dirt-floored house with a cooking fire gently crackling. Our contingent consisted of Jaime Escudero from San Agustín Zaragoza, a local man we have known since the 70s, Cristina Estrada, at the time a caver from my grotto in Dallas who is Mexican and was in graduate school, and me. Cristina was my translator. The conversation went from Mazatec to Spanish, Spanish to English. The Agua de Cerro village leader asked questions and I answered them with two people in between us. "What if we let you in the caves and our kids get sick?" I was asked. "We've been going into the caves near San Agustín for forty-eight years and the kids there are fine, right Jaime?" Jaime spoke up and agreed. Same for their corn.

At the end of the meeting we were told that they would have a community meeting to discuss it, have a vote, and get back to us the next week. We knew the answer would be no.

As we rode back to Huautla in the police truck, the director of civil protection suggested that we put a display up in the Huautla government building, complete with photographs from within the caves and information about the caves and us. This suggestion led to the quality display that we created and installed in the *presidencia* last year [see article elsewhere in this issue].

The Agua de Cerro decision came back no, as we expected. We installed the display in Huautla in 2015, realizing that it was going to be a long process to ever get a yes answer in Agua de Cerro.

We owe thanks to a local, progressive school teacher in Santa María Asunción named Norman Bravo. Norman saw the display in the Huautla government building last year, coincidently at the same time that his students were assigned to do Internet research on caves. He found out we were in the area and

speleosteele@aol.com

immediately drove to San Agustín and found us. He invited us to give a presentation to his students a couple days later. We did that, and it was well received. A photo of me giving the presentation with Yvonne Droms translating was used in the PR brochure in Spanish that was so effective this year. This is where we got the idea to give presentations in schools.

In November 2015 I got a Facebook friend request from a woman in Huautla. I accepted it. Over the next couple of months I noticed that she commented on almost everything I posted about Huautla and PESH, in good English. Finally, I asked her about herself. Yes, she lives in Huautla, teaches English there, has a university degree in English, had taught English at the university level in Tehuacán, had grown up in Mexico City, her parents were from Huautla, and she has lived in Huautla for about a year. Her name is Alma Rodríguez, she has a small English school in Huautla, and she said that she thought what we are doing in exploring the caves was the most interesting thing happening in the Sierra Mazateca and she wanted to help in any way she could.

Alma turning up, and the nicely designed information brochures Whole Earth Provision Co. printed for us, seem to be making a difference. We used the brochure in Spanish from the border crossing on. We gave them out generously. We ran out and had more brought down midway through the expedition.

Alma Rodríguez, Huautla resident, English teacher, and PESH's number-one diplomat. *Bill Steele.*

During the 2014 and 2015 PESH expeditions we had talked to friends in Huautla, including government officials, about how we should go about addressing the cave-spirits concern. The consistent answer was to have a proper *curandero* ceremony conducted, asking for permission to enter the caves, making up for many years of not having had the ceremony, and "get right with the cave spirits." This year it fell into place and happened; in fact it happened three times.

This year during the meeting in the *presidente's* office in Huautla the first full day we were there, we told the man in charge, the number-two guy (the *presidente* was in Oaxaca City), that we wanted to "get right with the cave spirits" and have a *curandero* cleansing ceremony to ask the blessing of the cave spirits. His immediate response was, "*¡Excelente!*" He told us that a training session being conducted by an UNESCO anthropologist coming from Mexico City would occur that afternoon, and if we were there at the beginning we could meet the right people to make the ceremony happen.

In 2015 Huautla had won a competition to be named a Pueblo Mágico, a federal designation to boost tourism. It means federal pesos. Four cities in the state of Oaxaca were chosen. I had been asked to send cave photographs for them to use in their pitch. It turned out that the director of Pueblo Mágico for Huautla has been a school teacher in Huautla for twenty-five years and is a *curandero* of long standing. We met him while we waited for the UNESCO anthropologist. Once she arrived we set a date for an entourage to come to the small village of Plan Carlota in a few days, to meet the cavers (they respectfully call us *los espeleólogos*), and go into an easy cave.

They came in a few days ,and we took them into a walk-in, easy cave not far from our rented houses in Plan Carlota. The cave has walking passage, but it is about as wide as a home's hallway and twists and turns. About 100 feet into it is some old, broken pottery. I pointed it out and told those at the front with me how old it is and how that's determined (style, color; 2,000 years old). We hadn't gotten far beyond the pottery when word reached me that we had to leave the cave. When the anthropologist saw the pottery she said it was pre-Hispanic, it was sacred, and that cave spirits entered her body and she had to leave the cave. We turned around. Outside the cave a cleansing ceremony was conducted to rid her of the spirits, complete with copal incense, songs, prayers, and the customary burp, the way a Mazatec *curandero* expels a spirit they have removed from a person.

Another ceremony was done at the entrance of La Grieta that day. The cave spirits were asked for us to be kept safe and told that we are good people, we have good intentions, and our work is important. Once it concluded the entrance shaft was rigged and cavers descended to camp underground.

We set a date with Alfonso, the *curandero*, for our project's ceremony. That day came, and he and his wife arrived in their late-model Ford SUV. We had been asked to purchase a medium-sized turkey and a particular type of small white flowers, like small daisies. Ana Diaz and I went to San Andrés for these two things; the day the *curandero* was coming happening to be market day in San Andrés. At first it seemed that we would not be able to find either one, but we persisted in asking, and finally someone told us to go down a narrow side street where if there were any turkeys for sale. There was one turkey there, just the right size, and a nearby flower vendor, the only flower vendor we saw that had the right flowers. Meant to be.

Back in Plan Carlota the *curandero* conducted a preparation ceremony. He had brought a painting that portrayed things sacred to the Mazatec people, which was left with us. Copal incense poured forth thick smoke,

Be Right with the Cave Spirits

It was a windy night when the cavers arrived here. Father Wind was trying to say something, but they didn't know. PESH 2016 was about to start after a long trip from the United States to get to Huautla de Jiménez, the mountain town in the Sierra Mazateca where cavers have been coming for fifty years. Somehow all of them knew why this is a special place and different from the rest of the world: Mazatec people still believe in nature, mushrooms, rituals performed by a *curandero* or shaman, the presence of Father Sun, Father Wind, and the spirit owners of the cave, the water, and the mountains. There is something special, a feeling that we cannot explain with words; there is something in the air; something about sacred places.

Bill Steele has been concerned about spiritual beliefs and Mazatec culture for a long time. On the first day of the expedition, he went to the *presidencia* building and asked for a *curandero* to perform a ceremony so the group would be OK with the spirits in sacred places. This is complex; first the *curandero* explains the importance of the elements included in a ceremony. He needed cacao beans, feathers of a special bird, and many candles, which are payment to the gods.

A blessing ceremony took place first at the La Grieta entrance ,where the *curandero* asked for wellness and permission from the spiritual owner of the cave and sang nice songs in the Mazatec language. The next step was to have a cleansing event with the expedition members in the field house. After that, they offered a turkey to the entrance of La Grieta. Most of the offerings need to be repeated in the future, however, due to cavers having come here for many years and not having performed them before.

In the meantime, Bill and I went to schools and some local organizations to talk about PESH's work. Children were impressed, as they had never heard anything like that or even seen any of the amazing pictures that he was showing. Something interesting happened during a presentation. While talking about the nonphysical presence of spirits inside the cave, a lady saw a woman's face on one picture of a rock in the slide presentation, so people started whispering about it—I knew they assumed it was a spirit.

Communication in some villages was a challenge, because most people speak Mazatec or incomprehensible Spanish; language is often their most valuable weapon. And even though Huautla nowadays is a big and developed city, there are some troublemakers who are influenced by political parties and a feeling of jealousy about the limits of villages.

Another concern of the Mazatec people is the environment inside a cave. They consider that having strangers in a virgin cave will disturb the peace inside the cave and eventually cause problems on the surface. With this in mind, when I had the opportunity to be at an entrance, I told the cavers to pray, to have positive feelings, to respect the cave, to speak in their minds to the sacred place as being part of the whole natural world. This is the way the Mazatec people act, and the cave will be peaceful.

The most enriching task of the expedition was the communication process. With speakers in English, Spanish, and even Mazatec, it was a complex process to convey the right thing to the Mazatec person who was translating. While doing the translation, he explained even more than what we were saying. Mazatec people seemed interested in what was being said.

As we were going to different villages in the area, sometimes we needed to talk to *agentes* or *representantes*. It was hard when they didn´t speak Spanish, as I only know the basic words in Mazatec. That being the case, I tried to do my best. Any language has difficulties when translating. I heard some cavers trying to express themselves in Spanish, but confusing words and expressions, thus creating misunderstandings and maybe a little discomfort.

The last task was about creating good relationships in many communities. San Agustín Zaragoza has under its jurisdiction the biggest entrance to the Sistema Huautla, and this year people leading the village asked the cavers to donate things. Because of an agreement letter written last year in Spanish, people in San Agustín thought that cavers would be donating more and more things each year. Apparently again, it was a language problem; nothing like that was clearly stated in that letter. They did donate last year, and this year a video display that was set up in the *agencia* containing many pictures from the expeditions. After a very long meeting finally they agreed to give cavers permission to go to the entrances and take GPS locations and to be nice to the project.

Some villages still use the old method of electing their *representantes* or *agentes*—in some cases we had the permission from the *agente* but not the *representante*, or from the *representante* but not the locals—so it was very hard, especially when villages were using both systems, the old *usos y costumbre*s and the official government system.

Cavers had a good time in the Sierra Mazateca talking to locals, enjoying the food, talking to children in Plan Carlota, and so on. I'm glad I was there telling them the importance of natural unexplored and virgin spaces.

By the end of the expedition I had learned more about my own culture, my language, and the little towns in the Huautla area. Meeting all these professional people makes me feel like talking about PESH every time I can and anywhere I am, explaining to my people that this is harmless and positive, I understand their thoughts and share what I know now. One instance could be the presence of wind when they arrived here, something was trying to say hello. Surprisingly, the last night at the expedition house was windy too, so I could tell something was sayibg "see you later." Maybe it was Big Wind Cave,which if connected will add depth to the system.—Alma Rodríguez

beeswax candles were lit, one for each of us cavers, and a ritualistic ceremony conducted. The turkey, with its feet bound together, was passed over each of our bodies as we stood still in the copal smoke. We were given seven cacao beans each and told to keep them with us while on the expedition.

That was the preparation. Next was to be the actual cave-spirit ceremony. We got into the PESH van and drove the rough rocky road to Agua de Cerro. When we arrived at the outskirts of the village Alfonso asked us where the cave was. This was a surprise. We thought he knew and he thought we knew. We explained that we have not been allowed to hike around and look for caves there. When asked if he wanted to go into the village to talk to people, he firmly said, "No," and asked for us to return to the Plan Carlota valley. We would do the ceremony at La Grieta.

At La Grieta the ceremony was just like the ones we had already witnessed at the little cave where the anthropologist was cleansed. Alfonso had mentioned that morning that we were going to need to go farther than usual with the ritual than usual, because cavers have been going into the Huautla caves for fifty years and have never before asked for permission to do so from the cave spirits. He mentioned how the ceremony was going to involve blood of the turkey.

At the edge of the 60-meter-shaft entrance of La Grieta, I was handed the turkey and asked to hold it. The *curandero* asked if I had a knife. I anticipated that the turkey's leg would be nicked with it and blood would be dripped onto the smoldering copal incense. Instead, Alfonso used my knife to cut the cord binding the turkey's legs. Then he asked me to hold the turkey out over the pit. My next instruction was to drop the turkey onto the ledge a few feet down. At first I thought he meant climb down to the ledge, which I wasn't going to do, not over a 60-meter drop. When he repeated several times to drop the turkey into the pit, I realized that we were going to sacrifice the turkey. I had stroked the calm turkey on its head and it had looked at me like I was its daddy. I was hesitant to kill it. But take one for the team I did, and I held the turkey out over the pit and let it fall. I was the only one there with a vantage point to see it drop fast, frantically flapping its wings, and disappear into the blackness.

The ceremony with the *curandero* at the expedition's base in Plan Carlota. In the bottom photo, Black Harrison is having a live turkey passed over his body. *Bill Steele.*

Solemnly, we went back to the field house 1.5 kilometers away. The *curandero* told me how much it cost, the painting, the cacao beans, the candles, etc. and I gave him 700 pesos ($41 USD). Though I felt good about "getting right with the cave spirits" after all these years, I felt sick to my stomach about killing the turkey. As the leader of the expedition, it had fallen to me to do it. I knew that my fellow cavers would make light of it, and I frowned at the first person back at the field house who even hinted at joking about it. Not with the *curandero* still there. Be serious. Be respectful. That's not the way to get it right.

I was ready to tell the local people that we had gone through the full cave-spirit ceremony with a *curandero*. To my surprise, and even disappointment, the *curandero*, Alfonso, said no, that it should be a secret. You don't talk about such things. It is between us and the cave spirits.

Alma Rodríguez told us later that was correct. Word will get out the right way. Don't push it out there, at least not locally. In our own country, in social media, that's OK. But be low key about it while still in the Huautla area.

Alma turned out to be a godsend. She jumped in with both feet, spending more than half the days of the expedition with us, sleeping on the concrete floor on an inflatable pad like everyone else, and serving as my translator through many public and private presentations using PowerPoint. I gave fourteen public-school presentations to around eight hundred students. Three of those were back-to-back-to-back in Huautla to 150 students each time.

In San Andrés I was able to give two presentations at the preparatory high school, and I was told that the better students from surrounding communities, including Agua de Cerro, were there. I imagined them going home that night and rattling off things they learned about the grand caves beneath their homeland.

Alma also became our number-one diplomat. Though she told me that she's shy, I didn't see it, and even in difficult meetings, where resistance or even adversity was present, she was forthright and direct, countering points calmly and succinctly. Alma and I and expedition member Ana Diaz did a radio interview in Huautla. During the expedition we talked about her forming a Friends of the Speleologists group in Huautla, something I have no doubt that she'll do.

We made good progress with community outreach this year, and we will continue the effort. Alma and her mother plan to visit outlying communities such as Agua de Cerro this summer. They'll have the PESH public-relations brochures made in Mazatec. Alma's mother speaks fluent Mazatec, is from a prominent Huautla family, and will speak well of what we are there to do.

And just like how I first heard from Alma, through Facebook, I regularly receive friend requests from people who live in Huautla or are originally from there and now live elsewhere. When I post something on the PESH Facebook page, and even on my own personal page, if it's about Huautla or the caves there, there are always immediate "likes" from these friends.

In 2017 we'll give more school presentations and meet with more community groups. We'll take more PESH posters and give them away to stores and restaurants. Also, we'll take a lot of in-cave photos to give to local government offices to decorate their walls. They may have ancient beliefs about what's in the caves, but we have photographs of what we've seen.

Bill Steele, with Alma Rodíguez translating, gives a presentation to 150 school children in the auditorium of the Huautla municipal building. *Frank Bogle.*

A less formal roadway presentation. *Kasia Biernacka.*

Comunicación Social con la Comunidad Mazateca

Durante la expedición 2016 del Proyecto Espeleológico Sistema Huautla, se hizo un gran esfuerzo para educar a los habitantes locales sobre sus cuevas y las actividades de los cueveros. Se dieron varias pláticas en escuelas locales y otros lugares. Se utilizaron los servicios de un curandero para realizar ceremonias en la entrada de La Grieta al Sistema Huautla, donde se sacrificó un guajolote, y en el campamento base en Plan Carlota. Una maestra de ingles de Huautla, Alma Rodríguez, fue de mucha ayuda al actuar como traductora en las pláticas.

LAVANDERÍA AND MYSTIC MONKEY

Brad Hacker and Nic Barth

One of the objectives during an August 2015 caving trip to Quintana Roo was to map an unnamed cave previously explored by the Paamul Grotto in 2005. Access was via a drive into the jungle from Paamul, then a 1.2-kilometer hike through the jungle, caving through parts of Jaguar Paw and Jaguar Jaw caves, and then another 1.6-kilometer jungle hike. The cave itself was an east-west-trending maze that became known as Cueva Mystic Monkey.

Surveys began on August 9, and by the thirteenth Nic and Brad decided that an early start at 7:00 a.m. was needed to avoid excessive sweating. Their objective that day was to follow up on leads in the eastern part of Mystic Monkey that Nic and Guin McDaid had started mapping the previous day. All leads ended after a couple hundred meters of survey. This eastern promontory of Mystic Monkey is defined by one or two anastomosing main passages within an area about 300 meters in east-west extent and 60 meters north-south; the passage height is from 2 to 3 meters. Nic and Brad then passed through an area being surveyed by Sabrina Simon and Nathan Williams and began working passage toward the west, quite near the entrance. About 50 meters west of the entrance the cave expands in footprint, and the main passage changes to the 330° trend that is typical of the cave systems in the region. Beyond several hundred meters of survey to the northwest, there were leads in many directions. The area had some great cave-pearl collections. The day's survey ended near a skylight entrance with nice Maya walls. At 4:30 it was time for the long march to the car.

Nic and Brad returned the next day, determined to push this 330° trend. Almost immediately, however, the trend changed to 360°, and about ten stations of survey led them to the Somewhat Annoying Entrance at the northern limit of Mystic Monkey, where the passage is 3 to 4 meters high. This entrance debouches into a topographic depression that is visible on LIDAR. A two-minute thrash through the jungle brought us to a limestone arch in the middle of the depression. The passage through the arch is almost filled with sediment and required only one short shot, and at this point the prospect for further cave in the area did not look great. A similar jungle-thrash across the second half of the depression revealed a slightly more promising, but still not particularly attractive cave that later became known as the Missing Link. This entrance, largely sediment filled, was named the Weird Smell Entrance because, well, it smelled weird; others have since referred to it as the Knee Basher Entrance. Following the same trend, only nine survey shots, some barely under the dripline, carried us to the entrance on the north side of the Missing Link. This entrance sits in a small depression hidden on the side of the depression seen on LIDAR. At this point, the size of the depression was fueling hopes for big passage across the way, but the significant sediment fill in the Missing Link tempered expectations.

It took a while to scout the large depression; only one entrance looked promising, but it looked very promising. A little bit of scouting inside the entrance uncovered a quite interesting Maya feature: a roughly 2-by-2-by-2-meter cube of stone and mortar, complete with steps, two stelae, and pot sherds. The feature, perhaps an altar, looked so much like a washing machine that the name Cueva Lavadora (Washing Machine Cave) was a natural. Survey north along a 360° trend reached a sizable 1-meter-deep lake with frogs and Maya steps less than a minute's walk from the altar. At this point there were leads in many directions. The character of the cave here is still broadly similar to the large passage in Mystic Monkey: one to two anastomosing main passages, 3 to 4 meters high and modestly decorated away from entrances. After a short time, the north-trending passages all ended in porous, punky limestone. This

Sara Gallagher floating in the Lavandería section of Mystic Monkey. *Nicholas Barth.*

hacker@geol.ucsb.edu
ncbarth@gmail.com

seemed like an ominous development, but a low duck revealed good, going passage trending about 300°. Beyond this duck the number of entrances decreases, soft, brown, guano-like floors begin to supplement the usual gray and white old-flowstone and small-breakdown floors, and the speleothems become notably more abundant and diverse. This was now beyond where the Paamul Grotto had previously explored. Pushing past two skylights, Nic and Brad reached more shallow water. At this point, the passage trend shifts back to 330° and the cave necks down to a single passage with columns. Initially the water is only knee deep and can be skirted, but soon there is no way to avoid getting wet. After a brief scout, it was time to commute back.

On August 15, Brad and Nic started surveying the wet passage. Calcite rafts, some in multi-meter-wide continuous sheets, were locally abundant, and the passage floor beneath the water is mostly made up of accumulations of thickened raft flakes, "cornflakes." Stranded rafts and cornflakes decorate the shorelines, creating multi-centimeter-thick dunes in places. In some places the rafts are stranded more than 2 meters above water level, suggesting significant fluctuations. The overall effect is visually quite striking. The survey continued past a nice formation room with a basketball-size skylight and then under a couple of low, delicate ceilings into more passage floored with shallow water. Some side leads were obscure—a careful maneuver beneath stals sometimes revealed beautiful water-floored chambers, including an obscure one home to many bats. Another lead led to the surprising Lost Stranglers entrance in another region of punky limestone. At the end of the day they found a major water passage, this one heading north. The water was getting deeper, and they vowed to return the next day with neoprene and waterproof notebook.

The following day's survey in the increasingly wet passage became challenging. The quality of the cave was continually improving, and the water temperature made for comfortable caving. Nic and Brad eventually reached neck-deep, azure water, problematic for effective surveying. Nic scouted ahead about a hundred meters or so, returning to announce that the passage constricted down to a 1-by-2-meter gap through which water flows in a riffle and where the draft was the strongest observed. Beyond the gap the passage appeared to open up into extensive continuing passage requiring much swimming. The decision was made to hold off on the very wet survey until the next day so that a pack-raft could be brought in to assist. With a half-day left, they retreated partway back through the cave to tie off dry leads and close loops. There was much anticipation for the next day.

On August 17 Nic and Brad recruited Bill Mason to join the wet survey, and Sabrina and Nathan came along to spend the day studying the Lavadora and the Maya Lake. They made interesting observations about the altar and lake's being illuminated by late-afternoon light and the possible ceremonial significance of the broken pottery, pecked holes, and deposits of seashells. The Alpacka boat was deployed to great success. Brad had the pleasure of recording data and sketching in the boat spinning endlessly in disorienting circles while Nic and Bill swam and shot and marked stations without getting the DistoX2, flagging, or Sharpies wet. The swimming begins in a 30- to 40-meter-wide passage with many

A panoramic view of the 80-meter-wide Cenote Arco Luminoso at the north end of the Mystic Monkey system. The main skylight is visible in the distance. Note the caver in the blue raft. *Nicholas Barth.*

columns that was challenging to navigate and sketch; here the water is about 2 meters deep and the ceiling height above the water is about the same. The boat just barely fit through the windy gap that Nic had found the day before, Los Rápidos Primero. Beyond this, the cave passage broadens back to some 25 meters, and it continues north. The density, variety, and beauty of the formations increase significantly, with a mix of columns, stalagmites, stalactites, helictites, and ornate straw-dominated ceilings that are chiefly cream, yellow, and black. After passing a lovely stalagmite and broken-straw section, El Osario (the Charnel House), a second shallow section with south-flowing rapids, Los Rápidos Segundo, was portaged. Beyond, they pushed ahead along going passage, but in a direction of 30°, no longer the 330–360° trend that had so generously been coughing up non-stop passage.

Concerns about this strange trend began to mount, and indeed, after reaching a relatively large room 50 by 50 meters, the 30°-trending passage got smaller and smaller, and lower and lower, and finally marooned them in a sad, tiny hole with water flowing *northward* into a low sump. They then worked counterclockwise around the end of the cave, first west along the north wall, then south along the west wall, eventually ending up on the back side of El Osario. This disappointing development, combined with the late hour, caused a literal run through the jungle for home. That evening, we changed the name from Lavadora to Lavandería (Laundromat) to honor, besides the washing-machine altar, the soap-flake floors and our well-washed clothing and bodies. We also sat down and looked closely at the Mystic Monkey and Lavandería line plots to try to figure out where the water flowing north and south out of the known part of the cave was coming from. The line plot showed that the 330–360° trend we had been following ended right in the area where our counterclockwise loop failed to find the way on. Perhaps we had overlooked something?

The next day Nic, Bill, and Brad met for the alleged 5:30 a.m. opening at the usual breakfast-taco spot. After hanging around for thirty minutes they learned that *abierto* was not imminent, and they "breakfasted" at the Oxxo instead. After a 2- or 3-hour jungle walk plus cave-walk plus cave-swim they arrived to where they had been skunked the day before, and indeed a little route-finding revealed a way into 330° passage. This passage was large, several meters deep, 4 to 5 meters high, and rather lovely. Perhaps the most delicate and beautiful parts of Cueva Lavandería are the Battleship Room, with its many collapsed and rotated stalagmite floor sections, and the Pompeii area, with its delicate floor-covering and pyramids of cornflake ash. This area—plus the Charnel House—should be flagged and not trampled wantonly.

While Nic and Brad were surveying this area, Bill swam off to the east, a generally unpromising direction. Minutes later maniacal laughter heralded Bill's return, and he began babbling about a huge cenote that he had just found, blah, blah, blah. Nic and Brad kept surveying for a while, while Bill kept saying they should really have a look. Then they went to see what Bill was yammering about, and oh holy shit!

You swim along a 10-meter-wide passage with a few meters of water and 1 to 2 meters of air, and then suddenly you are in an elliptical room that is over 100 meters across and has a spectacularly arching ceiling that reaches 12 meters above the inky black water. The ceiling has one large skylight about 1 by 2 meters and two others less than 1 meter in diameter. A curving root illuminated in a sunbeam piercing through one of the skylights is reflected and

Sabrina Simon sketching in Mystic Monkey. *Nathan Williams and Sabrina Simon.*

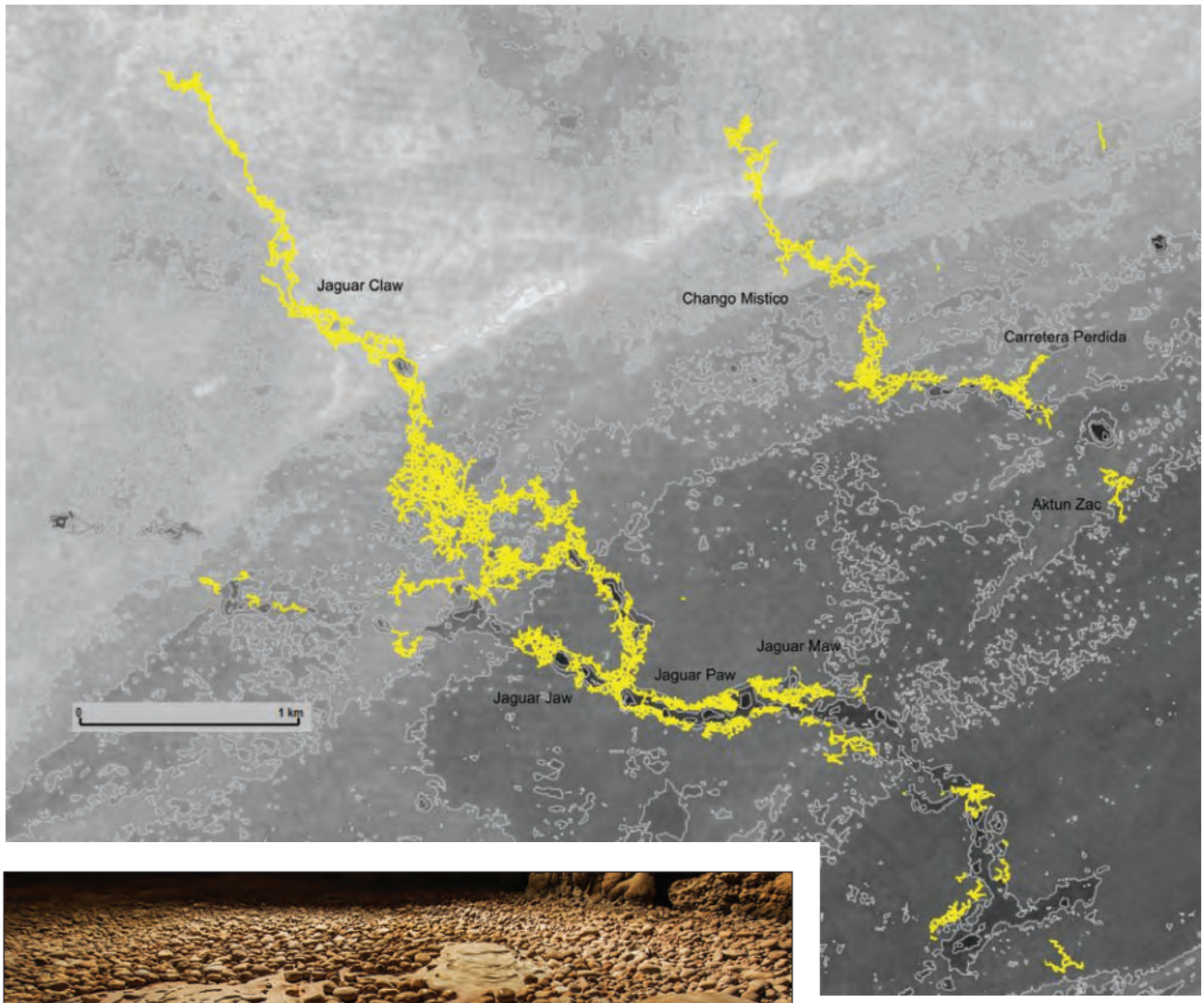
refracted into a curving underwater light beam, giving the name Cenote Arco Luminoso. Underwater ledges fade 20 meters into the pure darkness of the abyssal waters. Because of limited time, they made a cursory survey of the area using splay shots, measured the depth of the water at greater than 30 meters with a nylon cord, and then returned to Puerto Aventuras. The passage seemed to terminate at that cenote, but there were leads still to check.

On August 19, Nic, Bill, and Brad were out at Arco Luminoso again, this time with a second Alpacka captained by Sara Gallagher for hauling fins, masks, cameras, and other gear, to characterize the cenote in more detail and to push leads. Bill examined the underwater section, measuring a depth of 29 meters in one spot with a weighted dive line. Nic and Brad groveled along the north, west, and east walls of the cenote, but could find no going passage, only oxbows in the tapering chamber walls. A detailed check of the passages west of the cenote for an extension in the 330–360° direction also came up empty-handed. The rest of the day was spent cleaning up leads on the way out of the cave and getting lost a few times, as portions of the water passage are truly disorienting. A few good photos of the Battleship Room and the cenote were taken by Nic and Sara.

A "waterfall" of roots illuminated by the main skylight in Arco Luminoso. *Nicholas Barth.*

The next day Barbara Luke and Brad went out with Sabrina and Nathan to try to connect Lavandería with the Missing Link, which would involve bypassing the large collapse visible on LIDAR. Sabrina and Nathan started in eastern Lavandería and surveyed southeast toward the Link. Barbara and Brad started in southwestern Lavandería and surveyed south toward the Link, but were unable to find passage going the right way, and instead ended up swinging back around into Lavandería, tying off several leads. They then hopped over to the Link to try the connection from that side of the collapse. There a series of cave margins and short passages filled with boulders, mosquitoes, and Maya walls led northeast and then northwest into the area where Sabrina and Nathan were working. The connection was made, and the Missing Link was subsumed into Cueva Lavandería.

Two days later, Peter Sprouse dispatched Aubri Jenson and Andrew Lloyd to work on Mystic Monkey and Brian Kendrick and Brad to a cave not far up the Jaguar Trail from the parking lot. Unfortunately one of the lanky old farts and his failing knee joints (not Brian) found the latter cave impenetrably narrow, so they sprinted out to Mystic Monkey to try to salvage the day. There, both teams worked to connect Mystic Monkey to the Missing Link section of the Lavandería System. Aubri and Andrew surveyed north from Mystic Monkey. Brian and Brad tried to go northeast in Mystic Monkey, but, stymied by a definite northeast limit to passages there, they switched over to the Missing Link section and surveyed south. The two teams came within a few meters of each other but did not connect. Finally, on August 27 Aubri and Peter made the Mystic Monkey–Lavandería connection via an obscure crawlway. The resulting Sistema Chango Místico was then 10,984 meters long. Efforts later in the winter added another kilometer to this, though attempts to push the



cave to the east in order to connect to Cueva Carretera Perdida were not successful. That cave would add 2.2 kilometers if connected, but a 65-meter gap remains. Meanwhile, plans are afoot to mount a diving effort at Cenote Arco Luminoso.

Field of cave pearls in the Missing Link. *Nathan WIlliams and Sabrina Simon*.

Lavandería y Mystic Monkey

En agosto de 2015, espeleólogos trabajando en la cueva Mystic Monkey en Quintana Roo encontraron una cueva nueva con tendencia noroeste, a la cual llamaron Lavandería. Una multitud de pasajes laberínticos, algunos con lagos profundos, eventualmente llevaron al enorme Cenote Arco Luminoso, con un lago de 100 metros de diámetro y al menos 30 metros de profundidad, y con tres tragaluces. Lavandería fue conectada a Mystic Monkey a través de una pequeña cueva llamada Missing Link, con lo que se creó el Sistema Chango Místico, de alrededor de 11 kilómetros de longitud. Conectar con la cueva Carretera Perdida agregaría unos 2 kilómetros, pero aún no se ha encontrado una conexión.

DIVING CENOTE ARCO LUMINOSO

William Mason

In August 2015, Nic Barth, Brad Hacker, and I found a cenote with intriguing potential while surveying a cave west of Paamul, Quintana Roo, Mexico [see article "Lavandería and Mystic Monkey" in this issue]. A small square entrance in the cave ceiling opened down on a pool of crystal-clear water approximately 70 meters in diameter and 30 meters deep, as determined by sounding with a weighted line. We surveyed the pool surface area but were unable to conduct a dive due to its remote location and discovery at the end of the expedition [*NSS News* March 2016 and article «Lavandería and Mystic Monkey" in this issue]. Unable to forget such haunting beauty, I returned several months later during a narrow window in my work schedule to conduct the first dives in this unexplored cenote.

