

A person wearing a red helmet and an orange shirt is crouching on a vast, cracked, and dry landscape. The ground is composed of large, irregular, brownish-yellow fragments of earth, creating a mosaic-like pattern. The lighting is bright, casting sharp shadows that emphasize the texture and depth of the cracks. The overall scene conveys a sense of aridity and environmental impact.

AMCS

ACTIVITIES

NEWSLETTER

Number 36 June 2013





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

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

This issue was edited by Michael Pugliese, with help from Bill Mixon, Mark Minton, and Yvonne Droms.

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

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FRONT COVER

Mud cracks in Anthodite Hall,
Sistema Huautla, Oaxaca.
Photo by Elliot Stahl.

REAR COVER

Stream passage of Sistema
Huautla, Oaxaca.
Photo by Elliot Stahl.

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NEWS



**BILL STEELE SURVEYING FORMATIONS IN SISTEMA HUAUTLA.
PHOTO BY ELLIOT STAHL**

MEXICO NEWS

COMPILED BY BILL MIXON

CHIAPAS

There is a short video by the Italian group La Venta on its 2010 project in Chiapas, during which they explored Cueva del Puercoespín and others in the vicinity of Tuxtla Gutiérrez (see “Mexico News” in *AMCS Activities Newsletter* 35), at <http://vimeo.com/15429782>.

AMCS Bulletin 23, *Heart of Earth: Studies in Maya Ritual Cave Use*, contains the article “Cueva del Sapo: A GIS Spacial Analysis of Surface Remains in a Classic Ritual Cave in Western Chiapas, Mexico,” by Davide Domenici and Cristina Pongetti. Cueva del Sapo is located in the Selva El Ocote, north of the Río La Venta.

An international expedition, coordinated by the Associazione di Esplorazioni Geografiche La Venta and composed of forty members from Italy, Mexico, Spain, Costa Rica, and the United States, took place in April 2012. Its goal was to explore leads remaining from explorations in the 1990s along the left bank of the Río La Venta in the state of Chiapas. The high plateaus near La Florida have concealed one of the most important hydrological systems in the area. Entering through sinkholes in the southernmost sector, the team explored 4.5 kilometers of large passages along the main stream of Sistema Castillo, which ended in a series of sumps. A few kilometers farther downstream, they finished the exploration of the Cueva del Convento, a resurgence to the system that had already been identified in November 2011. It was not possible to connect them, despite repeated attempts at diving the sumps.

Other caves were also explored in that area, among them Sistema Aguacerca (1.6 kilometers), a fossil tunnel containing exceptionally beautiful formations. In the canyon below Colonia Nueva Jerusalém, a large resurgence was explored and named Cueva San Vincente; it ended in a sump after 350 meters of large passage. A small group continued prospecting in the El Ocote forest, discovering a new deep pit that could not be descended due to lack of time. A lot of effort was put into underwater exploration, adding 320 meters to a water depth of 20 meters in Cueva del Naranjo, where

the passage continues as a large borehole. A through-trip in Cueva del Río La Venta enabled a team to finish rigging the stretches of rapids along the main stream with Raumer stainless-steel hardware.

Two more expeditions are planned, one focused on diving in November 2012 and one in April 2013. *Source:* Francesco Sauro in *Speleologia* 67, December 2012, page 77, translated by Yvonne Droms.

In the Spring of 2012, the Grupo Espeleológico Jaguar A.C. explored and surveyed many thousands of meters of new passage in the Sumidero del Higo, located in the high plateau of San Fernando, near Tuxtla Gutiérrez. This cave, found in 2010 and first explored together with the Associazione La Venta in 2011, is revealing its significant potential. The entrance opens as a large pit covered with vegetation. Soon a series of pits drops down 200 meters, then a river can be followed downstream for over one kilometer, ending in a sump. Upstream, a sump is encountered after about 500 meters. It points in the direction of the Cueva del Puercoespín, which was explored by La Venta and the Jaguar group for 3.5 kilometers and whose terminal siphon lies just a few meters away as the crow flies (see *Speleologia* number 64 [and pages 6–8 in *AMCS Activities Newsletter* 35]). Sumidero del Higo is now over 3 kilometers long and close to 400 meters deep. There is still plenty of work ahead to find a connection with Cueva del Puercoespín, together with which it would form a large system. A new entrance in the deep Cañon del Sumidero is also possible, although it is a few kilometers away. Exploration in this area is slowly revealing a complex underground hydrological system, much of which remains to be uncovered. *Source:* Alessandra Lanzetta and Kaleb Zárate Gálvez in *Speleologia* 67, December 2012, pages 76–77, translated by Yvonne Droms. See also article about Sumidero del Higo in this issue.

The expedition Selva Chiapas 2013 of the La Venta Esplorazioni Geografiche group from Italy had two parts. The first part was focused on the forest around Veinte Casas, where re-exploration of Cueva Chute Redondo is a La Venta project. They also were committed

to locate a large pit, which they call *Chiccivà*, seen on aerial photographs. After three days of chopping, they reached the pit, but had to postpone descent until next year because of lack of rope. The second part of the expedition was in the forests around Colonia Rabasa in the protected area of the Selva El Ocote. From a base at Tierra Colorada, they reached a pit, *Oaxaca de las Huellas*, about two hours into the forest. It proved to have a drop of 60 meters to a breakdown slope into a room with nice decorations. The total length of the cave is about 700 meters. The remaining days of the expedition were devoted to trying to establish routes to remote valleys, not an easy task in the dense vegetation growing among large blades of karren, not to mention the venomous *nauyaca* (fer-de-lance) and assorted nasty spiders and scorpions. *Source*: post at www.laventa.it by Francesco Lo Mastro dated May 23, 2013.

CHIHUAHUA

Dr. Penny Boston, in collaboration with Dr. Diana Northup and Michael Spilde, both of the University of New Mexico, Albuquerque, and Cameron McMillan, Northern Arizona University, Flagstaff, continue to analyze materials collected during the 2008 and 2009 Naica expeditions to Chihuahua, Mexico. Based on analyses of DNA, the nearest relatives to microorganisms found in this remarkable cave system include microbes from other caves elsewhere in the world, volcanic soils, heavy-metal environments, and other unusual environments. New results show that some of the cultured strains have extreme tolerance to high-osmotic-pressure conditions, which may fit them uniquely for life in the hot calcium-sulfate-saturated fluid environment of the Naica caves. *Source*: National Cave and Karst Research Institute 2011–2012 Annual Report, p. 4.

COAHUILA

An article on the web site of *El Zócalo Saltillo* by Rosy Revuelta, posted November 12, 2012, outlines the



history of Mónica Ponce's interest in caves and caving, including her organizing the EspeleoCoahuila conferences and her participation in the La Venta group's work at Cuatro Ciénegas. The post is at www.zocalo.com.mx/seccion/articulo/monica-ponce-en-el-corazon-de-la-tierra.

GUERRERO

The cave *La Mariposa*, also called *El Mogote* because of its closeness to that town, has been developed for tourists. The first 200 meters is prepared for families; the rest of the route has been dubbed "extreme." Usually cavers can reach the pool nearly 700 meters from the entrance fairly easily. However, in early summer 2012, there was high CO₂, and of the party of five, three gave up at 340 meters, and the other two turned back shortly thereafter. They photographed a white centipede during their visit. *Source*: June 1, 2013, on Tlamaqui e-mail list by Homero Reséndiz.

Abstract: Caving Projects in Tamaulipas and Guerrero, Mexico, on Indefinite Hold, by Bill Steele.

In December 2009, the Mesas Juárez Expedition launched a project to explore pits in search of the highest possible entrance to the 95-kilometer-long Sistema Purificación, which could add as much as 600 meters to its current 957-meter depth and much length. Sistema Purificación is in the state of Tamaulipas, one of the worst for violence in the Mexican drug war, and after more than thirty-five years of caving, cavers have quit going there.

Also in 2009, the Grutas de Guerrero project was started, to explore and map caves in the Omiltemi area west of Chilpancingo. Preliminary work was done there by French cavers in 1976 and Mexican cavers in the '80s. The French cavers mapped over 5 kilometers in Sima del Borrego, leaving many large side passages unexplored.

Grutas de Guerrero expeditions took place in March



New tourist entrance and centipede, Cueva La Mariposa, El Mogote, Guerrero.



Petroglyphs at Tlayacapan, Morelos.

2009 and April 2010 and started remapping Sima del Borrego, began exploring and mapping Cueva del Tigre, and explored and mapped Grutas Acatatlaca. However, criminal activity was evident, so a return expedition in spring 2011 to camp underground for a week in Sima del Borrego was canceled.

These two Mexico caving projects are on indefinite hold, as is most caving in Mexico by U.S. cavers, due to lawlessness and violence. This presentation will discuss the caving potential of these areas, results to date, and why it may be a long time before expeditions return to them.

Source: 2012 NSS convention program book, page 85.

Cavers from Mexico City have made a nice ten-minute video (https://www.youtube.com/watch?v=S_9dkTzqeok) of a cleanup of the “bottle sump” in Resumidero de Acahuizotla, Chilpancingo. *Source:* Tlamaqui post by Ramsés Miranda.

HIDALGO

In pursuit of a pit said to be 220 meters deep, cavers visited Zimapán, Hidalgo, in May 2012. It turned out to be 85 meters deep and full of used diapers and other trash. Two other pits were not descended because they were right in town and even more disgusting. *Source:* posts to Tlamaqui e-mail list by Gustavo Vela and Arturo Robles.

JALISCO

There is a report by John Pint on a visit to Cueva de los Monos, Toxín, Jalisco, at www.saudicaves.com/mx/monos/. Emphasis is on the difficulty of reaching this highly decorated cave. A map of the cave appears in Carlos Lazcano’s *Las Cuevas de Cerro Grande*, AMCS reprint 4, page 126.



MORELOS

Petroglyphs have been found in rock shelters in volcanic rocks at Tlayacapan, near Oaxtepec. *Source:* Enrique Méndez Torres.

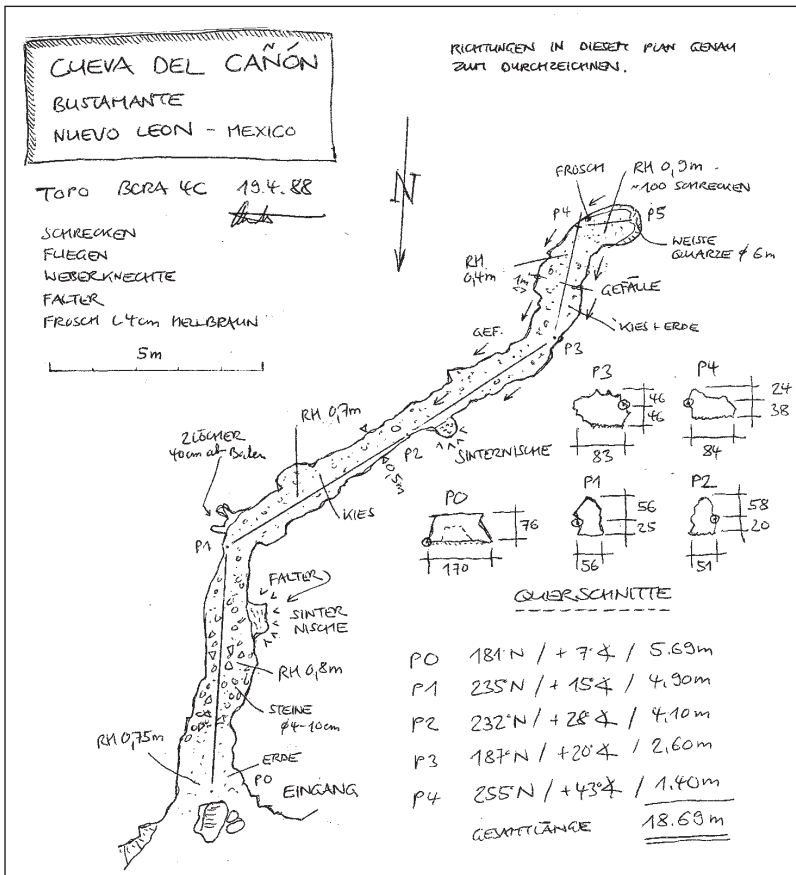
NUEVO LEÓN

A part of show-cave Grutas de García, near Monterrey, can now be rented for social events and celebrations for up to 130 people. The cave is operated by the government of Nuevo León, and arrangements can be made through the Operadora de Servicios Turísticos de Nuevo León. *Source:* SexenioNuevoLeón post at <http://www.sexenio.com.mx/nuevoleon/articulo.php?id=12400>, November 15, 2012.

On April 19, 1988, Cueva del Cañón at Bustamante was visited and surveyed. It is about 2 kilometers back toward Bustamante from the Manantial de San Lorenzo, the karst spring in the canyon. The cave is 18.69 meters long and small, with an entrance 1.7 by 0.7 meters. The cave is dry, but there were locusts, flies, harvestmen, and butterflies in it. A brown frog was seen at the back end of the cave. *Source:* Oliver Knab.

The party room at Grutas de García.





Park Zoo, Jimenez plans to do small, interactive skits in one of the towns near the caves to teach children and their parents about the bats that live in that area.

Rachel Saker, a senior wildlife and fisheries and vertebrate zoology double major, has been caving with the Aggie Speleological Society for more than a year. Her interests in caving and bat biology are the main reasons she was chosen for the team. Saker's area of research pertains to the foraging habits of the bats in Laguna de Sánchez. With help from the rest of the team, she will be netting bats at ranges of 20, 40 and 50 kilometers from the cave and tagging them with different UV powders that react under black light. During the day, they will go into the caves and try to find the bats that are tagged. Based on the UV colors they find most often, the team will be able to determine how far the bats forage during the night, as well as the possibility of other roosting places. *Source:* <http://www.thebatt.com/students-research-team-to-further-conservation-awareness-of-bats-in-mexico-1.2983763>.

A unique group of student researchers with a variety of interests, from botany to caving to theatre arts, have one unifying goal: bat conservation. This spring, a team of three [Texas] A&M students will head to Mexico to conduct research on a species of bat known as the Mexican long-nosed bat.

Ph.D. student Emma Gomez, who received her master of science degree in environmental management, will lead the research team. She will leave in April and stay in Mexico through August. Her major focus is the habitat conditions of the Mexican long-nosed bat in its northern range.

Mexican long-nosed bats eat nectar and migrate to follow the blooming of the agave plants, which serve as their main food source. The agave plants play an important role in the ecosystem and have other uses, such as tequila production. The bats pollinate the agave and help diversify the genetic makeup of the plants.

Based on the location of the agave plants, it is possible to predict potential roosting sites of the bat. Gomez hopes to find some of these sights and protect them.

The social aspect of the project will be tackled by Citlally Jimenez, an undergraduate who is double majoring in wildlife and fisheries and theatre arts. She will be spending her time in Mexico raising bat conservation awareness through theatre performance.

Inspired by the Wildlife Theatre in the Central

Philip Russell (William Russell's brother) recently visited Bustamante. He spoke with Sr. Martín Rico, the superintendent of the Grutas de Bustamante Park. Sr. Rico said that he would roll out the welcome mat for any cavers who wanted to come visit the cave. Sr. Rico can be contacted at phone number 8291010143. *Source:* Bill Russell, 12 March 2013

OAXACA

Cueva Rey Condoy, at San Isidro Huayapan east of Oaxaca City, was discovered by cavers when Jason and Tamara Ballensky visited the town in January 2011. The cave, with its long and well-decorated river passage, had been familiar to the local people, and it had been gated in 2004 to avoid looting. The cave contains pottery and human bones. The Ballenskys returned in December with Elliot Stahl, Philip Rykwald, and Rob Spangler. On this trip, the cave was photographed and surveyed, and the numerous large mud sculptures were noted. These make the cave one of the most notable archaeological finds in recent years. INAH archaeologist Marcus Winter attributes the sculptures to the Mixe-Zoque cultures and estimates their date at Late Preclassic, approximately 200 BC. The local people have become even more protective of the cave, with preservation as the primary goal, and perhaps ecotourism in the

future. *Source:* article in the September 2013 *NSS News* by Tamara Ballensky. See the photographs by Elliot Stahl elsewhere in this issue.

On March 13, 2013, Marcin Gala and Phil Short cracked Sump 4 in J2. They had been underground for 15 days when the first exploration dive took place. Approximately 150 meters into the dive they had to repair a broken guide line laid by Jose Morales in 2009, but otherwise were able to use the 2009 dive line to the limit reached by Jose in the right hand tunnel at 300 meters penetration from dive base. There Phil Short led on laying a full 120-meter spool of Cortland dive line followed by 2/3 of a second spool before they



were confronted with a travertine wall blocking the underwater tunnel. After some searching, they discovered a small opening through a stalactite curtain that allowed them to get out of the water onto a travertine platform. They left their dive gear there and proceeded onward for 100 meters in a large air-filled tunnel that included travertine walls and large stalactites and one significant swim that they did in their Santi drysuits. Ultimately they reached a large borehole tunnel where the river descended into a fractured vertical fissure. Lacking vertical gear, they terminated the recon effort there. The inbound swim had been 71 minutes in a very large tunnel (12 × 6 meters with crystal-clear turquoise water, white sandy floor, and no silt). The return dive was 40-minute continuous swim. The maximum depth was 12 meters.

Peripheral to the diving work, surface reconnaissance work in the upper Aguacate canyon by Pawel Skoworodko, Artur Novak, and David Rickel resulted in the discovery of a karst capture zone approximately 1 kilometer west of the Last Bash entrance, in an area

predicted to have a fault parallel to the J2 and Cheve faults. A new shaft series was discovered in Last Bash, leading off from the base of the first pitch. This was initially pushed by Mark Minton, Yvonne Droms, Kasia Biernacka, Bill Stone, and Nico Escamilla. Further exploration found that it reconnects with the established route down Last Bash into J2, unfortunately not bypassing the tightest section. Considerable progress was made upward in From Russia with Love, but nothing major was found.

Later, during a twenty-one day trip into the cave, Marcin Gala and Phil Short returned through Sump 4 and set a bivouac beyond. The river passage that had been discovered on the first dives was explored down several short drops to a point where the water disappeared into finger-width slots in the floor. A thorough search found no way on.

Sump 4 was surveyed to 510 meters long, and the sides of the sump were examined for side passages. The only one found reconnected nearby. The new part of Sump 4 and the cave beyond add up to roughly a kilometer of cave. The new depth of Sistema J2 (J2 and Last Bash) is 1229 meters, and the length is 14.84 kilometers.

Sources: www.usdct.org/j2_2013.php; www.philshorttechnical.co.uk/blog/?p=26; Bill Stone.

Nicholaus Vieira has posted a long report on his caving during the 2013 J2 expedition at <http://www.crazycaver.com/content/j2-mexico-2013>. Another long report, this one by Phil Short, one of the lead divers, is at <http://www.philshorttechnical.co.uk/blog/?p=26>. We hope to have a real article on the expedition after the Discovery Channel video has been shown and the embargo on photographs ends.

Abstract: 2012 Huautla Expedition, Oaxaca, Mexico, by Ernie Garza and Jon Lillestolen.

Exploration on the Huautla Plateau has a rich history. Building on nearly fifty years of exploration in the more than 62 kilometers of passages that make up Sistema Huautla, cavers of the Cave Diving Group of Great Britain have decided to pursue Huautla's most famous lead and find what lies beyond Sump 9. This talk will discuss the history of Huautla caving, the recent 2012 Huautla reconnaissance expedition, and the future 2013 expedition to explore beyond the sumps in Sistema Huautla.

Source: 2012 NSS convention program book, page 84. See article in this issue.