I flew into Cancun and endured a four-hour line to enter customs, then traveled south to Puerto Aventuras. On the previous expedition we had noted an opening in the dome that spanned the lake, but we had no way to climb out and obtain an accurate location. On the day after arrival, I successfully navigated overland to the skylight over the lake based only on the previous expedition's cave survey data and a handheld GPS with calculated coordinates. The data proved accurate and, after several hours of sweat and blood, two motmots heralded my arrival at the skylight. I took a GPS reading (N20.56941 W087.21451), tossed in a rock to confirm it was water that shimmered far below, and then began the vine-tangled slog back to the vehicle. The off-piste travel through the jungle will likely leave some scars on my legs, but an early victory helped build momentum to get through several access issues. Roads that were open to cavers during the previous expedition were now chained, and landowners denied access to their land, including the entrance I had used only the day before to confirm the skylight coordinates. After several days of false starts and dead ends, we gained access to the original cave route with the help of Peter Sprouse and Nick Banks. I rented tanks at Zero Gravity, enlisted the support of a local adventurer named Julio Monterosa, and planned for an early departure in the morning.

Because the route through the jungle was brutal and would have taken a week or more to clear with machetes, Nick, Julio, and I used the same route through the cave that we followed in August during the initial discovery of the cenote. Julio carried the dive tank, Nick carried our caving supplies, and I carried dive gear. Navigation was a factor, since no one remembered all the details of the route, but we made good time and were aided by markers placed by Gil Harmon that led like Ariadne's thread to *le objet du désir*. At the cenote I laid out the dive gear, Julio assisted with dive preparation, and Nick prepared to snorkel instead of dive due to a chest cold. Conditions remained unchanged from when I first saw the chamber in 2015—water as clear as air and the bottom swallowed in darkness even with a thousand-lumen dive light. I tied off a dive line by station BT690 and descended vertically along the wall. Soon a log became discernible followed by bottom debris at 36 meters as the wall belled out to form a massive undercut.

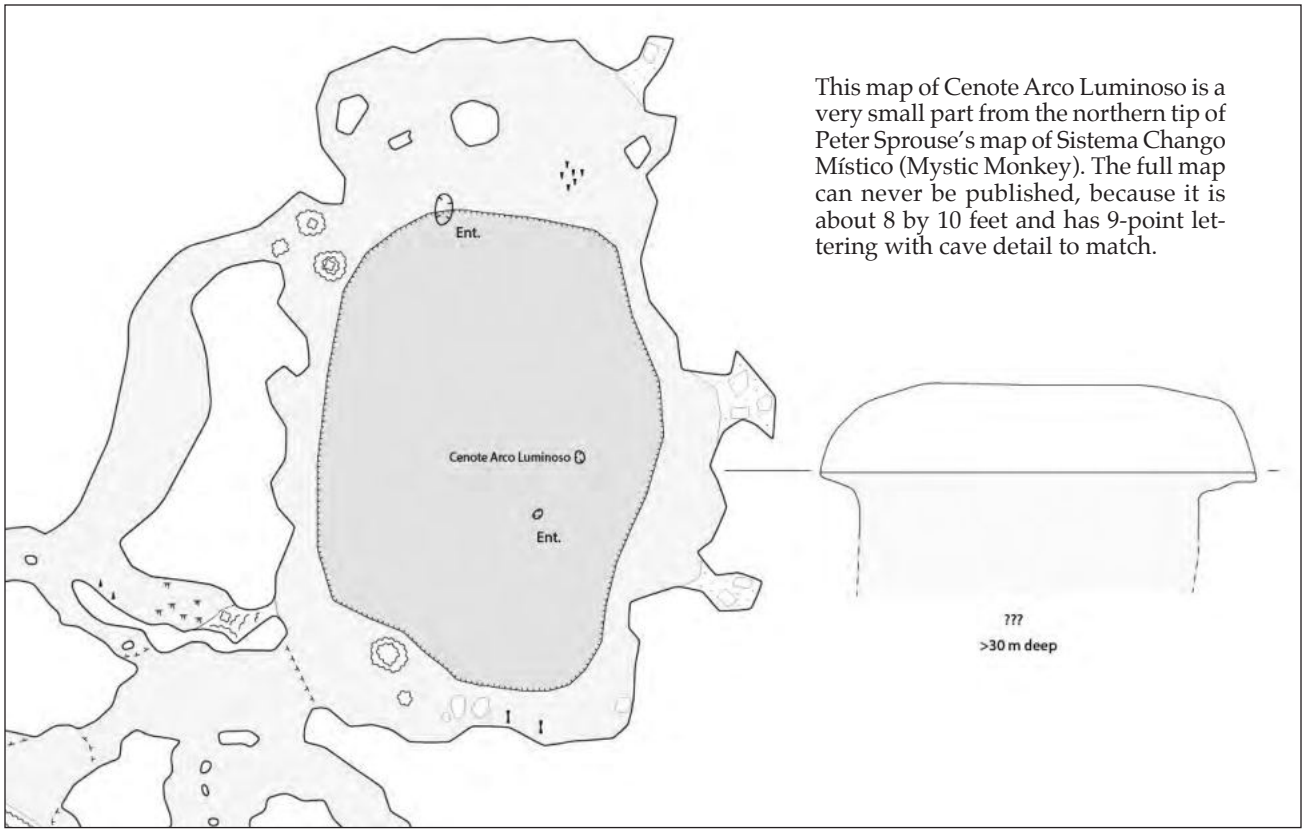
The deepest area was approximately 40meters in a small depression on the west side of the cenote. The walls belled out on the north, west, and south. I didn't have enough breathing gas to check the east edge, but the bottom sloped downward to the west, covered in light debris resembling leaves covered in silt and large boulders strewn along the west edge. Stalagmite columns over 1 meter tall grew in the northeast area, among which a cave-adapted fish approximately 8 centimeters long swam leisurely. I found no going passage, but not all areas of the cenote were explored completely due to the limited gas. The source of water flow remains unclear; we observed no vent or indication of current while diving and snorkeling.

Following the dive we packed up and made steady progress back to the vehicles. Confident in our navigation, we arrived just after sunset.

These dives represent only the initial exploration of Cenote Arco Luminoso. I hope to return later this year or in early 2017 to continue mapping the cenote and searching for the water source. Better photography by someone with a good camera and photography experience of the area is also desired. Evocative lighting is readily available in this unique and beautiful location.

I extend sincere thanks to Nick for sharing generously his time, resources, and effort to make the expedition successful, to say nothing of enduring a twelve-hour day with a chest cold. Julio proved a strong, sharp, and worthy companion throughout the effort. Gil's work in preparing navigation aids was

masoncaver@gmail.com



This map of Cenote Arco Luminoso is a very small part from the northern tip of Peter Sprouse's map of Sistema Chango Místico (Mystic Monkey). The full map can never be published, because it is about 8 by 10 feet and has 9-point lettering with cave detail to match.

invaluable to our success and saved many hours of tedious route-finding. Kudos to Nic Barth and Brad Hacker for a superbly accurate survey. Alessandra Figari, Christine Loew, Dennis Weeks, and Peter Bostik kindly offered equipment and labor. Peter Sprouse went out of his way to provide crucial information and support throughout the process. The NSS provided crucial financial support for this ongoing effort.

Buceando el Cenote Arco Luminoso

El Cenote Arco Luminoso es un lago muy grande con una entrada a través de un tragaluz. Se descubrió al norte del Sistema Chango Místico en agosto de 2015. Un viaje más reciente ubicó la entrada en la superficie, pero fue más fácil acarrear el equipo de buceo a través de la cueva que a través de la selva. Se llevó a cabo una inmersión a una profundidad máxima de 40 metros, y se exploró el perímetro del cenote el máximo de tiempo que los tanques de buceo permitieron, sin lograr ubicar pasajes de entrada o salida de agua.

PESH 2016: MEGAFAUNA FOUND IN TWO CAVES IN THE VICINITY OF HUAUTLA

Iván Alarcón-D. and Joaquín Arroyo-Cabrales

During our participation in the Proyecto Espeleológico Sistema Huautla 2016 expedition, a few caves in which project speleologists had recognized the presence of bone material, either from recent or ancient animals, were visited. We did *in situ* preliminary identification of the paleontological materials and only collected those that were loose and at risk of loss.

While we were staying at the town of Plan Carlota, Mark Minton showed the us some bones recovered from the newly discovered Cueva de Pared de Huesos (Bone Wall Cave). They were fragments from a humerus, a radius, and a vertebra, as well as a mandible canine, that were tentatively identified as elements similar to the extinct ground sloth *Megalonyx jeffersonii* (Pilosa, Megalonychidae), and also a phalanx, a vertebra, and a decidous molar that were assigned to a deer, probably *Navahoceros fricki*, a Quaternary animal recorded from Cueva Venado (Deer Cave) in the same area. Further study of the materials would corroborate those initial identifications, using both specialized literature and comparative materials.

Cueva de Pared de Huesos has a narrow entrance, with a couple of pits 12 to 15 meters each, and right at the base of the second one there is a tall wall made out of large boulders, among which the fragmented bones from the ground sloth and deer were found, along with remains from small vertebrates and mollusks. Based on the nature of the wall and the positions of the bones, we infer that there was a collapse inside the cave, so that several animal remains were incorporated into the debris, producing a "bone wall." Recording the bone materials was difficult due to the high angle where bones were cemented into the boulders, and some of those boulders were loose. Some bones were collected and packed for transportation to INAH´s lab after a preliminary preservation.

Cueva de Basura has two entrances with pits between 35 and 40 meters deep and a cone-shaped central room approximately 35 meters high with an ellipsoidal floor, with sediments rising from the base of the room to the roof. This room is right between the two entrances, the route from one involving going down and up 15 meters each way, and from the other a narrow, straight passage.

The central room was named Cuarto de los Perezoses (Sloth's Room). It has two bone deposits separated by at least 7 meters. In the first one, there is a mandible with a pair of molariform teeth, pertaining to a Xenarthran, similar in size to Jefferson´s ground sloth *Megalonyx jeffersonii*. Originally it was thought that there was only a mandible in a vertical position, with an ulna and a radius above (see the photo); but after beginning excavation of the mandible we found that actually the mandible was articulated with a partially complete cranium, quite exciting since there are few megatheriid sloth crania known from Mexico. This specimen is quite important since a skull so complete is rare in Mexico. Additionally, the ulna and radius were articulated along with the phalanxes, so most of the left arm is present.

At the second site were found a left mandible with a canine and a molar, probably from another, small-sized sloth, and also a pelvis, vertebrae, and ribs of a juvenile animal preliminarily associated with the sloth. Finally, close to the mandible there was a large-sized metapodial of a horse, maybe a specimen of *Equus mexicanus*.

Due to the interesting and rare find, it was decided to collect the complete skull and the mandible fragment, since those were sort of loose and could be easily extracted, while other elements were partially cemented to the calcareous matrix.

The presence of several animals, like the tropical porcupine *Coendu* sp., besides the two possibly complete sloth skeletons inside the room more than 30 meters deep that cannot

Entrance to Cueva de Pared de Huesos.

ialarcond@yahoo.com.mx
arromatu@hotmail.com

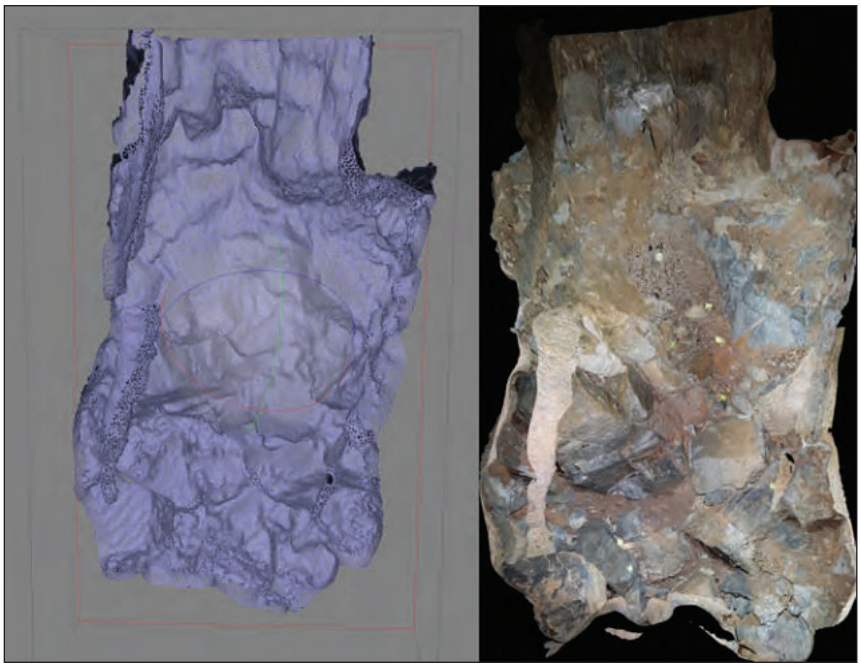
be reached today by horizontal passages, suggests the existence of one or more entrances that at present are closed, perhaps buried under the sediments; furthermore, the presence of both articulated bones and small-vertebrate bones could mean that they have not moved much from where the animals originally died.

At all the sites, there was also mud attached to the different bones or among the boulders, and once that mud was removed, many small bones of mice, rats, bats, lizards, and the like were found.

In summary, the paleontological exploration was successful, recovering bone elements of at least three Pleistocene ground sloths, a Pleistocene deer, a Pleistocene horse, two porcupines, and many small vertebrates like rodents, bats, and amphibians. These will be studied in due time at the Archaeozoology Lab of the Instituto Nacional de Antropología e Historia in order to verify preliminary identifications of large material, as well as finalize identifications of small vertebrates and mollusks.

In the future, there are plans to recover further materials from Cueva de Basura. For that, it will be necessary to recover bones that are quite cemented onto the boulders, as well as those mixed with damp

Iván Alarcón-D. on rope in Cueva de Pared de Huesos. *Yvonne Droms*.



3-D reconstruction of the bone wall, viewing from the central-left portion. On the photograph, small tags indicate the positions of some bones.

Southern entrance to Cueva de Basura.

Small mandible with canine and molar; to the left, there is a horse metapodial diaphysis.

3-D reconstruction of ground-sloth mandible, radius, and ulna from the first site in Cueva de Basura.

sediments. It is necessary to look for a method for freeing the bones from boulders without damage and plan for enough time to do it.

It is evident that the caves have been sites with low microenvironmental variation over time, and that has allowed the preservation of bones from animals that either lived inside the cave and died, or arrived from outside by different means. In fact, if there is no breakdown or running water, bone remains may be found in good condition waiting to be discovered by speleologists and studied by paleontologists.

Complete skeleton of a juvenile porcupine *Coendu* sp. in Cueva de Basura.

Paleontología PESH 2016

Durante la expedición 2016 del Proyecto Espeleológico Sistema Huautla, paleontólogos del INAH ubicaron huesos en la Cueva de Pared de Huesos y Cueva de Basura en los alrededores del Sistema Huautla. Entre ellos estaban huesos de un perezoso del pleistoceno, un caballo del pleistoceno, un venado y un puercoespín. Algunos de los huesos fueron recolectados, otros serán más difíciles de remover de la pared. Otros huesos de animales más pequeños fueron hallados en lodo y otros sedimentos.

URBAN CAVING

Diana Tomchick

"This is urban expedition caving," I told Bill Steele back in 2007, the first time I headed out with him from our fieldhouse in San Agustín one fine morning for a day of exploration in Sistema Huautla. I was prompted to this remark by the numerous friendly greetings by the locals we met on our path through the village, in particular the one that told us to stay safe. Bill admitted that he had never really thought about Huautla caving in that manner, though the observation had some merit. The local atmosphere in the Sierra Mazateca region is totally unlike what I had experienced on expeditions to the Purificación area in northern Mexico. The sheer number of local inhabitants and the extended history of human occupation in the region present the expeditionary caver with some unique opportunities and challenges on the surface that might not appear obvious at first glance. To mount a successful expedition under these conditions requires not only extensive planning, but also participants that can contribute a wide variety of skills while also staying safe both above and below ground.

Of greatest importance to the success of the Proyecto Espeleológico Sistema Huautla expedition in 2016 would be having a centralized fieldhouse where we could store gear, feed and house the participants, provide minor medical care, and centralize the cartographic efforts. Access to sufficient water for drinking, cooking, and cleaning, as well as enough room to house roughly twenty-five participants above ground at any one time were also critical. From 1968 until 2015, the Huautla expeditions had been based out of the village of San Agustín, as this was near the locations of the major system entrances Sótanos San Agustín and Río Iglesia, the roads were suitable for personal vehicle traffic, and the local inhabitants were friendly to cavers. Making the decision to change the location of the expedition base would be no trivial matter.

During the 2015 expedition, cavers had been shuttled almost 3 miles from the village of San Agustín to the La Grieta entrance to the system. During one of these caver shuttle trips, Bill met a resident of the village of Plan Carlota named Epifanio. His village lies just under a mile from La Grieta, and, as Epifanio had noticed how often cavers were being shuttled to and fro, he eventually asked Bill, "Why not base your expedition here?" Epifanio then showed Bill several houses that he would be willing to rent to the expedition the following year. Changing the location of the expedition fieldhouse was a big decision and required some additional information that Bill didn't have the time to obtain during the 2015 expedition. In December, Tony Akers volunteered to help provide that info and traveled from Ayuatla, in the southern Sierra Mazateca, to visit Epifanio in Plan Carlota and double check that the houses would still be available for rent and to photograph the accommodations. Following the end of Tony and Marion Akers's Proyecto Sierra Mazateca expedition, Ernie Garza visited in January 2016 and established that indeed there would not only be sufficient housing, but two indoor toilets and two showers, one with hot (!) as well as cold water. Thus the plan to base the 2016 expedition in Plan Carlota was finalized.

The heart of the expedition in Plan Carlota was the main fieldhouse, which stands along the main road that runs north to south in that portion of the village. Adjacent and to the north of the fieldhouse lies the covered basketball court, and on the far side of the basketball court is the schoolhouse. The local schoolchildren played on the court after school and often asked some of the young men on the expedition to play with them. South of the fieldhouse lies our landlord's house, his small *tienda* that sells snacks and cold beer, and the church. Of the two rooms in the main fieldhouse, the largest room served as kitchen and eating area with shelves that were constructed during the first week by expedition participants from bricks and boards found in the rented building. They ringed the outer walls for storage of food and other general expedition supplies. Tables for meals, dish storage, and cooking filled the room, as well as wooden benches and the ubiquitous colorful plastic chairs. Vico Jones, one of the two expedition cooks, slept on one of these tables

The main expedition fieldhouse in Plan Carlota. *Matt Tomlinson.*

diana.tomchick@
utsouthwestern.edu

Camping on the roof. *Kasia Biernacka.*

so that he could be roused from his slumber to prepare a hot meal for cavers returning to camp late at night. The smaller room served primarily as gear storage for items to be used in underground camps, ropes and rigging hardware, camp duffels, spare loaner gear ,and safety equipment. Packing for the groups that camped underground was done in the fieldhouse. Much of the food that was used underground had been prepared prior to the expedition at Bill Stone's house in Austin, Texas. A set of stone steps on an outside wall of the fieldhouse leads to a flat roof where participants pitched tents, as well as small room with a small window and two doors that served as additional sleeping quarters.

The expedition data room for cartography and charging electronic devices ("the office"), one of the restrooms, and a small room with a bed used by Gary Napper, the other expedition cook, were located in a neighboring house. Epifanio and his family live in this house, but they had vacated these rooms temporarily for our use. Down the hillside about 30 feet, across a jumble of 1.5- to 2-foot-diameter crudely shaped karst rocks that served as stepping stones, lies the third building, the lower bunkhouse, that was used as expedition housing and personal gear storage. This building consists of one large central room flanked by two smaller rooms, one of which was filled with construction materials, yet served as the route to the second restroom and shower. Across the large room from the main door is a second door that can be opened to provide a cool evening cross-breeze. This door, which faces to the east, leads to a narrow 3-foot-wide ledge that proved useful for hanging wet cave gear out to dry, but the hillside plunges down to the *milpa* from the ledge, which is approximately 15 feet in the air. Though it was a pleasantly breezy, shady place to sit on a hot afternoon, the presence of several long rebar rods that were stored on the ledge and the dizzying height down to the ground made this a treacherous thing to negotiate under the best of circumstances. Access to the roof of this building for pitching personal tents was by a wooden ladder, which meant fewer people chose this option.

Since the expedition spanned from the last week of March until the end of April, the weather conditions ranged from cold, wet, and windy to dry and oppressively hot. Tents pitched on rooftops needed to be firmly secured to exposed rebar or very large rocks or they would have been blown away during the several extremely windy nights that bookended the expedition. Participants who slept indoors often sweltered through the first half of the night due to limited airflow through the small windows in the buildings, and some complained that the smell of the pigpen located not far outside the main entrance of the lower bunkhouse was offensive. The first night Steele noticed vampire bats in the pen with the two hogs and promptly decided to erect a tent over his sleeping area inside the bunkhouse.

April is typically the end of the dry season in the Sierra Mazateca, and to underscore the seriousness of water issues, Alma Rodríguez had informed us that the city of Huautla was experiencing a severe water shortage this year—water for washing and other household use was being delivered to houses only once every other week. To obtain drinking water, Huautla citizens had resorted to purchasing it in the ubiquitous clear blue plastic 20-liter jugs at 10 pesos (about 60 cents) each, which they then had to haul to their houses. To reinforce the need to not use so much water that it would inconvenience our landlord, signs were placed in the upper restroom near the office cautioning us to flush only when necessary and please conserve water. In addition to the small amount of rainwater that Epifanio's family was able to collect in small buckets and other containers, he hired a local man with a tanker truck to provide water from a roadside water catchment for 100 pesos per tank, although the volume of water provided varied from day to day. The

The kitchen. *Bill Steele.*

Our cooks at work. Vico Jones (top) and Gary Napper. Kasia *Biernacka.*

stone basin collected water from a hillside spring, and the man and his children ran a siphon hose from the top of the basin down to the tank on his truck. From his truck he was able to siphon the water either into a storage tank that held about 750 liters on the road opposite our office or to a tank inside the fieldhouse. The final transfer of water from the outside storage tank to either the lower bunkhouse or the office building required a human bucket-brigade to fill the rooftop storage units that supplied the bathrooms. These bucket brigades became an opportunity for the local children on their way to and from school to observe the gringo cavers boast, joke, and rib each other with tales of their caving exploits (and embarrassing incidents) while engaging in a group task. Although it was an amusing and not too strenuous chore, the general consensus was that we should bring a motor to pump the water to the rooftop next year.

Strict discipline in maintaining cleanliness in the kitchen area was key to maintaining the digestive health of participants on the expedition. Blake Harrison, our fieldhouse manager and quartermaster, treated water with Microdyn prior to pouring it into the designated drinking-water jug. To encourage participants to wash their hands with soap and water prior to meals, an extra hand washing station was placed outside the fieldhouse. There we also placed a dishwashing station with three tubs for hot, soapy water, rinse water, and a final disinfectant rinse with water plus bleach. Participants who weren't working were actively discouraged from entering the cooking area during meal preparation and cleanup.

The expedition cooks put the variety of food available from the town of San Andrés Hidalgo and the city of Huautla to excellent use. In fact, if you want a recommendation of the best places in those towns to grab a tasty bite to eat, Vico Jones is your man. Inti García in Huautla had loaned a small refrigerator to Bill for the expedition; it was primarily used for storing leftovers and beer. Breakfasts typically consisted of reheated leftovers from the previous night's dinner if available, granola and milk with added goodies such as dried fruit, nuts, or maple syrup, or hot oatmeal. Lunches were portable meals for in-cave or surface hikes and included tuna fish, various types of granola bars, and snacks that could be purchased from the local *tiendas*. Dinner menus included such fare as *milanesa*, lentil soup, fried chicken, chili, and other spicy Mexican meat dishes with sauce, and often pinto or black beans plus rice. Vegetable dishes included cauliflower, broccoli, green beans, and fried potatoes. The cooks often obtained fresh corn tortillas for our meals from the traveling Tortilla Man, a young man who peddled them from the back of his motorcycle and announced his presence in the village via a cheery song that rang out from a speaker mounted to his handlebars. Every time we heard the song, Steele would say, "I want that job," not because of a compelling desire to sell tortillas, but because it seemed an ideal way to travel around the area searching for cave entrances from the road. Late in the expedition Vico confessed that more than once the Tortilla Man had saved the day for the cooks.

Being able to contribute substantially to an extended expedition requires participants do their best at staying healthy and to accurately judge their current capabilities with respect to the task at hand. One can't expect that there will be no accidents or illnesses on an expedition, but one can hope for them to be minor and

The dish-washing station outside the fieldhouse. *Bill Steele.*

Plan Carlota at dawn. The fieldhouse is just to the right of center. *Matt Tomlinson.*

to be prepared when they do happen. Aside from the common cold, hangovers, bug bites, and brushes with poison ivy and the stinging nettle known as *mala mujer*, which were easily treatable with our first aid kit superbly stocked by Zeb Lilly, we had only two serious orthopedic incidents, one below and one above ground. Approximately two weeks into the expedition, Scott Wahlquist slipped and tore his rotator cuff on the last day of survey in La Grieta prior to the planned exit of his group from the cave. For the rest of the expedition he was unable to go underground, but he helped out in any way he could, including assisting Blake, Vico, and Gary with grocery shopping, organizing the gear in the fieldhouse, as well as participating in the cave-entrance location searches. Four days after Scott returned to the surface, Jim Smith slipped on the treacherous stepping stones on his way down to the lower bunkhouse and caught his left foot between two of the rocks—but the rest of his body and leg kept moving downhill. His quadriceps tendon was severed from the kneecap, which required major surgery upon return to the U.S. and will necessitate about one year of physical therapy to recover. This injury caused his leg to swell enormously and prevented him from walking without assistance. I loaned him my hiking sticks to help him hobble around camp, but he required assistance from two people in order to negotiate the steps between the fieldhouse and the lower bunkhouse. After a few days he rode into Huautla with Blake and picked up a pair of crutches, which were safer to use for short walks, but he wisely still requested assistance for negotiating the dreaded stone steps. By this time Blake was already discussing plans to replace these rocks with new steps at the beginning of next year's expedition. Jim and Bill spent one day driving around on many of the new roads in the area so Jim could make strike and dip measurements and photograph geological formations in the recently made road cuts. In addition to the more serious incidents, Vico twisted his ankle while walking on the rough and uneven pavement in downtown Huautla and Frank Bogle twisted his ankle while out bushwhacking and scouting for cave entrances.

Jim Smith's injury did not go unnoticed by our landlord. The night after the incident, while we were milling about the fieldhouse awaiting dinner, Epifanio and his daughter Ermina arrived to apply some local medication. Armed with a bundle of an unidentified plant with long, narrow leaves, a red onion, a bottle of *aguardiente*, a basin, and a cigarette lighter, they asked if they could treat Jim's injury. Jim laughed and then assented to undergo treatment for the sake of community relations, but I do not believe that he completely understood what was about to happen to him—in fact, I think he thought they were going to make him drink the alcohol, which he complained "smells more like turpentine than moonshine." Ermina sliced the onion and placed it and some of the alcohol into the basin and set the mixture on fire. Epifanio then dipped a bundle of the leaves into the basin, pulled the now-flaming plant out of the alcohol, blew on it gently to extinguish the flames, then applied it to Jim's knee. This treatment was repeated several times. Jim's look of shock and nervous laughter was a source of great amusement to everyone in the fieldhouse, especially when he started to swear that Epifanio hadn't actually extinguished the flames. By the time all the leaves had been applied to Jim's knee the alcohol had finished burning in the basin, and Epifanio retrieved the onions, placed those on top of the knee and wrapped the knee and vegetable bundle up with gauze. The whole process took less than ten minutes, and Epifanio and Ermina left to the smiles, laughter, and thanks of all who witnessed Jim's treatment. To Jim's great dismay, this scenario was repeated the following evening, when he was taken unawares by Epifanio and Ermina, who had

A bucket-brigade transferring water to a roof-top tank. *Bill Steele.*

Jim Smith receives local treatment for his injured knee. *Bill Steele.*

managed to enter the fieldhouse and begin their preparations while Jim was busy swapping tales with a group of cavers. Over subsequent evenings, Scott, Vico, and Frank received the same treatment, and they reported that in fact it felt quite good while the heat from the burning alcohol lasted.

One of the main cartographic goals of the 2016 expedition was to obtain accurate GPS locations and elevations of many of the main entrances to the system. Decades ago, when these entrances were being used for active exploration, the locations were based on simple compass, inclinometer, and tape overland surveys and were not very accurate. This, complicated by the fact that the local farmers practice crop rotation, has led to some confusion and difficulties in relocating some of the smaller entrances to the system and other caves in the area. What was a *milpa* ten years ago might be an overgrown tangle of bushes and thorns now, and vice versa. For example, it took three days of concentrated and determined searching by many people to locate the entrance to Nita Nanta. On the first day of the Great Nanta Search, Tommy Shifflett thought we would easily locate the entrance by looking in the same general area as the Nita Nashi entrance, but Steele claimed we weren't in the correct doline, so it was determined we should return on another day with accurate GPS coordinates. The GPS led us on the second day to a location about 15 feet below a stone house and near a church that clearly had existed on the site for many decades, and of course there was no cave entrance. In addition, this location was in a another doline that also didn't match up with Bill's memories—it didn't face in the proper direction and just didn't "look right," although Bill admitted it had been thirty-five years, and things clearly had changed. One complication to the search was that no one had a photograph of the entrance to Nita Nanta for comparison purposes. That evening, Tommy Shifflett decided that perhaps the GPS coordinates were not correct, as they were based on the old overland survey, and maybe it would be best to try again with updated coordinates that were tied to the in-cave survey. Mark Minton joined us on the third and final day of the Great Nanta Search, but the new GPS coordinates led us again to the same doline as the previous day. Mark decided to cross the doline and search along a precipitous, overgrown ridge, while Tommy, Scott, and Bill checked out a nearby area that had seemed promising. Within about forty-five minutes they located the Nanta entrance, which was confirmed by locating survey stations in the entrance passages. Though the entrance area had become overgrown, the compass orientation of the entrance and the presence of a nearby surface sinkhole matched Bill's and Mark's memories. [See separate article by Tommy Shifflett on efforts at accurately pinning down the cave's location elsewhere in this issue.]

The Tortilla Man. *Kasia Biernacka.*

There remains much work to be done in finding and accurately pinpointing locations for known and unknown entrances in the Huautla area. The constantly changing pattern of cultivation plus the determined search for known entrances led to the discovery of multiple new entrances that we did not have time to explore. Complicating these search efforts were many local landowners, some of whom were not too welcoming. However, through the efforts at improving community relations, especially the talks given at local schools as outlined in Steele's report [see article in this issue], we remain hopeful that this work will profitably continue in the years to come.

Espeleología Urbana

La expedición 2016 del Proyecto Espeleológico Sistema Huautla tuvo como base de operaciones tres edificios rentados en Plan Carlota. Tenían dos baños e incluso una regadera con agua caliente, pero el agua tenía que ser llevada en pipa y transferida a los tinacos.

HISTORY

POST-CONVENTION CAVING IN MEXICO IN 1964

Charles "Squire" Lewis

June 15, 1964, Monday. New Braunfels, Texas, Cypress Creek campground. Heavy rain in a.m., glad for tent. At Imperial Motel 9 a.m., registered, found out we should have been at Devil's Sinkhole in West Texas. Left, arrived 12:30 p.m., ran into Corrie mob in middle of wilderness, hooked up with same. Sara, George, and Bruce Corrie, Ted Will, Forry, Andrea, Tom Smith. Doubled back and ate in Rocksprings cafe, Lacey's—incredible scene, twenty-two of us served family style, all we could eat, huge platters of chicken-fried steaks, pork chops, fried chicken, etc., etc. Cost $2 each. Loafed on village square, no hurry as there was a long line at the pit. *San Angelo Times* runs feature article on the cavers, referring to us as resembling a "scene from *Tobacco Road*." Lowered into the pit about 6 p.m., out at 7:30 in time for the bat flight. The UT Grotto has lowered 203 cavers into the pit without a major incident using a climbing rope rigged through a pulley to a car that they drive back and forth. Our group got special permission to camp at sinkhole from Mr. Witworth. Four rappelled in at midnight: Sara Corrie, Bill Kohler, Bill Jasper, and Roger Craig.

June 16, Tuesday. Breakfast at Devil's Sinkhole, proceed to Brackettville, Webb Cave at Alamo Village. Sara and George Corrie, Bruce, Bill Jasper, Tom Smith, Will, Roger, Thren, and Squire. Denied entrance by deputy sheriff with very large gun and owner's wife. Proceed in disgust to lunch at Brackettville. On to Indian Creek Cave near Uvalde, way back incredible dirt roads that kept getting smaller and smaller. Huge dead 6-foot rattlesnake hangs from one gate post, giving the easterners a hint of what to expect. Sara, Squire, and Thren did cave together with two strangers found in cave. Made community stew, met Rose Clements, camped at cave.

June 19, Friday. Back to convention in New Braunfels from Sonora about 5 p.m. in time for Mexican post-convention trip planning session. The cavers are getting unruly, resenting regimentation. Took showers. We form special group and plan extra trip to Xilitla.

June 20, Saturday. NewBraunfels. Vertical methods demonstration session at quarry. Glenn Merrill narrates. Demonstrators: Sara Corrie, Bob Thren, Bill Bush, Suzy Loving.

June 21, Sunday. Up at 5 a.m., ready to depart for Bustamante. Incredible confusion surrounds Corrie/Will parties. Finally left 9:30 a.m., arrived border 1 p.m.. More mass confusion all over Laredo. Unbelievable mob scene at Mexican immigration, finally cleared about 4 p.m.. Arrived Bustamante, greeted by huge sign over street welcoming cavers. The second thing we see is the town cop with gigantic silver-plated 45 automatic on his hip. The town has set up free eats and beer for us in an abandoned house on the square. Utterly indescribable town untouched by tourists apparently loves cavers. Obviously early cavers here have done good PR. We meet El Presidente, Señor Flavio Santos. Our Alamo Grotto guide leading us to base of mountain gets lost four times. We finally abandon him and proceed to trail at base of mountain. Corries negotiate three burros at 50 pesos each ($4), for up and then back the next day. The burro with the gear falls off the mountain. Up mountain 2 p.m., arrive at entrance about 3 p.m. Into cave, set up camp in first big room, ate, slept.

June 22, Monday. Inside Gruta del Palmito. Up, breakfast, and explore cave about 10 a.m. to 2 p.m. Left cave, ate, and down mountain about 3 p.m. Arguments and fun with *burreros*. Unreal desert heat. The burros solicit us to pull stickers from their muzzles; everywhere there are big donkey-sized bites out of the prickly-pear cactus. At the base of the mountains, the town has set up a truck with free ice-cold beer for the cavers. The sheriff is there with his giant gun, very friendly to us—we intend to keep it that way. Supper at the Ancira Hotel in Bustamante, roast beef and goat 80 cents American, including two beers. Went to grocery store and ancient church. Bid goodbye to the sheriff and took off. Discovered fantastic oasis along road, a huge resurgence spring made into a primitive park with concrete swimming pools and such like. There is a cop here who knocks us down for a peso each ($0.12) to swim and camp. He joins us swimming. Warns us of the tarantulas and mostly the *vivoras* that hang out in the palm-thatched shelters we are sleeping under.

June 23, Tuesday. Off after mass confusion. Breakfast in Villaldama, *huevos rancheros*. Side-trip below Monterrey to Grutas de García, did same. Jacked around all afternoon getting above Ciudad Victoria.

Edited from portions of Squire Lewis's trip log that were published in the *NSS News*, September 1986, pages 322–377, in connection with a long profile of famous caver Sara Corrie.

Everytime we stop, all doors fly open and Corries, Wills, etc. disappear in different directions. Ted has blowout as school is letting out, and kids enjoy watching the *gringos* change the tire. The nearly new Michelin is highly coveted by the locals, who want to make *huaraches* out of it (different cultures, different status symbols). Proceed and lose Ted and Glenn's vehicles. Camp near El Limón. Attacked all night by ferocious mosquitos.

June 24, Wednesday. Up and off at 7 a.m. through beautiful mountains and into true rain-forest country, grass huts, and naked kids. Stop about 9 a.m. at El Abra, impressive cave entrance high above the road. Did same. Flocks of parrots and eerie entrance, plus skylight. Dead bats litter floor. Proceed and find Ted and Glenn, who had camped along road south of us . Proceed toward pit we are seeking in vicinity of Tamuín. Cross rope ferry and wander around fabulous Ruinas Tamuín under blazing sun. We lose Corries and Kohler, hunt a pit way back a dirt road, are forced to turn back by torrential rains. This was Ventana Jabalí, 503-foot free fall with a walkout entrance at the bottom. At this time it was the deepest known drop on the continent. Bill Bell had rappelled it; an unbelievable feat to most cavers at the time. Sara was frothing at the bit to find it. We make it back to main road, impossible to go on, must stop to wait out extreme downpours. Turn off at Huichihuayán into mountains. Reunite with Corries and Kohler. Cross river on incredible man-powered rope ferry. Up unbelievable road stuck to side of mountains with sheer drops. Ran out of gas, used stove gas to proceed. Corries have third flat. Near entrance to Xilitla, pass Casa Inglese, an unreal castle built along road by an Englishman who has lived there forty years, supposedly an outcast son of an English nobleman. We cause a traffic jam in Xilitla at the gas station, which fills us up with a gallon can measuring out gas from a big tank on the back of a stake-body truck. Fantastic town. The gas-station owner turns out to be El Presidente; we make friends. Corries, Kohlers go berserk around the town square, we draw crowds. Supper on the square. Total for *enchiladas con queso* with two beers, about 50 cents. On to Señor Gómez's. The sedans haven't clearance enough to manage road. Must drive with one wheel on grassy center strip, one on shoulder along huge precipices. With continuing rain making grass slippery, Ted's Volvo slides off edge, balancing on shoulder with left wheels dangling over drop of couple of hundred feet. We are delayed two hours getting it back on road in dark. We proceed, guiding sedans on foot with flashlights. Girls walk ahead. Arrive at Rancho de Huitzmolotila. Señor Gómez wakes up. Gives girls a room in the house, men bed down in coffee-bean shed.

June 25, Thursday. Wakened by gun shots. Glenn stung by strange, malicious creature. Chickens walked and roosted on us all night. We have been carefully inspected during the night by sundry dogs and cats. We are served beautiful fresh *café* in the kitchen shed surrounded by the chickens, cats, dogs, and a pet squirrel. There is a modern gas stove of which Señor Gómez is very proud, but which appears never to have been used. They apparently use the primitive charcoal hearth for all cooking. We set up camp and make breakfast on the large coffee-drying flat or patio in front of the ranch house. Gómez assigns a young boy, Javier Reinoso, to be our guide throughout our stay. His friend Manuel tags along. We all walk down below the house through dense underbrush to peer into Sótano de Huitzmolotitla, a huge 365-foot pit with a second drop of 156 feet. Glenn had done this pit on a previous trip. We give all our empty tin cans to Javier and other kids. They value them highly and are thrilled. Señor Gómez makes one of the men give me a pack of cigarettes. He won't accept money, so I give him a can of beany weenies that he seems very proud of, showing it to everyone. George and Señor Gómez go off in his truck. Lord knows what they are up to. Gómez has his own personal chair in the post office in Xilitla of which he is very proud. Ted and Roger are down with serious dysentery. We load up and proceed about a mile to the end of the road to the Huastec village of Tlamaya to try to locate Sótano de Tlamaya. This pit has been explored by some of the UT people to about 1500 feet deep. The purpose of our trip is to complete exploration to its bottom and complete the survey. When the survey is complete, this will be the deepest cave in this hemisphere. We are seriously warned to watch out for poisonous centipedes. The village is all stick and mud houses. Stop at store for Cokes, etc. Javier leads us carefully through an active corral full of bulls and on up the mountainside to the pit. Far across the valley is a very distinctive peak called La Silleta—looks like a thumb sticking up. All around us on the surrounding mountainsides, people are whistling elaborate tunes back and forth. Javier explains that they are talking to each other about us. We horse the gear up to pit and rig. Glenn, John, and Thren into pit at 3 p.m. Glenn burns hands severely in descent. Out about 11 p.m., back down the mountainside and to Gómez's for first aid to Glenn's hands.

June 26, Friday. Ted and Roger totally out of it with dysentery; others are queasy. Glenn crippled with hands. We have *café*, roast corn, and avocados on patio with Señor Gómez. He gives us tour of the coffee plant. Sara and John go to Sótano de la Porra (or Gorra) to do same. Squire, Thren, Glenn, and Andrea follow to support. Sara is already in the pit when we arrive. We find the two safety lines have been cut off, 40 feet of the rope, several carabiners, nylon strap, and a duffel bag and knapsack used as padding have been stolen during the night. Only a single knot and the standing line into pit remain. Deeply disappointed by this, the first time anything stolen in the area. Scared for Sara who shouldn't have gone in without any safety lines or padding. Sara and John get safely out without further incident. We load out and back through Tlamaya. The Tlamaya store now has two packs of cigarettes, which I buy. On arrival at rancho, Señor Gómez has Delicados, refuses payment for same. He gives us delicious hot chocolate with cinnamon. Drink beer and have general fun in the kitchen with the gang,

Señor, his women. Carilita, about six years old, does the twist and sings for us. Javier, Manuel, friends join with many dogs to help us make supper on the patio in exchange for the prized empty tin cans. Treat Glenn's hands, take showers, and to bed.

June 27, Saturday. Squire and Bob load out and leave for home 7:30 a.m.

Cueveando en México Después de la Convención en 1964

Después de la convención de 1964 de la National Speleological Society en Texas, se organizó una visita a Bustamante, Nuevo León. El autor y otros más continuaron más allá en México, visitando Xilitla y Tlamaya, San Luis Potosí.

BREAKING AND ENTERING THE U.S.

Nancy Weaver and I had been camping in the proposed Sierra El Carmen National Park on the Mexican side of the border near Big Bend in August of 1996 and decided to cross back into Texas at the La Linda bridge. Unfortunately when we got there the Mexican customs agents informed us that the bridge had just been closed by the U.S. They showed us a letter to that effect. We couldn't believe it. I guess an unguarded U.S. point-of-entry was too good to last. We argued and pleaded, and they walked across the bridge with us and showed us the lock and chain. They had no key, they said. Nancy suggested cutting the chain or disassembling the gate—not possible, they said. How about a ramp? "¡*Me encanta!*" one replied. Damn! The next-nearest crossing was a hell of a long way away. It was evening, so we camped down by the river with their permission.

Just as we were getting ready for dinner we saw a vehicle with a searchlight coming toward us. It was a truck full of heavily armed Mexican police. They said there were some bad men loose in the area and it was no not safe for us to camp there. We asked what we should do, and they said they had changed their minds, and to follow them with our headlights off. What the heck? We weren't sure what to think as we drove back toward the bridge in the dark. At the customs station they told us to follow an old man, who walked toward the gate armed with a rag and a single wrench that happened to be the proper size. As he began to undo the bolts holding the gate, we noticed immediately that the previously rusty threads were now well-oiled. They had already tested this idea. Just as he got the gate loose, we saw headlights coming from the U.S. side, so we quickly pushed the gate back into place and retreated to the Mexican side. An official vehicle came to the gate and scanned it with a spotlight. Convinced that all was secure, he turned and left. Whew! We then quickly took down the gate and drove through. We hastily helped to reassemble the gate and then drove off down the road.—Mark Minton, *Texas Caver*, third quarter 2007.

ACCURATE LOCATIONS FOR THE SISTEMA HUAUTLA ENTRANCES

Tommy Shifflett

For the first Proyecto Espeleológico Sistema Huautla expedition, in 2014, I was charged with overseeing the survey data. Much had already been done in the way of survey-data input, starting with the early Canadian effort in San Agustín in 1966 and Río Iglesia in 1967, and continuing from the late 70s through 2007 by American-organized teams and the British expedition in 2013, many of which added other caves to the system following the connection between San Agustín and Li Nita in 1980. The software Walls by David McKenzie is the survey software now used for entering and compiling the data and for developing line plots for drawing maps. This being my first time using the software, I started out totally unfamiliar with its use, but I have gradually become more familiar with how to enter data, use directives, and export files for import into other programs. I have come to discover that Walls is a very powerful survey-software tool for processing survey data, and there is still a lot more for me to discover.

After I had become a little more familiar with Walls and how to review the files that had already been input, Mark Minton brought to my attention that no date directives had been added to adjust for magnetic declination. Also, I discovered that all the entrance locations were based on an arbitrary coordinate system based on the corner of a prominent house in San Agustín Zaragoza that had mostly been destroyed by a landslide. In addition, the overland surveys to locate the entrances from the corner of the house had been made with compass, inclinometer, and tape with no backsights or closures, so there was no quality control against blunders in the readings or way to assess random errors. There was a loop closure of sorts, in that the overland surveys for locating the entrances were included along with the cave survey when the total was computationally adjusted, but this meant that the entrance locations were also being adjusted.

tommyshifflett@gmail.com

At about the same time I took on the task of working with the survey data, Bill Steele sent me a 330-MB TIFF file of the topographic quadrangle of the area and asked to see an overlay plot of the cave system on it. After importing the map into the Bentley Company's Microstation platform and adjusting the map to the UTM coordinate position and to scale, I then imported shape-files of the cave system exported from WALLS into Microstation for a map overlay. The line plot fell onto the map more than a kilometer north of where it should have landed. I reviewed the overland data and was able to estimate new base coordinates that resulted in the overlay being much closer to where it should be, but still not very accurate. Based on this, I saw that more needed to be done to verify horizontal accuracy; and because the entrances were also being adjusted up or down with the overland survey and subject to change with each new loop in the cave, they needed to be fixed for a more reliable depth figure. After all, Sistema Huautla is currently the deepest cave in the Western Hemisphere, so a reliable, unchallengeable depth is important. In addition to that, the officials in the town of Huautla were asking us about sources of water in the cave, as adequate water supplies to meet the city's needs had become a concern. Because they would need to drill a kilometer deep to reach Sump 9 in Sótano de San Agustín, the system's best source of water, we dared not give them any information without some confidence in the location.

Before the 2015 PESH expedition I began looking into how we might better determine locations for the entrances. Looking closely at the topographic map I noticed there were a couple of control points and a few gravimetric stations within the karst area. All of these features have accurate coordinates, especially the control monuments. I set about looking into how I might obtain information on the monuments or the gravimetric stations, which also have coordinate locations good to at least a tenth of a meter. It didn't take me long to find the web site of the Instituto Nacional de Estadística y Geografía (INEGI), which has custody of Mexico's geographic, mapping, and other resource information, much like our U.S. Geological Survey. The problem for me is I cannot read Spanish very well, and which buttons to press to find and download the needed information from the site was not apparent.

To my rescue came Diego, a student of Oscar Francke, a professor at UNAM in Mexico City who specializes in research on arachnids, especially scorpions. Oscar Francke and several of his students have participated in PESH and have discovered a number of new species. Diego was able to download the needed information and also provide me instructions on how to download information from the site should I need more. Data for three monuments were downloaded. One monument is located in San Andrés Hidalgo, not that far from the San Agustín and Río Iglesia entrances and almost centered over the extent

of Sistema Huautla. The others are located at Santa María la Asunción and Llano de Agua, a few kilometers to the south.

The monuments at San Andrés and Llano de Agua offered the shortest route where we could survey between them, locate cave entrances, and set temporary control points along the way. Beginning at San Andrés, Bill Steele, Jim Smith, Virginia del Rosario, and I set about surveying along the roadway using Suunto compasses and inclinometers and survey tape. The monument in San Andrés was easy to find and located in a school yard. The other was not so easy, and only by finding the witness markers were we able to pinpoint the location. We didn't find the actual monument, coming to the conclusion that it either is buried under the soil or has been removed. At least we could survey to the location measured from the witness markers, which is good enough.

Bill and I read foresights and backsights while Jim Smith kept book. To say the least, this was a tedious affair that gave me much respect and admiration for the overland surveyors of the past who surveyed a considerably longer distance than we did. While surveying along the roadway, we encountered much interference with the compass readings from buried metal pipes, overhead electric lines, rebar in curbs and the concrete pavement, and other sources not identified. At least the back shots gave us warnings, and by relocating stations away from the interference we were able to take readings in each direction that agreed. The previous overland survey teams, not taking backsights, would not have been alerted to such interference.

After a couple days of surveying under the Mexican subtropical sun, we reached the other monument and tied in. We next planned to carry the survey toward the entrances to the north, including Li Nita, La Grieta, and Nita Nanta, the location of the highest entrances. Already burned out from the survey between the monuments, we planned a strategy of surveying at night using DistoXes to help speed the survey effort. A DistoX does not work well during the day, because the beam cannot be seen for hitting a distant target. However, in the process of extending the survey through the town of San Andrés heading north, we awoke many barking dogs and soon had a mob of people ready to run us off, so we had to abandon that plan. We elected to tie the survey into the missing house corner that marked the beginning. Luckily for us we were shown a few remaining blocks that marked the corner. The old overland surveys could not be put on the same coordinate system as the monuments and the map. With new coordinates calculated for the cave entrances, I added a FIX directive in Walls for each and recompiled the cave system. This time the overlay landed very close to where it should be.

After the 2015 expedition I looked more closely at the closure between the two monuments. After review for input errors and working out some readings that did not agree between the foresights and backsights, I reviewed to see how accurate we were. Our closure error (the vector for x, y, and z) was 40 meters. This was an eye-opener. Despite taking foresights and backsights and taking precautions to avoid magnetic influence, we were still considerably off, even though this error would be distributed along the route between the two monuments. A compass, inclinometer, and tape survey up and down the considerable changes in elevation and for the several kilometer distance evidently cannot be expected to have the accuracy we sought. That made me realize that the previous overland surveys, despite being tied in to our overland between the two high-order monuments, had no guarantee of accuracy of any kind within several tens of meters. And using compass, inclinometer, and tape for any new overland survey to the distant higher entrances would require a big connecting loop for any improvement in accuracy—a lot of time and work. A new strategy was needed.

Looking ahead to the 2016 expedition I bantered back and forth by e-mail with Bill Stone on this problem, and we discussed the chance of somehow getting our hands on some GPS equipment, including a tripod and the usual other bulky equipment that requires occupying a location for many hours, then post-processing the data in order to determine accurate coordinates. This equipment is expensive, including the cost for the post-processing, and too bulky for carrying around, especially when you have to climb down and back up deep, jungle-covered sinkholes.

Being a professional civil engineer and land-surveyor in the highway design and construction business (I work for the Federal Highway Administration's Eastern Federal Lands Highway Division) I often receive e-mails on new technology that relates to the industry, and I happened to receive an e-mail about using new, compact GPS receivers that connect via Bluetooth with an iPhone, iPad, or other tablet for GIS and survey-grade applications. That caught my attention, so I investigated a little more into this technology. The e-mail was marketing a new app for iPhones for GIS location of utilities and other features for civil-construction work. But what I was mostly interested in was what kind of GPS receivers these apps were being designed for. This led me to EOS Positioning Systems, a Canadian company that builds the Arrow series of GPS receivers. EOS markets three different receivers, the Arrow Lite, Arrow 100, and Arrow 200. The Arrow 100 caught my attention most because it can obtain sub-meter accuracy without post-processing, for a 60-centimeter accuracy with 95% confidence, as long as there is a clear view of the satellites, and it is not overly costly given its accuracy capability. The Arrow is able to obtain this accuracy by the many satellites it can obtain and the free SBAS (Satellite Based Augmentation System) that provides differential positioning to the information that is obtained. The cost for this receiver, which includes an external antenna that is worn in a pouch on top of a hat that is included, a charger, and carrying case is $2,995, way less than the traditional tripod mounted GPS equipment that can costs tens of thousands of dollars. Most importantly, the Arrow receivers are compact (12.5 × 8.4 × 4.2

cemtimeters) and weigh only 372 grams, much easier to carry while climbing up and down sinkholes looking for entrances. The Arrow 200 will obtain centimeter accuracy without post processing, but it costs a couple thousand dollars more.

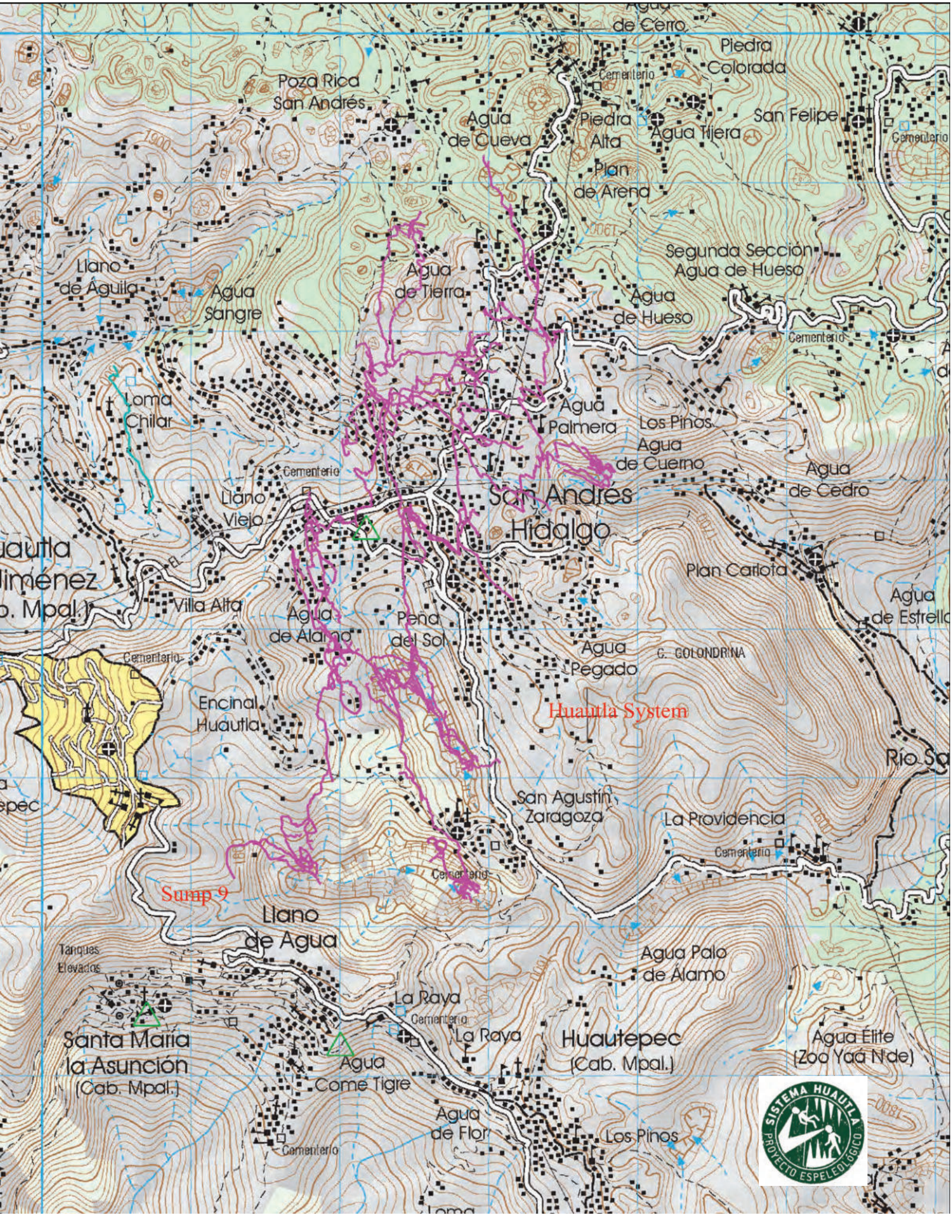
PESH, an official Project of both the U.S. Deep Caving Team and the National Speleological Society did not have the funds to purchase the Arrow100, even though it is inexpensive compared to the older equipment, so I wrote a proposal to EOS about testing one for locating cave entrances. After about a week I heard from David Wildman of the distributor Newland Group in Floyd, Virginia, that EOS had passed on my proposal to him; how could he serve us? I explained that PESH is a charitable organization and that we have no money to buy one, but any donations would be tax-deductible, and if the GPS worked as advertised, our articles and presentations would provide exposure to other cavers like ourselves looking for a simpler way to obtain high-accuracy locations of their projects' cave entrances. Also, I mentioned that the survey department where I work might be interested, should I be able to demonstrate the receiver's capability to the department employees. After talking more about PESH and our goals, Davis offered one as a loaner through EOS. I didn't turn it down. It was the end of March before I received the equipment; I had been hoping to get my hands on it earlier to become familiar with its use by locating some cave entrances in Burnsville Cove, Virginia, and to demonstrating its use at my work. With only one weekend left before the expedition, I was still able to test it out before the trip, locating sixteen entrances in Burnsville Cove, and I was able to demonstrate the Arrow at work, reading coordinates on an accurately located existing point that had been previously set in our parking lot. The Arrow's coordinates were within a foot for this point. This gave me much confidence in the Arrow's readings, as it did also to the department's manager and employees.

Besides the Arrow, another loaner the project received was the TruePulse 360R laser measuring device from Laser Technology, located in Centennial, Colorado. This device operates much like a DistoX ,in that azimuth, inclination, and distance are read. There are some differences; the device is much more robust than a DistoX, waterproof, and can read a distance up to 2 kilometers away if aimed at a suitable target. The device has a screw connection, much like a camera, for mounting on a tripod for the longer-distance readings. Horizontal, vertical, and slope distance can be obtained from the TruePulse, in addition to missing legs with triangulated readings. Another distinct difference is that you are required to sight a point or target using an eyepiece that has a crosshair and can zoom in on the target. Once on the target you push a button labeled *fire* and then toggle through the various readings for distance, inclination, and azimuth that are displayed in the eyepiece. We originally wanted to test the TruePulse for surveying in the cave, but some negatives for this use came up. First, the beam is invisible, even in the dark, which makes pointing to a station or target out of the question. If the eyepiece is used to sight a target, it is difficult to see the readings in the eyepiece. These shortcomings were later passed on to Laser Technology after the expedition, along with some suggested changes that would make it more desirable for surveying in a cave, and to cavers. It did turn out the TruePulse worked very well in locating cave entrances when the GPS reading had to be taken a distance from the entrance because the Arrow's view of the satellites was blocked by very heavy vegetation or the depth of the sinkhole.

Besides the Arrow, we were also able to acquire both the GNSS Surveyor and GPS Pro+, GPS receivers from Bad Elf, which can obtain readings with 1- to 2-meter accuracy. In the middle of March, not yet having received the Arrow, I was beginning to get worried that I might not receive it, and a lot of planning was in place to locate the system entrances to 1-meter accuracy. So I wrote a proposal to Bad Elf, and they responded right away and sent the two receivers. Soon afterward the Arrow showed up in the mail. But that was OK; we would test and use them all.

There was one more piece of equipment needed for increasing our confidence in the vertical readings of the GPS receivers. Typically, for the GPS receiver the vertical inaccuracy is 2 to 3 times the horizontal inaccuracy. To have a better check on the elevations, I came across a high-precision digital altimeter made in Canada (MicroTim) that we were able to purchase at a very

Tommy Shifflett and Jim Smith recording entrance GPS data. Shifflett is wearing the Arrow 100. The receiver is at his hip, and the antenna is in the pouch on top of his hat. *Bill Steele.*


Agua de Cerro
Piedra Colorada
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Poza Rica San Andrés
Agua de Cueva
Piedra Alta
Agua Tijera
San Felipe
Cementerio
Plan de Arena
Segunda Sección Agua de Hueso
Llano de Águila
Agua Sangre
Agua de Tierra
Agua de Hueso
Cementerio
Loma Chilar
Agua Palmera
Los Pinos
Agua de Cuerno
Agua de Cedro
Cementerio
Llano Viejo
San Andrés Hidalgo
Plan Carlota
Villa Alta
Agua de Alamo
Peña del Sol
Agua Pegado
C. GOLONDRINA
Cementerio
Encinal Huautla
Huautla System
San Agustín Zaragoza
La Providencia
Cementerio
Cementerio
Sump 9
Llano de Agua
Tanques Elevados
Agua Palo de Álamo
La Raya
Cementerio
Santa María la Asunción (Cab. Mpal.)
La Raya
Huautepec (Cab. Mpal.)
Agua Élite (Zoo Yaá N'de)
Agua Come Tigre
Agua de Flor
Los Pinos
Cementerio
SISTEMA HUAUTLA
PROYECTO ESPELEOLÓGICO

The map is the latest overlay of Sistema Huautla on the Huautla topograhic map. The fine blue lines are a 1-kilometer grid. Greem triangles are INEGI first-order monuments. Map by Tommy Shifflett.

nice discounted price. With two altimeters, one is placed at a fixed location such as a control monument for monitoring apparent elevation change caused by atmospheric-pressure changes. When read at the same time as another at the cave entrance, the difference will give the correct elevation difference, regardless of pressure fluctuations, if the locations are not too far apart. This method has the potential for determining elevations to within 1-meter accuracy. Elevations determined using the altimeters would be a check on the elevation determined by the Arrow. The drawback is that this takes coordinated efforts for the readings, and preferably a way to communicate between the two altimeter locations. This operation works best when there is a settled high- or low-pressure system in place so that pressure variations both with distance and with time are small. For this year's expedition we not only did not have good radios to communicate with, we often did not have the extra people available for transporting the equipment to the monuments as well as the entrances and to make simultaneous readings. On top of that the weather was very turbulent atmospheric-wise, with adiabatic winds rolling off the higher ridge tops before dawn and taking a good part of the day to dissipate. Because of these obstacles we were not able to take advantage of the altimeters as a check on the GPS elevation readings. I had, however, planned one more elevation check. The GPS coordinates we are able to obtain are very accurate for horizontal position, and this can be used to check against the topographic map contours (20-meter interval), and against a digital-elevation-model I was able to obtain and on which I have contours plotted at 2-meter intervals.

As noted, the Arrow can obtain sub-meter accuracy. But to improve on that I also used an averaging app that will use weighted averages of the many coordinates that stream in from the satellites to the GPS receiver. The more points that are read, the better the accuracy becomes. It doesn't take long to collect over a hundred different point readings at the same location. Where I had clear view of satellites, such as a high point with nothing to block the receiver, the Arrow would be tracking over twenty satellites and fixed on almost all of them for accuracies to 0.1 meters. This was true for a number of the entrances, and also some prominent rock points that can be used to tie in an entrance found in the future using compass, inclinometer, and tape. For readings with horizontal accuracies better than a half-meter, the elevations are reliable to a meter.

For any GPS receiver, raw coordinates are constantly varying. With low-cost handhelds you do not see or collect all of that stream. For survey accuracy, a setup would take data for hours for post-processing. In addition to raw coordinates, other data are also being received from the satellites, such as their positions. This is called NMEA output, and this is the data that is used in post-processing for more accurate location determinations. With the Arrow 100, before beginning the averaging app it is recommended to allow at least 5 minutes (ideally 10) for the receiver to track and lock onto the satellites and download the ionospheric-grid broadcast by the SBAS satellites and carrier-phase smoothing data used to increase the accuracy and consistency of the positions. Because there is the chance that we may not be able to borrow the Arrow 100 again, I am now looking into some free post-processing software that I could use for the data that the Bad Elf can collect and download. If we are able to borrow the Arrow, again the Bad Elf receivers can still be used by other team members while ridgewalking for collecting data on any newly discovered cave entrances or other features.

For a map overlay of the system and other caves, it turns out that the Mexican topographic map for the Huautla area was developed using the ITRF92 reference frame, and the high-order monuments we used and the SBAS constellation satellites that provide the differential-correction data use ITRF08 (current epoch). The UTM reference frame for the map overlay that we use is WGS 84, which is equivalent to ITRF08 (epoch 2011) and nearly equivalent to the ITRF92. How do these differ differ? Only by the amount of tectonic plate movement for the area, which is about about 4 centimeters compared to the monuments, not enough to affect coordinate locations and how the cave map overlies the topographic map.

Prior to actually locating entrances using the Arrow or Bad Elf receivers, a first reading was taken on the high-order monument located in San Andrés. The reading checked very well with the monument's coordinates and verified what we could expect from the Arrow. We then set out to locate the San Agustín and Río Iglesia entrances, but we were turned back because of some public-relations issue from last year. So instead we started with locating some new entrances found in 2014 and 2016 in the vicinity of Plan Carlota. Then we moved to locating the La Grieta and Li Nita entrances to the system, and some of the larger separate caves such as Nita He. We located some new entrances as we advanced toward higher entrances to the system, the Nita Nanta entrances. Here is where we became bogged down. The vegetation had changed over the many years since this area had been visited, and where corn fields once were the area is now more jungle-covered. We could not find and identify any of the higher entrances. The coordinates we were using to find these entrances had been determined from the old overland survey that had been tied to the new survey between the monuments. One entrance we found looked sort of like Nita Nanta's highest entrance, but it was remembered as a tight fit going straight down after having been dug open. This entrance, though in about the right area, was many times larger, but it did go straight down as I had remembered. Mark Minton had found and dug this entrance open in 1981, and I had helped map it to

connect with Nita Nanta, but my memory of the location had long-since failed over time, and the size didn't fit. Near to where the main Nita Nanta entrance should have been located on the map we instead found an entrance that has much cold air blowing out. Was this the main entrance? I remembered that the higher entrances sucked air and did not blow, but I could not remember what the main entrance looked like, despite having entered it many times during the 1981 expedition. Bill did not recognize this entrance, nor did Minton or Jim Smith, but still the entrance was within 7 meters of where it was shown on the new topographic overlay. I couldn't help but think this blowing cave, which we named Big Wind for the strong blast of air, was the Nita Nanta entrance. How could we have missed finding this entrance if it was so close to the Nanta entrances? Mark's memory said that the Nita Nanta entrances were located on another nearby ridge. The result was a lot of scrambling all over trying to find them. After a couple days of looking and wasted effort (albeit we found a couple more new entrances), I decided to recalculate the cave system using the Arrow-fixed coordinates for San Agustín, La Grieta, Río Iglesia, and Li Nita. With a new overlay of the map, the Nanta main entrance had shifted to 49 northeast meters of Big Wind, as opposed to 7 meters directly east.