CUEVA REY CONDOY

Oaxaca, Mexico

COMPASS and DISTO SURVEY BY:

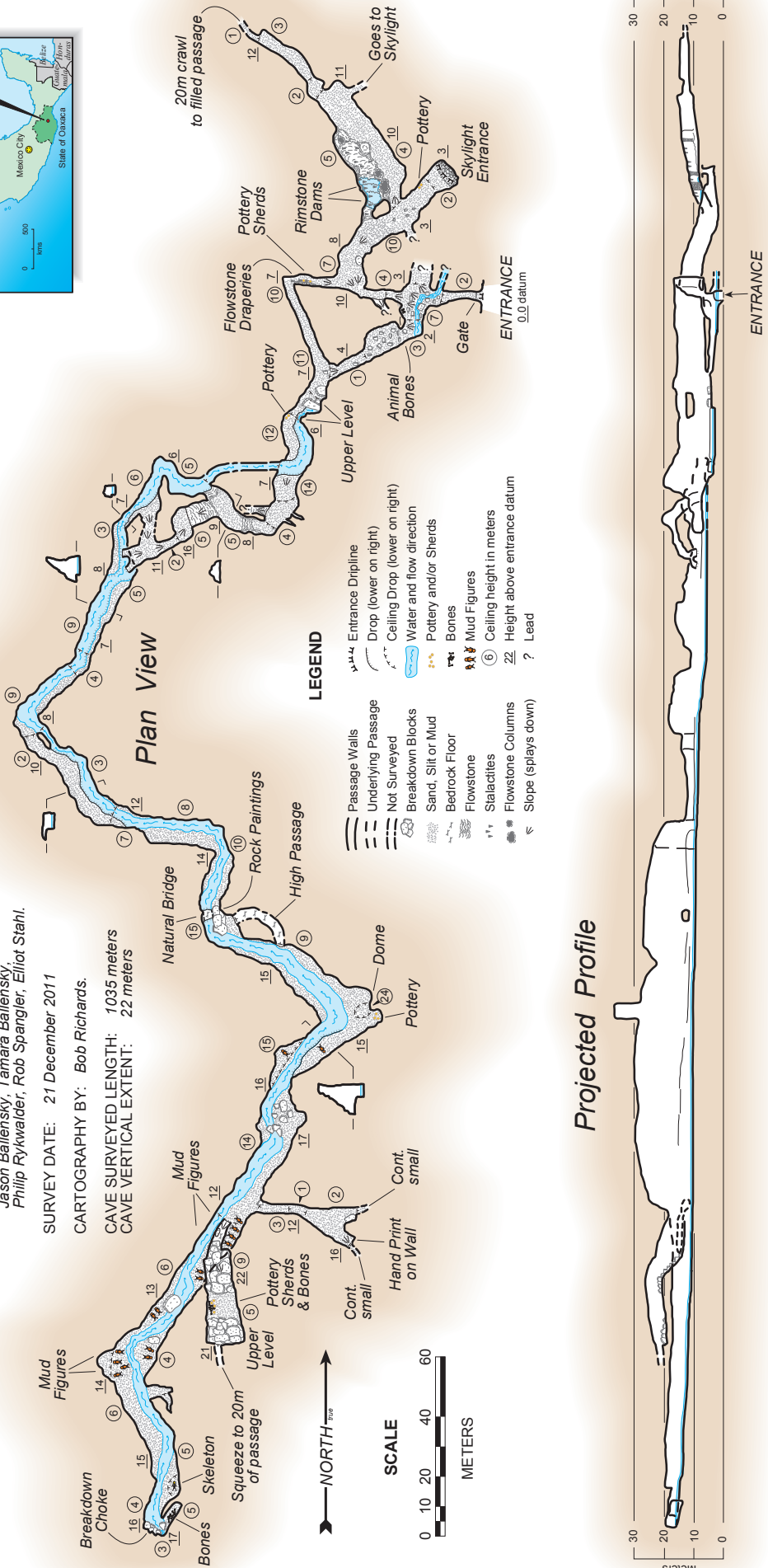
Jason Ballensky, Tamara Ballensky,
Philip Rykwalder, Rob Spangler, Elliot Stahl.

SURVEY DATE: 21 December 2011

CARTOGRAPHY BY: Bob Richards.

CAVE SURVEYED LENGTH: 1035 meters

CAVE VERTICAL EXTENT: 22 meters

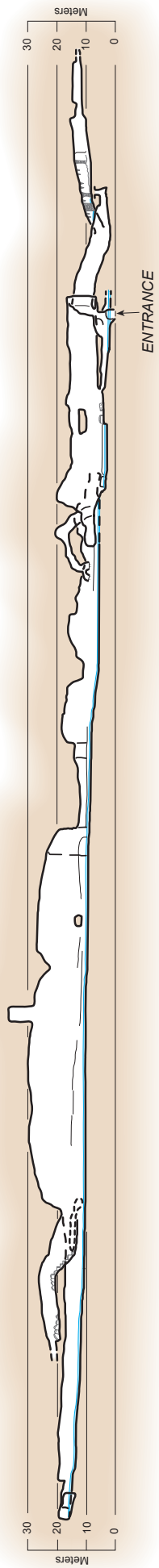


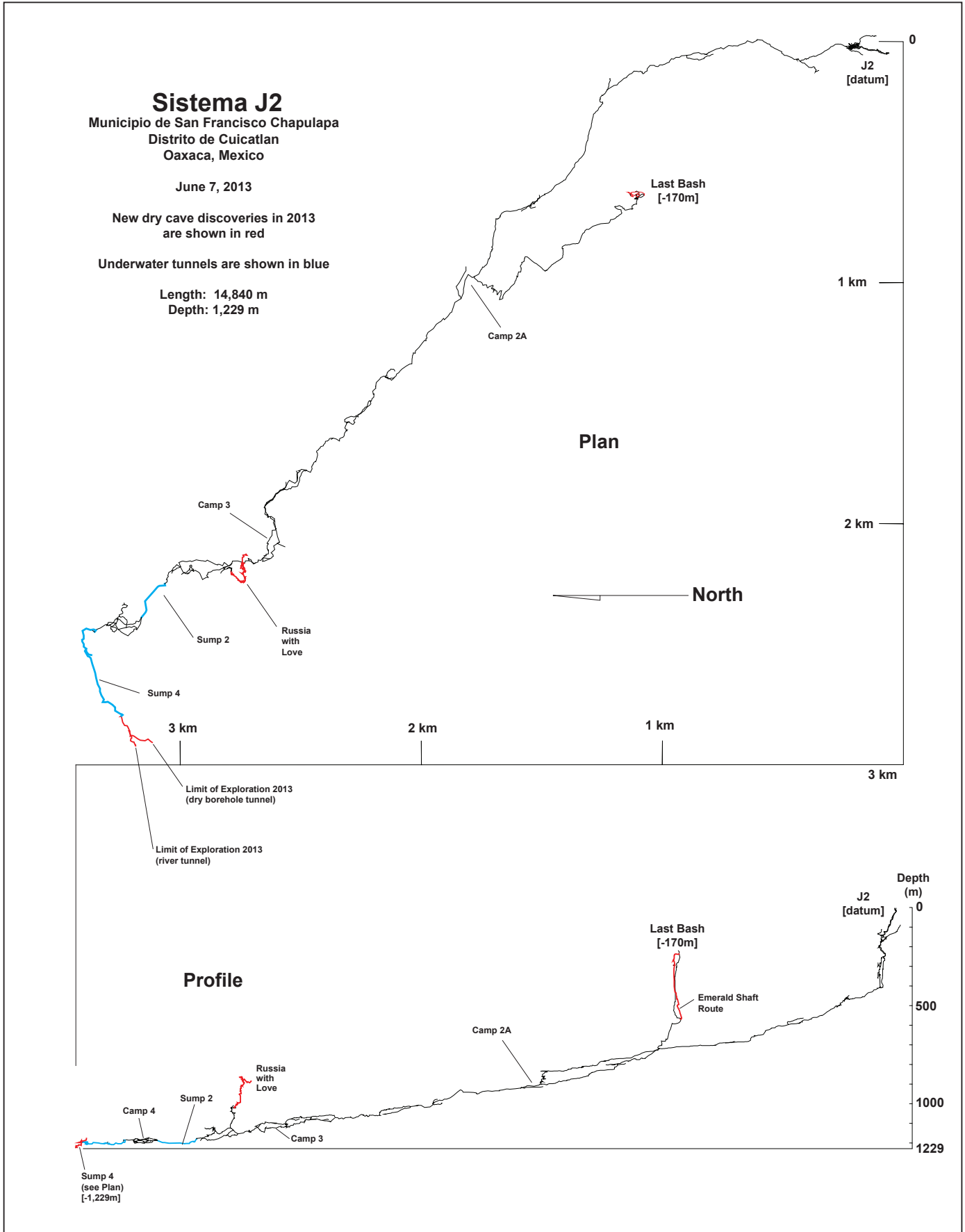
LEGEND

- Passage Walls
- Underlying Passage
- Not Surveyed
- Breakdown Blocks
- Sand, Silt or Mud
- Bedrock Floor
- Flowstone
- Stalactites
- Flowstone Columns
- Slope (splays down)
- Entrance Dripline
- Drop (lower on right)
- Ceiling Drop (lower on right)
- Water and flow direction
- Pottery and/or Sherds
- Bones
- Mud Figures
- Ceiling height in meters
- Height above entrance datum
- Lead



Projected Profile





Abstract: Casa Carlota Caving in the Sierra Mazateca, Oaxaca, Mexico, by Tony and Marion Akers.

Another year brought a group of fourteen cavers from California, Colorado, Indiana, and Texas to the ranch—an old coffee plantation community called “La Carlota” in the Sierra Mazateca, Oaxaca, Mexico. We have tales of cave exploration in several municipal regions, survey of both horizontal and vertical caves, and backpacking exploration of the upper regions in a cloud forest. We finished the survey of a 980-meter horizontal cave, found five pits, a small cave, and a vertical multi-drop cave with beautiful formations and more passage left to explore. Regarding permission from local authorities, we had both successes and failures. We encountered tombs, bats, excellent mountain-top vistas, rain and fog, several snakes—one of which is rare and little known—and learned and experienced (that means work!) how coffee and sugar are made. Caving Mazatec style, hand-made tortillas included.

Source: 2012 NSS convention program book, page 84.

José Montiel Castro’s report (in Spanish) on the rescue of Polish caver Josef Cuber from Sótano de San Agustín in 1980 that was originally printed in number 3 of Base Draco’s magazine in 1983 has been put on the web at <http://1980sanagustinoax.blogspot.mx>. Source: Tlamaqui e-mail list; Mark Minton.

The road from Cuicatlán has been paved to Concepción Pápalo and beyond. A caver register has been left in the Comedor San Bartolo in San Bartolomé Ayautla for visiting cavers to sign and leave notes. Source: Mike Frazier.

There is an excellent presentation about the Cave Diving Group’s expedition to Sótano de San Agustín in Sistema Huautla in 2013 at <http://www.youtube.com/watch?v=aM4vh6zvBpk>. Terry Holsinger prepared the video, over an hour long, from a PowerPoint presentation that Chris Jewell, leader of the expedition, presented at the UT Grotto meeting on April 17 when he was in Austin packing up gear for shipment back to the UK. There are some video clips in the show. See the article about the expedition elsewhere in this issue. The AMCS will publish the full expedition report as an AMCS bulletin.

Number 29, for 2010, of *Speleofórum*, the annual magazine of the Czech Speleological Society, contains an article by Petr Čáslavský on the 2009 J2 expedition.

The article is on pages 64–66, with some color photographs elsewhere in the magazine. There is an English abstract.

A recently discovered cave in the Oaxaca Valley contains several new and exciting examples of Zapotec visual culture, including rock paintings, lithics, and wonderful over-life-size mud sculptures of human and supernatural figures. The cave, named Cueva Rey Condoy by the Zapotecs to commemorate the defeat of a Mixe ruler, is located in the eastern highland region of Oaxaca, outside the town San Isidro Huayapan. Although the massive cave complex appears to have been well-known to locals, it seems to have been unknown to the wider world until an article was published in the September 2012 *NSS News*.

Previously unexplored passages of the cavern yielded some forty figures sculpted from mud directly on the cave floor. The majority of the figures appear to be female, and the ancient sculptor who modeled them paid particular attention to emphasizing their sexual characteristics or erotic poses. A particularly remarkable set of sculptures depicts two individuals lying on the cave floor embracing one another. Other sculptures take the forms of supernatural figures, such as jaguar-humans and saurian creatures. The paintings on the rock walls above show series of human hand prints and dots, as well as more detailed images of human and supernatural faces, hunting scenes, and local topography, all illustrated in black and red pigments. In addition to the sculptures and paintings, the explorers also found pottery, human remains, and various bone and obsidian implements.

The team of cavers who documented the initial discovery was aided in their analysis of the finds by INAH archaeologist Marcus Winter, who will be publishing his study in the *Journal of Cave and Karst Studies*. Based on preliminary stylistic analysis, Winter suspects a late formative dating for the artifacts discovered.

Source: revised from www.utmesoamerica.org/news/major-discovery-cueva-rey-condoy, by the Mesoamerican Center at the University of Texas. This seems to be the only published reference to the site besides the *NSS News* article. See Elliot Stahl’s photographs of the cave elsewhere in this issue.

Jason Mallinson describes his dive in Sump 9 in Sistema Huautla in an article at www.underwater-journal.com/cave-depth-record-achieved-using-kiss-rebreather/. The dive returned to that system the record of deepest in Mexico; Cheve had been deeper by an

unconvincing 9 meters. See the article on the expedition elsewhere in this issue. The complete expedition report is to be published as an AMCS bulletin.

PUEBLA

On Sunday, August 19, 2012, members of Espeleo Rescate México recovered the body of nineteen-year-old Efraín Martínez Martínez from Sumidero Atlalaquia, San Sebastián Alcomunga, Mpo. Ajalpan, Puebla. He had been swept into the cave nine days earlier. Water in the cave was high due to the rainy season, and much rigging was required. The body was found about 200 meters from the entrance. *Source:* http://xa.yimg.com/kq/groups/27864331/1628325727/name/Reporte_Operativo_Atlalaquia%2Epdf.

The October 2012 issue of *México Desconocido* contained on pages 76–80 the article “Sistema Tepetzala: Otra Aventura bajo Tierra” by Gustavo Vela. This cave in the Sierra Negra has been explored by cavers from Mexico and the Groupe Spéléo Alpin Belge to over 17 kilometers long and 500 meters deep. The photo on the first page of the article, is actually from a nearby cave. *Source:* Gustavo Vela on Tlamaqui e-mail list, October 9 and 14, 2012. A map of the system is in “Mexico News” in *AMCS Activities Newsletter* 35.

The Mexpé 2013 expedition of the Groupe Spéléo Alpin Belge took place in March in the Sierra Negra. The group of mostly Belgian cavers continued exploration in Tepetzala, adding about 2500 meters of passage in the remote Fuyez Pauvres Fous (flee, poor fools) area, where Camp 3 was placed. The cave is now over 20 kilometers long, with some side-leads remaining that might connect to other caves in the area. Continued exploration in Cueva Clandestina (OZ40) added about 2200 meters

Ricardo Pacheco and Miguel Barragan rigging during the recovery operation at Sumidero Atlalaquia, Puebla. *Ángel García.*



to the previous 995. The cave is relatively shallow, with depth estimated at under 180 meters. Some good leads remain, four downstream toward OZ20 and Tepetzala and one upstream toward OZ21. In Cueva Escondida (OZ41), approximately 500 meters of river passage led to an unexplored 120-meter pit overlooking an enormous room that could well be the bottom of Tepetzala. In the Ocotepetl area, above Cruztitla, a local guide led the team to a 100-meter-wide, 100-meter-deep pit that was not descended. Participants: Guido Debrock, Jean-Luc Nandancé, Luis Álvarez, Marie-Hélène Grandjean, Geneviève Sinn, Gustavo Vela, Nicolas Soetaert, Joseph Dewulf, Fernand Decock, Dédé Dawagne, Serge Delaby, Roland Gillet, and Richard Grebeude. *Source:* Report in French at <https://sites.google.com/site/speleogsab/resultats-mexplo-2011> [sic], summarized by Yvonne Droms.

Abstract: Mexpe 2011 and 2012, Sierra Negra, Mexico, by Christian Chenier.

The Mexpé project was started twenty-five years ago in the Sierra Negra, Puebla, Mexico. Some 90 kilometers of cave passages have been surveyed since, including Sistema Tepepa (now 29.4 kilometers long, 900 meters deep), Sótano Tres Quimeras (815-meter-deep through-trip) and several others.

The Mexpé project continued recently with expeditions in 2011 and 2012 to the Tequixtepec community, to the southwest of the study area. Caves are plentiful right in the village, with Cueva Futbol at –555 meters being the deepest. Several caves with through-trips, large passages, and multiple entrances were also surveyed, ranging from tens of meters to La Traversita at 2.2 kilometers.

Source: 2012 NSS convention program book, page 84.

Sous Terre, volume 23, number 1, winter 2013, contains an article by Eric Légaré on the Société Québécoise de Spéléologie’s expedition to Puebla, Mexpé 2011, on pages 7–11. See “Mexico News” in *AMCS Activities Newsletter* 35 for a nice Web source on that expedition. The *Sous Terre* issue also contains a centerfold map of Cueva Cañón S, explored during that expedition and the 2012 one. It is reproduced here.

Richard Grebeude has provided a couple of corrections to the material on the Groupe Spéléo Alpin Belge (GSAB) work in Puebla that appeared in “Mexico News” in *AMCS Activities Newsletter* 35. Gustavo

Mexpe 2012 Caves Pushed in 2012

	Length	Depth
Cueva Fútbol	1176 m	555 m (includes 2011)
Sótano Cañón "S"	989 m	256 m (includes 2011)
Chicharon Vegetariano	631 m	299 m
Cueva Pancho Villa	355 m	50 m
Cueva de Retro	221 m	67 m
Pulparindo Carnivoro	189 m	65 m
Cueva Elisa	188 m	60 m
Porche	140 m	32 m
Cueva Drenaje	134 m	34 m
La Lulette Resurgence	85 m	11 m
Cueva Shelob	68 m	6 m (survey interrupted by spiders)

Cueva Cañon S

Tequixtepec, Coyomeapan,
Puebla, México

Altitude : 1368 m

Développement : 989 m

Profondeur : -256 m

Relevés topométriques effectués par :

(2011) Christian Chénier, Gaël Hervé, Jacques Orsola, Nicholas Vieira

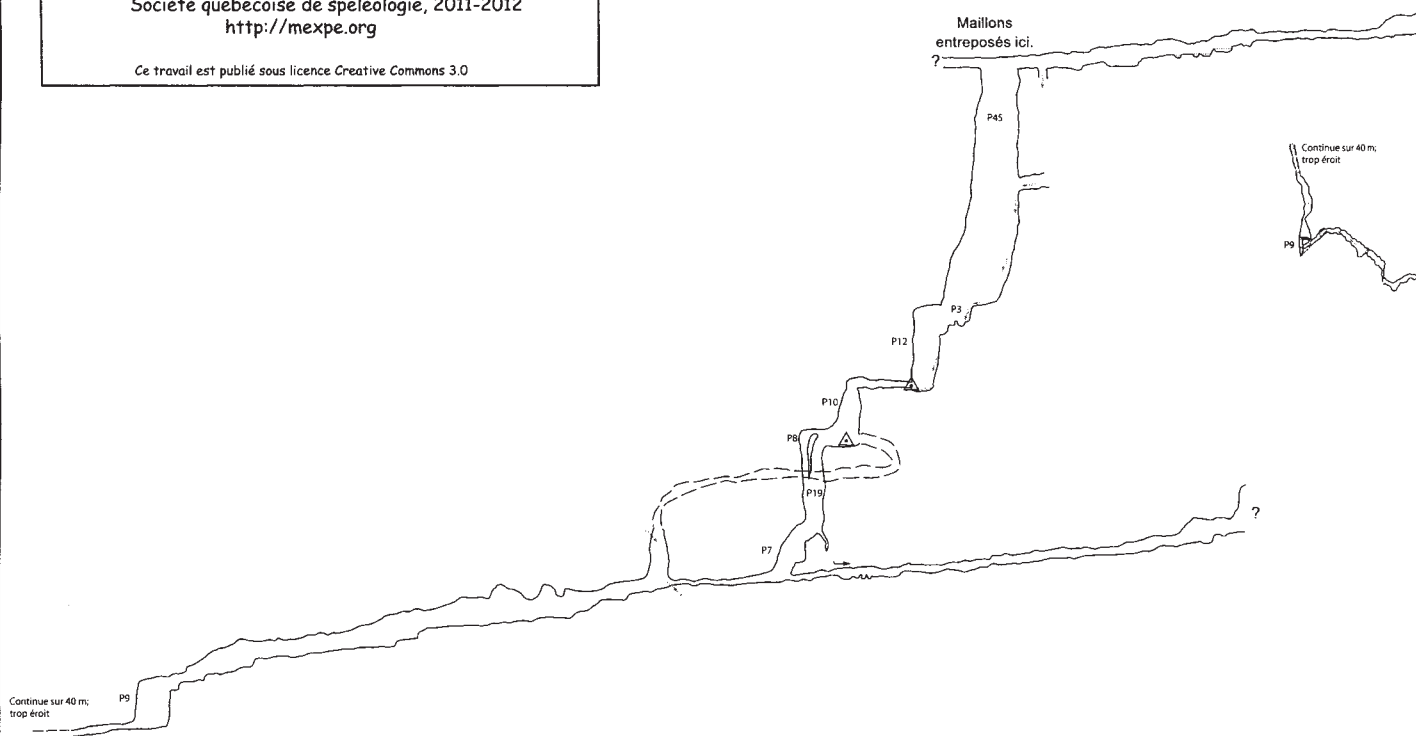
(2012) Christian Chénier, Catherine Tardy Laporte, Jesse Martin, Marc Tremblay, Patrice Tordjman

Dessin : Christian Chénier, Gaël Hervé, Nicholas Vieira

Dessin vectoriel : Gaël Hervé, Catherine Tardy Laporte

Société québécoise de spéléologie, 2011-2012
<http://mexpe.org>

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Vela's photograph that contains Grebeude on page 14 was taken in OZ21, not OZ20. Their work area extends into a small part of Veracruz, not Oaxaca. The heading on the table of principal caves on page 13 should state that they are in the Sierra Negra, *municipios* Zoquitlán, Coyomeapan, Ajalpan, and San Miguel Eloxochitlán, in the states of Puebla and Veracruz.