On a return trip we walked in the approximate direction from Big Wind I had calculated and paced off 50 meters. Terrain and vegetation surely affected both our direction and distance, but we did find a sinkhole with a cave that Mark suspected was the sinkhole entrance to Nanta, but we were not sure, because after much walking in this vicinity we could not find the main or highest entrances, which should not have been that far away. We all regrouped near Big Wind, and there was much frustration, as time was running out. Scott Wahlquist and I decided to retry the walk from Big Wind to locate the main entrance. Mark, Bill, and Yvonne decided to hike up and over the ridge where in Mark's mind the cave entrances should really be. As they left, Scott and I spread out to about 10 meters apart and headed in what we thought was a more northeasterly direction. In just a few minutes Scott located a small entrance in a small headwall about 50 meters from Big Wind. We both went in with our headlamps, following a narrow canyon with a trickle of water on the floor. Scott noticed that the walls appeared polished, as if cavers had moved through in the past, but this was not strong evidence. We continued farther, looking for a survey station but not seeing any. Then, up on a ledge I found what appeared to be a large carbide dump, an indication that cavers had been here from the past, although we had never tolerated dumping carbide in a cave. Then a bit farther in and just before a pit, Scott found a survey station number that was either P7 or P9. I knew the survey prefix for the Nanta main entrance was P. Hallelujah! We had finally found the main entrance to Nanta, and very close to where the Arrow coordinates predicted it would be. After locating the entrance with the Arrow and TruePulse 360, Scott and I then measured out a bearing and distance for where the highest entrance to Nanta should be. It turned out that the cave entrance previously found and suspected to be the highest entrance indeed was. Erosion over the many years had evidently made it considerably larger. Also, another nearby entrance turned out to be the sinkhole entrance to Nanta. Our location of the system entrances were now nearly complete, except for a couple of Nanta's lower entrances, all but one of which we located later.

As a result of this effort to determine a reliable depth of Sistema Huautla, the 2013 depth of 1,545 meters changed in 2015 to 1,554 meters. Now with almost all of the entrances located and using the Arrow coordinates for fixing the entrance locations in a recalculation of the system, the new depth is 1,560 meters; a 15-meter depth difference from the 2013 depth that had been determined by adjusting the old overland survey, and hence the entrance locations, with the cave survey, and only 6 meters different after fixing the entrances using on the old overland survey tied to the new line between the monuments. Given the distance between the system entrances and how rugged the Huautla karst terrain is, the overland survey performed back in the 70s and 80s has turned out to be quite accurate. I would have expected the accuracy to be considerably less, given that no backsights were taken and no loops closed.

Participants this year assisting with locating entrances included Bill Steele, Jim Smith, Diana Tomchick, Scott Wahlquist, Frank Bogle, Matt Tomlinson, Mark Minton, and Yvonne Droms, and they all deserve a big thanks for that assistance when they could have been underground. Also, many thanks to Pat Kambesis on helping me with the calibration of the TruePulse 360.

The PESH co-Leaders and participants give many thanks to and credit for the success in determining accurate locations of the entrances to the sponsors, and more particularly to EOS Positioning Systems and Davis Wildman of the Newland Group for use of the Arrow 100, to Laser Technology for use of the TruePulse 360R, and to Bad Elf for use of the GNSS Surveyor and GPS Pro+ receivers.

Ubicaciones Precisas de las Entradas al Sistema Huautla

Durante la expedición 2016 del Proyecto Espeleológico Sistema Huautla se utilizó equipo de GPS de alta precisión para ubicar de manera precisa las varias entradas al Sistema Huautla en relación con los monumentos del INEGI con coordenadas precisas ubicados en la zona. Fue difícil ubicar la entrada más alta al sistema, Nita Nanta, porque no ha sido visitada en muchos años y los sembradíos en la zona están muy descuidados. La profundidad del Sistema Huautla, en base a la nueva información de ubicación de las entradas, es de 1560 metros.

CAVING IN QUINTANA ROO ONE CAVER'S PERSPECTIVE

Tammy Otten

This was my second trip to Quintana Roo to cave with Peter Sprouse and the gang. My invite for 2015 had been extended by Howard Kalnitz. The first time I was there, I did not know what to expect. I had been caving in other places in Mexico and other similarly warm climates, but each expedition is a little different. "What do you mean we have a condo with air conditioning? I don't need my tent?" Seemed a little bizarre, but for the price, a condo in Mexico was well worth it.

This time I knew. What I did not anticipate was how crowded the airport was. Little hint: When traveling over Easter, put some flexibility in your travels and take the bump. So I totally ditched Howard, Pam Duncan, and Nathan Roser, and next year's trip back to Quintana Roo is already paid for. This was how I started my participation in the March 2016 Quintana Roo expedition.

Because non-caver Sheri Dimmerman and I had taken the bump, when we landed in Cancún on Friday, March 25, our transportation, planned for Thursday, had already left Peter had suggested the ADO and the *collectivo*. Having not used public transportation in Mexico, I was a little hesitant. ADO was easy to find, comfortable, and inexpensive. If you find yourself in Mexico, I highly recommend it. The *collectivo* was, shall I say, interesting, but again, easy and effective. The biggest problem we had was that the *collectivo* drops you at the highway, so we had about a two-mile walk to the condo. We took our time and almost made it, then we spotted a bar. So we waited at the bar for Howard, Pam, and Nathan to collect us on their way back from caving.

Tammyotten@yahoo.com

Those three had been caving in Aktun Zac. Howard had wanted to get underground right away on Friday to calibrate his DistoX for Mexico. They accomplished this and then some, with only one iPhone fatality. From that evening on, our group always had some piece of equipment or another submerged in the rice canister. Despite their iPhone fatality, at the end of the day the team had surveyed 387 meters and calibrated one DistoX.

The gang in Quintana Roo meets every morning at a little taco stand called Taqueria el Arbolito just off the highway in Puerto Adventuras. They have great tacos and even better smoothies. Each morning Peter has objectives laid out in his mind, waits to see who shows, then divides us up. Although he has things he wants to get accomplished he is flexible with the,"I want a light trip today," "I want to swim today,"or "Can I cave with so and so today," requests. I don't envy the organizer, and really waiting until morning makes the most sense. Otherwise you would just be reorganizing everything anyway when someone wakes up sore or sick.

Each evening the whole group, or most of us anyway, meets for dinner somewhere to drink, eat ,and tell our best caving stories—you know, the big one that got away—and read survey data to be entered in the computer, best done prior to too many drinks. Each night Peter posts for the group to see a new, updated line plot showing what work was accomplished. This is great for those of us who need instant gratification.

Carol Vesely sketching in Aktun Chen. *Bob Richards.*

Saturday morning, March 26, we woke up and met the crew at the taco stand. The iPhone, however, was feeling under the weather still and opted to stay behind in its bed of rice. Peter had informed us at dinner the night before to be ready to swim. We were headed to a tourist cave to begin mapping the above-water portions of the cenote and cave system, our goal being to connect to the dive line that was already there. The area had been developed with a small gift shop, a place to purchase snacks, and nice restrooms. Chikin Ha consists of an underwater passage complex with a couple of cenote entrances and one ceremonial cave called Cenote Taak Bil Ha. Howard, Pam, and I went off to survey Taak Bil Ha. The owners have built a staircase down into the cave to the edge of the large central island, so one is first impressed by the huge skylight. The trail wraps around the edge of the island so tourists can look out over the water. Our descent was greeted by motmot (Momotidae) birds chattering as they perched high in the trees growing

out of the skylight. As we surveyed throughout the day, the motmots took turns watching us from their high perches and diving in and out of the smaller karst windows.

The Maya altar is behind the staircase in the darkness of the cave away from the skylight. We began our perimeter survey by first heading toward the altar, but turned the other direction when a tour group entered. We worked our way around the perimeter of the cave in the other direction, not locating the dive line until we reached the side opposite from where we started. Our team opted to finish the survey, then come back to this point to make the connection to the dive line, as this would require us to get into the water. We were two stations away from closing the loop of the perimeter when the guides came in to prepare for the next tour. Our hopes of quickly finishing were dashed, because we were smoked out by incense. We grabbed our packs and headed to higher ground, out of the cave and the smoke, and took a break in the sun and fresh air by the other cenote entrance. After the tourists and smoke had mostly cleared the cave, we returned for our two shots and connection.

Despite our best efforts, neither Howard nor I could dive deeply enough or hold our breaths long enough to make the connection to the dive line. We improvised caver-style. We shot a station to the ceiling just above the dive line, then Howard tied a rock to the end of the tape and called it a 90-degree shot. Success, or good enough in a pinch.

Meanwhile Peter, Nathan, Alice Jaworski, Andrea Futrell, and Mike Futrell were working on a survey connection downstream from Chikin Ha to the X'tabay entrance of Sistema Ponderosa. It appeared that a survey route could be done under the dripline in order to make the connection. The previous month, Peter had scoped this out, and he had enlisted the help of German divers Andreas Becker, Jan Mendenwaldt, and Torsten Schnitter to survey an underwater section where it was not possible to do a dry survey under a dripline. Mike and Andrea surveyed north from the underwater survey around the tourist cenote's two entrances to Chikin Ha and slightly beyond, to where an underwater connection to a third system, Sistema Ixchel, seemed possible. A dive by Mauro Bordignon a few weeks later was stymied by collapse, so the Ixchel connection is yet to be done. Peter, Nathan, and Alice started surveying westward from the X'tabay entrance toward Chikin Ha. At first this involved surveying in swimming tubes while dodging snorkeling tourists. Then they ditched the tubes and got into dry cave, including an apparently virgin side passage where Nathan pushed a low-air-space pool to the end. Returning to the cenote's dripline, they mapped through a small hole in breakdown to tie into the end of the Germans' dive line, and the connection was completed.

Jen Hopper and Peter Sprouse enter survey data into the computer after supper at El Panucho Feliz. *Rodolfo "Fofo" Gonzalez.*

While we waited for the others to finish, Pam and I went in search of a place to purchase a cold *cerveza*—surely a tourist stop would have beer, right? Wrong. So Mike and Andrea were nice enough to share theirs, and the four of us split two warm beers. Mental note: Must remember to put beer in the car.

Our cave Easter Sunday was a *palapa*, our paper said *cerveza*, and the only numbers our sketcher kept were our tab; we took the day off. I'm sure someone caved somewhere and did some survey, but you will have to ask them about that because I spent the day on the beach, swimming with turtles and drinking *cheladas*. Ahhhh, the benefits of caving in Mexico.

Peter had been discussing a cave camp prior to this spring trip. Although I debated this, I was leaning toward not participating, as I had a non-caving friend going with me to Mexico. A week before the trip I received a message from Peter. "You are going on the cave camp right? I need you to sketch." Apparently there were plenty of people willing to go, but not very many sketchers. I really wanted to go, and this provided just the excuse. Now I needed to get that one-person tent

Cenote de Lorenzo on the Aktun Chen property is used as a swimming hole for tourists. It was surveyed by Bob Richards and Bern and Sandy Szukalski. Sumps containing dive lines lead off in several directions. *Bob Richards.*

I had been thinking about. Without enough time to do research on style and price, I decided to go get a cheap one at the store, so I checked Bass Pro, Field and Stream, Meijer's, and finally Walmart. The cheapest one-person tent was around $75, not bad, but a lot for a tent to be used only once. That's when I saw it on the shelf, the perfect tent—a two-child tent measuring six by three for the bargain price of $17.50. And that is what I took to Mexico.

Some of the party opted to hike in the day before with some of their camping gear. I did not want to lose a day with my friend, who would be leaving the area before my return, so I had loaded my backpack to carry everything I needed in one trip. This was not that difficult, given that there are only two spots during the hike where you have to crouch. Larry Keele, Peter, and I made a game out of no knees touching. I was successful despite the pack until my first step into the water. Splash! I managed to only barely dip the bottom of my pack.

In places it is easier to move through the jungle than to move through the cave. As we moved through the Jaguar System we worked our way by going in and out of various entrances. The walk through Jaguar Maw and Paw is well worn and well flagged, but this can be deceptive, believe me. In 2015 I fell behind three other people on the way out and got turned around in a large room. There was some debate about the length of the walk, some said 6 miles, some said 8; the bottom line is we made it to camp by late morning. The camp area was just inside an entrance and had a soft dirt floor and a large table-size rock. Peter quickly flagged the table rock as a mud-free zone and laid out the very long paper map. After selecting individual spots for our tents and getting settled, we were set up and ready to survey by early afternoon. I would find out later that this was the last opening to the jungle until we reached the Far Cry, our objective. We all walked to the edge of the water to blow up our preferred flotation device, a one-person raft or a ring. Chad Pedigo and Dennis Hoburg had opted to wear wetsuits and snorkeling gear.

On this first day of the Jaguar Claw camp, March 28, I was on a survey team with Larry and Dennis. We headed down the main water passage, very quickly coming to our objective, a side lead where we had to get out of the water and would have to deflate our rafts to make it through. The rest of the teams had already moved on, and we were uncertain whether this was our goal, so Larry and I sent Dennis ahead to check. He quickly found himself back in deep-water passage and located our correct survey station. So Larry and I deflated our tubes to make it through the squeeze and reinflated them on the other side. We popped through into a passage 13 meters wide on average, filled with water wall to wall but with plenty of ceiling room. Floating in water while surveying has its obstacles. Getting a DistoX reading while floating in water is no more or less challenging than compass and clino readings. You have to figure out how to stay still enough to get the reading. With creativity, it can be done. Sketching was easy, and I could just allow myself to float around in the tube while I sketched. To answer your questions, gentleman, yes, I can hear you while I'm sketching, I just choose not to answer. "Walking" the survey line does become a little more challenging, however, when you are floating. The Jaguar system has such large, open rooms that we have been navigating our way through the cave using line-plots on tablets, which, along with the Distos, must stay dry.

We adapted to the challenges and surveyed, then turned the other direction to work toward a second tie-in. We entered what looked like a formation garden. As we surveyed we had to paddle our way through a multitude of columns, stalactites, and stalagmites, until finally floating in the tube was no longer an option, and we had to deflate the tubes, round two, to move through the ear-dip created by the formations on the ceiling. This is when I learned that, even though I am in Mexico, even though the cave water is warm, it is still very possible to get very cold. Mental note: Wear more tomorrow.

On the first day our team surveyed approximately 123 meters, tied in at the beginning and the end, defining one of the walls and adapting to a different caving environment. Not bad for a half-day's work.

We had dinner, and one by one

March 2016 survey totals

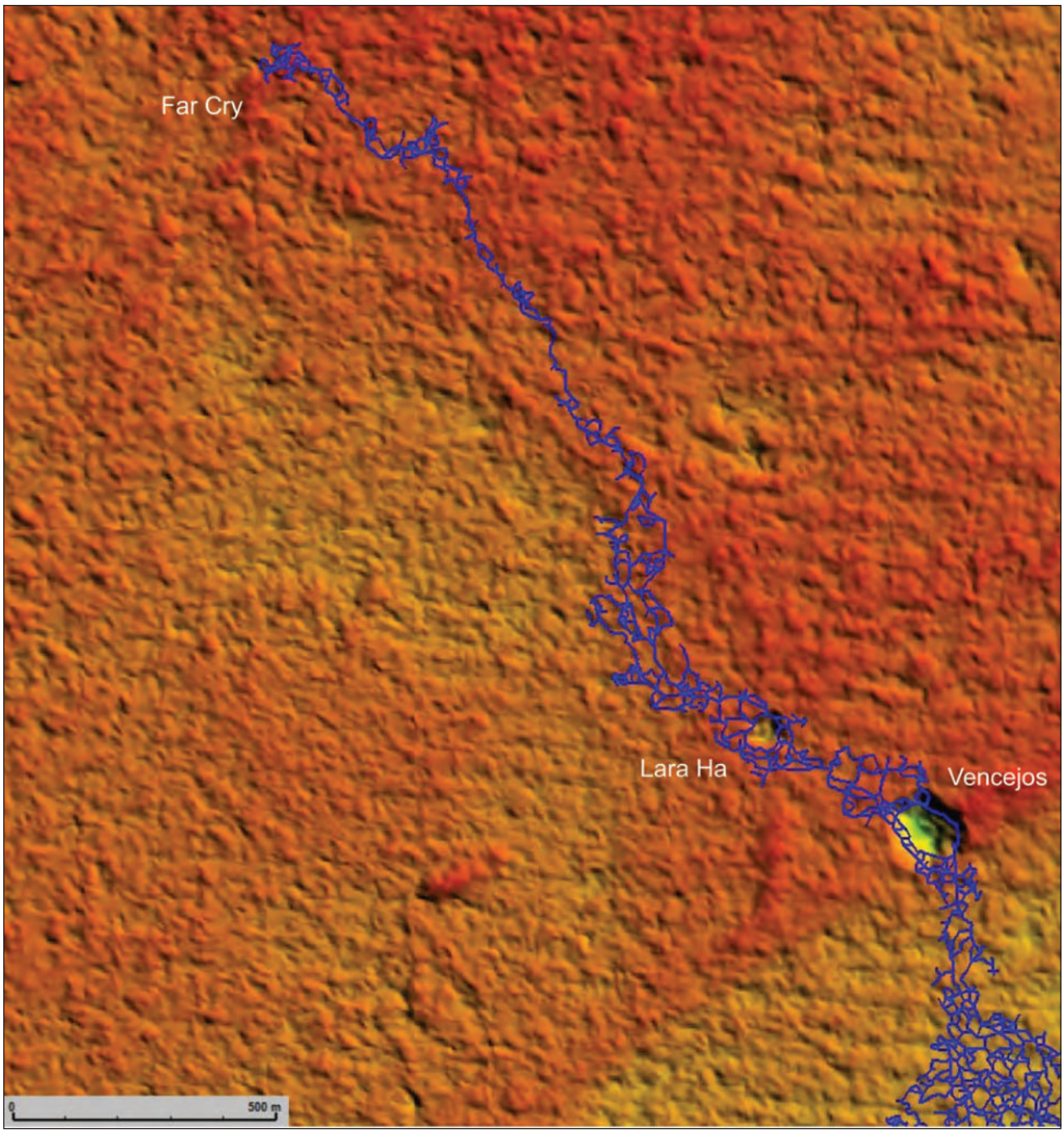
name	*March 2016 survey (m)*	*Total cave length with previous surveys (m)*	*notes*
Aktun Chen	3540		
Sistema Garra de Jaguar (Claw)	2360	41327	
Sistema del Vivero	1748	4176	Includes Cueva Timor connection
Sistema Ponderosa	557	~19300 (resurvey underway)	Connection of Chikin Ha to Ponderosa, 79 m of this survey is underwater
Cueva del Arbol	537	809	
Chuch Baxal	479		
Aktun Zac	387	1591	
Cenote Casa de Jaguar	271		
Cenote Mul Tun	236		
Cueva Lucha de Akumal	178		
Chac Nup	156		
Cenote Lorenzo	140		
Hon Chaha	116		28 m of survey is dry, 88 m is underwater
Cenote Casa de Jaguar Sur	110		
Sistema Quijada de Jaguar (Jaw)	88	10781	
Cueva Jaguar Crawl	84		
Cueva Fiskars	54		
Sistema Dos Arboles	30	7951	
Cueva Thong Tortilla	14		
Motz Ha	12	390	New survey is underwater

Total surveyed = 11097 m

people wandered off to bed. (Mental note for next time: Camp shorts. At least I wasn't the only one in my underwear.) The evening temperatures were comfortable for sleeping. Finding my way into the jungle to use the restroom in the middle of the night, not so comfortable! Was that a jaguar?

In the morning of the second camp day, we wasted little time, had breakfast, pumped water through purifying devices if we needed to (resulting in water that tasted tasted like it had run run through a softener three times and had a little salt added), got dressed, and headed out.

My team headed out to the Far Cry, the purpose of the camp. We started out by paddling for about two hours through some of the most brilliantly decorated cave I have seen, full of pristine formations. We floated and paddled on crystal-clear water surrounded by calcite. Our route did include a few portages. As I stepped out of my tube and went knee deep into a sandbar, I was struck by the fact that it was not sand at all, but a very thick, very deep deposit of sunken calcite rafts. Each portage was the same. I found myself thinking of all the tourists paying to paddle through something much shorter and not nearly as pretty. This was like a Disney ride in a made-up land, but even better because this was *real*. Thankfully



no one was singing Disney songs.

Mostly we paddled, and then we reached a long dry section where we were unsure if we needed to bring our flotation devices over. Once a few of us reached the other side we realized we did, so we returned, retrieved them, and continued on.

We arrived at our destination, dropped off Andrea and Mike Futrell and Alice Jaworski to begin at the end of survey from the last trip, planning to do a leapfrog survey. Peter took me to my team's starting point, which I was glad to see had walls. Yes, I could do this without warping my mind too terribly. Okay, they were more like very, very large islands, but the formations created what would appear to be solid walls—good enough. Our second shot took Larry, Nathan, and me up out of the water onto an island, so we left our flotation devices. As I was sketching that first shot, I dropped that stupid clear plastic protractor right in the drink, ugh! The water was so clear and luckily only knee-deep at that point , so, amazingly, after standing still for a minute, I could actually see the damn thing and picked it up right out of the water. As usual it took a few minutes to get the sketch started, and just when I was starting to roll, 24 meters into the sketch, this smallish passage opened up to a large water-filled room with an enormous formation-covered island in the middle—sketcher meltdown waiting to happen.

"Deep breaths, only sketch one shot at a time, choose left and right stopping points." This was my mantra. Peter had started on the other side of the island, so my job was to define this room, one shot at a time. As we worked our way around the island, Mike and his team came up from the right. Both sketchers were both having the same issue, running off the page. This time we drew the long straw. After a brief conversation we realized we could both reach the same rock in the middle of the water. Score! Neither sketcher had to start a new page to pick up the connection. Without too much melting down and maybe just a little whimpering, we worked our way around and tied into Peter's station, so the room was almost defined. One more shot would close a loop in this room. Damn! The plot of the last shot ran right into my cross sections, 8.42 freakin' meters. So the whimpering escalated to a growl, but we got the shot completed and sketched.

Just as we were finishing and I was thinking I would like to do one very large cross-section in this room, Chad emerged from the water like the creature from the black lagoon. He had returned to lead us to the far end of the Far Cry. So I gave up the cross section (which I still think would be a very cool addition, Peter), and we followed Chad. He led us out to the end of the Far Cry, where we met the rest of the crew and saw for the first time the back entrance. We were high, dry, and hot—where did this come from? It was strikingly different from the water passage.

Ken Demarest helping Mauro Bordignon enter a sump in Chikin Ha in an attempt to connect to nearby Sistema Ixchel. The way was blocked by breakdown. *Peter Sprouse.*

The other teams were busy surveying, and Peter asked Larry, Nathan, and me to do a survey of the drip line. The drip-line was intermittent, alternating with walls, but as the sketch developed it was easy to see the beginning of a circular collapse. We surveyed along 62 meters of intermittent drip-line until we came to what appeared to be the end, right when the rest of the crew was ready to head back. While we were surveying the drip-line, another team had found going large, dry passage. So as we paddled back to camp, some of the discussion circled around the need for another cave camp.

At some points during the paddling I found myself next to Chad and his incredibly bright dive light. I was amazed to see the underwater cave world that I had missed on the way in. Chad lit up some columns that he reported extended 30 feet

The Río Lara Ha in Jaguar Claw. *Mike Futrell.*

Alice Jaworski and Mike and Andrea Futrell in the camp in Jaguar Claw. A large copy of the cave map is spread out on the table rock. *Peter Sprouse.*

underwater. He also lit up an area of underwater formations that gave me the feeling I was looking down on a city of skyscrapers. Peter and I began to imagine ways to attach dive lights to our tubes so we could see more as we floated. Personally I think toe socks with waterproof LED lights in the toes is the way to go, as my feet were always dangling in the water.

Back at camp, we hung out in our underwear again, made dinner, and looked at our survey notes. As we ate and discussed the next day's objectives, we were entertained by dinner music and Alice, who was juggling light balls.

Order of the day on Wednesday was to get up, have coffee (because functioning without coffee is not an option), pack up, then survey some clean-up sections near the camp before we hiked out. Our team had gotten a little smaller, as some choose not to survey. Today it would just be Nathan and I as one team. Peter dropped us off at a little side lead he and Nathan had worked on Monday. It was nicely decorated and mostly out of the water, but ended quickly. Peter had suggested a second objective, but I had trouble locating it and did not seem to have the correct line-plot in my tablet. So Nathan and I headed back to the edge of the water, deflated our raft,s and went back to camp to consult the paper map. We found the survey on the paper map, but then had trouble locating it from there. We found the station number before the one we were looking for and wall that had no other survey markers, so we began to fill in the wall, hoping this was a necessary survey. It ended up not being the section Peter had pointed out, but he was forgiving and just said, "It all adds to the information of the cave."

We regrouped back at camp to make our exit hike with no knees to the ground. By the way, my two-child tent was perfect, and I highly recommend it for a cheap way to cave-camp.

After Thursday's breakfast at the taco stand, the group was headed to Aktun Chen, another tour cave in need of a good map. I would not be fooled again, and I packed beer. Five teams of two headed into the cave, Bern and Sandy Szukalski, Howard and Pam, Carol Vesely and Bob Richards, Juan Ortegon and Peter, and Nathan, and I. This cave was the first really dry cave of the trip and had multiple passages heading out of the entrance room. Each team took a different direction and began working. It really wasn't until we were done for the day and finished walking through the cave that any of us seemed to realize how extensive the cave really was; it just did not impress you as a large system when you entered it. We all agreed this was going to take a lot more work.

Burn, Sandy, Chad, Dennis, and Carol returned to Aktun Chen on Friday to continue the survey. Howard, Pam, and I kidnapped Bob and went snorkeling for the day at Yal-kul.

On Saturday, others continued to cave and survey, but the Cincinnati crew was beginning the transition back to the bump and grind of our other lives. Howard and Pam flew out Saturday; my flight was not until Sunday morning. I opted to spend Saturday at an all-inclusive resort near the airport. I spent the day drinking and swimming, trying not to think about returning to the cold of Ohio. The crowds and chaos were somewhat of a shock to the system. I much prefer the quiet beauty of the caves.

The March-April 2016 expedition surveyed a total of 11097 meters. As of now, I remember all my mental notes, but when I get there next year it will probably take a week to relearn them all. By the end of the week I'll have beer at the exit to the cave. Until next time . . . .

Cueveando en Quintana Roo:
La Perspectiva de una Cuevera

La autora describe sus experiencias durante un proyecto de exploración de cuevas no sumergidas en Quintana Roo en marzo de 2016. Se exploraron secciones en Chikin Ha, que es operada como un atractivo turístico. Se estableció un campamento subterráneo en el Sistema Garra de Jaguar, lo cual resultó en la topografía de pasajes semi sumergidos. Al grupo también exploró en Aktun Chen, otra cueva turística. Se topografiaron más de 11 kilómetros de cuevas en esta expedición.

RIGGING SÓTANO DE SAN AGUSTÍN

Text and photographs by Stephen Eginoire

My dream of traveling in one day from my place in Tucson all the way to the expedition field house deep in the mountains of Oaxaca in a take-no-prisoners single-day push quickly faded upon my arrival in Mexico City. The dream had been simple enough: wake up, take the early shuttle to Phoenix, hop on a three-hour flight to Mexico City, and catch the Estrella Roja, a twelve-hour bus ride to Huautla de Jiménez. From there a thirty-minute taxi ride would deposit me in San Agustín, a tiny Mazatec village conveniently perched above an entrance to one of the world's deepest caves.

But after dragging a hundred pounds of caving, camera, and expedition gear up flights of stairs and along broken sidewalks to the wrong bus station, I knew I was shut down. It doesn't help that I know about twenty words of Spanish, most of which are nouns. In my eyes, the Western Hemisphere's largest metropolis is much more frightening than the Western Hemisphere's deepest cave, and I likely would have spent a harrowing night scrambling around Mexico City had expedition-mate Steph Davlantes not shown up at the airport to take the reins. She speaks Spanish quite well and was traveling lightly enough to help me carry my duffel, laughing directly into my face when I told her about my one-day push to Huautla. How ridiculous.

Many hours later, we were southbound and well on our way to the mountains. We pulled onto the charming cobblestone streets of Tehuacán late that evening, and, as luck would have it, expedition leader Bill Steele and his convoy of fully-loaded rigs heading down from Texas were laying over there. They had booked a few rooms at an amusing Bavarian-inspired hotel and gladly let us crash on their floor, offering us a lift for the rest of the trip to Huautla.

There is no shortage of natural wonders to explore in southern Mexico. Take Pico de Orizaba for example, a dormant volcano, home to nine glaciers, barging through the troposphere to an elevation of 5,636 meters above sea level. The high-elevation summit of Orizaba is only a hundred kilometers from the marine sanctuaries located along the Gulf Coast. The life zones represented on this mass of vertical relief are found few other places on earth.

A day's drive to the south of Orizaba is a substantial area of 100-million-year-old Cretaceous limestone that has been uplifted, creating a dense area of mountainous karst, particularly in a region known as the Huautla Plateau. The steeply pitched highlands of the plateau are shrouded in cloud and rain forests, and where the vegetation has been clear-cut small villages cling to the hillsides.

Seasonal rains, low cloud cover, and 100-percent humidity fuel the tremendous biodiversity of these forests, and one need not look farther than a single large cypress tree to witness the astonishing symbiosis between flora and fauna. Branches draped in hanging gardens of moss, vines, and bromeliads grow above the forest floor, where exposed roots grab onto bare limestone like a giant squid might a ship at sea. Hummingbirds, warblers, and towhees flicker about the canopy; vertical streams of ants move en masse up and down the trunk. Vipers, tarantulas, and scorpions hunt for prey in the detritus of fallen leaves where the fruiting bodies of psychedelic mushrooms sprout from the decay. In this place, *forest* is more a verb than a noun, and it's not a stretch to imagine that if one were to lie down in the same place, his body would be swallowed up in a matter of hours.

It is the decomposition of this organic matter, along with the persistent moisture of the rainy season, that fuel the production of carbonic acid, which dissolves dense limestone as if it were made of salt—though on a much slower timescale. Combine

Really?

From the author's blog at http://www.stepheneginoire.com/blog/.
seginoire@gmail.com

a few million years of these processes, and you have entire rivers that disappear into the earth, massive sinkholes that yawn perpetual darkness, and entrances to caves just about everywhere you look. With thousands of feet of steep vertical relief spanning miles, this region has yielded some of the deepest cave systems on earth. In fact, it's hard to imagine a more impressive example of a karst landscape on this continent.

One particular cave system that exists beneath this jungle still remains a primary focus of investigation. Sistema Huautla, totaling some 71 kilometers of passage and pushed to a depth of 1554 meters, is the eighth deepest cave in the world, one of only a handful of caves known to reach a depth of over 5,000 feet. Twenty entrances are scattered at various elevations, and their caves converge into a "main drain" deep inside the earth. Sistema Huautla has been the scene of some of the most storied adventures in the history of modern-day cave exploration. A trip into this underground abyss might include intricately sculpted gorges lined with waterfalls, long swims across deep pools of turquoise water, scuba diving through submerged passages, vertical shafts as tall as skyscrapers, stadium-sized chambers, and weeks at a time underground.

Arriving at the very beginning of a six-week expedition has many perks worth mentioning, but having your pick of prime real estate in the bunkhouse within arms length of an electrical outlet and being the first team to set foot that year in an expansive subterranean wilderness are at the top. I have a hard time with crowds, especially ones where many strong egos are involved, not that I don't have one of my own. But partnering up with just teammates Corey Hackley, Steph Davlantes, and, a few days later, Mathew Garrett as a small team to rig some 800 meters of rope into the bowels of Sistema Huautla is one of the most memorable experiences I've had on an expedition, breaking trail into the ceaseless absence of daylight, just four tiny little humans deep inside a truly massive cave system.

One of the primary objectives of the Proyecto Espeleológico Sistema Huautla expedition for 2015 was to re-establish Camp 3 as a launch pad for a team of cave divers to explore Redball Canyon, the entrance to which is situated over 700 meters down in Sótano de San Agustín, the nearest entrance. It is a relatively complicated area, a network of beautifully sculpted passages that twist and meander, until the water pours out from it below Camp 3. Upstream progress in Redball Canyon was blocked by a sump, so scuba diving through a section of flooded narrows was the only way forward. [See "Diving Redball Canyon" in *AMCS Activities Newsletter* 38.]

Redball Canyon is significant in that the cave Li Nita—*little lamp* in the Mazatec language—had been connected to Sótano de San Agustín in the same area to create the first thousand-meter-deep cave outside of Europe. If a scuba team could push upstream in Redball Canyon

Matthew Garrett in the Lower Gorge.

beyond the sump, then perhaps passages of similar depth exist above. It is a counter-intuitive way to think about cave exploration, moving up from below, instead of moving down from above.

Heading deep into the earth for an extended period of time requires a considerable amount of planning and strategy. The process of packing is time consuming, a test of patience that usually breaks at least one individual in the process. There's nothing quite like observing a hardened cave explorer lose his cool over one too many PowerBars in the food pile. Fortunately for us, packing and preparation went smoothly, and we set off without a hitch, armed with a thousand feet of static rope, enough to rig the first segment of Sótano de San Agustín, a section known as the Fools Day Extension.

The Fools Day Extension is characterized by twenty-three or so relatively short drops descending in a long, winding staircase of plunge-pools—quite entertaining on the way in, not so much on the way out. Fools Day starts at the bottom of a steep breakdown slope where a couple of large boulders rest against the wall. Beneath the boulders is a small constriction through which howls gale-force wind, either inhaling or exhaling as the cave system attempts to equalize with the barometric pressure on the surface. Beyond, the passage eventually intersects a fault, where the route goes almost entirely vertical for over 300 meters. The shafts, a veritable drainpipe, pour into the inner workings of Sistema Huautla like someone running a garden hose over the edge of the Empire State Building. Known as the Bowl Hole Series, it is an absolutely committing section of cave to navigate,

humbling even to the most expert caver, a world-class vertical descent.

With our ropes fixed down to a point where a whirlpool of darkness continued swirling down the Bowl Hole, after ample pause to absorb the beautiful harmonics of falling water echoing into oblivion the three of us retreated back to the surface for sleep, more rope, and enough supplies to grant us a five-day stay underground.

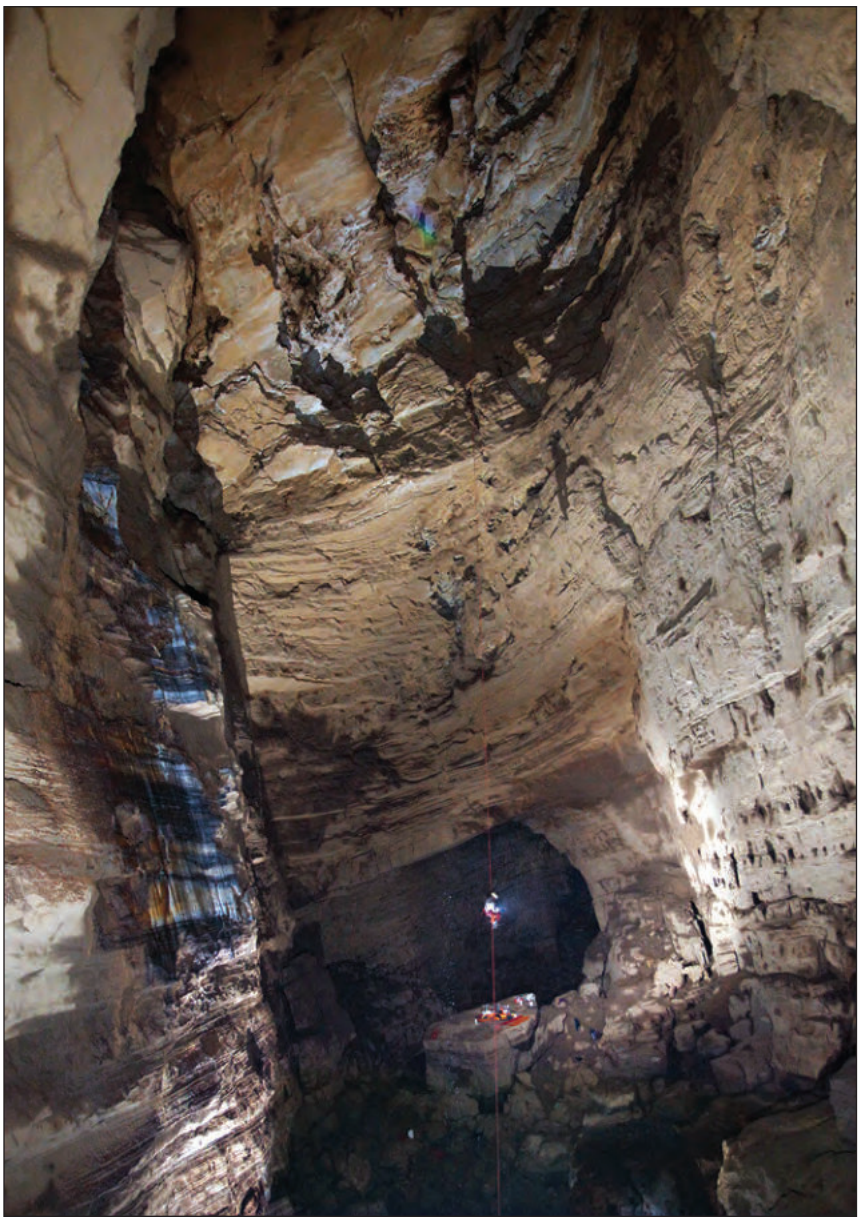
By 1 a.m. the following evening, we had steadily progressed down the vertical shafts of the Bowl Hole Series to a point just above the last drop. We were cold, wet, tired, and ready to escape the chasm. The three of us huddled at the top of the last big drop, just 80 meters above an enormous room with enough flat, dry ground to accommodate a luxurious camp, staring blankly at a few remaining waterlogged coils of rope in the bottom of our pack. We had maybe 30 meters left. "Fuck," was all we could say.

A few bags of equipment, along with ample amounts of additional rope, had been left hanging off a bolt 200 vertical meters above us, as was my camera equipment, so I wasn't able to capture our first underground camp. Once we settled into the small, wet, sloping sandbar on the far side of a muddy pool, just out of reach of the splashing water, it wasn't all that bad. But if you've ever taken a morning crap next to your partner, while hanging in a port-a-ledge midway up a big-wall climb, then you can relate to the intimacy of our surroundings.

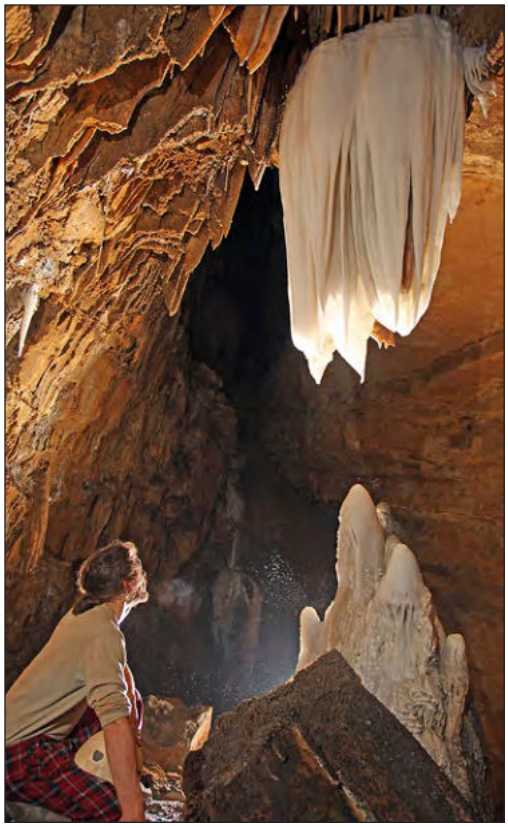
There really aren't any mornings underground, but hot coffee and dehydrated oatmeal set an encouraging tone the following day and restored a waning motivation to retrieve the rest of our gear that hung at the top of the Bowl Hole Series. Corey surprised us when he discovered an old rope from a previous expedition, coiled and stashed some 60 meters above us. As Steph and I continued up the seemingly endless climbs, passing countless rebelays, Corey set to work rigging the final length of rope that would free us from the Bowl Holes.

By the time our feet landed on the ground, we had spent something like twenty hours in the vertical drainpipes of the Fools Day Extension, and we were exuberant upon reaching the mostly horizontal mega-borehole leading into the main routes of San Agustín proper, over 600 meters deep. After setting up our second camp atop a spacious boulder, we were joined by Matthew Garret, who came in solo, another strong back to help us schlep the rest of our gear through the Upper Gorge, the last remaining obstacle between us and Camp 3.

The Upper Gorge of Sótano de San Agustín is incredible, an area defined by eons of flash flooding. Intricately sculpted and as polished as a marble countertop, it is the main conduit of the entire cave system, and the turquoise water that flows within spills over countless waterfalls into bottomless potholes, creating a perpetual reverberation of white noise. Deep water is unavoidable for anyone heading downstream, and full-on swimming is mandatory. If one were to become hypothermic, this is where it would likely happen. Your best tool against the cold is to generate body heat by moving quickly, but when you are rigging, things happen at a slower pace. Already shivering, Matt stood in the



Matthew Garrett near the bottom of the Space Drop. The flat rock is a convenient bivouac spot.



Corey Hackley views draperies.

spray of a waterfall, staring blankly into a deep pool. "My boot got sucked off," he said. "Uh, say what?" "My boot got sucked off, but I think I see it," and with that he performed a head-first duck-dive, a rubber Wellington boot on one foot, a neoprene sock on the other, emerging after a few seconds with his lost item.

True to form we nearly ran out of rope again, leaving the Upper Gorge with about an arm's-length left. It had taken us three days and around 750 meters of nylon to reach this point. Deep beneath the mountains of Oaxaca, it was time to savor our position. Our final destination, Camp 3, sits high and dry in the lower of two gigantic interconnected chambers. The higher chamber, Anthodite Hall, is as big as a football stadium, its far walls decorated with spectacular anthodite formations that can only be described as crystal fireworks. For the next thirty-six hours, we slept on the spacious soft-dirt floors in Camp 3, consuming the rest of our freeze-dried food, and exploring all we could before the next teams arrived with more supplies to stock Camp 3 for the push into Redball Canyon.

What was once far removed from anything human had been transformed into a veritable highway of nylon rope, with dozens of cavers moving duffel to and from various staging points along the route. Camp 3 bustled with loud voices, and folks busied themselves with various tasks. It was time to pass the torch and head back to the surface. In one long day we ascended the ropes we had so carefully rigged, admiring our work and noting areas where we could have done better. Arriving back at the surface well after dark offered a gentle emergence from the cave, as harsh daylight would have surely been a shock to our brains.

The following morning, the shapes of the jungle were more complicated than usual, the verdant hues more sharply defined. As I began the process of unpacking and cleaning my gear, I overheard our neighbors, a couple of Mazatec villagers, conversing in their native tongue. Their words, beautifully foreign to my ears, hinted at realms of discovery that exist above ground in much the same way as they do below.

Armando el Sótano de San Agustín

Durante la expedición 2015 del Proyecto Espeleológica Sistema Huautla el autor ayudó a armar el Sótano de San Agustín de la entrada al Campamento 3, usando unos 750 metros de cuerda.

PESH 2015 EXPEDITION

Bill Steele

The November 2015 issue of the *NSS News* was devoted to the 2015 expedition of the Proyecto Espeleológico Sistema Huautla. The text that follows is revised from the introduction and conclusions by project co-director Bill Steele. The articles on biology and archaeology in this issue are reprinted from that *NSS News*. Among the other articles in that issue are ones on the exploration of Redball Canyon in the Sótano de San Agustín part of the system and the explorations of the Mexiguilla and Super Awesome Die-in-a-Flood passages in the La Grieta section. Maps in this AMCS article are revised from ones in the *NSS News*. Articles in this issue of the *Activities Newsletter* by Stephen Eginoire and Adam Byrd are new, as is the article by Bill Steele on the display installed in the town of Huautla. Photographs have been selected from among a very large number of excellent photos. Last year's *Activities Newsletter*, number 38, contained a PESH 2015 article on diving Redball Canyon by Liz Rogers and two articles on the first PESH expedition, in 2014.—the editor

Cavers from Texas first reached Huautla de Jiménez, Oaxaca, Mexico, in 1965. The entrances of Sótano de San Agustín and Sótano del Río Iglesia, at the bottom of large, twin dolines, were entered the following year. For fifty years expeditions to the caves in the area have happened in a majority of years.

Proyecto Espeleológico Sistema Huautla (PESH) was launched in 2014, with plans for ten years of annual expeditions. The objectives include the thorough exploration and mapping of the caves, producing quality maps, supporting Mexican scientists in their work in the caves, and the documentation of all work.

The PESH 2015 Expedition consisted of forty-seven speleologists and support people from five countries (USA, Mexico, United Kingdom, Australia, and Poland); six other nationalities could be listed if birth countries were included (Peru, Switzerland, Germany, Romania, Austria, and Israel). It truly had an international feel.

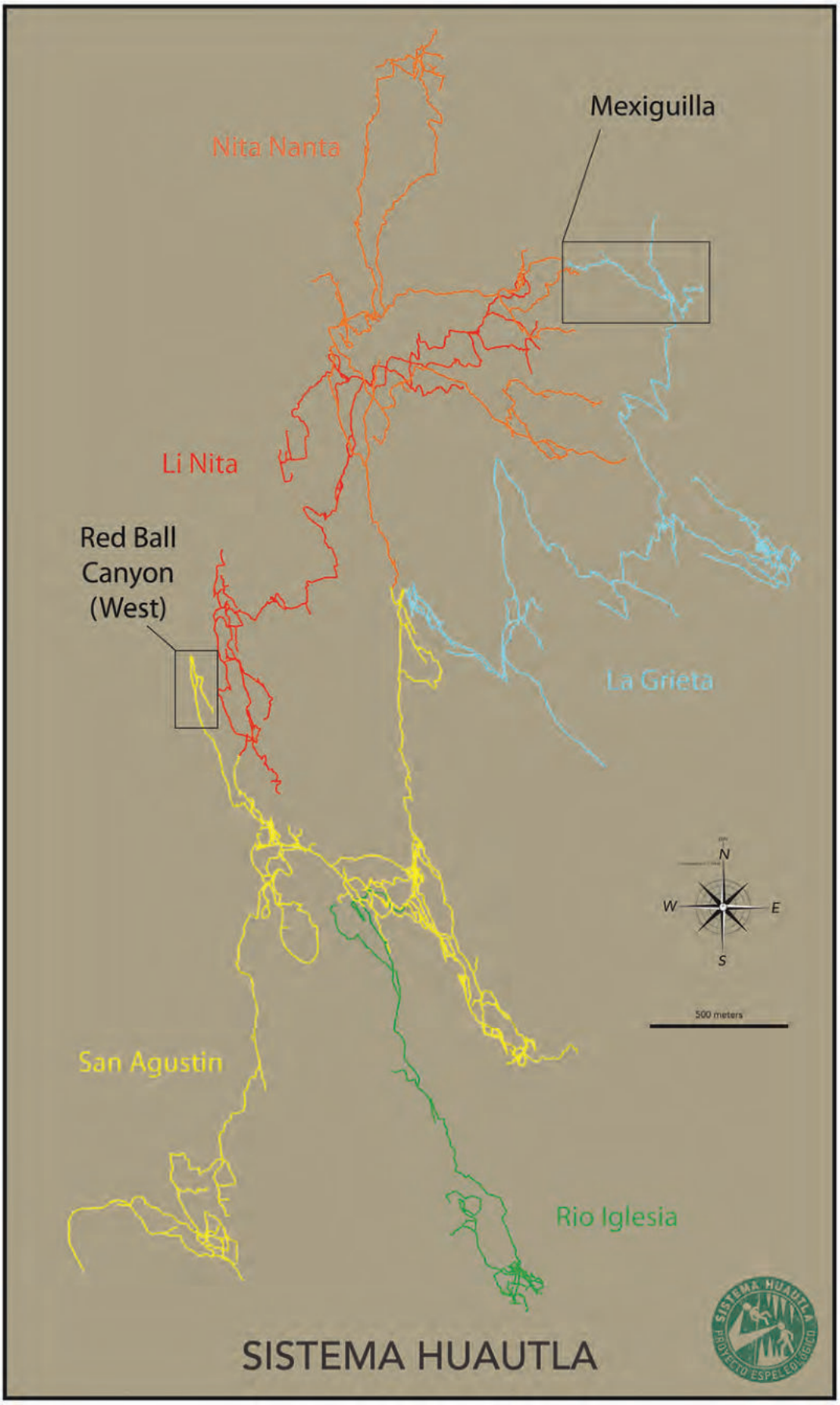
For 2015 there was a long list of objectives. Chief among them was to rig the Sótano de San Agustín section of Sistema Huautla to –700 meters and use Camp 3 as a base to explore an upstream sump in Redball Canyon, discovered in 1979 and not seen since. Also there was the La Grieta section of Sistema Huautla, where a significant breakthrough occurred in 2014, with the plan for this year being to prepare the route to a proposed Camp 3 to be established in 2016, getting it set up for heavy loads to be transported, and to explore and map various leads in the cave.

Other objectives for 2015 included bolt climbs in two caves on the flanks of the sinkhole valley to the southeast of the village of San Agustín Zaragoza with hopes of opening a new section of Sistema Huautla, installing a quality display in the government building in Huautla as a long-term attempt at enlightening the locals about our project and to show what we have found in the caves, taking of the best photographs ever by several top-notch cave photographers, and addressing diplomatic relations with outlying communities where there are known cave entrances that would probably connect with Sistema Huautla.

The PESH 2015 Expedition was a success. All of its objectives were met. Diplomatic relations with the locals progressed. Biologists from the Universidad Nacional Autónoma de México, the largest and most prestigious university in Mexico, and

Andreas Klocker on highly sculptured rock in the Metro, Sótano de San Agustín. *Matt Tomlinson.*

speleosteele@aol.com


Mexiguilla
Nita Nanta
Li Nita
Red Ball
Canyon
(West)
La Grieta
N
W
E
S
500 meters
San Agustin
Rio Iglesia
SISTEMA HUAUTLA

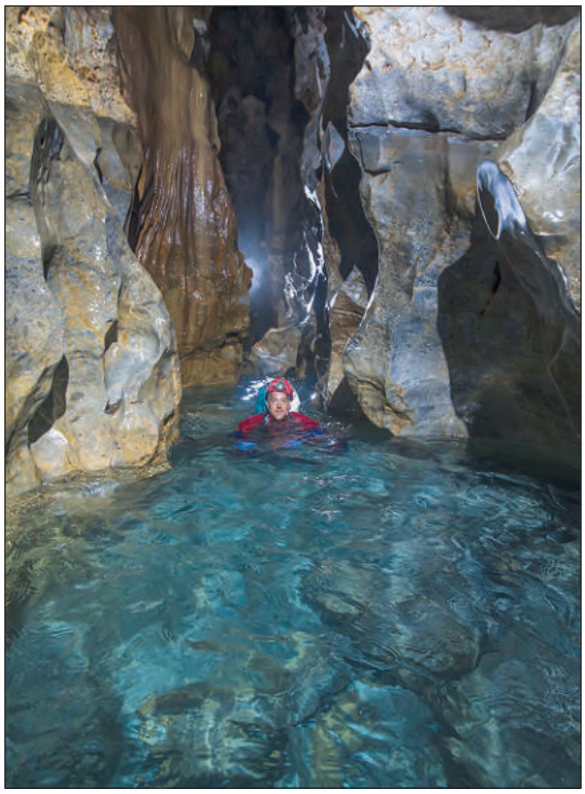
Ernie Garza hikes a local trail through the karst. *Dave Bunnell.*

Yvonne Droms in Sótano de San Agustín. *Dave Bunnell.*

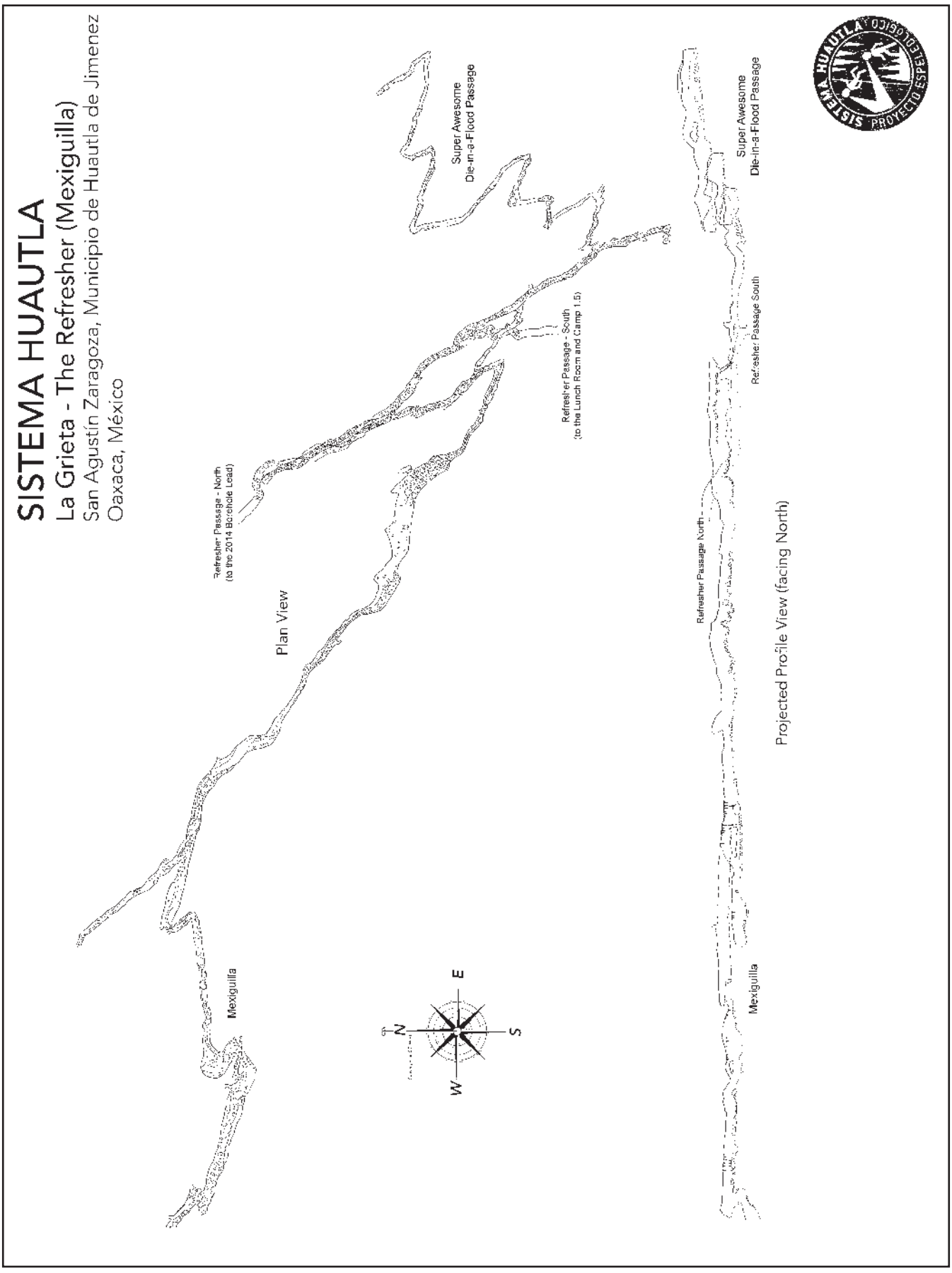
Anthodite Hall in Sótano de San Agustín. *Chris Higgins.*

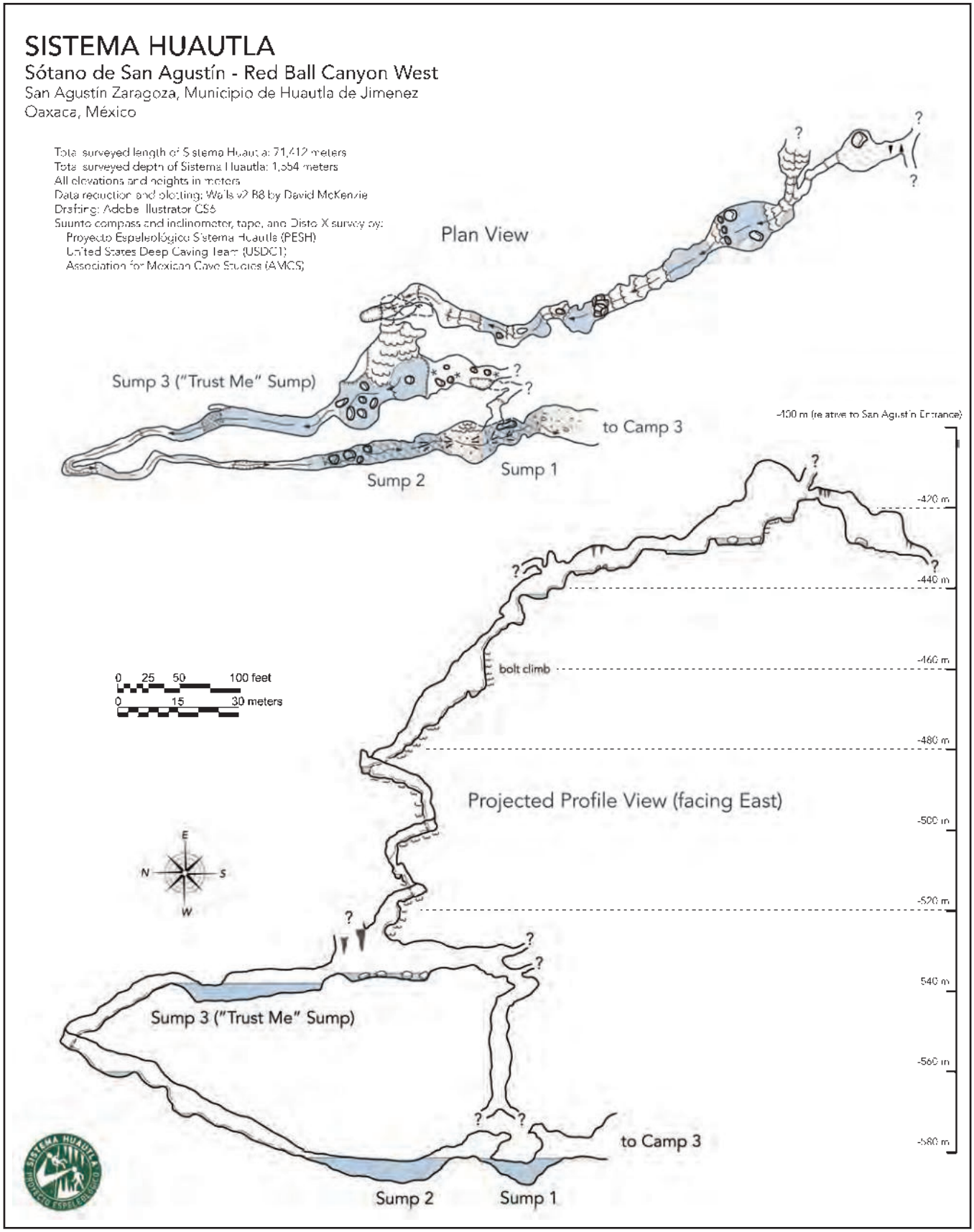
Formations just inside the entrance to Sótano de San Agustín. *Dave Bunnell.*

Andreas Klocker in deep water. *Chris Higgins.*

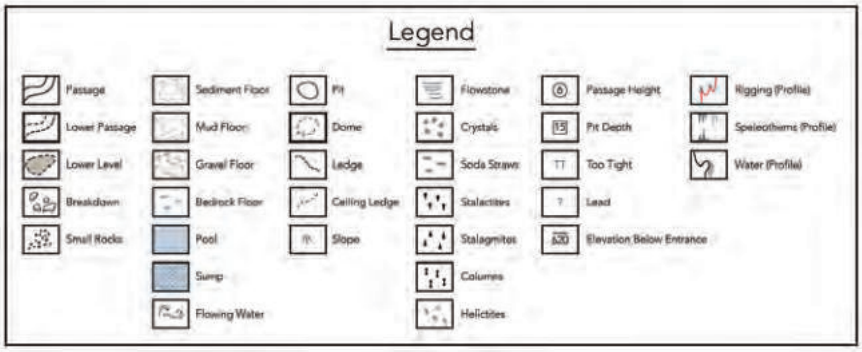


Jean Krejca goes for it in La Grieta. *Kasia Biernacka.*


SISTEMA HUAUTLA
La Grieta - The Refresher (Mexiguilla)
San Agustín Zaragoza, Municipio de Huautla de Jimenez
Oaxaca, México
Plan View
Refresher Passage - North
(to the 2014 Borehole Lead)
Refresher Passage - South
(to the Lunch Room and Camp 1.5)
Super Awesome
Die-in-a-Flood Passage
Mexiguilla
N
E
S
W
Projected Profile View (facing North)
Refresher Passage North
Refresher Passage South
Super Awesome
Die-in-a-Flood Passage
Mexiguilla
SISTEMA HUAUTLA
PROYECTO ESPELEOLOGICO


SISTEMA HUAUTLA
Sótano de San Agustín - Red Ball Canyon West
San Agustín Zaragoza, Municipio de Huautla de Jimenez
Oaxaca, México
Total surveyed length of Sistema Huautla: 71,412 meters
Total surveyed depth of Sistema Huautla: 1,554 meters
All elevations and heights in meters
Data reduction and plotting: Walls v2 B8 by David McKenzie
Drafting: Adobe Illustrator CS6
Suunto compass and inclinometer, tape, and Disto X survey by:
Proyecto Espeleológico Sistema Huautla (PESH)
United States Deep Caving Team (USDCT)
Association for Mexican Cave Studies (AMCS)
Plan View
Sump 3 ("Trust Me" Sump)
to Camp 3
Sump 2
Sump 1
0 25 50 100 feet
0 15 30 meters
-100 m (relative to San Agustín Entrance)
-420 m
-440 m
-460 m
bolt climb
-480 m
Projected Profile View (facing East)
-500 m
-520 m
E
N
S
W
540 m
Sump 3 ("Trust Me" Sump)
-560 m
to Camp 3
-580 m
Sump 2
Sump 1

The nice maps of Redball Canyon in the Sótano de San Agustín part of Sistema Huautla and the Mexiguilla/Die-in-a-Flood area of the La Grieta part were drafted by Derek Bristol. The originals are very large, and the maps have been revised somewhat for legibility at the size they are printed here. The enlarged legend below applies to both maps, although the La Grieta map is printed in black-and-white for clearest reproduction of the fine detail.



A different angle on the signature formations in Anthodite Hall, Sótano de San Agustín. *Kasia Biernacka.*

a paleontologist from the Instituto Nacional de Antropología e Historia, an important government agency, participated and were very pleased with their results. They look forward to returning in 2016.

Importantly, there were no injuries. This sort of original cave exploration has inherent dangers from floods if it rains and unstable rocks when traversing passages never before entered. There was a flood of Sótano de San Agustín while cavers were in it, but they made it out without difficulty.

When planning an expedition such as this one, objectives are stated beforehand and pursued, but what is really in the back of your mind is the hope that there will be a breakthrough, the discovery of something unexpected, something that thrills the participants and keeps the energy level high. Two years in a row, this has occurred. The discovery of Mexiguilla is exciting. Next year will see the exploration, mapping, and photography of it. PESH is two years into a ten-year plan, with good momentum.

At the end of PESH 2015 Sistema Huautla is the deepest cave in the Western Hemisphere, the eighth-deepest cave in the world, and the longest of the sixteen deepest caves in the world, over 71 kilometers long, 1,554 meters deep, and with twenty entrances. There are many other caves within the Sistema Huautla karst drainage basin that have been explored and mapped but have not yet been integrated into the overall cave system.

PESH had support from the US Deep Caving Team and NSS international exploration grants. Its web site is www.peshcaving.org. It sincerely thanks the additional sponsors

Climb Tech
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Expedición PESH 2015

Una breve resumen de la expedición 2015 del Proyecto Espeleológico Sistema Huautla. Los descubrimientos principales en las cuevas fueron el pasaje más allá de los sifones en Redball Canyon en la sección de San Agustín y otros pasajes, incluyendo Mexiguilla, partiendo de la extensión del pasaje Refresher que fue descubierto el año anterior en la sección La Grieta del sistema. Adicionalmente, biólogos y paleontólogos mexicanos hicieron descubrimientos importantes y se les informó a los habitantes locales sobre la cueva y su contenido.

THE HUAUTLA DISPLAY

Bill Steele

At the beginning of the 2015 Proyecto Espeleológico Sistema Huautla (PESH) expedition, a quality display was installed in the lobby of the government building in the town of Huautla. I wrote the first draft of the text and selected the photos. The other members of our design team were Frank Binney, a former Huautla caver who creates displays professionally for national-park visitor centers, Steph Davlantes, a current PESH caver who is a talented graphic designer, and Diana Xochitl Munn, who works in museums at Harvard University and is the daughter of a Mazatec woman from Huautla. Diana did the final edit of the Spanish text in the display.

Thirty-five years ago our Huautla expedition was named the 1981 Agua de Cerro Expedition. We hoped to explore caves in that remote village, but could not obtain permission to enter them. We have driven the rough roads in the area of Agua de Cerro, which is at the upper end of the karst drainage basin, and have seen very promising cave entrances. Through the years we have tried to get permission to go caving in the area, but it has always been denied. At the present time [October 2015] the explored and surveyed depth of Sistema Huautla is 1554 meters, making it the deepest cave in the Western Hemisphere and the eighth-deepest known cave in the world. If the total potential depth could be realized, from an entrance on a ridgetop in the Agua de Cerro area, the depth would be as much as 1830 meters, tying the depth of the second-deepest known cave in the world.

Speleosteele@aol.com

Project co-director Tommy Shifflett inspects the finished installation. *Dave Bunnell.*

During a 2014 meeting with village leaders in Agua de Cerro some challenging questions were asked. "Say we let you go in the caves and it upsets the cave spirits and our kids get sick, or our corn doesn't grow well, what about that?" Our friend Jaime Escudero from the village of San Agustín Zaragoza was with us. Caving has been based in his village for forty-nine years, and he is a Mazatec. I asked him to tell the man his experience with us. He said that San Agustín kids have not gotten sick and their corn grows just fine. After answering several such questions and explaining why we explore and study caves, we were told that they would hold a community meeting and give us an answer the next week. The answer was no. That's been the consistent story through the decades.

The display is a public-relations outreach to the people of the Sierra Mazateca to educate them about their caves and the work cavers have done in the fifty years since first arriving in the area. The concept was suggested by a senior Huautla government staff member following the meeting in Agua de Cerro, where he had translated for us from Mazatec to Spanish and back. The display is mounted on a wall in the municipal building in Huautla, and we are told that it is constantly viewed.

Other things are being done to gain access to the caves in the upper end of the Sistema Huautla drainage basin, including giving presentations in school. In 2016, at the advice of Mazatec friends who want us to succeed, we may consult with a *curandero* and ask that a blessing ceremony be conducted on our behalf, asking the cave spirits to not be upset about our entering the caves. Meanwhile, Sistema Huautla is being explored upslope to the north, in the direction of Agua de Cerro, deep inside the mountains. One way or the other, in time we hope to realize the full potential of this world-class cave.

La Exhibición de Huautla

En 2015 el Proyecto Espeleológico Sistema Huautla instaló una exhibición en el edificio de gobierno de la ciudad de Huautla. Esto es parte de los esfuerzos para educar a la población local sobre la cueva y las actividades de los exploradores.