The Mexpé 2012 expedition of the Société Québécoise de Spéléologie occurred in late February. Camp was established in the village of Tequixtepec, currently reachable only by trail. Cueva Fútbol, the entrance to which is near the soccer field, was finished at a depth of 555 meters; its length is 1176 meters. As part of the cavers' effort to befriend the local Mazatecs, a zipline was put up over the soccer field, and it was enjoyed by

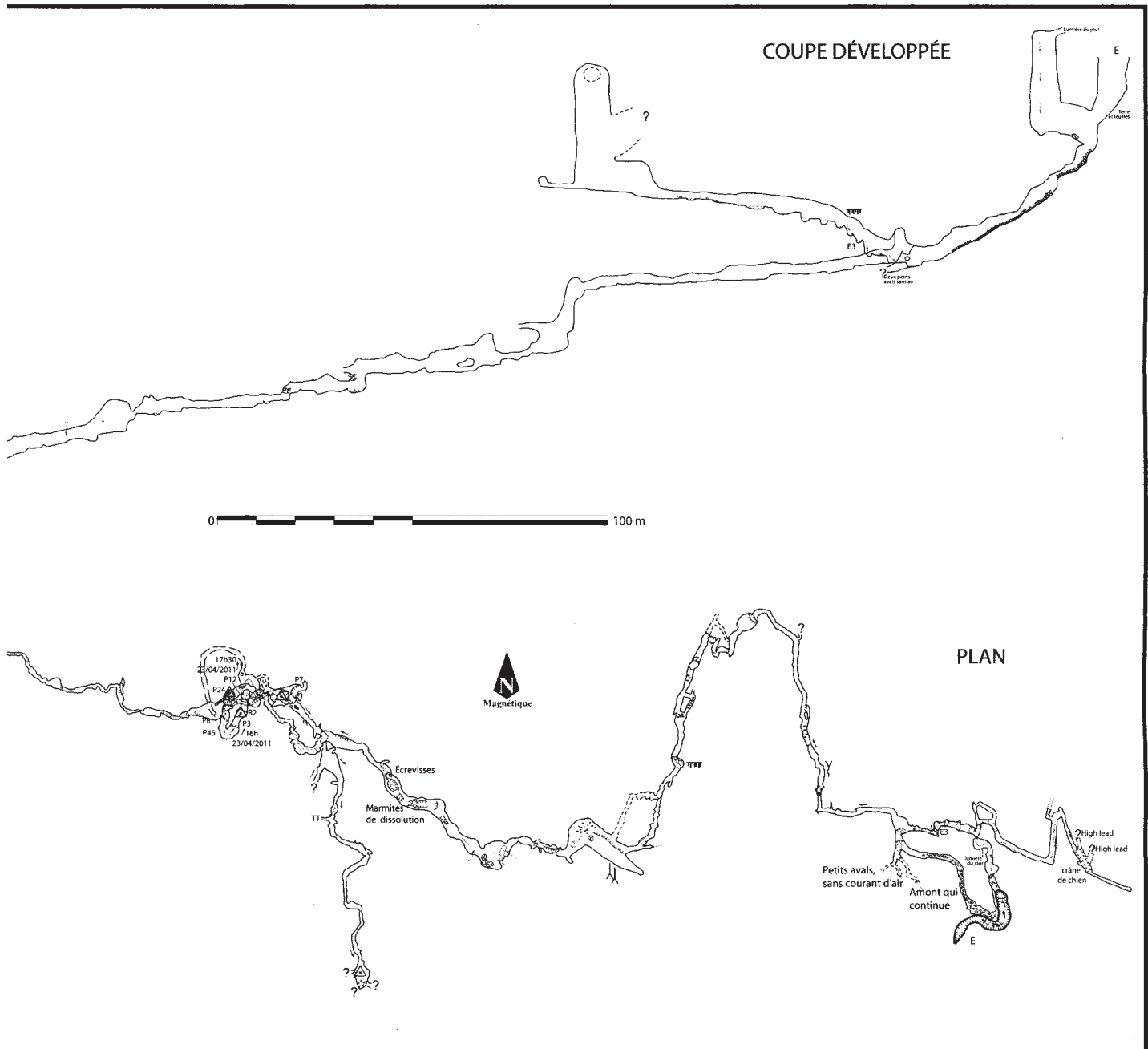
children and adults alike. *Source:* article by Jesse Martin in *Canadian Caver* 77, pages 18–25, December 2012.

The Société Québécoise de Spéléologie has a summary in French of its Mexpé expeditions to Puebla over the years at <http://mexpe.org>.

QUERÉTARO

There are some nice photographs of military macaws (*Ara militaris*) at Sótano de El Barro at <http://hockingphotography.smugmug.com/keyword/sotano%20del%20barro>. *Source:* David Locklear.

The Universidad Autónoma de Querétaro is going to publish an updated version of Carlos Lazcano's *Las Cavernas de la Sierra Gorda*. The AMCS made a facsimile



reprint of that 1986 book as AMCS reprint 5. Lazcano seeks information on explorations and discoveries since the original edition was produced, with maps (either sketches or surveys), locations, and any available information on fauna, archaeology, etc. He also seeks photographs of caves in Querétaro, including caves included in the original edition, because the university is planning an extensive photo section to enrich the book. Contact Lazcano at wenceslaolinck@yahoo.com.mx or jorgeretz@yahoo.com.mx.

QUINTANA ROO

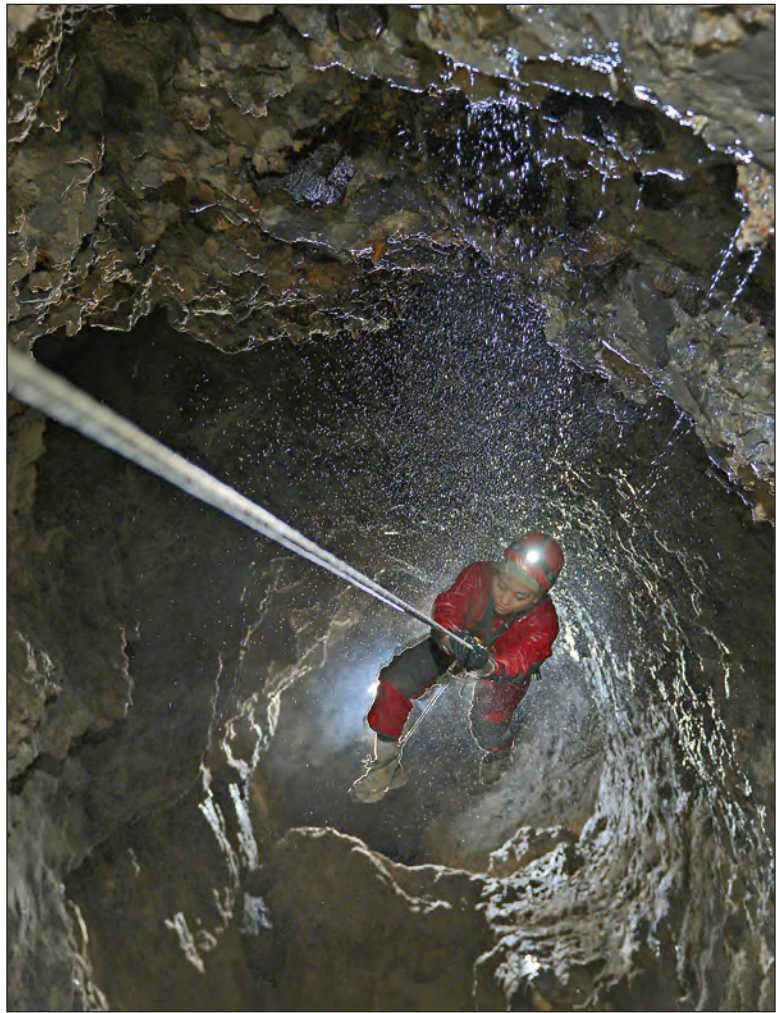
There is now a dry-cave connection between Sistema Dos Ojos and Sistema Sac Actun. As reported in the December 2012 *NSS News*, Don Arburn, Gill Ediger, Aida Ferreira, Devra Heyer, Carrie Hutchins, Pat Kambesis, Chris Lloyd, Rene Rogers Ohms, Bev Shade, Peter Sprouse, Terri Sprouse, Germán Yáñez, and Jacinto Vela surveyed this connection during August 2012. The connection was made between Sistema Dos Ojos's Don's \$100 Cenote entrance and Sistema Sac Actun's (Nohoch Nah Chich) Pet Cemetery entrance. It follows a similar path to that taken by Kay Walten, Gary Walten, and Dan Lins over a decade ago. *Source:* <http://www.caves.org/project/qrss/new.htm>. See article in this issue.

The Quiet Diver Team and the Dominican Republic Speleological Society have connected Cenote Herradura, Cenote K'oxul, Cenote Maya, Sistema Ak Tulum, Sistema Sand Crack, and Cenote Little Fish into one underwater cave system. The entire cave system is named as Sistema Sand Crack. There is quite a bit more cave survey that is part of the overall length of these connected caves. *Source:* <http://www.caves.org/project/qrss/new.htm>.

Francisco Solís-Marín of the Instituto de Ciencias del Mar y Limnología at UNAM reports that the fauna in Cenote Aerolito on the island of Cozumel includes twenty-three species of echinoderms, including the only known underground starfish. The large cenote entrance to

Susana Kaji (top) and Ulises Rivera is Sistema Ilama Coatl-Tomakak in the Sierra Norte, Puebla.

David Cilia García.



the cave is 240 m from the shore, and the total length of the cave is about 6100 meters. The cave is an anchialine environment, with a halocline. Various sources of pollution threaten the life in the cave, including fertilizer from golf courses that may affect this and the other seventeen caves on the island. *Source: La Jornada en línea*, April 20, 2013, <http://www.jornada.unam.mx/ultimas/2013/04/20/152137555-peligra-cueva-donde-se-hallo-la-primera-estrella-de-mar/>.

Abstract: Cavers from the Czech and Slovak Speleological Societies organized two more expeditions to the Yucatan Peninsula in Mexico in 2011, where they continued exploration in the K'oox Baal Cave System. The first trip took place in February, and 7 kilometers of new, partly huge passages were discovered, so the total length of the cave reached 36,364 meters. A 2400-meter-long passage was discovered in neighboring system Tux Kupaxa, which reached a length of 18,918 meters. The second expedition took place in December. Some 1,460 meters of new passages were discovered in three new and previously unexplored cenotes, all of which were connected to the Tux Kupaxa system.

On December 9 at 11 a.m., Daniel Hutňan and Miroslav Manhart connected 19,850-meter Tux Kupaxa and 36,741-meter K'oox Baal into one cave system. So the fourth-longest underwater cave system in the world was created, and the total length is now [2011] 56,591 meters. K'oox Baal is also the longest completely surveyed and drawn underwater cave system in the world, because in the longer flooded systems only about 20 percent of the passages have been completely mapped, the rest being only a survey of the line.

Source: English abstract to an article by Zdeněk Motyčka in *Speleofórum* number 31, for 2012, pages 63–65 and color plate. The 2009 map of the Tres Estrellas part of Tux Kupaxa is from *Speleofórum* number 29, 2010, page 61; while impossible to reproduce clearly here, it is an example of the detail in the map of Tux Kupaxa.

Six divers from the Speleoquanaut Caving Club spent a month mapping in the beautiful cave system of Tux Kupaxa, Quintana Roo, Mexico. They discovered more than 10 kilometers of new underwater cave. By connecting the cenotes of Sac Xiquin and Coop One into Sistema Tux Kupaxa, the cavers extended the length of the system to 15,144 meters, the eighth-longest underwater cave in Mexico at that time. *Source:* English abstract to article by Daniel Hutňan in *Speleofórum* number 29, 2010, pages 59–63 plus color plate.



We are pleased to announce the formation of the Círculo Espeleológico del Mayab A.C., a civil association created by cavers, cave divers, and supporters to promote exploration, conservation, and research within the subterranean environment of the Yucatán peninsula. Our goals are to be a repository of knowledge about Yucatán speleology and to have a positive influence on cave conservation and education. Integrating the efforts of local caving groups, institutions, and individuals into a regional union is at the core of the CEM ideal. Planned programs of the association include regular training courses, work sessions, conferences, rescue practice, archeological awareness training, and of course cave exploration and mapping. Please join us in these activities, since the participation of all who are interested in the marvelous world of Yucatán caves will be what makes this association successful.

As an initial effort, we have scheduled the lecture *Vida Cavernícola en las Cuevas de Yucatán* by cave-biologist Luis Mejía-Ortiz to be held in Playa del Carmen on June 8, 2013.

The CEM has a Facebook page at <https://www.facebook.com/pages/Circulo-Espeleologico-del-Mayab-AC/483051891765711?ref=hl> and a blog at <http://speleomayab.blogspot.mx>. They also have Internet addresses www.speleomayab.mx and contacto@speleomayab.mx.

Sources: Mario Zabaleta; notice posted by Roberto Rojo.

At around 9:30 p.m. [April 19, 2012] I received a call from Alejandro Mata, telling me about some divers missing at Cenote Chac Mol. On my way to the cenote I had to pass by the dive shop I work for, Protec,

Tulum, Quintana Roo, Mexico

Tres Estrellas (Ox - ek)

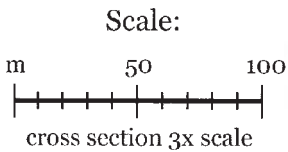
Surveyed passage: 3426 m

Sistema Tux Kupaxa

Total surveyed passage: 15144m

Primary Explorers:

Robbie Schmittner
Steve Bogaerts
Daniel Hutnan
Miroslav Manhart



Symbol index

- | | | | |
|--|--------------|--|---------------|
| | boulder | | speleotems |
| | column | | restriction |
| | step | | cross section |
| | slope | | depth (ft) |
| | pit | | sand |
| | chimney | | lake |
| | sinter pools | | |

Resurvey:

Daniel Hutnan
Miroslav Manhart
Martin Hones
Miloslav Dvoracek
Petr Chmel
Martin Hutnan

Exploration History

Tux Kupaxa (playground) cave system is located west of the village of Chemuyil. The system has been created by uniting four originally separated caves with these main entrances: Nai Tucha, Coop One, Tres Estrelas and Sac Xiquin. Gunnar Wagner and Robbie Schmittner started exploring Tux Kupaxa system in 1998 - 2001. They discovered the remains of mastodont bones, which has made the cave famous worldwide. The data from mapping gathered during the years 1998 - 2001 were lost. Bil Phillips, Robbie Schmittner and Andres Labarte (2003), Bil Phillips and Sabine Schmittger (2005), Steve Bogaerts (2005), Robbie Schmittner (2006, 2007) continued exploring the cave system. In 2009 Czech speleologists led by Daniel Hutnan remapped the whole cave, and they discovered two more kilometres of passages.

Thanks to:

Bil Phillips
Robbie Schmittner
Don Cupertino Maas

Cartography:

Daniel Hutnan
Anna Hutnan
Martin Hutnan
© 2009

to collect my diving equipment. Cenote Chac Mol is located close to the village of Puerto Aventuras, by the federal highway 307. I arrived on site at around 10:00 p.m., followed by Danny Riordan, cave-diving instructor, and Gonzalo Larraña, cenote guide and open-water instructor. We agree to a protocol to start a search for the missing divers or, most probably, a body recovery.

Only Gonzalo and I decide to take part in the underwater search, while Danny stays at the surface to coordinate the operation. Our first dive takes us along the cavern line and the most probable places where the divers could be. This first search-and-recovery dive gives no positive result. We therefore decide to surface and plan to search another area of the huge cavern zone of Chac Mol. On the second dive, we enter on the Kukulkan part of this complex cavern zone. We also agree on taking the search farther, onto the cave line located in this area. Unfortunately, we finished this dive without having been able to locate the missing divers. As it was our second dive, we decide to change tanks and get a full set of doubles to resume the search. But this time, we agree that we need to extend our search into the cave area, a section of the cavern only properly accessible to certified cave divers using appropriate equipment. Our plan is for me to go downstream, where the cave flows into the passage, and Gonzalo will search the upstream passage, where the flows come from. The dive starts at 12:14 a.m. After swimming for twenty-three minutes without having found any traces of the missing divers in the downstream section, I return and meet Gonzalo in the open-water area of the main entrance of Chac Mol. Using cave-diving hand signals, Gonzalo tells me that he found one of the missing divers, dead. Once we are both at the surface and with the help of Danny, we prepare for what is going to be the recovery dive and take a break to allow our bodies to recover from these repetitive dives.

On the fourth dive, started at 1:40 a.m. approximately, we encounter the first body after an eight-minute swim from the surface. The body is floating in mid-water. The diver is male, equipped with recreational scuba-diving equipment and in a position possibly indicating that at his last moment he was swimming into the cave. According to the procedure that we follow, I take the time to note the remaining gas in the scuba tank. I read 500 PSI. His diving light in his right hand is switched on, and his mask is on the face. Blood has come from the nose and ears. No obvious signs of struggle.

After the first body was recovered, the team finds the second diver around 80 meters farther into the cave passage. It is the guide, equipped with his complete

full-cave equipment with wing and harness and a reel clipped to the D-ring or attachment point of the harness. His primary light has no more power and is resting on the floor of the cave. His back-up lights are still stored on the harness. His left chest D-ring holds his personal directional and non-directional markers. The body is resting on the floor of the cave, a meter and a half away from the permanent cave line, in a position indicating that he was swimming into the cave at the time of his death. We note that his primary regulator, on the long hose, was deployed, indicating a possible air-sharing situation may have occurred during the dive. His mask was around his neck, with blood from his mouth and nose. His pressure gage was on zero. His air supply was depleted. At around 3 meters from the guide, we found the third diver, female, wearing recreational scuba diving equipment, with a single tank. Her body was lying close to the line, on the floor of the cave. The position indicates that she was diving into the cave at the moment of her death, with the diving light in the right hand, still on. Small lacerations on the hands could indicate contact with the rocks of the cave, possibly during the gas sharing or attempt at gas sharing. Her mask was in place, and blood was around the nose and the ears.

The divers were found at a depth of 14 meters, 200 meters into the cave system. The area of recovery is a huge room approximately 50 meters wide and 30 meters high, with a strong halocline or mixing zone where the fresh water meets the deeper salt water. This creates a blur when disturbed and reduces the visibility. We must note that they were found in an area not suitable for recreational divers. Only certified and properly equipped divers should penetrate a cave like the one at Chac Mol.

Source: Fernando Del Valle Prieto, IANTD safety officer, posted at [facebook.com/groups/cavediving-markers/](https://www.facebook.com/groups/cavediving-markers/). A shorter note on this accident appeared in "Mexico News" in *AMCS Activities Newsletter 35*.

The caves of the Riviera Maya are wonderful and unique, not only because of their speleothems but also because of the fauna. If you are a lucky cave diver, you may encounter a fish that has adapted perfectly to live in complete darkness: the Mexican blind brotula (*Ogilbia pearsei*). A U.S. team from the TV show *Jonathan's Blue World* was here in 2010, and they have created a ten-minute documentary about this blind fish in the Cenote Pet Cemetery part of Sistema Sac Actun. My work was to be their guide, but I also was invited to suggest the theme and choose the appropriate cenote, and I am very

honored and happy to have earned the confidence of Jonathan Bird. Over the last years, however, this cenote has been used for snorkel excursions more and more, and the artificial illumination of the dark but open-water cavern area has pushed the blind cavefish back. If you are lucky, you may still see the fish during the slow season on a cavern dive, but if not you will have another reason to start your cave-diving training in order to be able to safely dive into the dark zones of the cave. *Source:* Christine Loew. The video is at <http://www.youtube.com/watch?v=jOvcB30Yvrg> or <http://diving-caves.com/pet-cemetery/>.

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 6,300 km² in northeastern Quintana Roo. At this time we archive over 1,018 km of confirmed underwater survey data for 226 underwater caves and cave systems. We have added over 100 km of new underwater survey data during the past year.

Significant connections were made between Sistema K'oox Baal, Sistema Tux Kupaxa, and smaller satellite caves in the Chemuyil region. Sistema K'oox Baal is now over 65 kilometers in length. The Czech Speleological Society continues to maintain valuable dry and underwater exploration efforts within this cave region. CSS underwater explorations in K'oox Baal progress south towards Sistema Dos Ojos.

Explorations in the northwest region of Sistema Ox Bel Ha (Sistema Naranjal area) continue. The city of Tulum is expanding its urban boundaries within this cenote-rich area. Outlying Ox Bel Ha cave entrances are used to stage explorations to the frontiers of this cave. Access to these cenotes grows more difficult due to municipal and private property issues.

Explorations have been revived in the Muyil region southwest of Tulum. This area has produced two significant caves in the past year. Current mapping efforts support a contemporary hydrological model for this coastal zone.

Source: 2012 NSS convention program book, pages 84–85.

Abstract: Exploration and Mapping by the Paamul Grotto, Quintana Roo, Mexico by Peter Sprouse and Liliana Viola.

The first NSS grotto based in Mexico was founded

in 1999 by expats living in the Paamul trailer park. They explored and made line surveys of dozens of kilometers of “dry” (non-underwater) caves, including what is now the 14-kilometer-long Río Secreto tour cave. An influx of new cavers to the grotto has undertaken detailed mapping of these and other caves. Two recent efforts resulted in 20.5 kilometers surveyed in multiple caves. Expeditions in November 2011 and February 2012 concentrated on the Xcaret and Puerto Aventuras areas. In November, Sistema Sac Muul was largely resurveyed and connected to Sistema Fuera de Lugar and Cueva Picadura de Hormiga to become 11,145 meters long. In February, Sistema Dos Árboles was extended to 5,441 meters, and three new caves were mapped near Puerto Aventuras that exceed 1 kilometer in length thus far. At Akumal, Cueva de Camaras was extended to 1298 meters and continues. Few cave surveys have been completed, and many caves are expected to eventually connect. The Quintana Roo Speleological Survey now has data on 76 kilometers of dry cave passage, in addition to 1,018 kilometers of underwater passage.

Source: 2012 NSS convention program book, page 85.

Abstract: A New Genus of Speleophriid Copepod (Copepoda: Misophrioida: Speleophriidae) from a cenote in the Yucatan, Mexico, by Geoff A. Boxshall, Damiá Jaume, Thomas M. Iliffe, and Eduardo Suárez-Morales.

Here we report the discovery of a new genus and species of speleophriid from a cenote in Mexico and examine its relationships with the existing genera. The new genus was collected in 2004 from Cenote Carwash, near Tulum, Quintana Roo.

Source: *Extended Abstracts from the 2nd International Anchialine Symposium (Natura Croatica, vol. 21, suppl. 1, 2012), p. 12.*

Abstract: Ecological Baseline Establishment in the El Aerolito Anchialine System, by Fernando Calderón-Gutiérrez and Carlos A. Sánchez-Ortiz.

The sinkhole El Aerolito on Cozumel Island, Mexico, is the principal entrance to an approximately 18-kilometer-long anchialine system, with an average depth of 12 meters and a maximum depth of 27 meters. It is one of two systems in Cozumel with a sea connection. The sediment consists predominantly of mud and clay. Biologically, the El Aerolito system is very interesting because it has crustaceans, sponges, polychaetes, and fish, as well as the first recorded troglobitic echinoderms.

Source: *Extended Abstracts from the 2nd International*

Anchialine Symposium (Natura Croatica, vol. 21, suppl. 1, 2012), p. 21.

Abstract: The Aerolito de Paraíso Anchialine System: Paradise for Echinoderms, by Fernando Calderón-Gutiérrez, Guadalupe Bribiesca-Contreras, and Francisco A. Solís-Marín.

Anchialine cave fauna is generally composed of crustaceans, but there have been other taxa reported, such as sponges, molluscs, annelids, fish, and echinoderms. Echinoderms living in anchialine systems are rare, and they are usually found in low densities. Until 2005, the only echinoderms reported inhabiting these caves were sea cucumbers. Subsequently, sea stars, sea urchins, and ophiurioids were reported as well, inhabiting different systems: Tres Potrillos Sinkhole, Cocodrilo, and Aerolito de Paraíso in Cozumel Island, Quintana Roo, Mexico.

Source: Extended Abstracts from the 2nd International Anchialine Symposium (Natura Croatica, vol. 21, suppl. 1, 2012), p. 25.

Abstract: Polychaetes from the Mayan Underworld: Phylogeny, Evolution, and Cryptic Diversity, by Brett C. Gonzalez, Elizabeth Borda, Russell Carvalho, and Anja Schulze.

Recent cave-diving explorations in Cenote Crustacea, approximately 10 kilometers south of Puerto Morelos, have led to discoveries of several undescribed annelids inhabiting sediments that lie within the halocline and marine layers. Taxonomic and genetic evaluations support their placement within Acrocirradae and Flabelligeridae, establishing new records from anchialine systems for these families.

Source: Extended Abstracts from the 2nd International Anchialine Symposium (Natura Croatica, vol. 21, suppl. 1, 2012), p. 51.

Abstract: The Use of Stable and Radiocarbon Isotopes as a Method for Delineating Sources of Organic Material in Anchialine Systems, by Julie A. Neisch, John W. Pohlman, and Thomas M. Iliffe.

A dual isotope (stable and radiocarbon) investigation of anchialine cave systems in the Yucatan Peninsula compares the food web of a coastal and an inland cenote. Isotopic data demonstrate distinct photosynthetic and chemoautotrophic trophic levels, as well as the ability of fauna within the caves to be selective feeders within these nutrient-poor environments.

Source: Extended Abstracts from the 2nd International Anchialine Symposium (Natura Croatica, vol. 21, suppl. 1,

2012), p. 83.

The Amigos de Sian Ka'an announced plans for a conference *Manejo e Investigación de Agua en la*



Península de Yucatán at the Hotel Radisson Hacienda in Cancún on September 20–21, 2012. Co-sponsored by the Fundación Gonzalo Río Arronte, the World Wildlife Fund, and the Fundación Carlos Sim, the goals of the meeting were to understand the problems of karst water systems and the research tools and management strategies to deal with them, to provide a forum for communication among researchers, authorities, and educators to exchange information and strengthen partnerships, and to compile and distribute information related to water in the region to support decision-making and public participation. The first day of the forum was a workshop on water management led by George Veni.

EspeleoQuintanaRoo 2012, also titled Congreso Internacional de Espeleología sobre Cuevas Mayas, was held in Playa del Carmen in late May. It was organized by the Asociación Coahuilense de Espeleología and the Universidad de Quintana Roo.

May 25, the following talks were scheduled:

Arturo González, *Underwater caves and Ice Age archaeological evidence.*

Allan Cobb, *How did the Maya use caves?*

Nadja Zupan Hajna, *Karst surface pollution and its reflection in the caves.*

George Veni, *Geology and Hydrology of caves in Quintana Roo.*

Franco Attolini Smithers, *Aktun Hul explorations.*

Luis Mejía, *Reactionary crustaceans in Cozumel.*



Jorge Vargas, *Quiropterologic diversity in Mexico.*

Guillermo de Anda, *Actual status of the sub-aquatic archaeology of the Maya region: results and achievements.*

Jim Kennedy, *White-nose syndrome.*

Gustavo Vela Turcott, *Explorations in the Sierra Negra.*

Kyug Sik Woo, *Conservation, scientific research, and management of show caves and wild caves in Korea.*

Fadi Nader, *Cave conservation issues and speleothem studies: how to stop oversampling.*

Jaime J. Awe, *Protection and handling of Maya caves in Belize.*

Gonzalo Merediz, *Strategic study of the underground aquifers of Quintana Roo.*

Javier Banda, *Quintana Roo's snakes.*

Linda Palit, *Cave Management Plans, Process and Product.*

Daniel Riordan, *Explorations in Ox Bel Ha.*

German Yañez, *Comisión Nacional de Buceo Subterráneo.*

Stein-Erik Lauritzen, *A Norwegian stripe karst and its protection.*

May 26, classroom courses were scheduled:

Roberto Rojo, *Biospeleology.*

Gustavo Vela Turcott, *Exploration.*

Efrain Mercado, *Basic rescue.*

Allan Cobb and Linda Palit, *Underground photography.*

Joe Ranzau, *Cave restoration.*

Javier Banda, *Handling poisonous snakes.*

George Veni, *Cave and karst hydrogeology.*

Afonso Vaz, *Speleo tourism.*

Jim Kennedy, *Surveying.*

Artuno Montero, *Archaeology.*

Daniel Riordan, *Sub-aquatic surveying.*

May 27 was devoted to field trips.

Source: espeleoquintanaroo2012.orgmx.net.

Workshop Report: An Introduction to Environmental Impacts and Management of Karst Systems. Congreso Internacional de Espeleología sobre Cuevas y Cenotes Maya, Playa del Carmen, 26–27 May 2012. Instructor George Veni, Executive Director, National Cave and Karst Research Institute, Carlsbad, New Mexico.

The purpose of this workshop was to provide an introduction to the environmental problems that are unique to karst, or unique in severity in karst, and to the research tools and management strategies for solving those problems. The workshop was conducted over two days. The first day was classroom lectures and the second day was in the field, looking at karst features on the surface and underground. The lecture was divided into three sections that discussed the following topics: environmental problems in karst, hydrogeologic research methods for karst aquifers, and karst management strategies.

The second day of the workshop was held at the Yaaj Ximbal reserve in Cueva de Altar de Tigre, named after the man who found it and goes by the nickname Tigre. The cave is not fully explored and has not been mapped. The photography workshop also visited the cave; our workshops were the first outside groups to visit this cave. We examined about 150 meters of passages, although over 500 meters are known. The photography workshop entered the cave first, while my workshop examined surface karst features and discussed how to evaluate them relative to preventing or mitigating karst environmental problems. Inside the cave, my workshop focused on features that indicate how caves are formed and help to conceptually evaluate caves to manage the areas beyond where people can explore.

Source: George Veni.



Our team has been traveling to Cozumel since 2010 to explore and survey various systems on the island. Our current projects include exploration and survey of Sistema Cocodrilo and Sistema Dos Coronas.

We are resurveying Sistema Cocodrilo and exploring the cave system in hopes of finding a second entrance. We are working on updating the map, as well as producing a mosaic map of the system. Artist Michael Angelo Gagliardi has been taking video of the passages in Sistema Cocodrilo and putting the frames together to

Drawing of Sistema Cocodrillo, Cozumel, Quintana Roo. *Michael Angelo Gagliardi.*

form a mosaic image of the passage so that non-divers can see what cave divers are fortunate enough to be able to see.

We are also exploring and surveying Sistema Dos Coronas, a cave that empties out into the Caribbean Sea. The team has found five entrances to this system, including an inland cenote. In the past two years the team has explored and mapped almost two kilometers of passage in this cave, and there is more to explore. The current end of the line is almost one kilometer from the main sea entrance.

In order to raise funds to continue the Cozumel Cenote Mapping and Exploration Project, the team has put together a set of four museum-quality giclée [inkjet] fine-art prints. All prints are available. Each print is hand-signed, and the edition is numbered by the artist Michael Angelo Gagliardi. Each print also includes a certificate of authenticity. The team picked the prints from a series of drawings Michael Angelo is currently doing for the project. All prints are printed using the latest K3 archival inks on archival papers. This combination results in a print with a viewing life of one hundred plus years before any noticeable fading when presented in normal lighting conditions. The pricing is based on the number on the print, the lower the number the higher the cost. All proceeds go to funding the project. Any print can be pre-ordered. One of the drawings is shown here; another appears in the January *NSS News*. For ordering details, see www.cozcaves.org.

A blog by Mauro Bordignon at www.arianesline.com/blogengine/CW/ contains a number of trip reports on cave diving along the Quintana Roo coast during 2012.

Kur, the magazine of the La Venta group in Italy, has an article on pages 24–30 of number 19 (December 2012) on the Río Secreto show cave. The text is by Tullio Bernabei, and the large color photos are credited to the cave, without identifying the photographer. *Kur* is bilingual Italian/English.

There is a five-minute video at <https://www.facebook.com/video/video.php?v=10151002078437984> titled *Megafauna de la Era del Hielo en Cuevas Inundadas*, by Jerónimo Avilés Olgúin. Produced for INAH's Instituto de la Prehistoria de América, it shows numerous underwater deposits of bones dating from the Ice Ages. It is especially notable for having a lot of shots of the strange formations in Cenote Zapote (see “Mexico



News” in *AMCS Activities Newsletter 35* and *NSS News*, March 2012).

For many years, cavers in Quintana Roo were interested almost exclusively in underwater caves, and the list of long caves in Quintana Roo maintained by the Quintana Roo Speleological Survey reflected that, containing only the underwater length of caves with only underwater connections between their parts. The recent interest in the dry (or at least not completely submerged) caves has led to the survey of some significantly long dry caves, as well as some dry-cave connections between underwater caves. This complicates the Quintana Roo long-cave lists. The following lists are from the QRSS web site at www.caves.org/project/qrss/, accessed May 26, 2013.

Completely underwater caves' lengths
(all connections underwater)

1. Sistema Ox Bel Ha 243,556 meters
2. Sistema Sac Actun 222,704 meters
3. Sistema Dos Ojos 82,435 meters
4. Sistema K'oox Baal 73,600 meters

Completely dry caves' lengths
(no surveyed connection to underwater cave)

1. Sistema Pool Tunich (Río Secreto)
30,127 meters
2. Sistema Sac Muul 11,145 meters
3. Sistema Dos Árboles 7,082 meters
4. Sistema Río Escondido 5,533 meters

Connected wet and dry caves' lengths

1. Sistema Sac Actun 310,950 meters
(Sistema Sac Actun + Sistema Dos Ojos
+ dry cave)
2. Sistema K'oox Baal 75,139 meters
3. Sistema Xunaan Ha 59,671 meters
4. Sistema Taj Majal 6,434 meters



RESUMIDERO
LA JOYA JONDA

COMUNIDAD DE
MONTE CALDERA,
MUNICIPIO CERRO
DE SAN PEDRO,
ESTADO DE SAN
LUIS POTOSI

DIBUJO:
ROBERTO CARLOS
LEGASPI BALDERAS

SOFTWARE:
COMPASS
AUTOCAD



ENTRADA
SALON DE LOS
BLOQUESOTES
-117.1 M.

CAMPAMENTO 1
-240.6 M.

PUERTA A LAS
GRIETAS DE LOS
FLACOS ENVIDIOSOS
-276.8 M.

CAMPAMENTO 2
-500.1 M.



FINAL DE LA CUEVA
-895.4 M.

COMIENZO DE LA TERCERA
TEMPORADA 2013
-541.3 M.

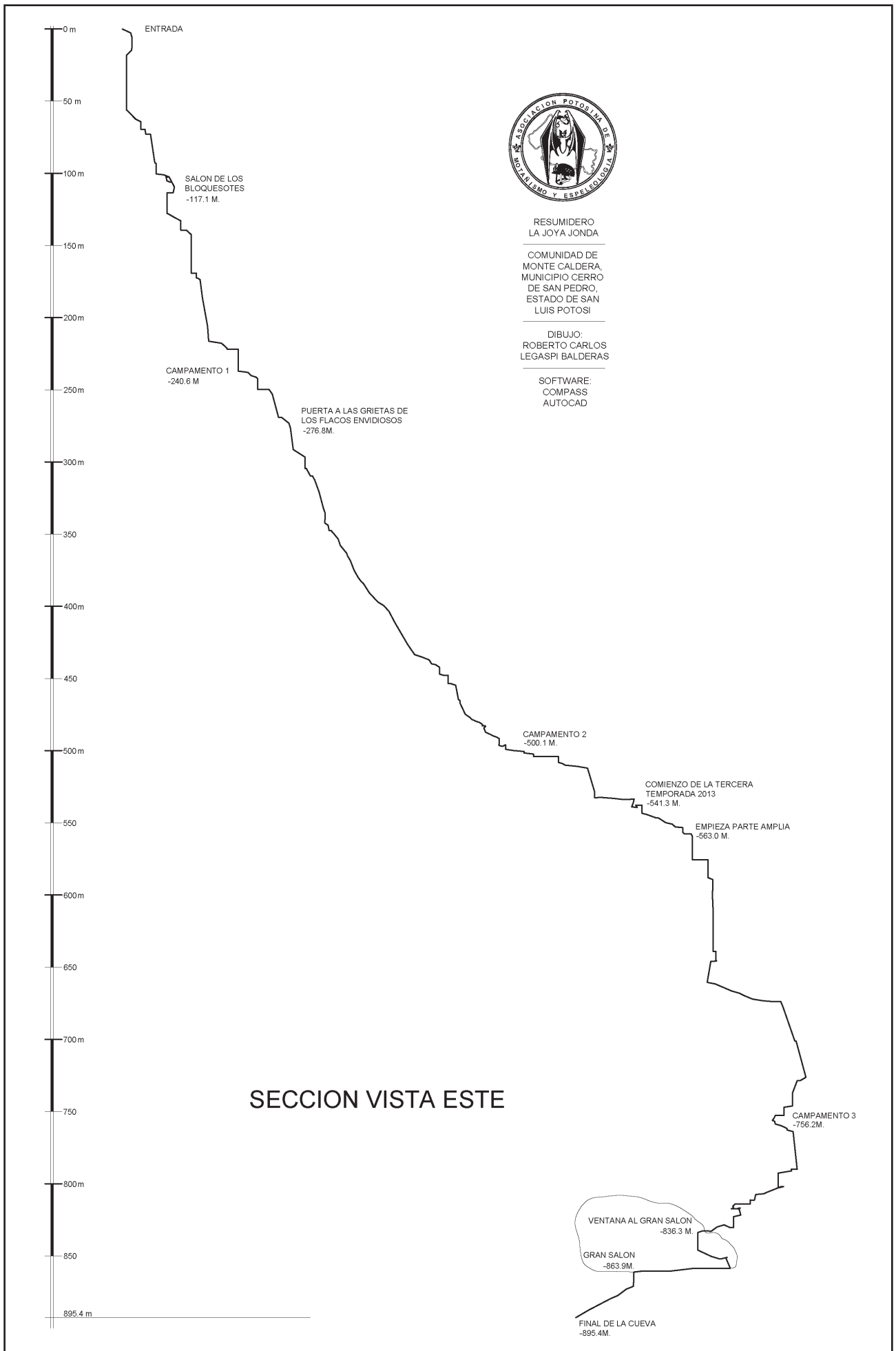
GRAN SALON
-863.9 M.

EMPIEZA PARTE AMPLIA
-563.0 M.

VENTANA AL GRAN SALON
-836.3 M.

CAMPAMENTO 3
-756.2 M.

VISTA EN PLANTA



SAN LUIS POTOSÍ

On April 20, 2013, after twenty-five years of exploring in the Sierra de Álvarez, the Asociación Potosina de Montañismo y Espeleología (APME) reached a depth of 895.4 meters during the third caving season at Resumidero de la Joya Jonda (Hoya Honda; deep hole). In 2007 exploration ended at -506 meters at the top of a pit, just beyond a very tight and long passage. The second season ended during the spring break of 2008 and only added 33 vertical meters, for a total depth of 539 meters. The third season of exploration, mainly on weekend trips, started in January 2013. After the depth of 560 meters was reached, the cave opened up to a series of wide pits that allowed us to easily reach -640 meters. Then the cave narrows again, not to mention the very constricted shaft entrances, until -750 meters, where Camp III was set up with three hammocks in line. This setup allowed the leading exploration group to leave camp when a fresh group arrived. At -830 meters a window in the wall, 12 m above the stream, gave access to a huge room about 100 meters in diameter and more than 50 meters high, practically filled with an immense collapse. Would this be the end of the cave? Gerardo Morrill, Roberto Legaspi, and Homero Reséndiz circled the enormous room, following a small stream that went down a short pit. They were quite

happy, because the cave continued and they embraced again the dream that the cave could go over the magic threshold of 1000 meters in depth. Once at the bottom of the pit, they walked down a very long and inclined ramp, with a downward sloping ceiling, that sadly ended in an impassable passage at -895.4 meters. This depth, at least for the time being, makes Resumidero de la Joya Jonda the deepest cave in San Luis Potosí, 61 meters deeper than Sótano de la Trinidad and 74 meters deeper than Resumidero El Borbollón. The total surveyed length is 1785.2 meters. *Source:* Roberto Legaspi and Sergio Sánchez-Armass.