Las Mundialmente Famosas Cuevas de Huautla de Jiménez

Ocultas debajo del terreno rocoso de la Sierra Mazateca existen algunas de las cuevas más profundas y bellas del mundo. Estas maravillas naturales únicas—conocidas como el Sistema Huautla—atraen a espeleólogos e investigadores de todo el mundo, quienes las exploran para estudiar y catalogar los ríos subterráneos, pasillos, pozos, y grutas que en ellas se encuentran. El conocimiento obtenido de estas exploraciones tiene potencial para beneficiar económicamente a las comunidades locales.

Jaime Escudero Rodríguez, agente de San Agustín Zaragoza, y su hijo, Virgilio Escudero García, exploran el Sótano del Río Iglesia.

Desde que el Sistema Huautla fue descubierto en la década de 1960, los espeleólogos han explorado más de 64 kilómetros de grutas y túneles subterráneos utilizando técnicas y equipo especializado para escalar, rapelar y bucear. Hasta la fecha, han descendido a una profundidad de casi 1,600 metros.

Dirección: Bill Steele y Frank Binney
Diseño: Steph Davlantes © 2015
Fotos: Chris Jewell y Elliott Stahl
Consultoría: Xochitl Munn Estrada

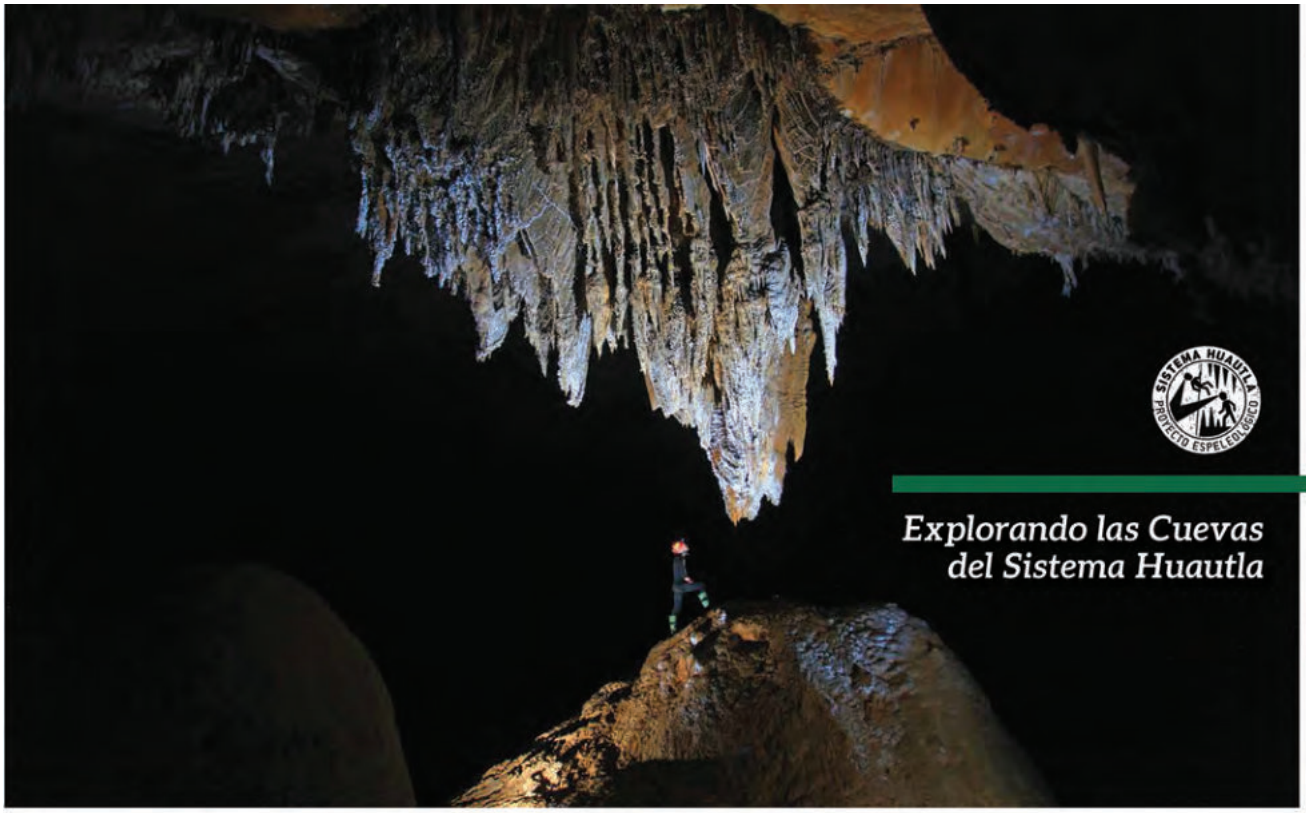


Foto: Stephen Eginoire | Dirección: Bill Steele y Frank Binney • Diseño: Steph Davlantes • Consultoría: Xochitl Munn Estrada • © 2015 PESH

Foto: Elliott Stahl | La Galería Antodita, ubicada a 600 metros debajo de San Agustín Zaragoza, es la cámara subterránea más grande del Sistema Huautla y una de las mas grandes del mundo. En ella podría caber el Estadio Azteca del Distrito Federal.

Fotos:
izquierda–Jim Smith
derecha arriba–Bill Steele
derecha abajo–Steph Davlantes

Los espeleólogos que visitan la Sierra Mazateca también disfrutan el interactuar con las comunidades locales y el aprender sobre la rica cultura mazateca.

Foto: Kasia Biernacka

Este espeleólogo utiliza una cuerda especial de gran resistencia para bajar a un sótano en donde buscará nuevas entradas al Sistema Huautla.

Foto: Kasia Biernacka | En el 2014, este equipo de espeleólogos descubrió una nueva área del Sistema Huautla decorada por hermosas estalactitas y estalagmitas. Su emoción es evidente.

Foto: Elliott Stahl | Dentro del Sistema Huautla existen pasajes profundos con cascadas de agua. Para poder explorar estas áreas de manera segura, los espeleólogos utilizan equipo profesional y técnicas de montañismo especializadas.

Foto: Elliott Stahl

En las cuevas se pueden encontrar muchas bellezas naturales, como estos frágiles cristales de calcita. Para no dañarlos, los exploradores se mueven con mucho cuidado.

Foto: Kasia Biernacka

Un científico mexicano de la Universidad Nacional Autónoma de México examina a un insecto descubierto dentro del Sistema Huautla. Son pocos los animales que pueden sobrevivir en el ambiente húmedo y oscuro de las cuevas.

Foto: Kasia Biernacka

Los espeleólogos utilizan instrumentos científicos para estudiar y trazar con precisión la profundidad, distancia y tamaño de los pasajes subterráneos del Sistema Huautla. En esta foto, la espeleóloga a la derecha utiliza un dispositivo para medir la distancia mientras que el otro espeleólogo registra los datos.

Foto: Elliott Stahl

Para explorar los lagos y ríos subterráneos del Sistema Huautla, los espeleólogos deben usar trajes de goma para mantener su temperatura ya que el agua es muy fría.

Foto: Chris Jewell

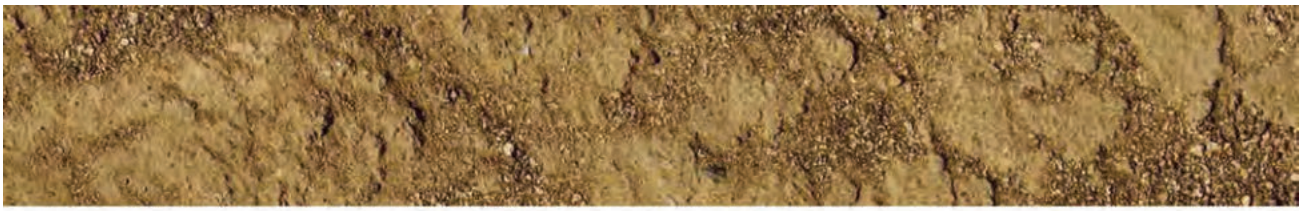
Estos espeleólogos han utilizado cuerdas para crear una plataforma segura en donde descansar y poder ponerse su equipo de buceo antes de explorar un cañón profundo.

Foto: Chris Jewell

Los espeleólogos mantienen campamentos en donde descansan y se alimentan. Aquí vemos a un equipo disfrutando de una comida después de un largo día de exploración.

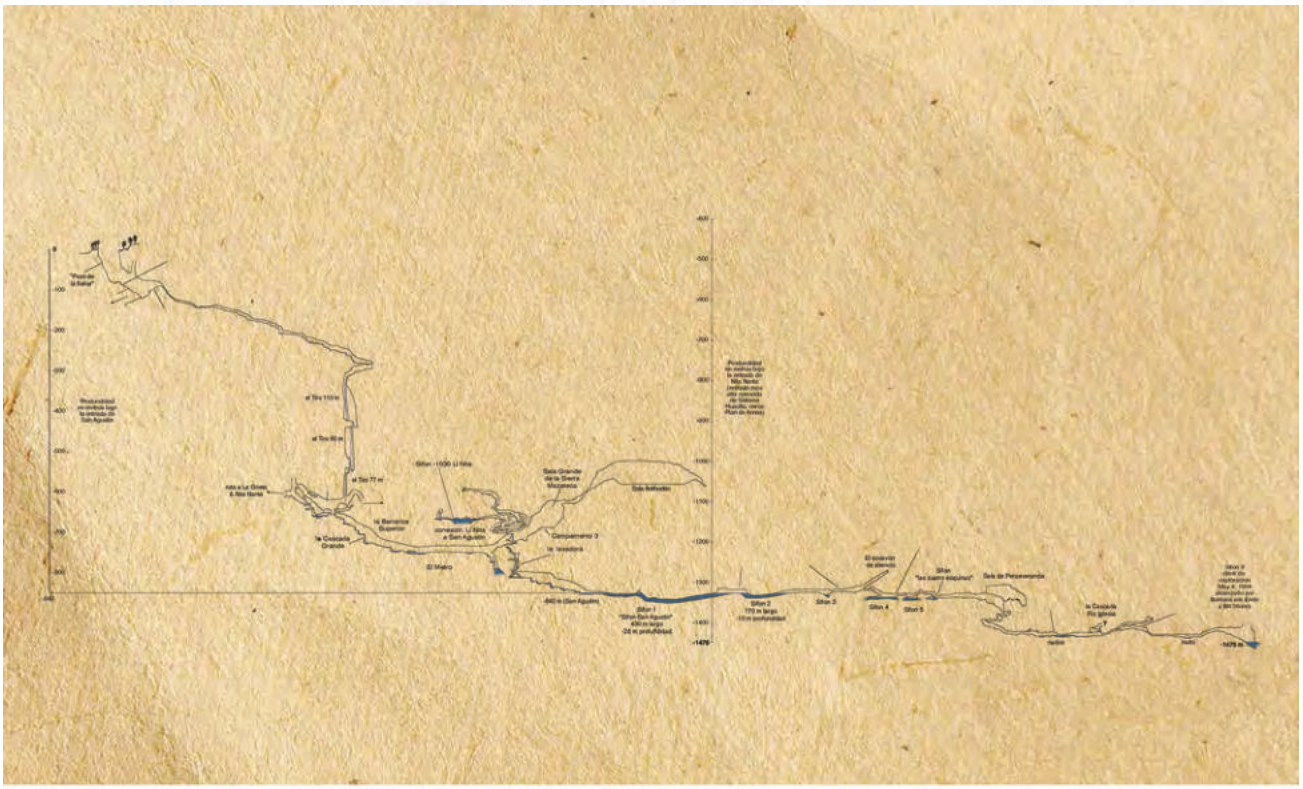
Foto: Chris Jewell | Equipo especializado de buceo es necesario para explorar los pasajes mas profundos del Sistema Huautla.

Foto: Kasia Biernacka | Los niños de San Agustín Zaragoza observan con gran interés a un equipo de espeleólogos que se preparan para regresar a sus países después de una ardua expedición.



Fotos: izquierda–Terry Raines derecha–Yvonne Droms

Las primeras exploraciones del Sistema Huautla se llevaron a cabo en la década de los 60s. La foto de la izquierda muestra a un equipo de exploradores en 1967 en San Andrés. Algunos de los exploradores de los años 70 aun regresan a la Sierra Mazateca para continuar explorando las cuevas, como se puede apreciar en la foto a la derecha.



Mapa: Equipo Estadounidense de Exploración de Cuevas Profundas (USDCT), Barbara am Ende y Bill Stone

Después de mas de treinta años de explorar el Sistema Huautla, y de elaborar mapas de sus varias rutas, los espeleólogos determinaron en 1994 que la profundidad del sistema—por la ruta del Sótano de San Agustín—era 1.475 metros. Nuevos descubrimientos realizados desde entonces han aumentado la profundidad del sistema a 1.545 metros. Su longitud es de más de 64 kilómetros.

BIOLOGICAL EXPLORATION DURING THE 2015 PROYECTO ESPELEOLÓGICO SISTEMA HUAUTLA EXPEDITION

Text and photos by Jean Krejca

As a cave biologist, just the thought of an eyeless tarantula or depigmented scorpion well within the deepest cave in the hemisphere sends tingles down my arms. These are totally different tingles than those of a non-caver thinking of spiders and scorpions in underground places.

The area of Sistema Huautla is known for at least nine described species of troglobites (Juberthie et al., 2015). While this list represents impressive collecting efforts by cavers dating back to the early days of exploration in the Sistema Huautla area, without a doubt it underrepresents the true biological diversity of caves in this region. During the 2015 Proyecto Espeleológico Sistema Huautla expedition, I had the fortune of working with Dr. Oscar Francke, Rodrigo Monjaraz, Jorge Mendoza, and Gerardo Contreras as they continue their work documenting the diversity of cave fauna, particularly arachnids, in the region.

My first collecting efforts in the area were in La Grieta, via the Hobbit Hole entrance. In the room below the historic La Grieta entrance the team of Steph Davlantes, Gilly Elor, Kasia Biernacka, Matt Tomlinson, James Brown and me paused on the way in to collect tarantulas and other spiders. Later during the five day camp from April 8–12 James and I collected a thysanuran, possibly *Anelpistina*, a *Stygnopsis* harvestman, and a small spider during a resurvey near Camp 1.5.

After getting out of the La Grieta camp, I was able to join on April 14 the team of cave biologists, together with Mark Minton and Yvonne Droms, in search of Cueva Inclinada. We first located a small cave at the downstream end of an area of construction that is soon to be a soccer field. Mark descended a short handline from a stone wall that was built to shore up fill in the bottom of the doline to make it level. After less than 50 meters, this cave ended where the mud floor came up to the downward-sloping ceiling. This cave to is in the correct location for Sótano del Agua, but if it is, the bottom of the cave is now filled in (Jameson and Mothes, 1982).

Next we proceeded to the other side of the construction site, over the lip of another doline, and down into the real entrance of Cueva Inclinada. Here we spent time rigging and dropping our team down the first two drops, collecting *Stygnopsis* harvestmen, and searching for other cave species.

After a lunch break in the hot shade, we drove to the Río Iglesia doline to locate and sample in

jean.krejca@gmail.com
Reprinted from *NSS News*, November 2015, pages 26–27.

From left: Gerardo Contreras in Cueva Inclinada. Rodrigo Monjaraz collecting *Stygnopsis* harvestman in Millipede Cave. Jorge Mendoza in Cueva Inclinada.

Clockwise from upper left: Troglobitic tarantula from Church Cave, *Hemirrhagus* sp. The large blue-green and yellow Rhachodesmid millipede in Millipede Cave. Oscar Franke collecting leaf-liter species on the surface near Millipede Cave. *Stygnopsis* harvestman, dipluran, and millipede from Skull Cave.

Described troglobites from the Huautla area

Group	Common name	Genus and species	Author
arachnid	scorpion	*Alacran tartarus*	Franke
arachnid	tailless whip scorpion	*Paraphrynus grubbsi*	Mullinex
arachnid	tarantula	*Hemirrhagus grieta*	(Gertsch)
millipede	flat-backed millipede (possible troglobite)	*Sphaeriodesmus grubbsi*	Shear
millipede	flat-backed millipede (possible troglobite)	*Sphaeriodesmus iglesia*	Shear
springtail	slender springtail	*Pseudosinella bonita*	Christiansen
springtail	slender springtail	*Pseudosinella huautla*	Christiansen
insect	silverfish	*Analpistina specusprofundi*	Espinasa and Vuong
insect	ground beetle	*Mexisphodrus urquijoi*	Hendrichs and Bolivar

Millipede Cave. This cave is named for the conspicuous blue-green-and-yellow millipedes in the entrance area (Polydesmida: Rhachodesmidae). Here we proceeded to the back, down a short climb best done with a handline, where we collected harvestmen and spiders, as well as two small pseudoscorpions, a new record for this cave. At the end of the back room is a breakdown pile that Mark dug at while the rest of us dodged rocks below. A small-person lead remains in this area. While most of us were in the cave, Oscar collected leaf litter species on the surface nearby.

My final collecting trip was to Skull Cave on April 16 with Victor Ursu, James Brown, Yvonne and Mark. Here, in addition to photography, Mark, Victor, and I removed some bedrock bridges blocking a small, wet crawlway with air. After a notable amount of effort I was able to squeeze past the last restriction, only to get to a slightly larger crawlway where ultimately the ceiling came down even farther; a a much greater bedrock-removal effort would be required to continue. We collected *Stygnopsis* harvestmen, millipedes, and a dipluran.

Thanks to Oscar Francke, James Reddell, Mark Minton, and Yvonne Droms for being inspirational biologists and cavers and for reviewing this article.

Jameson, R., and P. Mothes, 1982. Caves of the San Miguel Doline. *AMCS Activities Newsletter* 12, pp. 37–42.

Juberthie, C., J. Palacios-Vargas, and J. Reddell, 2015. Mexico. *Encyclopædia Biospeologia*, vol. IIa/*Mundos Subterraneos*, v. 25–26, 101 pp.

James Brown traversing in La Grieta.

Exploración Biológica Durante la Expedición 2015 del Proyecto Espeleológico Sistema Huautla

Nueve especies de animales que habitan en cuevas habían sido descritas con anterioridad en las cuevas del área de Huautla, Oaxaca. El autor ayudó a Oscar Franke y otros biólogos de la UNAM en la colecta de especies en la zona del proyecto del PESH en 2015. Las cuevas visitadas incluyeron La Grieta, Cueva Inclinada, Church Cave, Millipede Cave y Skull Cave.

PALEONTOLOGY STUDIES DURING THE 2015 PROYECTO ESPELEOLÓGICO SISTEMA HUAUTLA EXPEDITION

Iván Alarcón-D. and Joaquín Arroyo-Cabrales

Speleological work in Sistema Huautla and vicinity has been ongoing for the past forty-eight years, achieving important landmarks, including the finding and collecting of living species previously unknown to science (Steele and Smith, 2012). But evidence of past biodiversity had been seen over the years both inside and outside of the caves, so the area awaited paleontological study.

Ten orders, twenty-one families, thirty-five genera, and thirty-nine valid species of Pleistocene mammals have been recorded in the state of Oaxaca (Pérez-Crespo et al. 2008). Most of this information has been obtained from archaeological surveys or other excavations of surface deposits, and few caves have been surveyed for paleontological findings. Generally cave bones are very fragile and found several meters deep, which makes them difficult to collect. Also, small or medium-size bones have not been the paleontological collectors' focus in the past, and many such bone fragments do not have the diagnostic characteristics needed for precise identification of species (Arroyo-Cabrales and Polaco, 2003).

Among those known to the PESH, there are at least two caves where bone remains of possible fossil mammals have been found. Beyond the trashy entrance area in Cueva Venado (Deer Cave, Figure 1), which we visited in April 2015, in the last chamber there is a hole and fissure where there is an almost complete skeleton of a large juvenile deer (Figure 2). We know that this animal was a young one because the long-bone ephysises, the bone ends, are not fused to the diaphyses yet. Close to the end of the cave there were bones from another individual that may have been transported there by water movement in the past (Figure 3). Almost 1 kilogram of loose sediment was taken from the cave into the lab to search for bones of small vertebrates like rodents, birds, and reptiles.

Cueva Basura is more complex than the Cueva Venado and certainly requires better speleological techniques. In one of the chambers, near the middle of the cave, were found several ribs of an animal the size of a horse or cow—probably a cow judging by their morphology. Unfortunately these are below a large boulder that may weigh over 100 kilograms, evidence of roof fall after their deposition. This prevented their removal, and since ribs require detailed study for precise taxonomic identification because they do not have many diagnostic characteristics, we prefer not to assign those to any taxon at this point (Figure 4).

All of the collected bones were photographed on the surface and then packed using a polyurethane mixture for transportation to the archaeozoology lab at the Instituto Nacional de Antropología e Historia (INAH), where they have been cleaned and preserved using a polyvinyl acetate. Initial anatomical and taxonomical identifications were made (Table 1, Figures 5 and 6), but further studies are warranted. The large remains have been identified as belonging to an extinct large deer, probably *Navahoceros fricki*. (For a discussion of the valid name of the Pleistocene deer species, see Morejohn and Dailey, 2004). That would agree with the presence of that species in Cueva de San Agustín (Kurtén, 1975), which is not far from our study caves.

An initial search of the loose sediments found at least five vertebrate species (Table 2). Three were mammals, the woodrat *Neotoma mexicana* (Figure 7) and two bats, *Pteronotus* sp. and *Mormops megalophylla* (Figure 8). Two were birds, a roadrunner *Geocoxys* cf. *velox* and a swallow *Hirundo* cf. *fulva* (Figure 9). All these records improve our knowledge of

Figure 1. The entrance to Cueva Venado. *Dave Bunnell.*

ialarcond@yahoo.com.mx

Reprinted from *NSS News*, November 2015, pages 24–25.

Figure 2. The nearly complete deer skeleton in Cueva Venado, with details of scapula and mandible ramus (upper left), upper molars and skull fragments (upper right), and tibia and femor in anatomical position beside the pelvis, with unfused epiphyses visible (lower left).

Figure 3. Bones in the final chamber in Cueva Venado.

Figure 4. Ribs from animal the size of a cow found in Cueva Basura.

Table 2. Small vertebrates found in the sediments from Cueva Venado.

number of bones	anatomical element	side	species
2	upper M1 mandible with m3	right	*Neotoma mexicana*
1	mandible fragment with m2-3	right	*Mormoops megalophylla*
1	humerous distal fragment		*Pteronotus* sp.
1	humerous	left	*Hirundo* cf. *fulva*
5	2 scapulas, 2 tibiotarsii, 1 tarsometatarsus		*Geoccoxys* cf. *velox*

Table 1. Bones collected from Cueva Venado, tentatively assigned to the deer *Navahoceros fricki*.

number of bones	identification	side
1	skull anterior portion	
2	maxilla fragment	left, right
1	mandible	left
1	atlas	
1	axis	
1	femur, proximal end	right
1	femur, distal end	right
1	femur, distal end	left
1	tibia	right
1	tibia, distal end	right
1	metatarsus, proximal end	
1	metacarpus, proximal end	
1	radius, diaphysis fragment	
1	radius, proximal end	
1	radius	
1	humerus, distal end	right
1	humerus, distal end	left
1	humerus, diaphysis fragment	left
1	rib fragment	
2	vertebrae fragment	
2	pelvis fragment	left, right
1	scapula fragment	right
1	astragalus	
1	calcaneum	
1	phalanx II	

Figure 5. Fragments of maxilla (top) and a mandible of *Navahoceros fricki*. Scale bars are 5 centimeters.

Figure 6. Left titia of *Navahoceros fricki*. Scale bar 5 cm.

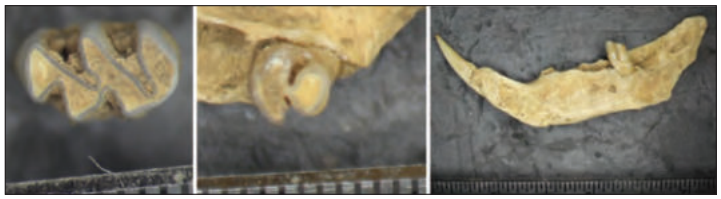


Figure 7. Molars and mandible from *Neotoma mexicana*.

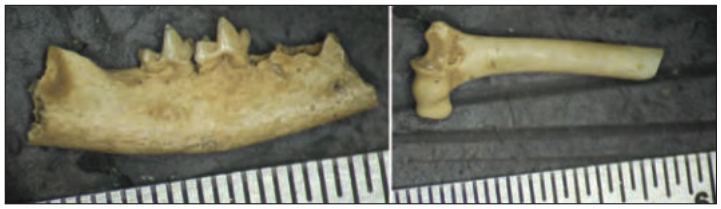


Figure 8. Mandible of *Mormoops megalophylla* (left) and fragment of numerus of *Pteronotus* sp.

Figure 9. Top, tarsometatarsus, two tibiotarsus, and scapula from *Geococcyx* cf. *velox*. Bottom, *Hirundo* cf. *fulva* humerus.

past Mexican biodiversity and help to understand the present great diversity in the country.

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Estudios Paleontológicos Durante la Expedición 2015 del Proyecto Espeleológico Sistema Huautla

Durante la expedición 2015 del PESH, paleontólogos de la UNAM recolectaron o fotografiaron huesos en la Cueva Venado y Cueva Basura, en Oaxaca. Los huesos largos identificados en el laboratorio son listados en la Tabla 1. También recolectaron algunos sedimentos en la Cueva Venado y encontraron en ellos huesos de cinco especies listadas en la Tabla 2.

PIEDRAS NEGRAS SHAKEDOWN

This story is about attempted bribery that was averted due to timely intervention by higher authorities. In May, 1986 we crossed into Mexico at Piedras Negras on our way to a cave in Coahuila. We were on the south end of the city leaving town when a police car pulled us over and claimed we were speeding. There had been no speed limit signs in the area, so it was hard to know if we were or not, but we not going very fast. The lead officer asked for my license, which he held in his hand while we negotiated. I knew the drill, and asked if we couldn't settle it on the spot. The cops said yes, $20 would take care of it. Our problem was that there were two of them, and we had no tens. Figuring they were each going to want a bill, we were stalling so as not to have to give them each a twenty, thus paying $40 instead of $20. Just then a pickup truck with several burly guys in the back pulled into the median next to us and men armed with automatic weapons jumped out and approached. The truck was unmarked and the men wore no uniforms. We feared the worst, thinking we might be about to become disappeared tourists. To my surprise, the head guy grabbed my license out of the cop's hand and handed it back to me, patting me on the shoulder and saying everything would be okay. He then berated the officer, saying this was bad for Mexico and bad for tourism and to get the hell out of there. The cops promptly turned tail and split. The guy then showed me his ID—Federal Transit Police. They were conducting a crackdown on police extortion. He bade us farewell, and they disappeared into the night.

—Mark Minton, *Texas Caver*, second quarter 2007.

EXPEDITION CHILE ANCHO 2016

text and photographs by Gustavo Vela Turcott

I opened my eyes but could not see a thing. I stood up, but I still could not see anything. My mind was still asleep, and I was not sure where I was. Finally, given how tired my body felt, I realized I was on the inside of Cueva Piedra Rosetta. We had been three days inside the cave with the goal of exploring it completely; we wanted to achieve 1000 meters of depth. Yes, we wanted to reach a kilometer of depth below the surface of the earth. Our goal was not easy, yet not impossible.

First week: preparations and first incursions—We got together in the state of Puebla. The group consisted of thirteen Belgians, three Frenchmen, and three Mexicans, all part of the Groupe Spéléo Alpin Belge. Our mission was to continue the exploration of a cave we had found on 2015. We stopped in Tehuacán to buy all the provisions for three weeks, including food, gas, tarps, and other necessitites, because in the sierra we can only find tortillas, ranch eggs, bananas, and *aguardiente*.

In the morning, we went up the long and winding road that leads to the high part of the mountain. We passed through Zoquitlán and took the dirt road to Oztopulco (which means the place of caves) and then to Cosavicotla. Once there, we were shown a field where we set up camp. While some set up camp, others started to visit the caves. We still had to rig the cave to the previous point of exploration.

The history of Cueva Piedra Rosetta started in the last days of 2015 expedition. Orlando and two friends were on the middle of the jungle. They went down a pronounced slope until they got to a small stream, which they proceed to follow until it got lost in the big mouth of a cave. They went inside a little way and saw that it continued. Since there was little time left, we focused our efforts on that operation and got to 300 meters depth, with ongoing leads.

In February of 2016 the days were passing and the results were positive. The exploration of Rosetta was delivering magnificent results. The first group that went down found a couple of pits, one 80 meters and another 30. At the end of the second one they found a big hall 60 meters in length by 40 meters wide, with breakdown and multiple leads waiting to be explored.

At the same, another group took on the task of searching for more entrances to the caves in order to have more objectives and possibly higher entrances. The search gave positive results.One of them was Cueva Mosquito. Just twenty minutes' walk from the point where we left the truck and over the same trail that leads to Cueva Rosetta, there was an entrance 20 meters high and 4 meters wide. We started exploring it little by little. First we found a pit of 8 meters, then one of 15, then an inclined gallery followed by another pit. The cave had good airflow.

Second Week: the bad weather—Our luck took a turn and the weather changed. The sunny days were over and storms arrived. We had a to stay a couple of days hidden in base camp in our frail tents or under the kitchen tarp. We took advantage of the merely cloudy days to head to the caves.

We had a two-hour hike to get to a very interesting zone where we had found a couple of caves. One of them had good air. Tom, Cedric, and I went to explore and survey it. The cave started with a passage 2 meters wide and 4 meters high. Farther ahead we found a 10-meter pit, which we proceed to rig and drop. The cave continued as another passage, but it was narrower, though equal in height to the first part of the cave. A little stream was our companion and wetted our feet. We advanced excited because we were exploring a new cave. To our great surprise we arrived at a much bigger pit. We threw a rock to judge the depth, which we estimated to be at least 50 meters. Tom got to the task of rigging, while Cedric and I surveyed. We decided to come back later, because a lot of water was falling into the pit.

Two days later Hugo, Cedric, and I returned to the cave. This time Hugo took the lead to rig. Cedric told him to do a pendulum to avoid the waterfall and rockfall. He took some time, but he shouted that the rock was really bad for bolting and proceeded to go down the same way as the water. When he arrived to the bottom, he gave us the signal that the rope was free. When the three of us arrived to the bottom, we realized we were in Cueva Piedra Rosetta. The new cave had connected with our main cave. Whoever discovers a geographic accident gets the honor of naming it. We thought and decide to name the 70-meter pit Libertad de Expresión in solidarity with the journalist Anabel Flores Salazar.

Meanwhile the exploration within Cueva Piedra Rosetta Cave continued and was going farther and farther. Our trips were getting longer and more difficult, so we decided to set up a camp at –300 meters to facilitate exploration. A group composed of Jack, Benito, Dedé, and Steph went

turmalinero@yahoo.com
Translated from Spanish by Fernando Hernández

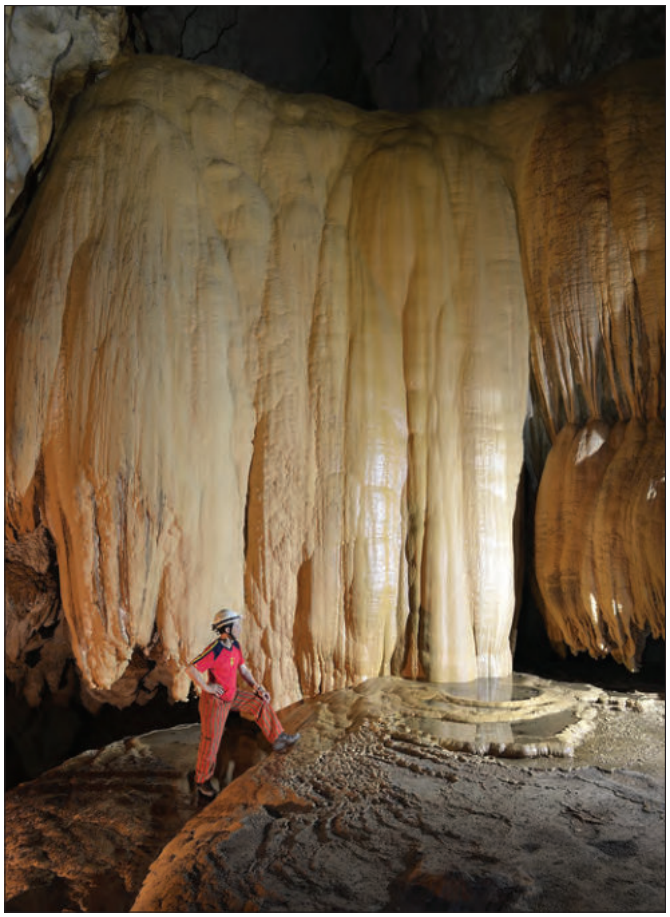
The road to Oztopulco, with Zizintepetl looming in the background.

Tim Lallemand and Cedric Clary at Cueva Miramonte.

Jack London at –400 meters in Cueva Piedra Rosetta.

Roger Laot prospecting in the karst.

Benoît Grignard at –300 meters in Cueva Piedra Rosetta.



Luis Álvarez at massive flowstone in Cueva Xantilco.

Richard Grebeude in Cueva Mosquito.

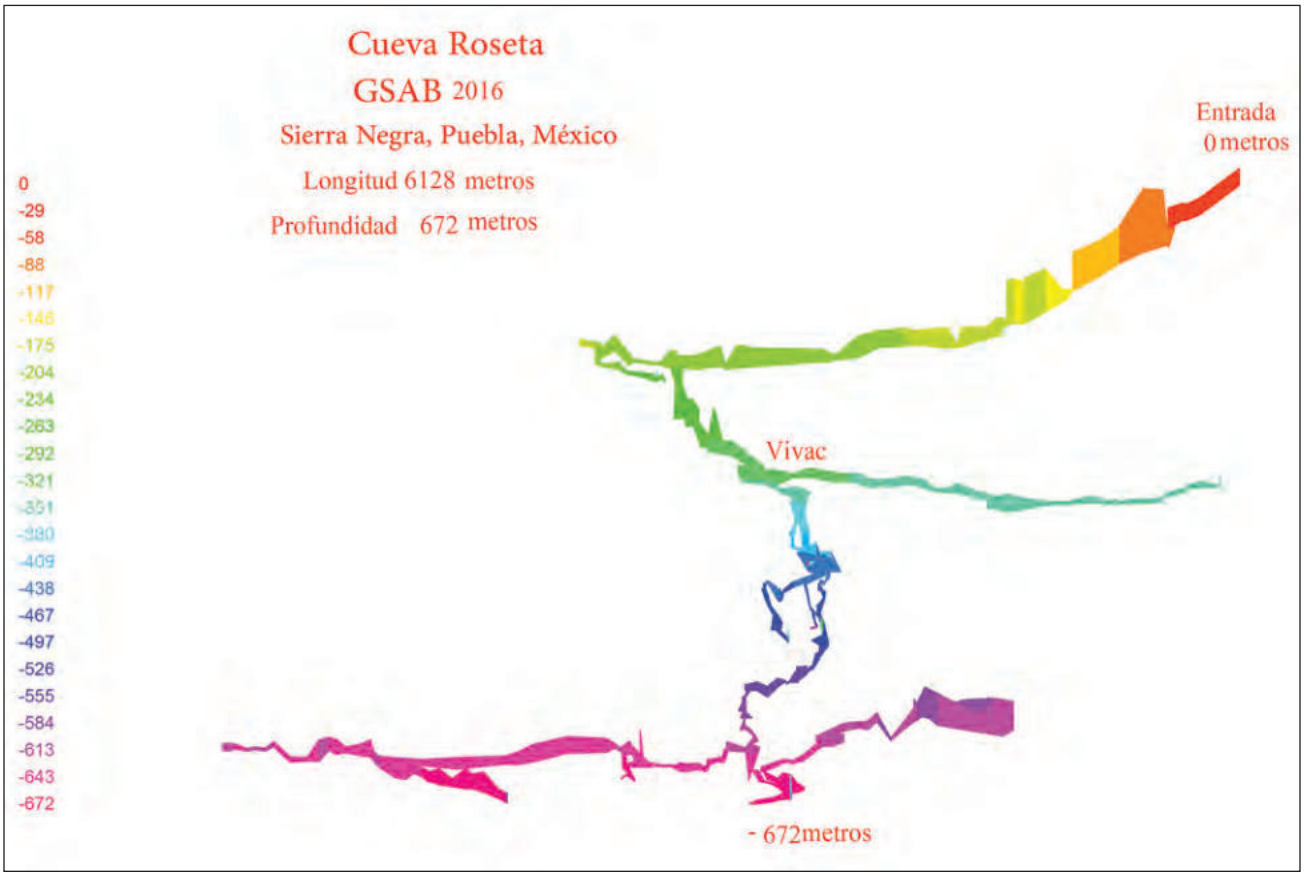
Cedric Clary in the entrance passage to Cueva Miramonte (TZ72).

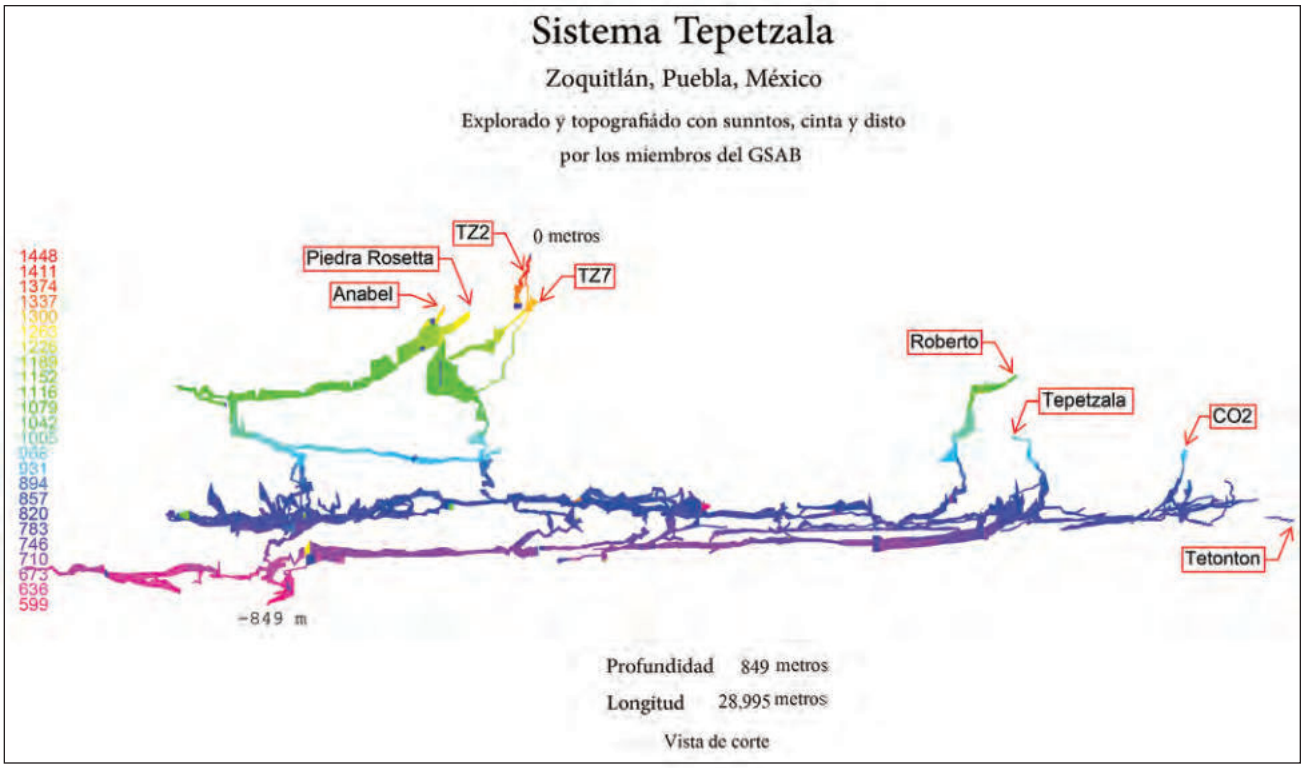
Standing, from left: Tom Lallemand, Cedric Clary, Jack London, Guido Debrock, Luis Álvarez, Richard Grebeude, Jean-Luc Nandance, Roland Gillet, Hugo Salgado Garrido. Below: Gustavo Vela Turcott, André Dawagne, Fernand Decock, Stéphane Pire, Benoît Grignard, Roger Laot, Serge Delaby. Not in the photo: Ángeles Verde.

into the cave to camp for three days. On their return after five days, they told us that they had had to wait two days because of high water. Luckily, they had packed enough provision to wait the extra days. When they had been able to explore, they did it through a branch that had several pits, but they wanted to walk. On their way they found some narrow passages and were accompanied by abundant water. At the end of their exploration they reached a gallery where three waterfalls fell from the ceiling. One in particular looked big and promising. They thought it would lead to a big passage, but on the contrary water and rocks blocked it. They could not believe it; apparently it was the end of the cave. They spend a couple of hours trying to find a way on. They just found an up-trending branch to the left. They went back to the camp disheartened.

After this news, we wanted to enter Cueva Piedra Rosetta to recheck the routes, but the bad weather was still with us. We had to wait two more days. We entered the survey data in the computer while we waited. The depth of the cave was 650 meters. We were not far from our objective of reaching a kilometer of depth, but time and ropes were scarce. Also it was not clear where to push inside the cave.

Another group focused on finding the hiighest entrance to Sistema Tepetzala, the TZ2 cave found on the end of the 1990s. That cave reached 230 meters depth and ended in an apparently impenetrable collapse. It stayed that way until 2015, when a group exploring the system did a very bold climb from the bottom of a collapse in Tepetzala that connected the same collapse in TZ2. That made the cave the highest entrance of Sistema Tepetzala. We still needed to find the elevation difference between entrances to validate the depth of the cave, which made it a priority to relocate TZ2. In 1999 there was no GPS available to us, and all the





entrances were triangulated on the topographic maps with a lot of error. After a couple of failed hikes, we finally found the entrance. We went down a little to make sure it was TZ2, and indeed it was. That same day another group did the surface location of the entrance to Rosetta.

Third Week: last explorations—Hugo, Jack, Benito, Tom, and I got ready to go into Rosetta for three days. We took food, rope, anchors, and of course cameras and lights to document our adventure. The hike under the jungle canopy takes one hour to get to the mouth of the cave. Even though there is a trail, in some parts it has washed our, and you go next to big cliffs. Nevertheless it is a very pretty hike. Even though you walk through the shade, sweat will cover all of you by the time you arrive at the cave. There we put on our thermal suits because, even though the cave is not very cold (13°C), over time you lose heat. We put on our harnesses and ascenders and descenders, double-checked our lamps, put on our helmets, and started the descent into the world of darkness.

We walked 100 meters before we found the first obstacle, a pit of 20 meters, then we descend one pit after another. We kept walking, now through the big room, where we reached the pit Libertad de Expresión. We left it behind, climbing over and down a series of big blocks and then down a 10-meter rappel. We continued down until we found another big room, the one with the waterfalls from the ceiling. We slid through a paleo-passage and advanced to the next pits.

We arrived at a big pit of 40 meters. Even though that is not so many meters, the room is beautifully shaped and polish by water. Jack told us we have to climb down one by one because there is a possibility of rock-fall and injury. We waited and avoided any accident. We went down two other pits and arrived at a big gallery named the Gran Avenida. This room is 10 meters wide and 15 meters high, and the floor is polished by water. After another 100 meters we arrived to the underground camp. We left the food packs and took the photography gear to continue our descent. This way we reached –400 meters, at a big room 60 meters long and 40 meters high and full of breakdown blocks. We divided in two groups: Tom and Benito did a climb to a passage to see if it connected to Sistema Tepetzala, because we had seen on the computer that the passages were really close at that point. Jack, Hugo, and I looked for a lead between the big blocks to see if we could find another way. Our efforts were in vain. My teammates helped me take some photographs, and we went back to the camp to rest.

The next day, Cedric came in to us at camp, we took some pictures and headed down to –670 meters, the deepest part of the cave. It took us a couple of hours, but finally we arrived. Tom and Cedric went to check a passage with a low ceiling and water that possibly continued. Jack, Hugo, and I went to check the up-trending gallery. We carefully manage to ascend the steep, muddy, and rocky slope, although it took us a lot of work. We arrive to an enormous, beautiful, and silent room. We did the survey, and the room is 150 meters in diameter, and in the higher parts it is 50 meters to the ceiling. We walked it in circles, but did not find a lead. Tired of photography and exploration, we returned to camp. Later, Cedric and Tom returned with the news that the passage they had been exploring continues. They told us that the walls are incredibly polished by water and

Sistema Tezetzala Speleometrics

year	length meters	depth meters	notes
2008	2059	269	
2009	3640	307	
2010	3867	404	
2011	10752	405	connection to Cueva Natitla (CO2), two entrances
2012	15517	554	connection to Cuevas Tetonton (CO4) and Roberto (TB1), four entrances
2013	19160	554	
2014	21177	554	
2015	22840	805	connection to Cueva TZ2-TZ7, six entrances
2016	28995	849	connection to Cuevas Piedra Rosetta (TZ27) and Anabel (TZ71), eight entrances

Expedición Chile Ancho 2016

La expedición 2016 del Groupe Spéléo Alpin Belge alcanzó una profundidad de 672 metros en la Cueva Piedra Rosetta en la Sierra Negra en Puebla, y la conectó al Sistema Tepetzala, que tiene ahora una profundidad de 849 metros. También exploraron la Cueva Mosquito hasta una profundidad de 258 metros, dejando sin explorar pasajes con buenas corrientes de aire.

said that I should go back to take pictures. But next day Hugo and I left the cave, and I don't get to see this marvelous place.

On the last days of the expedition, the last group entered Cueva Piedra Rosetta and went directly to the room at –400 meters. They finished their climb and then went down a 20-meter pit to where they connected to Sistema Tepetzala. Now this big system has almost 29 kilometers of length and 849 meters of depth.

Meanwhile other groups went back to Cueva Mosquito, which reached –258 meters and almost a kilometer of length, and, best of all, it has leads with air.

We did not achieve our goal of the kilometer of depth, but we explored 5 kilometers of new passages in the caves, and, most importantly, we had a wonderful time of laughter and adventure with friends.

RÍO LARA HA

Terri Sprouse

Fly to Cancún. Rent a car. Drive about 50 kilometers south on Carretera 307, then turn right and go westward into the jungle. Wind your way to the trailhead. Park your car. Grab your gear. Stash your keys, then follow the Howling Man Trail into the jungle for about thirty minutes until you arrive at Gil's Gamble, the entrance room to the Jaguar Complex. Go in, take a seat, catch your breath, put on your helmet and get ready. This is where your adventure begins.

My adventure began in September of 2010, when I took advantage of JetBlue's "All You Can Jet" promotion. For $499, I got a thirty-day pass to fly anywhere JetBlue flew. I decided to end my whirlwind travel month with a round-trip flight to Cancún. Coincidently, Peter Sprouse had been studying the Quintana Roo area as a possible new caving project. Feeling that the highway to Múzquiz, Coahuila, was becoming too risky, Peter had recently shut down his project surveying the deep pits he had found on nearby ranches. Anxious to get started caving again, Peter decided to fly down with me to Cancún to do some recon of the area to the south.

Our first lead down there came from long-time caver Jim Coke, who runs the Quintana Roo Speleological Survey. His lead was a dry cave near the Dos Ojos underwater system. We met the owner and got permission to return. After talking with several other landowners and getting the scoop from various cave divers, Peter knew there was enough cave to map in the area, so he began to set up the first Quintana Roo expedition. He looked into housing and got permission to rent one of the dorm rooms at the Centro Ecológico Akumal, which were reasonably priced but generally reserved for students. Peter's first expedition in Quintana Roo happened the next month [see Sprouse's article in *AMCS Activities Newsletter* 34].

During the first few trips, Peter had only a vague idea where to look for new caves. He had been introduced to Gil Harmon, president of the NSS-affiliated Paamul Grotto. Members of the Paamul Grotto had already explored a good number of caves, and these still needed to be mapped in detail. Also, owners of some of the nearby show caves were happy to have nice maps drawn, so a good amount of time during the first expeditions was spent mapping beautiful tourist caves.

But Peter suspected that a vast number of unexplored caves still existed out there in the jungle, so these first expeditions also included a fair number of days when teams randomly chopped through the jungle with a machete. While chopping they listened for the call of the motmot bird, a native species known to nest at cave entrances. While fun for some, randomly chopping through the jungle to listen for bird calls was not a very efficient way to locate cave entrances. It was during these first jungle chops that we learned about *chechen*, a native plant that causes blisters similar to poison ivy. At this time, we also learned about the antidote tree, the *chacah*, which is used by the locals to make a paste to ease the pain of the *chechen* rash.

Quintana Roo has long been the realm of cave divers, who have explored and surveyed 1300 kilometers of underwater caves in the area, and the underwater exploration continues. Considering how extensive the known underwater systems in the area are, it seemed that there should also be extensive dry systems close by. Some of the cave divers had reported coming upon quite a bit of dry cave passage, which they generally had little interest in exploring. However, the idea of exploring dry caves tweaked the interest of a few of the cave divers, as shown by the dive line that had been strung throughout most of the dry caves that had been explored by Gil Harmon and the Paamul Grotto. By the time we arrived in Quintana Roo, they had already explored and line-surveyed around 50 kilometers of dry-cave passages. Since 2010, Peter and his cave teams have carefully surveyed and drafted maps of most of these caves. But every now and then Gil remembers another system that he explored in the past and leads us out to the entrance.

Over the next three years, Peter fielded expeditions to Quintana Roo four times a year, exploring the known caves and discovering new caves here and there. [*Activities Newsletters* 35 and 36 each contain articles about these years.] But as of the summer of 2013, we had yet to find the big new, going dry system that we knew had to be out there. In 2013, Peter began pursuing the acquisition of aerial LIDAR data available through the Mexican government. The laser technology penetrates the thick jungle canopy so that the actual terrain can be mapped. Once the information was obtained, cavers processed this data into a digital-elevation-model and contour lines were drawn. Obtaining the LIDAR data was a game-changer. The cave-location process changed from a wild, undirected romp through the jungle to precise targeting of promising depressions. To our amazement there appeared

terri.sprouse@yahoo.com

Does this cave have walls?
Jen Hopper.

a series of depressions extending kilometers into the jungle. And the biggest of these features were directly across the main highway from the Paamul RV Park, home of the Paamul Grotto, where Peter and I had just bought a *palapa*.

In the short period between the November 2013 Thanksgiving expedition, when the LIDAR data was compiled and digested, and the December 2013 Christmas expedition when we returned to QR, members of the Paamul Grotto had chopped the Howling Man Trail through the jungle to gain access to what became the first cave in the Jaguar Complex. Alan Formstone, a former cave diver, and Gil Harmon led these efforts, navigating by GPS to get out to the depressions that appeared on the LIDAR map. The trail they chopped passes many entrances to small caves that have yet to be mapped. But it wasn't until the discovery of the entrance to Jaguar Paw that we realized the full dry-caving potential that the area held. During the December 2013 expedition, the survey of the Jaguar complex began.

A few reports have already be written about the extensive Jaguar cave complex [see *AMCS Activities Newsletters* 37 and 38]. The complex is actually a series of caves that seem to have been previously connected, but are now separated by collapses. Most of these caves have a characteristic maze of seemingly endless walking passages and a flat floor. The complex currently contains 59.8 kilometers of surveyed passage distributed among separate caves. Jaguar Paw, Jaguar Jaw, and the much larger Jaguar Claw are the main caves that allow us to reach the far parts of the system. Two smaller nearby caves that we are trying to connect with the main caves are Jaguar Maw and Jaguar Craw.

Jaguar Paw—2717 meters. The journey into the Jaguar complex begins at the end of the Howling Man Trail at the Gil's Gamble entrance into Jaguar Paw. From this entry room, the cave develops into a maze that winds around dazzling skylights and through low-stacked Maya walls. The system starts big, and it gets larger as it extends farther into the jungle. Early on it is distinguished by high ceilings, intermittent skylights, and wide, flat easy-walking passages. Instead of pinching into low ceilings and crawlspace along the sides as one might expect, almost the entire length of Paw has daylight pouring in from sides that open out into the jungle. While hiking through Paw, we are blessed with beautiful views of Maya walls stacked along the southern edge of the cave, backlit with sunlight filtering through the lush jungle foliage. It took an expedition or two to map Jaguar Paw to the end.

Jaguar Paw ends in a collapse, but the cave allowed for an easy machete-chop of a bypass route around the 5-meter hiatus; this is the first "pop-out" into the jungle. After the first, the pop-outs become fairly common, and oh so convenient. The jungle pop-outs are so convenient that they are not only being used to continue the survey in the direction of the original Jaguar cave complex, but they also allow the cave to provide easier access than a jungle chop into the far reaches of the jungle for recon for nearby cave systems.

Jaguar Jaw —10,781 meters. This next cave in the complex has the same huge, mazy walking passages and collapsed skylights, but contains more pop-outs, mostly used to avoid crawl spaces or water. Although there are fewer openings giving access to the jungle in Jaw, the ones that exist are in the form of large collapses. Many of these collapse entrances have been named, which helps with navigation. After another ramble through the maze, the second pop-out sends us over to the Antz-in-the-Pants entrance. There is some shallow water off to the left here, where jaguar tracks have been seen. A game camera was staged there, along with a tampon drenched with Calvin Klein's Obsession. The scent of men's cologne was rumored to attract the big cats, but so far we have had no luck with capturing images of them in this part of the complex. From Antz-in-the-Pants we hike past Twisted Sisters, a skylight entrance distinguished by two tree trunks twisted around each other. Continuing to hike through the maze, we pass by the Legs 11 jungle entrance. Those cavers who pushed the Mystic Monkey system popped out into the jungle here and hiked another 1.5 kilometers along a fence line to that entrance. During the August 2015 expedition, the Mystic Monkey system ended dramatically at a 100-meter-wide, 30-meter-deep lake that has a skylight that beams sunlight into its depths. [See the March 2016 *NSS News*, p. 23, and the article elsewhere in this issue.]

Jaguar Claw—41,327 meters. More evidence of Maya occupation is found in Jaguar Claw, including pottery, earthen ovens, and metates, along with the ever-present but always intriguing Maya walls. It is in Claw where we start to see more tracks of the big cats, and where the game camera picked up the first photos of the cats in the cave. Between the collapses dubbed Metateville and Litter Box is a narrow walkway through boulders that has been named Puma Pass. This is the spot where the game

camera got an excellent photo of a mountain lion as it walked between those two boulders along our access trail. After this first photo, images of jaguars, a margay, small rodents, and foxes have also been captured on game cams.

The complex takes on new characteristics in Jaguar Claw. In Claw the ceiling height increases and the natural light fades. The first extensive dark zone is present here. Huge breakdown sections are more common, and the complex, mazy spaces continue. The middle section of Claw seems to have endless passageways with no walls. Some parts of Claw stretch 300 meters across, punctuated by numerous columns. There are fewer skylights and long stretches with no jungle access. There is no standing water in Paw, and only a minor amount in Jaw. However, as we progress in the system through Jaguar Claw we come upon frequent shallow pools. Farther in, the cave itself morphs into a half-flooded, deep-flowing cave-river passage.

The first pool in Claw is Dead Turtle Lake, which contains the shell of an unfortunate turtle that died right at the edge of the water near the main passageway. The farther in we go, the more water there is, but it is mostly not along the main pathway and can be avoided. The last pop-out collapse is called Eden. Shortly beyond Eden we start to follow the dive line.

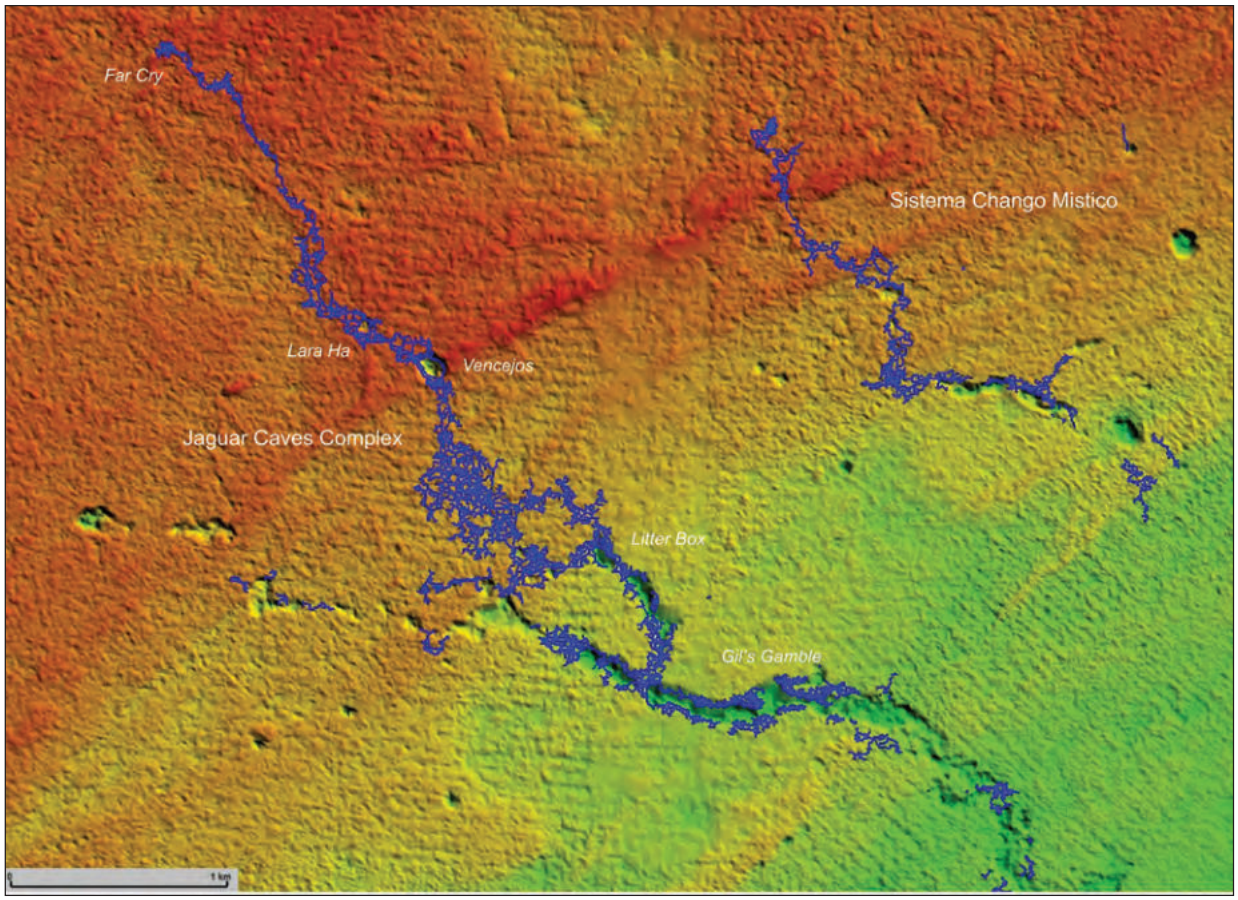
While the December, March, and August expeditions were making great headway surveying through the system, Harmon began to lay dive line showing the way through the mazier parts of the cave. In addition, Formstone continued to chop through the jungle a kilometer farther out towards a huge collapse that could be seen on the LIDAR. Alan was sure that this entrance would allow him to connect back to the Jaguar complex. He found a series of three oversized collapse entrances along a northwest-trending line. The largest and northernmost he named Vencejos. It was magnificent, with a 300-meter circumference. Vencejos's enormous breakdown slabs could be climbed to obtain a great vantage point where the great extent of this entrance can best be observed. After finding the Vencejos entrance, Formstone started surveying back to the southeast underground, putting in a series of stations, the AGD line. His line survey reached almost to the Eden collapse. This was a survey without a sketch, but the series of survey stations provided a convenient reference for mapping teams as we moved farther into the mazy cave. Each team had at least one member who had the line plot of the cave downloaded on a smart-phone or tablet. Teams would be told to go to station AGD37, and one team would survey from AGD37 to the east, while the other would survey from AGD37 to the west. It was in this way that the teams advanced, moving up the AGD line into the huge cave, surveying toward the big collapse.

As we worked our way up the AGD line we encountered more pools, wading in knee-deep water as we got closer to the majestic Vencejos entrance. Shallow water covers the trail until we reach the incline going up towards the collapse. Beyond Vencejos, Formstone had laid a guideline underground leading to additional collapses along the northwest trend. After a short walk along this line, the Karin Ha entrance is reached. This beautifully spacious collapse provides easy access to the jungle and access to water from the lake, and it contains quite a bit of level ground. In addition, it is a wonderful place from which to observe nesting motmots. All these features make it an excellent camping spot. Northwest of Karin Ha the water starts, and it becomes necessary to walk on submerged narrow calcite pillows to avoid plunging into the surrounding deep pools. After a short walk, the water becomes shallow again and flows on towards the stately Maya steps that lead up to the Lara Ha entrance.

Ahead, past the Lara Ha collapse, stretches a breathtakingly beautiful lake that extends throughout the half-flooded cave as far as you can see. Majestic stalactite draperies hang from the ceiling in clusters and can be seen to continue farther out into the darkness. Towering rock columns pierce the glassy surface of the pristine lake to hold up the 8-meter-high ceiling. Here and there, intermittent dry-land masses are exposed. Out into the lake and around the rock columns, calcite pillows provide ankle-deep walkways through and around the deep pools. When illuminated with a dive light, the deep, crystal-clear water turns aquamarine, showing off the sparkling-white calcite mounds that make up much of the lake's floor. The water in this river is the freshest, cleanest, purest water that I have ever had the pleasure to swim in. The cool, fresh water is surprisingly gentle and exhilarating as it flows over your body. So much beauty appears above and below the surface that the cave just morphs into a land of enchantment. Río Lara Ha is a magical place that holds the allure of adventure.

Once the survey reached the deep

Río Lara Ha. *Ben Schwartz.*



water, our thoughts turned to putting in a cave camp. Our standard procedure had been to get out of the caves, off the jungle trail, and back to the cars before dusk, before the fer-de-lances came out of their hidey-holes and the big cats started their evening prowls. From where our cars were parked at the trailhead, it was a good two-hour trek in, going down the Howling Man Trail, winding through the caves that make up the complex, popping in and out of the jungle, and navigating around the huge collapse entrances to get to the northwest side of Lara Ha. That meant four hours of the day would be spent just getting to and from the unsurveyed area of the system, leaving a mere four hours for new survey.

So during the December 2014 expedition Ben Schwartz headed up a three-day cave camp at Lara Ha [see *AMCS Activities Newsletter* 38]. They surveyed 2660 meters of passage and did what they could without flotation, but deep water continued beyond the end of their survey. During the December 2015 expedition, a Schwartz-led team put in a second underground camp of three survey teams using inflatable boats and inner tubes. The three teams pushing deep-water sections were Ben, Zachary, and Nathaniel Schwartz; Brad Hacker and Terri Sprouse; and Ben Miller and Katie Ingram. Great progress was made up the river passage, with teams leap-frogging each other, surveying, portaging boats over huge islands of breakdown, and maneuvering through long stretches of deep water. Eventually, the teams surveyed up to and over an island containing the skylight named Stairway to Kevin. Paamul grotto members Gil Harmon and Kevin McPeak had previously explored through the half-flooded cave passage and up to this island. Looking for a shorter way out, they had tied ladder rungs out of old rope and twine between two vertical roots to climb out into the jungle through the skylight. The ladder was left in place and now provides a noteworthy landmark. The survey of wet and dry areas continued several hundred meters beyond the Stairway to Kevin until the teams finally arrived at a massive breakdown pile that practically fills up the entire passage. The way past this humongous blockage was a long, gradual, and rocky ascent, winding up and around the immense breakdown pile. Cavers clawed their way to the very top of the gigantic breakdown mound, almost reaching the ceiling, to eventually pass under a tiny, unimpressive skylight only 1 meter wide and 3 meters high called the Barrel. I suppose, in a pinch, in case of a massive flood or desperation or some such, one could bail out of the cave through the Barrel, but someone would do this only if he really had to. Beyond the Barrel, the cave continues down-slope and opens back up to large river passage. Cavers mapped through deep water to another dry section, where the survey ended for that trip.

During the March 2016 expedition, a third camp was placed in the far reaches of Jaguar Claw. Camping at the Lara Ha entrance were Peter and Terri Sprouse, Mike and Andrea Futrell, Alice Jaworski, Larry Keel,

December 2015 survey totals

name	*Dec 2015 survey (m)*	*Total cave length with previous surveys (m)*	*notes*
Sistema Texcoco	5269	8197	Includes connections to Sistema Ventanas de Jaguar and Ocho Balas. Includes only part of Ocho Balas survey. Known to connect to Sistema Zumpango but connection survey not yet done.
Sistema Garra de Jaguar (Claw)	5241	38955	
Sistema Zumpango	1319	2595	Known to connect to Sistema Texcoco but survey not yet done.
Sistema Chango Místico	814	11875	
Chichan Kim Belai (Solstice)	795	1296	
Sistema Tres Banderas	139	1552	Connected to Cueva Morpho. Includes 80 m of underwater survey.
Aktun T'uyul	882	1968	
Cueva Huella de Animal	293		
Cueva Boy George	262		Probably part of Sistema Aluxes
Sistema Quijada de Jaguar (Jaw)	205	10693	
Cueva Nauyaca	173		
Cueva Jane	129		
Sistema Chu'uuy	159	1482	
Sistema Fauces de Jaguar (Maw)	154	3417	
Cueva Horno	109		
Sistema Pica Piedra	107	624	
Cueva Poza de Granja (Homestead Well)	105		
Cueva de la Planta	81		
Cueva de la Granja (Homestead)	80		
Cueva Carretera Perdida	63	2204	
Cueva Pi	58		
Cueva de la Llanta	58		Part of Sistema Aluxes
Cueva Atractiva	28	364	
Cueva Cerrado	27		
Cueva del Soldado Muerto	18		

Total surveyed = 16568 m

Commuting through Jaguar Claw. *Jen Hopper.*

Tammy Otten, and Nathan Roser [see Otten's article in this issue]. Chad Pedigo and Dennis Hoburg elected to camp nearby at Karin Ha. Before the start of the March trip, Peter and Gill Ediger had already drafted the map of the river survey from the December trip, so we started the survey with a mop-up of previous leads, then we headed on past the Barrel to the end of the previous survey. Water continued, but the cave never regained its full ceiling height. Teams leap-frogged their surveys, wet and dry, until the water had receded into side passages and all surveys converged at a land mass dubbed the Far Cry.