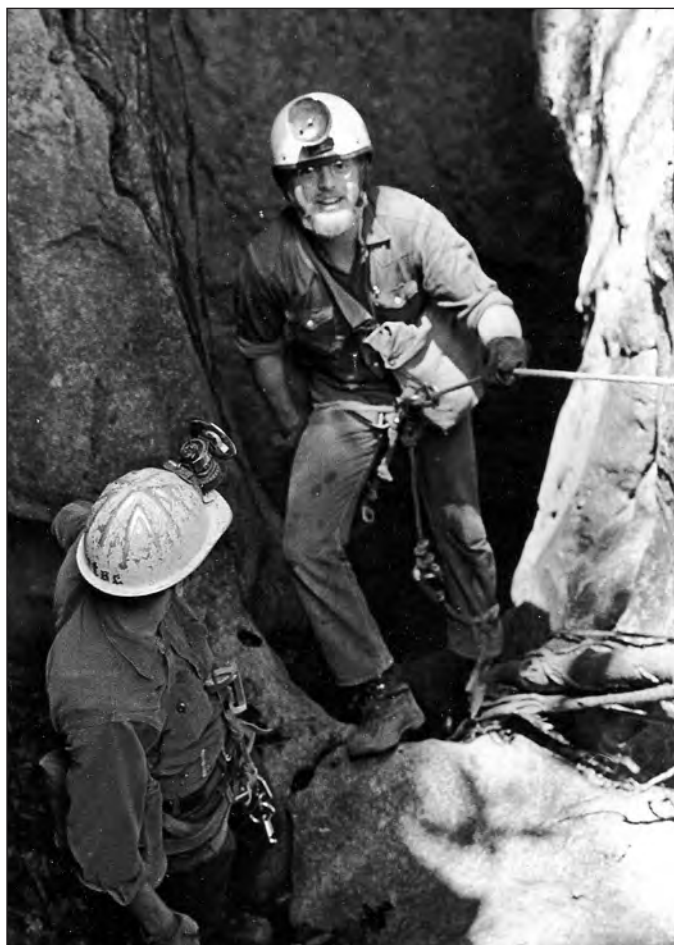
Several sources of information on the Mexican blind fish *Astyanax mexicanus* have been put on the AMCS web site through the efforts of William Elliott. These are the program and abstracts booklets for the Astyanax International Meetings held in Ciudad Valles in March 2009, 2011, and 2013 and the 1977 book *Mexican Eyeless Characin Fishes, Genus Astyanax: Environment, Distribution, and Evolution*, by Robert Mitchell, William Russell, and William Elliott. The PDF files can be downloaded from www.amcs-pubs.org/other/otherpubs.html. The AMCS still has paper copies of the 1977 book for sale. See also the report by Elliott on this year's meeting elsewhere in this issue.

A new freshwater hydrozoan of the genus *Hydra* was collected in Cueva de la Curva, Ciudad Valles, in 2009. *Source:* Article "Freshwater Hydrozoans in Caves, with a Report on New Records," by Maya Zagmajser et al., *Speleobiology Notes*, volume 3, pages 4-10, 2011.



Hugo Rodriguez in a tight spot at -505 meters in Joya Jonda.
Homero Resendez.
Sergio Sánchez-Armass descends the second pit in Joya Jonda.
Roberto Legaspi.





Bill Elliott starts his descent into Sótano de Jineo, Tamaulipas, in 1971. *Francis Abernathy.*

Some cavers who visited Sótano de las Golondrinas during the holidays at the end of 2012 were denied permission to descend the pit because of the large crowds of other tourists. The same thing may happen during Semana Santa (Easter week), and it appears likely to continue in future years. *Source:* Mike Walsh.

Over the winter holidays 2012–2013 a group of cavers visited deep pits in the vicinity of Aquismón, according to an article in the May 2013 *NSS News* by Amy Hinkle. They rigged multiple ropes in most of the pits, including two on the high side and one on the low side at Sótano de las Golondrinas. They had some trouble getting permission for Golondrinas; in contrast to the preceding item, their difficulty was apparently because of cool, cloudy weather that kept the birds from leaving the pit. The authorities do not want ropes in the pit while the birds are there. Amy's sixteen-minute video of the trip is at <http://www.youtube.com/watch?v=kvMcZiPSHZ4>. It has a good bit of "footage" of rappels and ascents done with a helmet-cam. It does help to turn the music *way* down.

A man committed suicide in full view of a bus-load of tourists by running up to Hoya de las Guaguas and jumping in some time over the holidays at the end of 2012. The rescue team from Sótano de las Golondrinas recovered the body. Someone took gory photos of the body, and these were sold to Mexican equivalents of the *Inquirer*, which put cave-rescue personnel in a bad light, appearing to profit from the incident. Cavers in San Luis Potosí do not approve of this. *Sources:* Freddie Poer, Mike Walsh, Mike Frazier.

There are six photographs of cave critters from the Sierra de El Abra at www.nabn.info/Cave_Critters/Pages/Sierra_de_El_Abra.html.

TABASCO

Laura Rosales-Lagarde defended her PhD dissertation on the geochemistry of the Cueva de Villa Luz system in Tabasco, Mexico, in January of 2012. She is now working as a post-doctoral fellow on climate data from caves in Mexico under the direction of Dr. Matthew Lachniet at the University of Nevada, Las Vegas. *Source:* National Cave and Karst Institute Annual Report 2011–2012, page 11. The dissertation is being published as AMCS Bulletin 24.

TAMAULIPAS

Karst Waters Institute Special Publication 16, *Carbonate Geochemistry: Reactions and Processes in Aquifers and Reservoirs*, 2011, contains the paper "Volcanogenic Karst Processes at Sistema Zacatón: Forming Megaposity in a Hypogene Setting" by Marcus Gary, pages 52–55. It mainly summarizes information contained in AMCS Bulletin 21, *Karst Hydrogeology and Speleogenesis of Sistema Zacatón*.

The AMCS has never published anything about Sótano de Jineo. Bill Elliott is now drafting the map based on his old survey notes from 1971 that were found in the archives of the Texas Speleological Survey and will soon also be in the AMCS archives. This shows the value of not throwing things away. *Source:* Bill Elliott.

According to press reports, a collection of 4,926 well-preserved cave paintings have been discovered near Burgos, Tamaulipas. They are in fact pictographs at eleven shelter caves in the Sierra San Carlos. No date for the paintings has been determined yet. The articles quote Gustavo Ramírez and Martha García Sánchez of INAH. *Source:* May 22, 2013, post at www.bbc.co.uk/news/world-latin-america-22632301, and elsewhere.

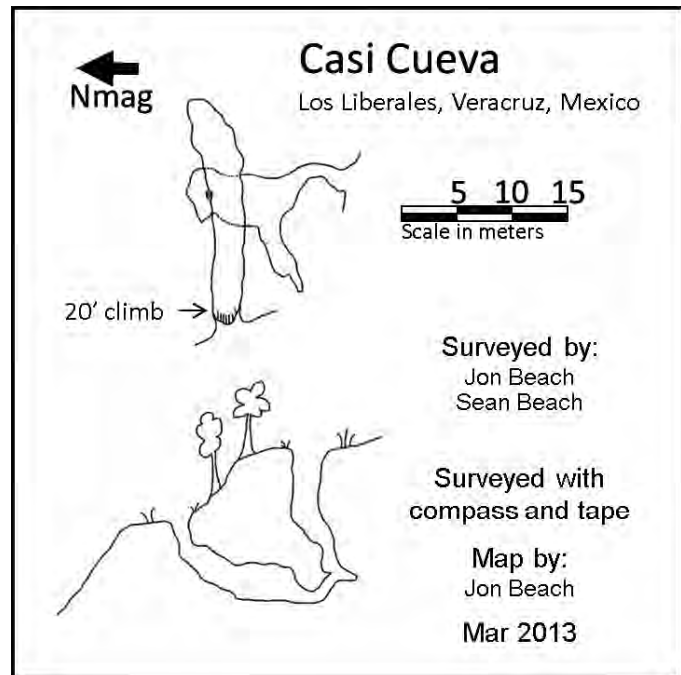
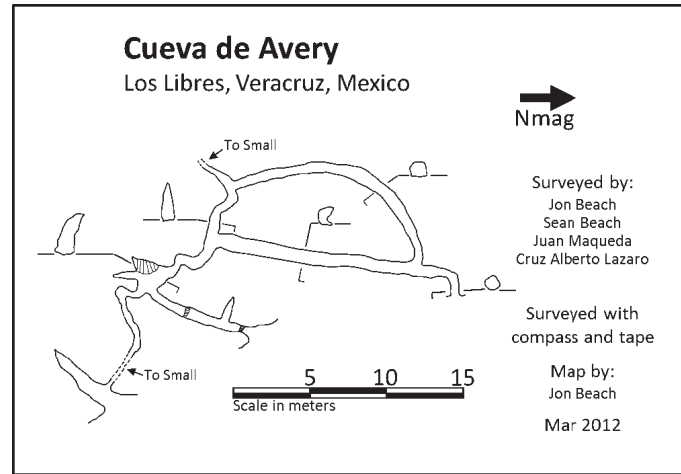
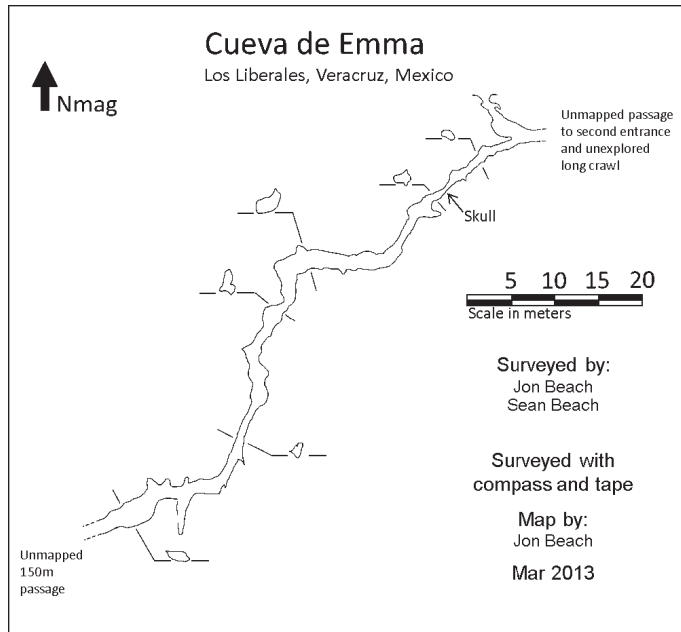
See also abstract of talk by Bill Steele under Guerrero.

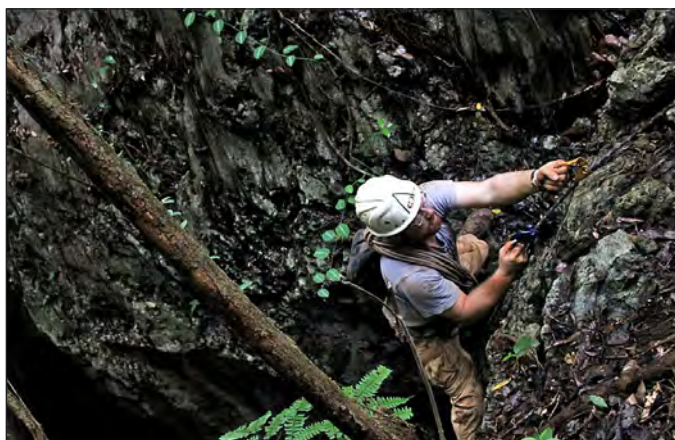
VERACRUZ

In 2012 and 2013, following tips found on a birding website, an area with a large number of caves in the very southern part of Veracruz, near the Oaxaca border, was found that had not previously been documented by the caving community. The area is at the edge of the Selva Zoque rain forest and centered on the town of Los Liberales. The town is an hour north of Carretera Zarabia-Uxpanapa, the main east-west road that runs along the foot of the mountains. According to locals much of the area was rain forest until the 1970s, when the Mexican government moved them into the previously lightly inhabited region. Since then they have cleared large swaths of the jungle to facilitate cattle farming, which appears to make up the majority of economic activity in the area. The geography of the area around the town is quite hilly, with many of the valleys being cleared and the hills remaining forested. As one drives into the town along the main dirt road there are clearly visible sinkholes in many of the cleared fields.

In March of 2012 we flew into the city of Oaxaca and completed the nine-hour drive to La Chinantla, an hour and half from Los Liberales on the main Zarabia-Uxpanapa road. Much of the drive is along two-lane windy roads through the mountains south of Oaxaca. While it is a beautiful drive, the number of blind curves made it quite dicey at times. When we arrived in La Chinantla we took up residence in the only hotel for fifty miles and were able to find a young man who spoke good English and a young local teenager who knew the area well. They agreed to help us, and we made arrangements to meet early the next morning.

There was a miscommunication during the first day of exploring, and we ended up taking a hike into the mountains to a waterfall. While the area was beautiful and the hike was nice, the waterfall was not the reason we were in Mexico. After some additional discussions that afternoon, the local guide took us to Los Liberales, as he had heard of a large cave near the town. The cave is a large entrance to a spring that is right off the side of the road north of Los Liberales. After we poked around and found no real leads in the spring, we went back into the town to talk to locals. We met some teenagers who said there were caves all over their farm south of town and that they knew of another farm with a large cave that no one had ever explored before. They took us to the land-owners, and after a short discussion we





Sean Beach climbs out of Casi Cueva, Los Liberales, Veracruz. *Jon Beach.*

were granted access to explore their lands.

The next day we drove back to Los Liberales and met up with the teenagers. They took us to an area south of the town that had a number of very old limestone outcrops that contained the remnants of old caves. The limestone appeared to have been exposed for so long that it looked like swiss cheese, with cracks and small passages everywhere. We spent the morning exploring

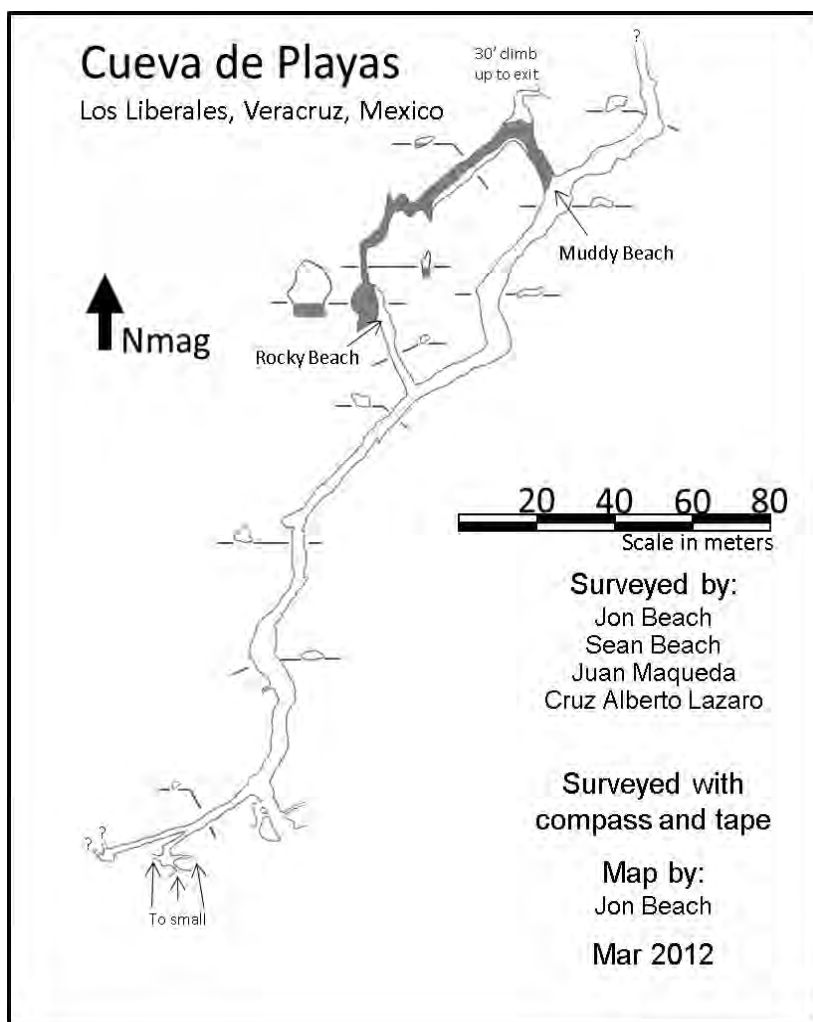
countless outcrops in the fields and surrounding jungle. We found only one cave of any size, Cueva de Avery. We quickly sketched it and headed back to town for lunch. After lunch that afternoon we decided to move north of town to see the large, unexplored cave. When we arrived it turned out that the cave was only about 200 meters from the spring we had seen the day before. It is located at the edge of a cow pasture. We did a quick initial exploration that afternoon and decided to come back over the next couple of days to fully explore and map the cave.

The next day we drove back and did a thorough exploration of the cave and began to map it. Our guide and interpreter took to caving very well and helped us with the exploration and mapping. The cave ended up being a little over 450 meters long and was a combination of dry and water-filled swimming passages. The swimming passage in one area started from a bank that was so muddy that one had to practically wallow in mud to get into the water. We nicknamed the place Muddy Beach and decided to call the cave Cueva de Playas. There was little in the way of cave formations, but the swimming sections of the cave were quite interesting.

In one room, dubbed Rocky Beach, there is another access to the swimming passage. Looking down into the deep water we could clearly see a lower level to the cave below the water table, with what clearly looked like large passage running perpendicularly to the upper passage we were in. After two full days of caving there remained a few unexplored leads that weren't pushed either due to time limits or instability of breakdown in the passages. We produced a quick sketch map of the system that won't win any awards, but at least shows the general outline of the passage.

In March 2013 we returned to the area, this time via Minatitlán in southern Veracruz. It reduced the drive time from the airport to La Chinantla from nine to three hours. We were also able to time our trip to be in La Chinantla for five and a half days. We spent the entire time in the same valley as Cueva de Playas.

For this trip we brought a Microsoft Kinect with us to test a new system for creating 3-D maps of caves. Each morning we completed the hour-and-a-half drive from La Chinantla to Los Liberales and then spent an hour or two experimenting



We also spent large amounts of time tromping around in the jungle in the hills that surround the valley. We found a number of smaller caves and a few large, water-filled caves that have some potential, but were deemed to be too dangerous as there was a constant threat of rain. Those will have to wait for another trip with better weather. Several of the caves we found in the hills were passages that started as vertical cuts into the hillside. None required true vertical-caving techniques, but often required a least a handline.

We mapped one of the smaller caves on the side of the hill above Cueva de Playas. The cave dropped into a small pit that ended up wrapping around itself and popping out of the hill a little below the first entrance. The cave initially looked very promising, but it didn't quite turn into the cave we hoped for. Based on that we opted to name it *Casi Cueva* (Almost a Cave). It was the only cave in the area in which any bats were seen.

It rained all of the night before our last day of the trip so we opted for a deep push into the jungle that day to find entrances to new caves. One of the land owner's sons, who had become quite enthralled with caving over the week, led the team. He was so skilled with his machete that he could hack his way through the jungle and still move faster than we who were using the cleared trail behind him. We ended up finding a number of small entrances that didn't go anywhere, but we did find one cave about a half mile into the jungle that dropped into a small dry room. It had what appeared to be one small pottery shard lying in the back of it. We left it in place and noted the location.

In all there are likely dozens more caves in the area to be discovered and explored. But it remains to be seen if the local geography will support any large or long caves. Regardless of that, the area is a wonderful mix of jungle, hills, caves, and a very friendly local population. The remoteness of the location and the fact that it is in southern Mexico make it relatively safe for foreigners. In all we thoroughly enjoyed both of our trips and look forward to traveling back to the area to find and explore more caves. *Source*: Jon Beach

Espeleo Rescate México scheduled a cave-rescue training and simulation event for December 7–9, 2012, at *Cueva Oztotl Tlali*, *municipio* Rafael Delgado, Veracruz. *Source*: Post at https://www.facebook.com/permalink.php?story_fbid=497526090271303&id=215796165110965, where more details are available.