The Far Cry is a long, sloping collapse leading up into the jungle that Pedigo and Formstone had found on an exploration trip. Around the bottom of the slope, the cave passages continue low into shallow water. But up off to the side of the entrance, a lead continues. At the end of the March 2016 camp, cavers left a going dry-borehole lead, an unsurveyed deep-water side passage, and a generous and convenient pop-out entrance that will give teams access to the mysteries that await discovery deep into the jungle.

The Maya previously occupied this land in the Yucatan Peninsula, and still do. The most prevalent evidence of their occupation in these caves is the presence of Maya walls consisting of rocks stacked in a line. These walls are found mostly at the entrances and within sight of daylight. They seem to have been built to create an enclosure, possibly to trap small animals. Every now and then we come upon areas that appear to have been used for cooking, where there are pottery shards and various types of metates. At the Lara Ha collapse in the far reaches of the cave, grand Maya steps lead from the water up into the jungle.

South of Cancún, along the east coast the Yucatan Peninsula, life is easy and caves abound. Without a doubt, there are still many kilometers of extraordinarily beautiful cave passage to discover. The area is not without its problems, however. As with many areas in Mexico, most communities outside of the large cities still lack infrastructure to dispose of trash and sewage. Due to explosive growth along the coast, this problem has reached a critical stage. An excellent account of these issues and methods for dealing with them have been outlined in "The Future of the Riviera Maya" recently published in the April 2016 *NSS News*.

Río Lara Ha

La cadena de cuevas Jaguar en la selva tierra adentro de Paamul, Quintana Roo, fueron visitadas por primera vez al final de 2013 al notarse una cadena de dolinas en las imágenes de LIDAR de la zona. Estas incluyen Pata de Jaguar (Jaguar Paw) con 2717 metros, Quijada de Jaguar (Jaguar Jaw) con 10,781 metros y Garra de Jaguar (Jaguar Claw), por mucho las más larga con 41,327 metros topografiados. En diciembre de 2015 cueveros acamparon en la entrada Lara Ha a Garra de Jaguar y exploraron pasajes al norte, hacia la entrada Far Cry. Una muy buena parte de la topografía fue en un pasaje con mucha agua, el Río Lara Ha.

HISTORY

HISTORY OF GRUTAS DE BUSTAMANTE

In 2001, Robert S. Sanders recorded an interview with Cayetano Gómez, whose father discovered Gruta del Palmito, Nuevo León, now known as the show-cave Grutas de Bustamante. The interview covered the discovery of the cave and also some of Cayetano's experiences as a guide at the cave. Gary Napper, assisted by Vico Jones, has provided an English transcript of the recording for us. It has been lightly edited for clarity, and some material not related to the cave has been omitted.

[CG] Hello, I'm Señor Carlos Gómez and I'm a resident of the Municipio of Bustamante. I'm here today in the history archives of the *municipio* with two very good friends, and we want to learn some highly important facts from one of them. Today is the twelfth of September, nineteen—two thousand one, pardon me. At this point I want to introduce Maestro Aguilar. What is your full name?

[JMA] Jesús María Aguilar Villareal.

[CG] And where were you born?

[JMA] Dos Pozillos, Nuevo León. Bustamante.

[CG] You're a quite sociable person, and you enjoy interacting and dealing with the people, serving the community and the people whom you can help, right? And Maestro Aguilar has brought with him on this occasion a very interesting person whom I'm going to ask, "What is your name?"

[Cay] Cayetano Gómez Duran.

[CG] Señor Don Cayetano, how old are you?

[Cay] I'm eighty-eight.

[CG] Eighty-eight years! And you appear to be doing very well. And what sort of work have you done?

[Cay] Farming, and working in the sierra, and guiding in the cave.

[CG] One of the interesting things about you is that you had a father who is known to have discovered the caves now known as the Grutas de Bustamante.

[Cay] Yes.

[CG] What was your father's name?

[Cay] Juan Gómez Casares.

[CG] And what work did he do?

[Cay] He worked in the sierra, bringing down materials, such things, and that was when he discovered the caves. And later he worked with the tourists who came, took them in the caves. He even took General Francisco Naranjo de Lampasos in, and they were in there fifteen days and never found the end.

[CG] OK. And what exactly were the products that your father brought down from the mountain?

[Cay] This sierra is very rich in vegetation, and he brought down palms for the houses, for the roofs, and wood and firewood. He took me along on burros and mules, and he was bringing down stuff from there when he discovered the caves, that's what he was doing, bringing down materials.

[CG] So how was it that he was able to find that exact place where he discovered the caves?

[Cay] They had gone farther up into the sierra to bring out wood that they had been cutting for fences, for fenceposts, he and a friend of his called Ramón Rodríguez. That is how they were accustomed to do it, a friend with a person, and where they were working out there, that friend would go along with him a lot of times. So the friend was along when my father discovered the cave, although no, they never thought there would be such things that they would feel on their feet, a little current of air, since they wore *huaraches* like I do, with three holes. And they made a temporary trail to carry out the wood that they were bringing down from there. At the edge of a small outcropping there were rocks piled up, not bedrock like steps, but all cobbles and round rock settled into place. There was a very high hill that measured more than thirty meters, when my father found it—right by there he found it. He got to right where the gate is today and made a right-angle turn passing by there. So there, right there he felt a really cool little current of air on the bottom of his foot, every time they passed by there, he and his friend both, but neither his friend nor he was especially curious about what they felt on the bottom of their feet, until Papa, one of the times he was carrying wood to leave at the loading area, where the animals were and the shortcut trail, the animals they were going to load, Papa was thinking about it, and thought, "When I feel that little cool air, I'm not going to move my foot if I'm carrying a load."

Papa, he told all this to me, since I had not been born yet when he found it. I was born in 1913, and he discovered it in 1906. Well that friend who was there all the time, he felt it too, but he wasn't too curious about it, eh, he was just up there cutting wood, out of sight in the woods, but he had to pass by there since they were bringing the wood out of there and bringing it this way. Then one time my father felt the little current of cool air when he was coming with a load, coming with the wood to bring it out, he was carrying it when he felt that. And like he had said, if I feel something like that, when I'm coming and going through there, the little cool air, I'm not going to take my foot away from that place, and he didn't. He threw the wood down. And what a little thing it was, to not take his foot away, so he could exactly mark the entrance that would lead to all the riches.

He had to try really hard to see it, to inspect such a really tiny hole. And then, since he was a smoker, so he could exactly locate where that little hole was he got out his matches and

lit a match right in front of where he was feeling the cool air, and the flame lit up, and then he saw the tiny little hole. There were sticks around, and he stuck one in there and worked it around till it was the size of a finger, and then he used a thicker stick to make it wider. From his efforts moving the stick around he could feel that the point was poking through, and he worked it around more till it led into something like a well below. Then he yelled at his friend, he said "Ramón," he said, "come over here so you can see what I found."

I have to tell all these things to the people who come here to me from Monterrey, because they want to know how and everything.

Then the friend came and he got really scared because, imagine, they were walking over what was just like an eggshell, and if they'd fallen through before it would have killed them. When he got there he told him, "Look what I found."

"Listen, Juan, how were you able to make this deep hole so fast, when you just got here?"

So my father told him, "I didn't make it, it was already here, a layer or cover that was here. Didn't you ever feel a little cool air here on your foot, through your *huarache*?"

"Yeah, yeah I felt it, and what a damn close call that we didn't kill ourselves, look at the big deep hole we were walking over."

"That's right, and I got curious about it and opened this up," but it was hard, he said, because the little hole it came from was tiny.

That's how it was that he came to discover the cave in 1906. Ramón Rodríguez, not knowing what this hole in the ground was, asked my father, "What are we going to do now, Juan?" My father said they should gather up all the palms and pile them up, all the leaves that are getting hard and hanging down and drying on the palm trees scattered around here, and they started gathering three armloads of material from these dry palms and got a big pile and then they started to make wicks from fibers, fibers of *zarandoque*. They made a big bundle of wicks tied up with fiber like torches to use for light. Then he said to go get the ropes that were in the saddles of the mules and burros to tie it all up with, because we have to investigate this.

Papa was pretty adventurous, see. So then they brought the ropes, and they used one to tie up a bundle of the torches to take down and another one to use going down the slope, over the rocks like stair steps, and he climbed down over those rocks and that's how he went down. That's where he went. And Ramón said, "No, Juan, I'm not going in there, I'm afraid; I don't know what might be in there."

"Well, OK if you' re afraid I'm just going to ask you to do one thing for me. If it goes bad for me or if it ends up being too dangerous down there where this shaft ends, just, well, go to my house and tell them, and to the *Presidencia* so they know what happened to me, if you will."

"Well, OK," he said.

Then they threw the bundle of palm leaves and fibers down and put a pole across and tied the three ropes to anchor everything that was going down. See, right there where that right turn is, where the cave door is now. Where it goes like this [gestures], that's where he got down into the bottom.

And then, well, when they threw that in, well, this is what I want you to do, to tell my family and inform the *Presidencia* and that's it, if I don't come back, and if I do come back and it turns out to be interesting then I'll come back and tell you. You know it could be good and it could be bad, we don't know what might be hidden down there.

Well, OK, and he went down into it. He went in right there where the door is now where you make a right turn, there where the slope starts, he went in and took out the first torch and lit it and saw the big cavity opening up below. Then he picked up the big bundle of palms and put it on his shoulder, and he went on from there and found three rooms with water, and went a long way and saw a lot of pretty formations and rooms, till he got to a point to where he calculated that with the rest of the torches he had he could get back to where he could yell up to his friend from where he was. So he stopped. He stopped there and went back to the slope. And he said to Ramón, he said "Ramon, it's really pretty, this is something really pretty, and there's a lot of water."

Ramón said, "Well, what are we going to do? Let's go tell about it, here I come." And he pulled up the rope that was hanging in and Papa climbed up stepping on the edges of the rocks until he got to the top. And he said, "It's important; let's gather up the rest of the wood we have here and go down and inform the *Presidencia* so they can come and help us go down farther. It goes way in and is a really deep hole."

And they went to the *Presidencia* and told them all about it. And you know when there's something new, it really attracts people, and Papa gathered up half the town and took them up with him. They took whole cows with them; there were a lot at the time because it rained a lot here. Papa told me they were really fat, all the animals, the draft animals and all really healthy because it was really rainy. They took whole cows for the people up there, all they could get, it was a lot of food. And the Gruta de Bustamante was discovered.

[CG] Later your father went in again and explored a lot and acted as a guide or something like that. Did you guide, as well?

[Cay] I didn't like school, see, I didn't like to stay seated, see? I was really one for playing hookey, me and another friend of mine, who was like me. Back then, they would fine you.

[JMA] Here in Bustamante, what they say to their fathers at home, they say "I'm going to school," but they don't get there. They go off and play, go hunting birds, or picking fruit; that's what they call a *cuajista*.

[Cay] There was another kid like me, who didn't like to go to school, then, Julian Viet—his father was a judge and they lived over there at the edge of town. They would charge a fine, and there was a *señorita* there in the old school that was right there on this side of Bacilio's.

[JMA] Where the Technical School is now.

[Cay] Yes, that's where the school was. And back then I and my friend who didn't like to go to school either would go off up the canyon or wherever we pleased, to kill birds.

[CG] Was your father born here in Bustamante, or did he move here from someplace else?

[Cay] No, he was a native, from here.

[CG] And how old was he when he died?

[Cay] Well, uh, you know, I never asked him, but he was already pretty old, when he died. Actually, he could have been seventy.

[CG] And you've been working as a guide, taking tourists into the cave, or aren't you still doing it?

[Cay] I'm not a guide now, because I've had some pretty serious injuries to my legs from rocks falling and hurting me, so I don't work in the sierra any more. My kids don't want me to go up there because I might fall.

[CG] Did you like that work?

[Cay] Sure, I always did.

[CG] How many animals, how many burros did you have?

[Cay] Papa had seventeen work animals, ten mules and seven burros.

[CG] And what is it that—did he sell all the wood and all the palm leaves?

[Cay] Yeah, all the material, he always sold it all here, all the material from the sierra, always. That's what we lived on, see, but not any more, because the forestry law and all that imposed restrictions.

[CG] And was your mother from Bustamante, as well?

[Cay] Yes.

[CG] And what did she do?

[Cay] Well she just worked at home.

[CG] What was her name?

[Cay] Her name was Cuca Duran.

[CG] How old was she when she died, or is she still alive?

[Cay] No, she died many years ago.

[CG] Did they have many children?

[Cay] No, just three. A girl and a boy, both younger than me. But they've both died. The girl was pretty old, and the boy still a baby.

[CG] Where are most of the people from that you've seen come to visit the cave? From Europe, from the United States?

[Cay] From the U.S., from many parts, many states. Me, I have lots of *gringo* friends, and I've never been to the U.S. But I have lots of friendships, because I took over from Papa. Since I didn't like school, see, Papa said to me, "Well, then, what do you like?" And I said, what I like is to go with you. And he had pack animals and carried metal down from the mines and such like. And when they'd call him from some mine, he'd bring them down shipments of metal, or wood, or whatever they needed.

[CG] Your father was a mine-worker, too?

[Cay] Yeah, yeah, he worked at everything.

[CG] What other products did he bring down from the mountain?

[Cay] Well, everything, wood, palms, oregano, laurel, and everything there is up in the sierra.

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[CG] Bustamante is about 100 kilometers from Monterrey, and we could say that this place is kind of a little garden, a paradise surrounded by semi-desert here in the north of the state and of the country, and besides the caves found in these mountains that no one's found the end of, there are other very beautiful places, the *cañón*, there are lots of springs, the mountain is very impressive when you see it from certain angles. Besides that I know, or I've been told that there are still a lot of smaller types of cave that it would be good to explore. Can you tell me anything about these other places similar to caves or grottos here in the mountains?

[Cay] There are several caves. And there are *galemes* too; those are where the Indians melted silver. They're little kilns, about this small.

[JMA] At the edges of the arroyos.

[Cay] In the arroyos, in the banks of the arroyos, there are caves, too.

[JMA] They made a hole in the bottom and put the firewood in there.

[Cay] They have a hollow place there that they call a *tronera*, they say, they melted metals there. It must have been the Indians, because we didn't know of anyone there.

[Cay] There's a cave that has steps down into the pit.

[CG] Pardon me, this happened in the cave named . . . . What was the name of the cave?

[Cay] Well they just call it Lado del Arco.

[JMA] El Rincón del Palmito.

[Cay] El Rincón del Palmito, then, that's where a nephew of mine and all those guys from Nuevo Laredo got a big scare, Javier Valle and Cuautemoc Cantu, something scared them and they ran, and I yelled at them, "Don't run, don't run!" They imagined it could be some kind of animal like a serpent because the noise was really loud. And the noise . . . . We were all sitting there on the ground with our legs spread, and I was cutting some sections of poles, because it's really soft, the ground is really soft, it's like a crust on top. They were taking bones out of there, and pots and broken tiles, on their knees.

[CG] Human bones?

[Cay] In a minute. Right now I'll tell you about how they left . We were there digging when suddenly we heard some kind of animal crying, it was there where I had a little pit, see, and a little pile of bones, and then they were all strung out along the passage, and I was here at the end, here where I was sitting on the ground, digging, when we heard that really loud noise. But it was first like an animal roared really loud, and afterwards you could hear like a whine and scratching like something climbing up out of a hole. The whole bunch of them took off, till they got out of breath from running, there where the passage makes a turn, their shovels and sticks and rocks and everything were rattling and echoing. I shouted at them, "Don't run, don't run." Then from way down the passage they yelled at me "Uncle", because one of the guys who were scared away was my nephew, "where are you?" I was right there in the same place. Whatever it was the noise was over now, and it's nothing. And where it came from there was a pit right there where I was sitting; the pit wasn't open at the bottom, but you could hear from the bottom, that loud noise, and I stayed there till it ended, and later you could hear it echoing from up above and then down to the bottom, and the noise ended.

[CG] Surely it was the pressure from the air when you opened the pit, the air escaping.

[Cay] It was closed, I never dug

through it.

[CG] Did you see anything, anything moving, an animal or something like that.

[Cay] Well see, it seemed like a bear or a big animal.

[CG] But you didn't see it?

[Cay] No, no, I didn't see it.

[JMA] Everybody who goes in there for the first time, that happens to them.

[CG] In some of the caves up there in the mountains, did you ever find any signs of . . . ?

[Cay] In a minute. I want to tell you, I think this is the thing. After a couple weeks, I met up with my nephew and talked to him, when he had some time and came down there. And I came one day and there they were at the *palapa*, he and some other friends there. And he said, "Listen, Uncle, one of these times you need to bring me some bones." He was working with a man from Monterrey, where they were involved in crushing stone.

[JMA] Yes, there are some stone mills there.

[Cay] They wouldn't give them time off.

[CG] What did he want the bones for?

[Cay] Who?

[JMA] Your nephew, Pedro.

[Cay] So they could test them.

[JMA] They analyzed them.

[Cay] So they could see if they were from animals, and then he'd tell me, so I told him that when I have time I'll go and bring you some.

[JMA] But now they didn't want to go with you?

[Cay] Heh!

[JMA] They didn't want to go then?

[Cay} Nooo, them go back? They never went back again. All those guys from Laredo, the whole group came and I told them come on, this way. They wouldn't come down the trail to the bottom of the arroyo, they just shouted to me from the other side, over there where the ridge is, where we had been in the cave, and shouted at me, "Where are you, Uncle?" and I was right here, and, "What are you doing down there?" Well I had to see what shape it was in, if it was closed where we had come out. "Come on, come on, let's see if we can dig through here and see how it is." But, "No, we're not going down there," and they were pretty far from where I was, way up above, shouting to me. "Come on, come on down," I said until I just went down myself. And I've always heard about how there were really brave people in Nuevo Laredo. But I found out there, heh heh heh, how they ran out of there saying how scary that noise was echoing from top to bottom in there. Yes, I said, it was right there where I was, by that pit that was closed on the bottom. And I said they say there are brave people in Nuevo Laredo. No, they said, we're all out of bravery, *señor.* They never came back, never came back.

[JMA] And what did Pedro tell you the bones were?

[Cay] After all that happened. One day my nephew told me, when he came to talk to me. Listen, Uncle, when can you bring me some of the bones, because I talked to the owner where I work, up there in Monterrey, that's where the the owner was from. And he says I should bring some bones up there and show them to him, and see what they are. So I said OK, some day when I have time, some afternoon I'll take a burro. And one day when I had some time, it was about 3:00 in the afternoon and I wasn't busy, so I got a burro, and my wife said to me, so where are you going, and I told her I'm going up in the mountains, I' m going to bring some bones for Pedro now that I have some time. I was pretty busy with the *palapas* then, but found some time and I went and brought about half a burro-bag of bones, and I got back from there about 8:00 at night and came back here, it was dark when I came out of the cave. And nothing happened to me, nothing. Only when those supposedly brave guys were there. So then I went and ate dinner and took the bones to Pedro, and they were having dinner. And they told me, "Come on, Uncle, have some dinner with us," and I said, "No, no, I just finished eating dinner." They asked what do you have in that burro bag, and I told them it was the bones you asked me to get for you. They said when did you come from there, and I said just now. And they said you came out of the cave in the dark? And what did you hear? Nothing, I told them. All the times I've been there, I've never heard anything, except when I was there with you and you got scared away.

And he took the bones to the owner, where he was going to take them, to see what they were. He took them there and it turned out that they were from people, but really big people, must have been giants, they tested them.

[JMA] The kneecaps were as big as soccer balls, or baseballs or softballs.

[Cay] And those spines were this big [gestures].

[CG] I suppose it's possible that maybe over time they might have swollen, but— maybe they belonged to Indians who somehow inhabited the region, and in that case they were very tall, strong people.

[Cay] They thought they must have been giants, because there were really long leg bones.

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[CG] Pardon me, Don Cayetano, to go back to the start, I believe you also told us that you guided a general or military officer or someone like that to the interior of the cave.

[Cay] General Francisco Naranjo.

[CG] You saw him?

[Cay] No. That was in 1913 when he came, and I hadn't been born, when the revolution of 1913 ended. I heard Papa say the general had talked to him where they were fighting in the south, and told him he had heard that they had reached the end of all the caves in the territory, but they hadn't reached the end of the Bustamante cave. So General Francisco Naranjo de Lampasos said that if they don't kill me, I'm going to find the end of it. I'll come well prepared with one or two platoons of soldiers to carry all the food, this and that, all we need, good lights and everything.

And that's what happened, they didn't kill him, and when the presidency fell when the revolution of 1913 ended, he came with two platoons of soldiers, the food and such that he estimated would be enough for them to get to the end, because there's plenty of water, and even some strong currents of water, and

rooms you have to traverse carefully so as not to fall into the water, and then you're cold and shivering.

[CG] But you can't drink that water, or can you?

[Cay] It's good, it's very fine, so clear you can't see it even with the best light you have. You can't see it because it's covered over with frost.

[JMA] That's right. There's a lot of potholes, and if your guide doesn't know, or doesn't tell you where the holes are, you'll fall in.

[Cay] Without seeing it.

[JMA] It's super cold.

[Cay] Like I said, there in the water you'll end up shivering, see, and you can't see that it's really deep.

[CG] How many times have you gone into the caves? Do you remember?

[Cay] Well, since I was fifteen years old. I went a lot from the time I was little.

[CG] How many rooms do you know of, how many chambers?

[Cay] No, I don't have a count. I've been in there for four days and four nights without sleeping.

[CG] Room by room, room after room?

[Cay] Room after room, but I didn't count them.

[JMA] And how far did he go? Tell them about how far General Francisco Naranjo got to.

[Cay] Okay, I will, I'll tell you. He came prepared, prepared with the soldiers, two platoons of soldiers. They didn't kill him, so he came, he came prepared with food, good lights, good lamps, and the two platoons of soldiers and stopped right here at the *Presidencia.* Lots of food for the soldiers to carry because it's a long way. He went in there for fifteen days and only slept one time, Papa said. Because the general wanted to be able to claim that he had found the end. But he didn't get to the end, and he was scared when he came out.

I have to tell you all these facts. People from the government come here to me. They come looking for me here at the municipal court, they come to important people like Don Felipe, and when I've not there they come and say they're waiting for me. I have to tell you all these facts because everyone is always asking me.

So, then, Papa came to the *Presidencia,* and the judge said to him, listen, Juan, General Francisco Naranjo de Lampasos said he's going to come and find the end, and you should guide him, because there are lots of passages really deep with intersections, and like a room that you follow down deep, and more pools way down there, eh, there are lots of passages with branches and a hell of a lot of holes where you keep going down, and no way to orient yourself well.

I've gone in to bring out lost people who never get that far. When a new guide, see, gets lost with some tourists that I didn't want to take, because I can't anymore, I'm still helping out because the police from here or maybe not from here—I'm not sure if it's the *comandante* because I don't know them anymore. But for some time now the police from Monterrey have got involved, and their commander came to me when they needed to ask for help because some guide has got lost with the tourists, and now what do we do, the commander says. They say it's really big, and if we go in, we'll get lost. There were a lot of people here until very late, here in the plaza, who came to see the part of the group that didn't go in, and wait for those who got lost and didn't come out during the day. And now it was midnight, and they hadn't come out all day, and now it was midnight and they still weren't out. So they come here, and a whole group of tourists are lost, guide and all. They're young kids, these guides, who don't know. They think they can just find their way with their electric lights, see. Because they get lost, from here to there. So what do we do now, says the commander, because they say it's really big, and if we go, we'll get lost, and that's when they came to find me, even like I am now. And someone tells them that his grandfather says that Cayetano can't do it anymore, he's in bad shape from all the hard work and gave it up, but he can still help out. They ask, "Who is *he*?"

He's the son of the discoverer. He can get them out. He's around here somewhere. See, that's why I say, see, I say that when I'm dead they'll go and get my bones out of there.

Anyway, sometime in the morning they all go. And when I hear the noise from the trucks coming at night, I figure that they're coming to get me to help them get someone out. I'm lying there by myself and hear them, and I go to the door of my house that faces the street, and there are some low walls there where I wait, and I hear them when they turn into this block in their pickups. The boys from here in town, who know me, bring the police up here and the friends of the ones who are lost, and they get here and stop on the side toward Caborca, and I can hear what they're saying. He's here, here in these houses. And the *comandante* gets out, and I'm sitting on the low wall by a gate next to the street, and "Come in," I say. And he says no, we've come here to you with some urgency, he says. What's it about? Some lost people, and we know you've given up this work because you're no longer able, but please, couldn't you get them out? Sure, I say, because sure, I'll get them out, but just get me a good light because my eyesight is failing. And away I go, such as I am, falling down and getting back up, because I'm pretty worn out from all the hard knocks.

The people lost in the tunnels where they are out of reach of the light, that's what I'm looking for. In the tunnels that go far, I go with a good light and pay attention when a stone is turned over and where they are, and where a rock is moved, that's where they've gone, there they go and there I go. It's easy to find the lost people. When I go as far as from here to the end of the village, then I turn off the light because I know where the tunnels are that go straight without turning, because some of them go as straight as this street, eh, and if they are there you can see their light. And where they turn, I go in a long way to where the sight is direct, and see all the group with only one light, because there they are when I see them really far away. Then I light my light. I kept it off so I could see where they are, pretty far off or closer. The whole group is frightened and really tired of walking around day and night, they throw themselves down in the rooms and the guide is there

on the flowstone, looking down, frightened because he hasn't found the way out, and now it's morning. And then I give a shout, when I see them, and I've made my way like two blocks or so, I shout, and the guide answers, "Who are you?" "I'm Cayetano Gómez Duran." "Ahhh, you're Cayetano," and he's really scared, because all the people here know me.

"Where are we?" "Well you're right there where you are. Don't move, because you'll get even more lost and make more work for me." They're scared and yell at me, "Where are we?" "Well, you're right there where you are," and then they see me coming down the passage.

Historia de las Grutas de Bustamante

En 2001 Robert S. Sanders grabó una entrevista con Cayetano Gómez, cuyo padre descubrió la Gruta del Palmito, en Nuevo León, ahora conocida como las Grutas de Bustamante. La entrevista aborda el descubrimiento de la cueva y algunas de las experiencias de Cayetano como guía en la cueva.

SHAMAN CAVE CEREMONY

Christmas–New Year 1973–74 I was with a small group that did some caving near Huichihuayán in San Luis Potosí. Cueva del Brujo, along with nearby Cueva del Aire, were known to the AMCS but had been rarely visited. As its name suggests, Aire has good airflow, so this seemed like a good project. A local guide took us to Brujo first, and accompanied us a short distance into the cave. Almost immediately we saw evidence of ritual use. There were coins and various plant leaves and flowers placed at several locations along the passage. When I started to pick up one of the plant bits, our guide said, "*¡No lo toque!*" Apparently it was bad juju to handle the offerings. As we proceeded deeper into the cave, our guide left for the surface.

We passed through some nice formation areas and then some vampire-bat guano crawls. Soon the passage started to open up, and we found ourselves in a large, sloping, complex room divided up by breakdown and formations. At the bottom was a small, muddy sump. As we explored upward following the air, we began to hear something like distant voices. As we got closer it became obvious that they were in fact voices, but they didn't seem to be coming toward us. Again we encountered coins and plant offerings like those we had seen near the Brujo entrance. I crept up behind a large formation and peered around the corner. To my surprise there was a group of men standing around a makeshift altar, chanting. Not wanting to disturb them, I quickly ducked back down, but apparently not before a small boy had seen me. We were in the process of retreating when the boy caught up with us and said we should come meet the *brujo*. Busted!

It's not every day that one meets a genuine shaman in a cave, but that is exactly what we did. The local boy led us up to the group of men, who interrupted their ceremony and greeted us warmly. We had been afraid that they might be upset that we were in the cave, that we might have somehow interfered with the gods and cast some pall over their rites. But in fact they were very friendly and actually invited us to join them. They had set up an altar made of stones with broken cave formations at the corners. A small dead animal lay on a cloth in the center as an offering, and the men were walking around the altar chanting in Huastec, drinking *caña*, and sprinkling a bit of the *caña* at various points around the circuit. They showed us the routine and we followed suit, not really knowing what we were commemorating or beseeching.

To us, the ceremony seemed to go on forever, but we noticed that the bottle of *caña* was almost empty, so we stuck it out, getting more tipsy all the while. Just when it seemed we would be done, the shaman produced another full bottle from his bag, but we begged off. We said we had to get back to our camp because our friends would be concerned. They graciously accepted the excuse and we parted friends, having experienced a part of native life few outsiders ever encounter. We climbed out of the nearby Cueva del Aire entrance, having established the connection with Brujo and completed the through trip.

—Mark Minton, *Texas Caver*, second quarter 2009.

LA GRIETA: TERMINUS ’68 AREA

Adam Byrd

During the PESH 2015 expedition, teams spent several days cleaning up leads around the Terminus ’68 area (see map at www.mexicancaves.org/maps/0104.pdf) near the entrance to the La Grieta section of Sistema Huautla.

Day 1—Adam Byrd, Mike Green, Chris Higgins, Matt Tomlinson. After squeezing through the Hobbit Hole entrance to La Grieta, we quickly descended several short pitches to arrive at our lead, a window atop a sediment bank along the perimeter of a small room. Scott Wahlquist and Zeb Lilly had left a handline and rigged a previously undescended pit in this area in 2014, but had run out of time before surveying it. Carbide survey stations from the original survey were long gone, so we drilled a hole in a prominent boulder to serve as a permanent station, then took several splay shots to obvious features in the room to allow us to tie into the original survey with acceptable accuracy.

On the other side of the sediment bank was a taller chamber floored with breakdown. Three leads were identified: Scott and Zeb’s rope, an alcove, and an obvious lead atop the breakdown pile. Matt and Adam surveyed into the alcove first and found a tight fissure with weak air rising from the pre-rigged lead below. Mike and Chris climbed up the breakdown pile and rigged a handline for us to follow. Atop the pile was a drippy dome. The laser rangefinder registered a ledge 30 meters above us, but the dome clearly continued higher beyond a constriction.

Some creative rigging from natural anchors took us down several 5-meter pitches before depositing us at a hands-and-knees crawl heading down-dip that we followed to an intersection. One grim crawl obviously connected to the passage from which we entered, a 7-meter pitch led to a 6-inch-wide too-tight crack taking a bit of water, and some exposed climbing looped around to a window seen in one of the 5-meter pitches. After a thorough search for more leads, the area was derigged. Before making a hurried exit, a quick reconnaissance of the previously rigged pit was made to determine whether additional gear was required to continue. Despite our being an hour overdue, Mark Minton and Tommy Shifflett had waited patiently for us. While squeezing past several tarantulas in the cracks of the Hobbit Hole entrance, I decided that I would rig the 60-meter pit entrance for return trips.

Day 2—Adam Byrd, Mike Green, Matt Tomlinson. During the recon of Scott and Zeb’s pit, a short aid-climb and a pit had been seen beyond a heavily decorated popcorn squeeze. Racking up for the climb, I quickly found that I had left our etriers and adjustable daisy-chains on the surface. Undeterred, Mike made a few tenuous free-climbing moves to a wide ledge at 5 meters and rigged a fixed line. From the wide ledge one could skirt halfway across the pit to measure 30 meters of space above us. The dome was offset, and the top could not be seen. We rappelled 10 meters down a fissure and stripped off our vertical gear to enter the crevice at the base of the pit. Decent air was moving out of the crevice, but powdery corrosion residue on the walls made a mess of the situation, falling into our suits and clinging to our skin. Matt wisely stood at the bottom of the rope where he could hear us call out survey data and various exclamations until I could not fit through a narrow constriction. Mike turned an additional corner and, after briefly opening up, the passage clamped down to impassable dimensions.

The last lead in the area was a drippy pit on the periphery of the room at the bottom of Scott and Zeb’s rope. A free-hanging rope was threaded 15 meters down the pit and things were starting to look good. A large rain well and breakdown slope lay to one side, and a ledge

Adam Byrd in La Grieta. *Kasia Biernacka.*

adam.byrd@gmail.com

overlooking a large chamber lay 10 meters in the opposite direction. Nearing our turnaround time on Matt and Mike's final day of the expedition, we rigged a final pitch and left a permanent station overlooking a steep canyon and an active 1-meter by 4-meter infeeder across it.

Day 3—Adam Byrd, Liz Rogers, Scott Wahlquist. Liz was recruited within an hour of her arrival in San Agustín, and Scott changed his plans to accompany us. After a considerable search for rock that was not rotten, I did a tension traverse across the canyon into the infeeder lead. A couple meters around the corner the lead immediately died as a tight waterfall from some 4 to 5 meters above me. Liz then rappelled 8 meters down the canyon, before getting off rope and downclimbing a series of ledges to flatter terrain. Perched on large breakdown blocks, we were in the chamber the ledge above had overlooked. A rope could be seen below us, as well as another at the opposite end of the room. We had closed a loop, reconnecting to the trade route leading to the lower levels of the cave. With no more leads and no advantages as an alternate to the established route, the area was derigged on the way out. The total survey in the Terminus ´68 area was 419 meters.

We arrived back on the surface several hours before our scheduled pickup and decided waiting would be better than the long walk home. We were surprised to see a headlamp approaching from the cave at dusk. The deep-camp team had left the cave several days early, and serendipitously their final team member appeared just as our ride arrived.

La Grieta: Zona Terminus ´68

Durante la expedición PESH 2015 grupos pasaron varios días explorando pasajes en la zona Terminus ´68 cerca de la entrada a la sección de La Grieta en el Sistema Huautla. Se topografiaron 419 metros.

Breakfast. GSAB 2016 photo by Gustavo Vela.