YUCATÁN

George Veni of the National Cave and Karst Research Institute, along with Carlos Duarte and Raúl Manzanilla of Grupo Ajau in Mérida, visited Actun Kaua in September 2012. No survey had been done in Actun Kaua since 2003 (see *AMCS Activities Newsletter* 26, pages 65–69). At that time the total survey was 10.4 kilometers of mazy passage. There were 566 loops in that survey, and passage density reaches 1 kilometer under a 100-meter square. The local police provided a new ladder into the cave, and a small amount of new survey and resurvey was accomplished on this reconnaissance trip. Surveying is slow because most of the passages are about 1-meter square, with tighter spots.

Many questions remain about Actun Kaua. Its full extent is not known. Its mode of origin is unusual, and potentially geologically unique. The known limits of ancient Maya activity extend to near the explored limits of the cave. The ancient Maya have proven capable of exploring long distances into caves; it is possible that they penetrated considerably farther, which additional exploration and survey of the cave will determine.

The trip was also an opportunity to prepare for the future of the project. We reestablished ties with the town mayor and police, who are happy to see continued work at the cave. Additionally, with NCKRI sponsoring and confirming its interest in the project, the chances for more substantial project sponsorship have significantly improved. While continuing the survey and exploration of the cave is important, additional geological and archeological study are also needed. My hope is that a multidisciplinary team can return to the cave, including at least two or three survey teams plus geological and archeological teams to evaluate the cave's origin and the extent and intent of its ancient use. *Source*: Extracted from NCKRI Project Report by George Veni, November 2012, at <https://www.box.com/s/hzjsjh8klkzqb290ya66> (a Flash document, for some no doubt strange reason).

The April 29, 2013, edition of *El Diario de Yucatán* contained an article “Una Madre Milenaria,” by Dioné León, describing a visit by members of Grupo Ajau of Mérida to Cueva Madre Cristalina near Santa Rita. The article is on the paper's web site at <http://yucatan.com.mx/imagen/una-madre-milenaria>.

An article dated May 7, 2013, on a cave clean-up and restoration at the town of Sanahcat is at <http://www.reporteroshoy.mx/wp/sorprendente-hallazgo>

-en-un-cenote-aparecen-mamuts-pinguinos-y-gansitos.html. *Source:* post to Tlamaqui e-mail list by Fátima Tec Pool.

There is a twenty-minute video by Sergio Grosjean titled *Secretos de los Cenotes de Yucatán* on the web at www.infoliteras.com/noticia.php?id=7049. The narration is in Spanish. Much is made of the problems of garbage and trash pollution of the cenotes in the Yucatan peninsula.

The *ejitadarios* at Libre Unión, near Yaxcabá, have prepared the surroundings of Cenote Xmaquil for tourists, hoping to profit from their visits to the poor community. They have cleared brush and added benches and railings around the cenote, which is about a kilometer from the village. They seek support from authorities to publicize their ecotourism venture. *Source:* *Diario de Yucatán*, April 7, 2013, post at <http://yucatan.com.mx/yucatan/ecoturismo-en-libre-union>. An annoying ad will display for too long before the article appears.

MISCELLANEOUS

Over 2600 maps of Mexican caves have been put on the AMCS web site at www.amcs-pubs.org/maps/. All of the maps published by the AMCS and many others are there. No doubt many more lurk in the AMCS library and archives; they will be added to the collection as time permits.

Thanks to Dan Oliva for pointing out that INEGI topographic maps of Mexico are now available free on the web. They include:

- 1,238 cartas, escala 1:20 000 en formatos pdf, tiff, gif y 1,236 de las cuales tienen además formato shp.
- 2,085 cartas, escala 1:50 000 en formatos tiff, gif, 2074 de las cuales tienen formato shp y 2060 tienen formato pdf.
- 419 cartas históricas (1973-1988) escala 1:50 000 en formato pdf.
- 121 cartas, escala 1:250 000 en formato tiff y gif, 94 de las cuales tienen además formato geopdf.
- 32 cartas (entidad federativa) escala 1:250 000 en formato pdf.
- 11 cartas, escala 1:1 000 000 en formatos pdf, tiff, gif y shape.

To see the maps, go to www.inegi.org.mx and select *Geografía/Topografía*. On the resulting page, select *Cartas topográficas* under *productos y servicios*. This takes you to a page where you can select the maps you want to choose from; don't be alarmed when the page dies

temporarily while it mulls over your choices. Then click *Consultar*, and you'll see a menu of the selected set of maps, with icons to click for the various available types (TIFFs, PDFs, etc.). Before your first download proceeds, you'll be asked for your e-mail address and password, which you register the first time you visit by clicking *Regístrese* on the login screen; registration is free. After you fill out the registration form to its satisfaction (be sure to click the box confirming that you accept the conditions), you are sent an e-mail message asking you to click *aquí* to confirm your registration. I imagine there are index maps somewhere on the site; I haven't found them.

That's the good news. The bad news is that I've not yet managed to make this work. After much experimenting and consulting with others, I finally got it to accept my registration form by claiming to live in Mexico and giving a date of birth forty years after my real one, and I got the confirmation. But still, even after I've logged in once, trying to actually click on a map to download it just dumps me back to the login page again. Some people have made it work. Your mileage may vary.—Bill Mixon

Abstract: Caving in Mexico: A New Game, by Philip Rykwald.

Since the 1960s American cavers have explored thousands of caves in Mexico, including some of the deepest caves and pits in the world. Caving in Mexico became a highlight on cavers' resumes and many drove thousands of miles to explore south of the border. In more recent years, however, violence related to drug trafficking started along the Mexico–United States border and then spread farther south in Mexico.

According to the most recent statistics from the U.S. State Department nearly 50,000 people were killed from 2006 to 2011 by the ongoing drug war. Carjackings and highway robbery are serious problems in many parts of the border region, and U.S. citizens have been murdered. SUVs, which are common vehicles for cavers, are a target. The U.S. State Department has advised no travel to San Luis Potosí, Tamaulipas and Zacatecas, which contain many popular caves. This talk discusses some of the present border issues and includes travel advisories for Mexico travel and caving.

Source: 2012 NSS convention program book, page 85.

Abstract: Wallsmap Software for Regional Cave Surveys, by Peter Sprouse and Jim Kennedy.

Wallsmap is a freeware GIS program specifically

designed for cave databases developed by David McKenzie, author of the Walls cave mapping program. Both the Texas and Mexico geodatabases utilize Wallsmap, with data on over 12,500 caves. Being specifically designed for regional cave surveys, Wallsmap offers advantages over mainstream software options. The native file format is the ESRI shapefile, and the program associates unlimited text, photos, and cave maps with each record. All sorts of background images can be added to the map view such as topographic maps and aerial imagery. Vector layers can include geologic units and cave line plots or shapefiles. Locations can be viewed in Google Earth or Google Maps. Contributors can send the database manager updates in shapefile format that can be readily integrated into the master file. The Texas Speleological Survey was founded in 1961, and has 15 directors who meet quarterly. The TSS regularly responds to data requests and plays a key role in karst conservation, particularly in fast-developing central Texas. The Oztotl Project was begun in 2007 by Peter Sprouse, building on the Mexico Cave Survey previously maintained by Gerald Moni. It is coordinated with state cave surveys from Quintana Roo, San Luis Potosí, Tabasco, and Veracruz.

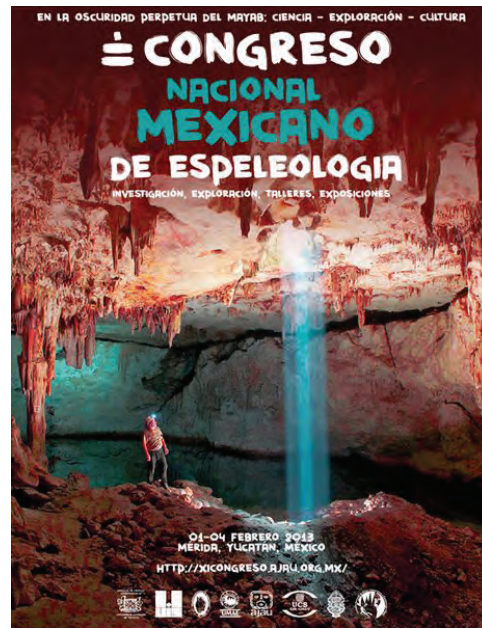
Source: 2012 NSS convention program book, page 91.

The web site of the Italian group *Esplorazioni Geografiche La Venta*, which has done a lot of cave exploration in Mexico over the years, contains reformatted reprints of a number of papers on Mexico that appeared in various proceedings and journals. They are at www.laventa.it/index.php?option=com_content&view=article&id=73&Itemid=69&lang=en.

The XI Congreso Nacional Mexicano de Speleología was a total success. It was held in Mérida, Yucatán, from February 1–4, earlier this year. Celebrated concurrently was the thirtieth anniversary of the Federación Espeleológica de América Latina y el Caribe.

We had a reasonably strong participation of about 200 attendees, 106 of whom were speakers. Participants were from Belgium, Brazil, Italy, France, United States, Puerto Rico, Argentina, Spain, Cuba, and of course Mexico. Twenty-five caving organizations were represented.

The meeting lasted four days, three of oral presentations and one of field trips. In all, fifty-six general oral papers were presented, five keynote speeches were given, three books were introduced, and one table discussion was held. Additionally, a mock cave rescue was mounted.



Nine research posters were exhibited, two documentaries were shown, and there were two art shows, one exhibiting individual works, and one exhibiting the collective work of three visual artists.

During the event, we had local, state, and national mass-media coverage, resulting in eight newspaper/web-site pieces and six radio and two television interviews.

We want to thank the strong support of the Universidad Autónoma de Yucatán and their various research centers (Facultad de Ciencias Antropológicas, Facultad de Medicina Veterinaria y Zootecnia, and the Unidad de Ciencias Sociales del Centro de Investigaciones Regionales Dr. Hideyo Noguchi) as well as the Federación Mexicana de Actividades Subacuáticas (FMAS). We'd also like to thank the Federación Espeleológica de América Latina y el Caribe (FEALC) and the Unión Mexicana de Agrupaciones Espeleológicas (UMAЕ). Additionally we'd like to recognize the generous support of our sponsors: Feros Arneses, Poseidon Centro De Buceo, Comisión Nacional para el Desarrollo de los Pueblos Indígenas Delegación Yucatán (CDI), Comisión Nacional del Agua (CONAGUA), Centro de Investigación & Estudios Avanzados (CINVESTAV), Secretaría de Fomento Turístico (SEFOTUR) Ipan Tepeme Ihuán Oztome (Between Mountains and Caverns), Hacienda Nuestra Señora del Rosario Kankirixche, Vertimanía, Ecocurs, Yucatán Dive Center, and Vertical Sport. Much thanks to the essential participation of the speakers, academics, students, artist, authorities, community leaders, and cave-effort-related people who joined us.

Source: Fátima del Rosario Tec Pool. The program of talks at the congress follows, from <http://xicongreso.umaе.org>.

Friday

Christian Thomas. *Proyecto Espeleo-Yuc: exploraciones espeleológicas en la Península de Yucatán.* (conferencia magistral)

Arturo Montero. *Nuestro patrimonio subterráneo: Historia y cultura de las cavernas de México.*

Saturday

Ercilio Vento Canosa. *Santa Catalina, el mayor sistema cárstico subterráneo del centro de Cuba.* (conferencia magistral)

Jorge Antonio Paz Tenorio, Oscar Gilberto Cabrera Pozo, Carlos Alberto Paz Lara, Emmaline Montserrat Rosado González. *Exploraciones espeleológicas y su aplicación en el estudio de procesos de remoción en masa, sur de Tuxtla Gutiérrez, Chiapas.*

Gabriel Merino Andrade, Kaleb Zárate Gálvez. *En las profundidades de San Fernando, Chiapas: exploración del sumidero del Higo 2012.*

Gustavo Vela Turcott, Franco Attolini. *Resultados de las exploraciones Tzontzeuciculi 2011-2012.*

Omar Hernández. *Expedición Ixtololo Alt, Sierra Negra 2011/2012.*

Raúl E. Manzanilla Haas. *Trabajos de exploración y registro en Aktun Jaaleb.*

Tullio Bernabei. *Upsala, el glaciar que vive.*

Susana Echeverría Castillo. *El cenote Xlakah de Dzibilchaltún.*

Juan Carrillo González. *Por los umbrales de lo divino. Concepciones mayas en torno a la geografía sagrada: el caso de las cuevas y cenotes.*

Sonia Thalía Acosta Sierra. *Formas de apropiación de abastecimiento del agua en Noc-ac, Yucatán.*

Racso Fernández Ortega, Dany Morales Valdez, Dialvys Rodríguez Hernández, Hilario Carménate Rodríguez. *Análisis de la evaluación y diagnóstico de los impactos medioambientales en estaciones rupestres de la cordillera de Guan Guanico, Cuba.*

Mario Novelo Dorantes. *Destrucción y contaminación de ecosistemas subterráneos en el sur de Yucatán. Medidas urgentes para su protección y conservación.*

María del Carmen Flores Martínez, Jesús Alfredo Torres Maldonado, Amyalli Yits Hernández Acuña. *Ximopanolti Timochtin.*

José Guadalupe Palacios Vargas. *Biogeografía de los Collembola (Arthropoda) en las cuevas de México.* (conferencia magistral)

Aurelio Sánchez Suárez. *Entre la tierra y el inframundo. H'Wan Tul y su vinculación a cuevas y cenotes.*

Carlos Evia Cervantes. *El simbolismo del tiempo en las cuevas.*

Sergio Grosjean Abimerhi, Jorge Victoria Ojeda. *Los*

cenotes y los mayas del siglo XXI: una nueva forma de interrelación.

Alba Valdez Tah. *Turismo, organización económica y cambios en los significados de la naturaleza: el caso de los cenotes de Chuncanán, Yucatán.*

Kristen Taylor. *La minería de salitre en cuevas de Virginia y West Virginia durante la Guerra Civil Americana.*

Mónica Chávez Guzmán. *Los rituales mayas de petición de lluvia y las cavernas.*

Ezel Jácome Galindo-Pérez, Edson Espinoza Graciano, Flores Martínez María Del Carmen, Blanca Estela Chávez-Sandoval, María del Pilar Villeda Callejas, María Teresa Castañeda Briones, Francisco García-Franco. *Calidad del agua de la cueva boca del Río Apetlanca, Guerrero, México; utilizando artrópodos como bioindicadores.*

María del Carmen Flores Martínez, Ricardo Mariño Pérez, Laura Leonor del Castillo Martínez, Francisco Medina, Enrique Antonio Embriz Sánchez, Daniel Embriz Alba, Edson Espinoza Graciano, Ezel Jácome Galindo Pérez. *Composición faunística de dos cuevas de Guerrero: "La Joya" y "El Izote"*

Pablo Moreno, Gabriela Heredia Abarca, Blondy Canto Canche, Irma L. Medina Baizabal, Marcela Gamboa Angulo. *Micromicetos aislados de cenotes de Yucatán como fuente de productos antimicrobianos.*

Fernando Calderón Gutiérrez, Carlos A. Sánchez Ortiz. *El Aerolito de la Isla de Cozumel: singular sistema de cueva subacuática de gran diversidad y abundancia.*

Juan Montaña Hiroshé. *Rabia transmitida por vampiros.*

Tammy Esperanza Chi Coyoc, Griselda Escalona Segura, Jorge A. Vargas Contreras, Roberto Rojo, Enrique Escobedo-Cabrera, Mónica Ponce, Alfredo Bravo, Alicia Dávila, Fátima Tec Pool y José Pez. *Una mirada al interior de la cueva "El Volcán de los Murciélagos," Campeche, México.*

Luis Briceño Pat. *Club EspeleoZotz.*

Israel Huerta Ibarra, Argelia Tiburcio Sánchez, Alejandro Villagrán Hernández. *Historia de la espeleología en el IPN.*

Ángel Graña. *Vida y obra de Núñez Jiménez.*

Tullio Bernabei, Alicia Dávila García. *Centro de Estudios Kársticos La Venta: un impulso a la espeleología de Chiapas.*

Héctor Martínez Cerda, Reyes Orozco. *¿Cuánto cuesta un rescate en cavernas y cómo se organiza?*

Esteban Grau González Quevedo. *La protección del patrimonio cárstico en la costa norte de Matanzas.*

Alicia Dávila, Tullio Bernabei. *Cueva del Río la venta, un sueño subterráneo.*

Sergio Grosjean Abimerhi. *Secretos de los cenotes de Yucatán.*

Sunday

Carmen Rojas Sandoval. *Arqueología en cuevas sumergidas de Quintana Roo. La importancia de los exploradores en los descubrimientos arqueológicos y su protección. (conferencia magistral)*

Eugenia Pulido Madariaga, María Eugenia Paredes, Manuel Xool. *La problemática de la seguridad en los proyectos de turismo alternativo.*

Xia Briceño Canto. *Turismo sustentable y espeleoturismo en Yucatán.*

Elías Alcocer Puerto. *Manejo sustentable de los cenotes y cuevas de Yucatán: una propuesta de la antropología del turismo.*

Roberto Rojo García. *Río Secreto, reserva natural. Un ejemplo exitoso de espeleoturismo sustentable.*

Emmaline Montserrat Rosado González, Jorge Antonio Paz Tenorio, Oscar Gilberto Cabrera Pozo, Carlos Alberto Paz Lara. *Geoturismo de las cuevas de México como propuesta para la conservación del patrimonio biocultural indígena. Caso la cueva de las Sardinias, estado de Tabasco.*

Alma Rafaela Bojórquez Vargas. *Niños Tennek y su labor como guías de ecoturismo en cavidades subterráneas de la Huasteca Potosina.*

Ezel Jácome Galindo-Pérez, Edson Espinoza Graciano, Blanca Estela Chávez-Sandoval, María del Pilar Villeda Callejas, María Teresa Castañeda Briones, Francisco García-Franco. *Caracterización molecular de artrópodos de la cueva de Boca del Río Apetlanca, Acahuizotla, Guerrero.*

María Del Carmen Flores Martínez, Laura Del Castillo. *Revisión de fauna epizóica de Eptesicus fuscus (CHI-ROPTERA: VESPERTILIONIDAE) en dos colecciones: Laboratorio de Espeleobiología, Campus Juriquilla, Querétaro y Laboratorio de Acarología "Anita Hoffmann", Facultad de Ciencias, UNAM.*

Adrian Miguel Nieto. *Un acercamiento a los habitantes microscópicos de las cuevas.*

Mario Gómez Ramírez. *La espeleología como parte de la formación educativa de los estudiantes de la Licenciatura en Geografía de la Universidad Veracruzana.*

Aura Rosalía Montiel Camacho. *El conocimiento adquirido como medio para la prevención de accidentes en espeleo.*

Luiz Afonso V. Figueiredo, Alma Rafaela Bojórquez-Vargas, Guillermo Alejandro Contreras-Castro. *Formación Básica en Espeleoturismo y Educación Ambiental: Informe sobre una Experiencia de Extensión Universitaria en la Huasteca Potosina (México).*



Terry Raines (in back) prints an early AMCS publication, assisted by Bill Elliott (left) and James Reddell. Yes, the shop really was in an old schoolbus. *Robert Mitchell.*

José Antonio Reyes Solís. *El trabajo arqueológico en la sierra de Coahuila.*

Oscar Carubelli. *Metodología para medir distancias en una caverna con una foto digital y Autocad 2D en gabinete.*

Luis Samayoa Navarrete, Eduardo Castillo López, José Abraham Torres Méndez, Máximo Ávila Cruz. *Aplicación de la ingeniería topográfica, la percepción remota y los SIG en la modelación de la Gruta Karmidas ubicada en Zapotitlán de Méndez, Pue.*

Arturo Montero García. *Propuesta para un sistema de manejo de datos en espeleología.*

Oscar Carubelli. *Hipótesis sobre la estabilidad de las cavernas.*

Jerónimo Avilés. *Hallazgo de huesos de fauna extinta de la Era del hielo en una cueva inundada de la península.*

Jerónimo Avilés. *Crustacea, la cueva de los remipedios.*

James Brady. *El Estado de la Arqueología de Cuevas en México y su Dirección Futura. (conferencia magistral)*

Helena Barba Meinecke. *Recientes descubrimientos en cuevas del estado de Campeche, península de Yucatán.*

Sergio Grosjean Abimerhi, Octavio del Río Lara. *Sorprendentes hallazgos arqueológicos paleontológicos y faunísticos en los cenotes de Yucatán.*

Fátima Tec Pool. *Aportes del Grupo Espeleológico Ajau a la investigación arqueológica en cuevas de Yucatán.*

Rubén Manzanilla López, Raúl barrera Rodríguez, Mauricio Gálvez. *La gruta de San Miguel Guerrero ¿un patrimonio perdido?*

Edgar Daniel Pat Cruz, Jorge Aguilar Montero. *Protección técnica y legal: marco jurídico del reglamento de cenotes, cuerpos de agua y cuevas del estado de Campeche.*

Ricardo Arturo Viera Muñoz. *Arqueología en la cueva centella, Matanzas, Cuba.*

Germán Yañez, Kaleb Zarate. *Exploración Subacuática en cuevas de Chiapas.*

Reyes Orozco, Mario Salas. *Explorando Xol-kuele.*

Gustavo Vela Turcott. *Sistema Tepetzala.*

Gabriel Merino Andrade. *Proyecto espeleológico "Cerro brujo" municipio de Ocozocuahtla, Chiapas, México.*

Mónica Ponce. *Cueva de la letrina y/o coyote.*

Gustavo Vela Turcott, Mark Tremblay, Guillaume Peletier. *Attention: traversée de gouffre mexicain.*

Posters

Ezel Jácome Galindo-Pérez, Edson Espinoza Graciano, Blanca Estela Chávez-Sandoval, María del Pilar Villeda Callejas, María Teresa Castañeda Briones, Francisco García-Franco. *Caracterización molecular de artrópodos de la cueva La Joya, Taxco, Guerrero, México.*

Lailson Becket, Luna Pilar, Pedroza Lisseth y Cabadas B. Héctor. *Caracterización Micromorfológica y Petrográfica de Materiales Cerámicos Recuperados en Cavernas Inundadas de Yucatán: Un Caso de Estudio.*

F. Calderón-Gutiérrez, G. Bribiesca-Contreras y F. A. Solís-Marín. *Sistema El Aerolito: Dominio de equinodermos.*

Gilberto Varo de la Rosa, José G. Palacios Vargas. *La fauna cavernícola de Chimalacatlán, Morelos, México.*

Oscar Carubelli. *Metodología para medir ángulos en una caverna con una foto digital y Autocad 2D en gabinete.*

Omar Caballero Hernández, Manuel Miranda Anaya, Juan B. Morales Malacara. *Estudio en laboratorio de la expresión del ritmo circadiano de actividad locomotriz en organismos del Sótano de la Tinaja, CD. Valles, San Luis Potosí.*

Rogelio Hernández Vergara, Rocío Merino Castrejon, Keven Jesús García Díaz, Sergio Nágera Blas, José Eder Salgado Hernández, Mari Carmen Romero Rojas, Julio Cesar Aponte y Octavio Ortiz Enríquez. *Espeleogénesis de la cueva San Miguel, Municipio de Taxco de Alarcón, Guerrero.*

Rogelio Hernández Vergara, Rocío Merino Castrejon, Keven Jesús García Díaz, Sergio Nágera Blas, José Eder Salgado Hernández y Mari Carmen Romero Rojas. *Geología estructural de la Gruta de San Miguel, Municipio de Taxco de Alarcón, Guerrero.*

Rogelio Hernández Vergara. *Estudio Geológico-Espeleológico del Sistema Cárstico Zacatecolotla-Las Granadas, Municipio de Taxco de Alarcón, Guerrero.*

There is a five-page report on the XI Congreso Nacional Mexicano de Espeleología by Oscar Carubelli of Argentina in the May 2013 issue of Noti-FEALC, <http://espeleodocs.yolasite.com/resources/Noti-FEALC%2C>

%20Mayo%202013.pdf.

The XII Semana de Cuevas at UNAM was held on November 20–23, 2012. The following talks were scheduled.

Tuesday

Juan B. Morales Malacara. *Las cavernas, un recurso natural: Un enfoque hacia su conservación.*

Adrián Reyna Dominguez. *Polidésmidos (Diplopoda) asociados a cuevas de México, en la colección del Laboratorio de Acarología.*

Miguel Ángel Hernández Patricio, Julián Bueno Villegas, and Fabio Germán Cupul Magaña. *Miriápodos de la Cueva Los Riscos.*

Mariana Gamboa Vargas. *Síndrome de "la nariz blanca" en murciélagos.*

Ignacio M. Vazquez R. and M en C. Laura del Castillo Martínez. *Actualización de datos de Trombidioideos (Trombidiformes, Prostigmata) de la cueva Arroyo del Bellaco.*

Mariana Servin Pastor. *Biogeografía de la fauna Cavernícola.*

Itzel Sigala Regalado and Rosaura Mayén Estrada. *La cueva, el guano y las amebas atestadas.*

Violeta Jiménez Parejas. *Arqueología de Cuevas.*

Wednesday

José Javier Vargas Guerrero. *Proyecto Quebradas de Durango. Casa en Cuevas.*

Guillermo Espinosa G. *Radón en cuevas (su origen, medición, distribución y riesgos en salud).*

Carlos E. Santibáñez López. *El troglomorfo como eco-morfotipo en los escorpiones.*

Dulce Flor Piedra Jiménez. *Aves en cavernas.*

Víctor Cruz García. *Tláloc.*

Elvia Manuela Gallegos Neyra; Montes A., Calderón A., Mayén R., and Sigala I. *Identificación de Amibas de vida libre patógenas en Cuevas de la Región Central de México.*

Elsa Coronado Galicia. *Estudio preliminar de ácaros*





cunáxidos de Cuevas de México.

Antonio Barrientos Martínez. *Prevalencia y determinación de ectoparásitos en murciélagos (Quiróptera) y roedores (Rodentia) en dos localidades de la Mixteca Poblana. Santo Domingo de Tonahuixtla y Teotlalco, Puebla, México.*

Thursday

José G. Palacios Vargas. *La distribución de los colémbolos cavernícolas en Mexico.*

Roberto Rojo García. *Conservación, cultura, investigación y turismo.*

Gustavo Vela Turcott. *Resultados de las exploraciones en la Sierra Negra 2011-2012.*

On June 13–15, 2012, a Festival de los Murciélagos en Oaxaca was hosted by the Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional and the Asociación Mexicana de Mastozoología. Open to the public, it featured exhibits and activities for youth, as well as scientific lectures and posters. A three-day course, *Diversidad y Conservación de los Murciélagos de México*, was taught by Yolanda Hortelano, Gloria Magaña, and Migual Briones-Salas. Total attendance the first day was about eighty; approximately one hundred people visited the event each of the last two days. Over the three days, the following lectures were presented.

Wednesday

Blas E. Perdomo Rasilla. *¿Los murciélagos son vampiros?*

Oscar Retana Guascón. *Importancia Cultural de los Murciélagos.*

Miguel A. Briones-Salas. *Los Murciélagos de Oaxaca.*

Emma Cisneros. *Síndrome de nariz blanca.*

Osiris Merino. *Etnozoología de los murciélagos de Santa María Zacatepec, Putla, Oaxaca.*

Thursday

Diego Sánchez Moreno. *¿Es difícil ser un murciélago?*

Cristina MacSwiney. *Diversidad y Conservación de murciélagos en Uxpanapa, Veracruz.*

Antonio Santos Moreno. *¿Cuántas especies de murciélagos faltan por registrar en Oaxaca?*

Natalia Martín Regalado. *Representatividad de murciélagos en la Colección de Mamíferos de Oaxaca.*

Cristian Kraker. *Uso de hábitat por murciélagos insectívoros en Sta. Ma. Chimalapa, Oaxaca.*

Margarita García. *Murciélagos insectívoros de los Valles Centrales de Oaxaca.*

Friday

Emma Cisneros. *Nuestros amigos los murciélagos.*

Luis Ignacio Iñiguez Dávalos. *title not announced.*

Alvar González C. *De vampiros a vampiros.*

José Luis García. *Murciélagos en parques eólicos: investigación e implicaciones para la conservación.*

Mario Peralta Pérez. *Los disturbios y las comunidades de murciélagos: el caso de los Parques Eólicos.*

Yazmín Martínez. *Murciélagos de la Venta, Juchitán, Oaxaca.*

Source: <http://ciidiroaxaca.ipn.mx/?q=node/72>, <http://ciidiroaxaca.ipn.mx/sites/default/files/pdf/ProgramaFestival.pdf>; Gustavo Vela.

The best-in-show prize in the Video Salon at the 2012 NSS Convention was won by a video by Ben Edelstein of the Mesas Juárez trip at the end of 2009; see “Mexico News” in *AMCS Activities Newsletter 33*, under Tamaulipas. The cover of *Activities Newsletter 34* won a merit award (blue ribbon) in the Cover Art Salon,



photographic category, for the photographs by Daniel Riordan and Franco Attolini.

The web site espeleorescatemexico.org no longer works, and its previous content has been lost. (Fortunately the AMCS has archived the operations reports that were on the site. An attempt to archive the entire site turns out to have been futile, because it was an overly clever Flash thing that consisted entirely of undisclosed links to files that no longer exist.) The new web site for Espeleo Rescate México is www.espeleorescatemexico.com, which has little content so far.

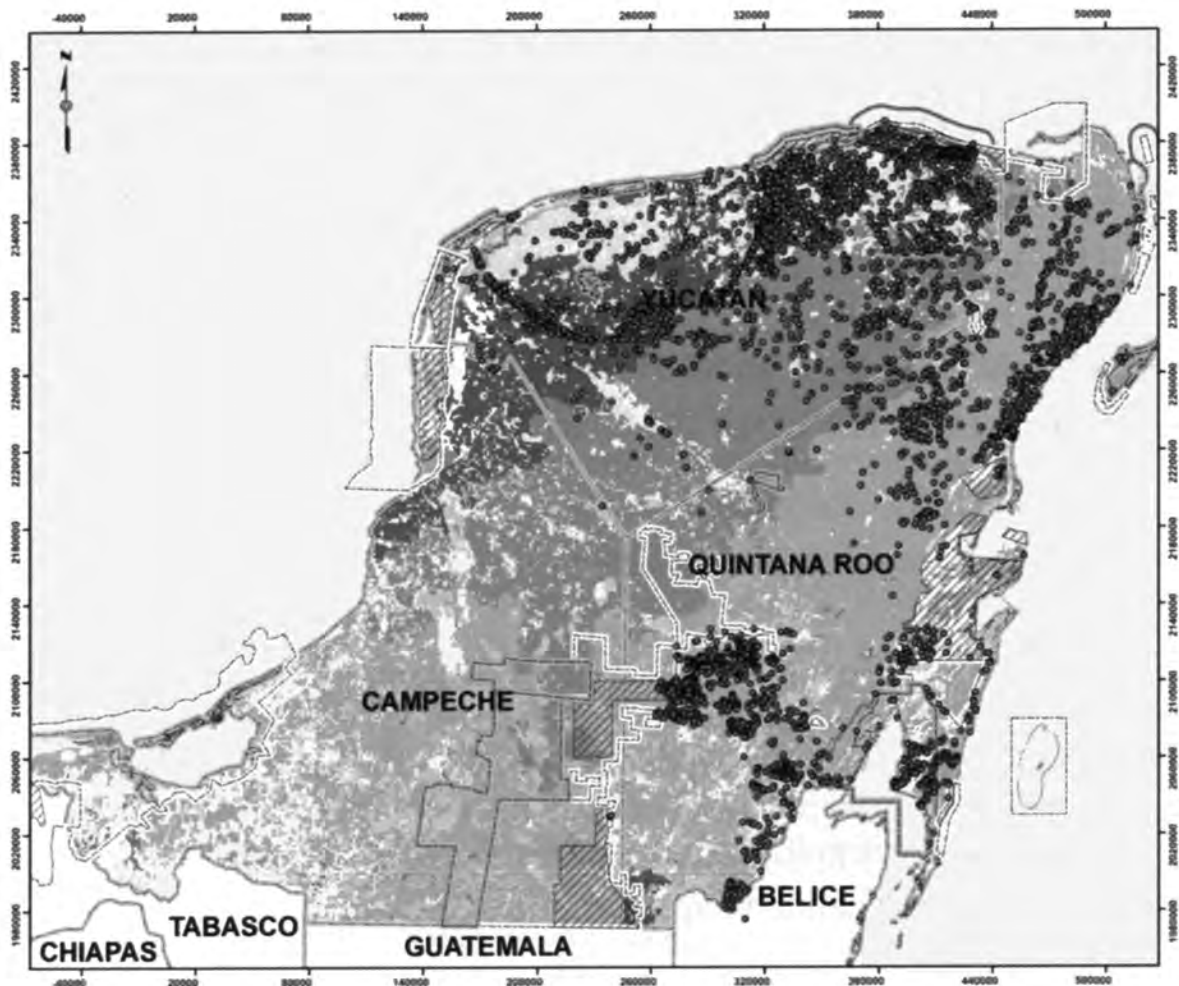
Number 22-23 of *Mundos Subterráneos*, magazine of the Unión Mexicana de Agrupaciones Espeleológicas, is available on-line at <http://www.karstportal.org/node/11482>. Articles (in Spanish) cover rock art at Ocozocoautla, Chiapas; pictographs in Kanun Ch'en, Homún, Yucatán; rock art in Cueva de Chicomeatl, Zacatal Grande, Veracruz; caves of the Lacandon Maya at Ocosingo, Chiapas; and a description of the through-trip in Cueva del Río La Venta, Chiapas, this last being the same as a chapter in the Spanish edition of the recently published book *Cueva del Río La Venta: An Underground Dream*. Source: Mark Minton.

Abstract: Steps for Specific Vulnerability Maps, Management, and Conservation in Yucatan Peninsula Anchialine Systems, by Olmo Torres Talamante, Alejandra Aguilar Ramírez, and Gonzalo Merediz Alonso.

A GIS project was developed for cenote management and decision-making in the Yucatan Peninsula. Information was obtained through governmental and civil databases, satellite imagery analysis, and field visits. Spatial analysis was performed at a scale of 1:250,000 for cenotes and geology, land use and vegetation, soil type, protected areas, urban areas, population size of human settlements, and roads. Danger and risk models for ecological degradation of cenotes were developed. [Covers Campeche, Quintana Roo, and Yucatán. The cenotes location map is figure 1 in that paper.]

Source: *Extended Abstracts from the 2nd International Anchialine Symposium (Natura Croatica, vol. 21, suppl. 1, 2012)*, p. 95.

James Brady's *Sources for the Study of Mesoamerican Ritual Cave Use*, Publication 1 of *Studies in Mesoamerican Cave Use*, is available at www.oztotl.com/maya/BIBLIO%202012.doc. Revised in 2012, it contains about 1700 sources.



MARK MINTON
MAY 2013
DEPTH IN METERS

DEEP PITS OF MEXICO

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

LONG CAVES OF MEXICO

MARK MINTON
MAY 2013
LENGTH IN METERS

1	Sistema Sac Actun (+Dos Ojos)	Quintana Roo	310950
2	Sistema Ox Bel Há	Quintana Roo	243556
3	Sistema Purificación	Tamaulipas	94889
4	Sistema K'oox Baal (+Tux Kupaxa)	Quintana Roo	75139
5	Sistema Huautla	Oaxaca	64258
6	Sistema Xunaan-Há (María Isabella, 3B) - Tixik K'una - Templo	Quintana Roo	59670
7	Cueva del Tecolote	Tamaulipas	40475
8	Sistema Cuetzalan (Chichicasapan+San Miguel)	Puebla	37676
9	Sistema Toh Há	Quintana Roo	32015
10	Kijahe Xontjoa	Oaxaca	31373
11	Sistema Yok Ha' Hanil (Río Cristal, Pool Tunich, Río Secreto)	Quintana Roo	30127
12	Sistema Tepepa (Ehécatl+Niebla+Xalltégoxtli+Pozo 4)	Puebla	29401
13	Sistema Soconusco - Aire Fresco	Chiapas	27793
14	Sistema Cheve	Oaxaca	26194
15	Sistema Sand Crack	Quintana Roo	25704
16	Sistema Coyolatl-Esperanza	Puebla	22221
17	Chjine Xjo (Xine Xao, Chine Xao)	Oaxaca	19515
18	Sistema Aerolito	Quintana Roo	18288
19	Sistema Tepetzala (TB84-TB1-CO2-CO4)	Puebla	16527
20	Cueva de Alpazat	Puebla	15200
21	Sistema PonDeRosa (Pondazul, Edén)	Quintana Roo	15019
21	Sistema J2 (Ozto J2 (Faustino, Barbie) + Last Bash (Hija Puta))	Oaxaca	14840
23	Sistema Dos Pisos (Ka'p'el Nah)	Quintana Roo	14176
24	Sistema Camilo	Quintana Roo	13215
25	Sistema Sac Muul	Quintana Roo	11145
26	Atlixicaya	Puebla	11120
27	Sistema Río La Venta	Chiapas	11020
28	Sistema San Andrés	Puebla	10988
29	Cueva de la Mano	Oaxaca	10841
30	Actun Káua	Yucatán	10360
31	Grutas de Rancho Nuevo (San Cristóbal)	Chiapas	10218
32	Cueva del Arroyo Grande	Chiapas	10207
33	Sistema Doggi	Quintana Roo	10170
34	El Chorro Grande	Chiapas	9650
35	Sistema Muul Three	Quintana Roo	9629
36	Sistema Tepetlaxtli	Puebla	9600
37	Sistema Ek Be	Quintana Roo	9408
38	Sistema Brumas-Selváticas	Puebla	9324
39	Sistema Chac Mol - Mojarra	Quintana Roo	9193
40	Cueva Quebrada	Quintana Roo	9000
41	Sistema Minotauro	Quintana Roo	8653
41	Cenote Muk K'in	Quintana Roo	8628
43	Sótano de Las Calenturas	Tamaulipas	8308
44	Gruta del Tigre	Quintana Roo	8200
45	Sumidero Santa Elena	Puebla	7884
46	Sistema Zapote (Toucha-Há - Vaca Há)	Quintana Roo	7869
47	Sistema La Ciudad	Puebla	7828
48	Cueva Yohualapa	Puebla	7820
49	Cueva de la Peña Colorada	Oaxaca	7793
50	Cueva de Comalapa	Veracruz	7750

MARK MINTON
MAY 2013
DEPTH IN METERS

DEEP CAVES OF MEXICO

1	Sistema Huautla	Oaxaca	1545
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	Joya Jonda (Honda)	San Luis Potosí	895
15	Nita Chó	Oaxaca	894
16	Sótano de Agua de Carrizo	Oaxaca	843
17	Sótano de El Berro	Veracruz	838
18	Sótano de Trinidad	San Luis Potosí	834
19	Hard Rock Cave	Oaxaca	830
20	Resumidero El Borbollón	San Luis Potosí	821
21	Las Tres Quimeras	Puebla	815
22	X'oy Tixa Nita	Oaxaca	813
23	Nita Ka	Oaxaca	760
24	Sistema H31-H32-H35	Puebla	753
25	Sonyance	Oaxaca	740
26	Nita Xongá	Oaxaca	739
27	Yuá Nita	Oaxaca	705
28	Aztotempa	Puebla	700
29	Sótano de los Planos	Puebla	694
30	Sótano de Alfredo	Querétaro	673
31	Cueva Santo Cavernario+Tototzil Chichiltic	Puebla	667
32	Sistema de los Tres Amigos (Te Chan Xki)	Oaxaca	659
33	Sistema Cuetzalan (Chichicasapan+San Miguel)	Puebla	658
34	Cueva Tipitcli (Tipitli)	Puebla	653
35	Sótano de Tilaco	Querétaro	649
36	Nita Nashi	Oaxaca	641
37	Cuabtempa Superior	Puebla	640
38	Oztotl Altepeticac (Cueva Paisano)	Puebla	638
39	Sistema Soconusco - Aire Fresco	Chiapas	633
40	Sistema Atlalaquía	Veracruz	623
41	Cueva de Diamante	Tamaulipas	621
42	Sistema Coyotlatl-Esperanza	Puebla	620
43	R'ja Man Kijao (Nita)	Oaxaca	611
44	Nita He	Oaxaca	594
45	Meandro Que Cruce (Meandre Qui Traverse, H54)	Puebla	588
46	Olbastl Koltik (Sótano Chueco)	Puebla	587
47	Yometa	Puebla	582
48	Sótano de las Coyotas	Guanajuato	581
49	Sistema Los Toros	Nuevo León	576
50	Arriba Suyo Sótano	San Luis Potosí	563

BOOK REVIEW: CUEVA DEL RÍO LA VENTA

BILL MIXON

Cueva del Río La Venta, An Underground Dream. Tullio Bernabei, Antonio De Vivo, Francesco Sauro, and Giuseppe Savino. La Venta Esplorazioni Geografiche, Treviso, Italy. ISBN 978-88-95370-12-5. 8.25 by 12 inches, 158 pages plus map plate, hardbound. €25.

This is a large, heavily illustrated book about a cave in Chiapas and its surroundings. The Italians of the La Venta group have been working on the caves in the vicinity of the canyon of the Río La Venta for many years. They published an earlier book on the area, *Río La Venta, Treasure of Chiapas*, in 1999. This new book is more focused on the Cueva del Río La Venta and its immediate vicinity.

There is a chapter of geological background and a chapter on the history of the La Venta projects in the area, including the connection in 1995 that created a spectacular and challenging through-trip and a report on the first trip between the upper Sumidero II entrance and the lower entrance on the river. A long chapter and a shorter one of technical notes on rigging provide a guide for the caver attempting that trip. The material here is similar to an article in AMCS Activities Newsletter 34. A large team spent several days in 2009 on a traverse of the cave in order to take photos for this book, and that effort is described, both in the main text and in some of the interesting shorter personal narratives inserted with green backgrounds. Final chapters discuss the relationship between cavers and the cave and the local people, ancient and modern.

There are about seventy nice full-page color photos and many smaller ones. A 30-by-38-inch folded plate is in a plastic pocket in the back of the book. On one side is an aerial view of the area with Cueva Río La Venta and other area caves superimposed; a lot of other caves are known in the surroundings. The other one contains a perspective drawing of the cave under its surface terrain; a more conventional map of the cave is spread across pages 66 and 67.

In addition to the directions for a through-trip, the book includes information about arranging for permission and guides. This suggests that part of the motivation for the book was to help the villagers in López Mateos benefit from their past hospitality to the La Venta teams by encouraging speleo-tourism, if only by serious cavers from around the world who are prepared for a long, wet trip with a lot of short drops and climbs. With so much else for serious cavers to do in Mexico, I wonder whether this will be successful, but I wish them luck.

This book is available from the AMCS for \$35 plus shipping; see www.amcs-pubs.org/other/otherpubs.html. There is also a Spanish version, *Cueva del Río La Venta, Un Sueño Subterráneo*, ISBN 978-88-95370-10-1. The AMCS has a very limited number of those for the same price; contact sales@amcs-pubs.org. An Italian version, *Cueva del Río La Venta, Un Sogno Sotterraneo*, ISBN 978-88-95370-08-8, is available from www.ecstore.it/view_montagna/speleologia/. La Venta's 1999 book, *Río La Venta, Treasure of Chiapas*, is still available from the AMCS.



**AT THE BORDERS OF CIOCHIMÍ:
A FORGOTTEN ROCK ART**

CARLOS LAZCANO

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REPRINTED FROM:

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PHOTOGRAPHY:

CARLOS LAZCANO

At first sight the landscape appears barren, almost hostile. We are in the Deserto Central, in the middle of the Baja California peninsula. This area features one of the driest climates in Mexico, as well as in the whole of North America. The desert is located in the states of Baja California in the north and Baja California Sur in the south, divided by the 28th Parallel. In the southern state, the desert comprises the El Vizcaíno natural reserve, which, with a surface of more than two millions hectares, stands as one of the largest protected areas in Mexico. In the northern state, the desert encompasses the Valle de los Cirios preserve, which covers an area similar to that of El Vizcaíno.

The Deserto Central has many peculiarities, one of which is having been the homeland of one of the most surprising and mysterious native cultures of pre-Hispanic America. One of the most distinctive products of this scarcely known civilization is some of the oldest and most spectacular expressions of rock art on the American continent: the Gran Mural style of painting. This style is characterized by large images, mostly created inside caves and rocky shelters, depicting very

realistic illustrations of fauna, people, and ceremonies. In Baja California Sur these works of art have been meticulously catalogued and have been the subject of many studies aimed at determining the cultural identity of their creators, their age, and other important features. As for their age, the most ancient ones can be found inside the Cueva de San Borjitas; painted about 7500 years ago, they are the most ancient ever found on the American continent. The Sierra de San Francisco, with more than our hundred sites, is the area with the highest concentration of paintings, dating back to three to five thousands years ago. Thanks to the importance of these finds, in 1993 UNESCO added the Sierra to the list of World Heritage sites.

Even though it is known that the area occupied by the civilization that created the Gran Mural style extended northward beyond the 28th parallel, almost all paintings are clustered in Baja California Sur. Only a handful have been recorded by the Mexican Institute Nacional de Antropología e Historia (INAH) in the northern state, and there is no plan to catalog them systematically.

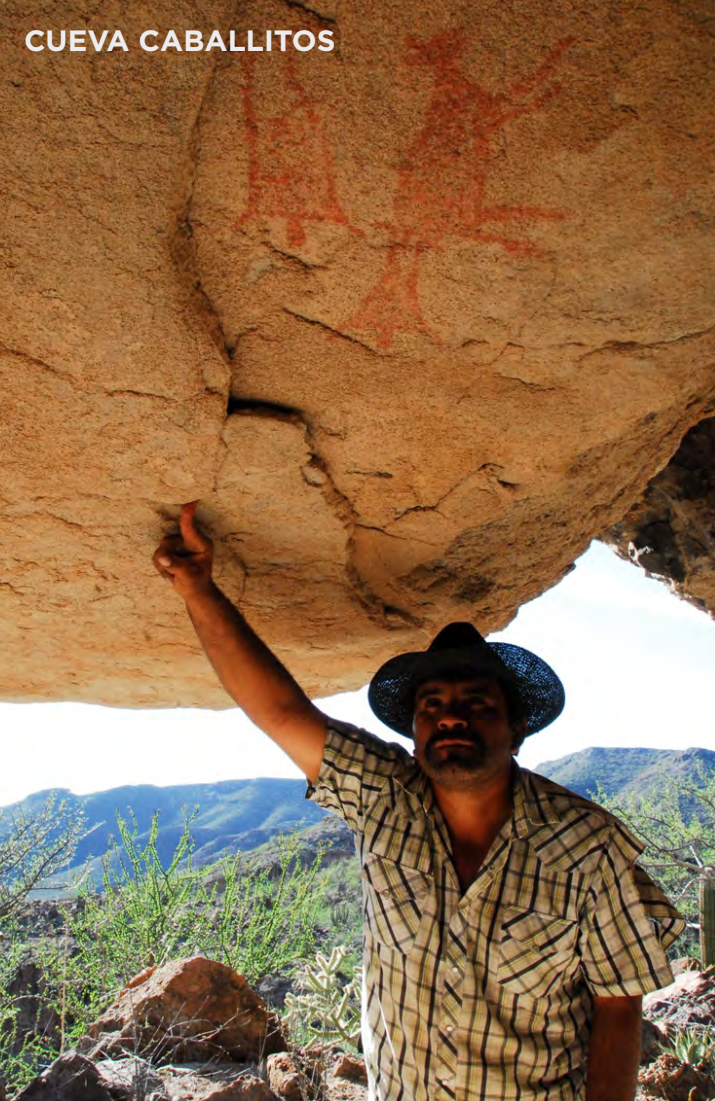
I traveled across the Valle de los Cirios, i.e., the northern part of the Deserto Central; I did it on foot and on horseback, studying the ancient and now abandoned Camino Real, created by the Jesuit missionaries in the mid-eighteenth century. During my explorations I discovered by chance some rock-art sites, most of which were in Gran



Mural style. I was always surprised by the size and beauty of the figures. My guides told me about many other sites, hidden away in a barren region, amongst small volcanic ranges and plains. This is how I came to realize how widespread this exceptional cultural heritage was.

At present, the Deserto Central region is one of the least densely inhabited in the whole of Mexico; the Valle de los Cirios, covering more than two million hectares, has a population of just twenty-five hundred, much less than in pre-Hispanic times. It's also a very isolated place, with only a few roads, something that has favored its natural and cultural conservation.

In the past few years, in Baja California there



has been much talk about a mining project called El Arco, which was to take place right in the middle of the Deserto Central; more precisely, in the southern part of the Valle de los Cirios, a few kilometers from Vizcaíno. The project aims at the exploitation of large amounts of gold and copper via the creation of an open-pit mine that will reach a diameter of eight kilometers. The natural and social impacts of such an endeavor would be deep, severely defacing the Valle de los Cirios preserve and putting the many native and endemic species of the area at risk of extinction. Such a heavy operation would also jeopardize the ancient aquifer, which would be contaminated with dangerous substances like cyanide. A significant social impact would also be inevitable, as the project would draw between fifteen and twenty thousand people to the region.

The fact that the mining company managed to obtain all the necessary authorizations has deeply worried environmental activists in Baja California and throughout Mexico. Knowing the region where the project should be developed, it is easy to forecast a significant negative impact on

rock-art sites, especially on the Gran Murals. As there is no systematic catalogue of such sites, it will not be possible to know how many will be ruined or destroyed, and one can easily imagine that the arrival of thousands of people could lead to vandalism. The few inhabitants of the region have always left the sites untouched, well aware of how rock art is part of their cultural heritage. However, the situation might change with the arrival of people who do not associate the area with their identity and their roots.

Faced with the imminent arrival of the El Arco mine I thought I could do something to avoid some of the worst consequences; in particular, I decided I could fight for the preservation of the rock paintings by starting a specific project. The first need was hence to thoroughly explore the area, starting a systematic catalogue of the sites. There were many questions that needed to be answered: How many were there? Where were they located? How could they be reached? What was their state of conservation? What was their archaeological context?

Thanks to the many projects I have carried out in the Deserto Central I am well acquainted with the locals, and it did not take long to gain their support. So, last year I formally started the cataloging of the rock art sites in the the state of Baja California between the 28th and the 30th parallels. My partner in this endeavor is Alejandro Hinojosa, an oceanographer with expertise in cartography, who uses a GPS system to precisely locate the sites. So far we have carried out three expeditions of ten to fifteen days each, entering into poorly known regions of the Valle de los Cirios. We have found a great number of sites, more than seventy in fact, most of them belonging to the Gran Mural style; some of them are amazingly beautiful. Almost all travel was done by horseback, in barren regions rich in the Cactaceae and thorny plants that are typical of the region. We found rock paintings and petroglyphs in caves and on outcrops, as well as on isolated boulders. Almost all the caves are formed in volcanic rocks, such as basalt, andesite, and tuff, produced by ancient volcanoes that are now extinguished and destroyed by erosion. We also found granite caves, which are normally more beautiful and host better-preserved paintings, due to the hardness of the rock and to the lighter, more even surfaces. Many of the caves and shelters are located inside canyons or on volcanic

highlands. Some are found in remote, hard-to-reach locations, which at times require some climbing to be reached. At times, we had to walk for long stretches through areas so rough that even the horses could not pass. Traveling by horse was not easy, either. We spent many days riding, often far from beaten trails, to reach sites that even our guides had visited only once, many years before. Due to the extremely arid nature of the region, all trips were carried out during the winter. My guides were generous and showed us the treasures hidden in the desert, so caves and shelters revealed their concealed and forgotten art, affording us the chance to rediscover amazing items, unusual for the beginning of the third millennium.

During each journey I was shown a wealth of treasures: In front of me I saw a parade of medicine men (and women), deer, bighorn sheep, pronghorns, mountain lions, fish, turtles, whales, hares, vultures, and many other subjects. They were drawings and paintings of great beauty, realistic, made with mostly inorganic pigments inside caves and shelters. Many of the sites also contain millstones, knives, scrapers, spear points, and other stone objects. We also noticed seashells and stones

placed in circles. These were unknown sites, of which science was totally unaware.

Standing in front of those paintings, made by our ancestors three to four thousand years ago, were very emotional moments. When I saw their beauty, I realized how true is the saying “art does not evolve.” The extraordinary beauty of the sites demonstrates that techniques evolve, but beauty does not. I felt a deep bond with these sites. According to anthropologists who have studied rock art around the world, including Baja California, through their works the artists expressed their view of the world and their fears. Drawings containing animal figures were made during ceremonies in which people asked the Deities to preserve the fauna that made their existence possible. Other paintings represent ceremonies during which the shamans contacted the deities to propitiate the preservation of the land. This is why I felt so connected to those people from thousands of years ago. They painted what they wanted to preserve; I came to realize that many of my naturalistic photographs portray threatened or endangered sites that I wished to preserve. Our future rests on conservation. My fears, just like those of many



CUEVA DE LA SOLEDAD



modern people, are analogous to those of the artists who created these millennia-old paintings. From this point of view, we humans have not changed. We are still frail and fearful when compared to nature, but we are also full of hopes. What I now portray with digital images, conservation and care for nature, was depicted on the rock by my Californian ancestors more than three thousand years ago. This is something that has not changed so far, and it will not change in the future.

Our most important explorations were carried out in the area surrounding the old Saint Gertrudis Mission. Established in 1737 by the Croatian missionary Fernanda Consag, it is located in a remote position and can be reached from Guerrero Negro after a two-hour drive on an ugly dirt road. At present, the Saint Gertrudis community comprises just five families, proud of descending from the Cochimí, the ethnic group that inhabited the central part of the peninsula. They consider the rock paintings as part of their cultural heritage. In this region, the most important site that my guides showed me is the one located at the Cueva de la Soledad. On the roof of this cave, at a height of about 6 to 7 meters, there is a huge mural painting, 15 to 20 meters long. It portrays deer, bighorn sheep, pronghorns, many human figures in ceremonial poses, and many other motifs. The subjects are large, almost life-size, and their colors are still vivid, despite the millennia. Red-ochre, black, and white are the most common tints; some of the figures are painted in two colors, generally red-ocher and black, that divide them in half. This mural, a forgotten witness of a vanished culture, deeply impressed me. To get there, I had to ride for more than six hours on horseback and then continue on foot for three more hours to reach the top of a plateau. Oddly enough, almost all the most spectacular sites are hard to reach, far from the trails and often inaccessible by horse. Certainly, being so remote not only made them more special but also helped their preservation.

Another region rich in rock art is the Sierra de San Juan, a place so forbidding that it is hard to imagine that in the past it could have been home to human beings.

In reality, there are many sites that witness how humans were able to flourish there without too much trouble. The paintings in this area belong to several styles; there are Gran Mural sites, but also examples of petroglyphs and very abstract drawings. I was quite taken aback by the Dipugosa Cave, formed by four distinct caves in volcanic stone whose roofs and walls are covered in abstract motifs made of small pits, as if they were carved with hammer and nails.

North of there, in the area surrounding the 1762 San Francisco de Borja Mission, abstract rock art is predominant; the Gran Mural style is rare here, as if this region marked one of its geographical boundaries. Two sites with many caves and shelters, Montevideo and Las Cuevitas, are particularly remarkable; they contain many examples of abstract



art, mostly paintings. I mapped many sites in this area, but many are still unexplored.

Last summer, the company that owns the El Arco concession announced that they had given up the mining project, apparently because of the drop in the price of copper, the main metal they had planned to extract. For those of us who love the Deserto Central this was great news; for the time being the threat posed by mine was gone. I say for the time being, though, because the concession lasts for fifty years and, should the price of copper rise again, the threat might present itself again. Meanwhile, we will continue our cataloging project in the region, and we will look for every possible way to make it better known, especially the Valle de los Cirios. One of our goals is to extend the UNESCO endorsement to the Gran Mural sites we have mapped and, ideally, also to the Camino Real. The latter was a missionaries' road, still well preserved, that along its path are preserved cultural traditions that are very ancient

but still alive, as well as elements of vanished traditions like the Gran Mural's.

I am well aware that there is still much left to do in order to complete our catalogue of the paintings; maybe three or four years' worth of work. Basically, we have just begun. So, I invite all who might be interested in the project to join us in Baja California and to help us in this wonderful job of cataloging and preserving a heritage that does not belong just to Mexico but to all humanity. There are still many finds waiting for explorers.

CUEVA DEL CARRIZO



2013 HUAUTLA EXPEDITION

CHRIS JEWELL



JARVIST MOORE FROST



CHRIS JEWELL

Caving began on Tuesday, February 26, 2013. Thanks to a strong team, within one week the cave was rigged to Sump 1, Camp 3 established, and Jason Mallinson had relined Sumps 1 and 2. After another week the rest of the diving and other equipment for exploration beyond the sumps were ready at the sump so that a team of five divers could spend one week exploring. Jason went through and set up Camp 6 on Monday, March 11. The following day the rest of the divers made their way through Sumps 1 and 2. In total, six dry tubes' worth of gear was dived through, with each of the three rebreather divers making two dives. Two other divers went through to Camp 6 using open-circuit gear.

A total of six dives were made in Sump 9 by Jason Mallinson and Chris Jewell. On the first dive Jason reached -30 meters in poor visibility. On the next dive Chris reached -48 meters before ascending to surface in a static pool after 250 meters. A muddy ascending tube was followed for around 30 meters. On the third dive Jason returned to this section with some rope, but all passages closed down. Next Chris and Jason dived together, with the divers on opposite sides of the passage in an attempt to find the main underwater continuation. Jason found a tunnel leading off the left hand wall that both divers followed down to -60 meters before surveying out. The final dive was made by Jason, who followed this tunnel down to -81 meters, which was the limit of the trimix being used. The final dive reached a point 440





CHRIS JEWELL



ELLIOT STAHL



CHRIS JEWELL



CHRIS JEWELL



ELLIOT STAHL



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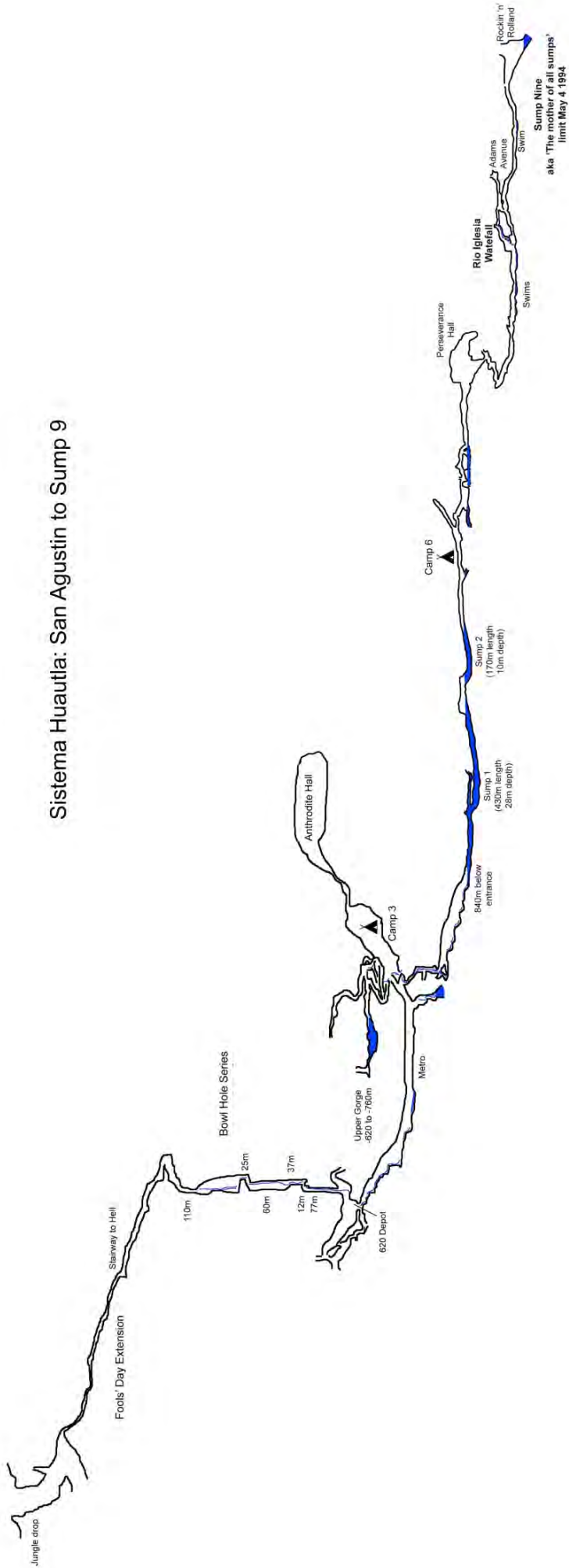
meters into Sump 9.

Meanwhile the rest of the team, Mirek Koptowski, Jon Lillestolen, and Rich Hudson, were busy looking for dry passages. The passage at the top of the Río Iglesia waterfall was found to choke after a short distance, and short sections of cave were surveyed in Perseverance hall and shortly before the low-air-space swim. Long extensions were discovered leading from the back of the Sump 9 chamber. These extensions followed the trend of Adams Avenue and in places dropped back down into known cave. In total 1,774 meters of dry passages were surveyed, but no bypass to Sump 9 was discovered. One mystery does remain, however, as on the last day an undescended pitch was reached. Appearances suggested this would drop into known cave, and the team was short of time and rigging gear so it was left. However when we plotted the survey data this pitch was going into new territory.

While the diving team was beyond the sumps they were in touch with the cavers at Camp 3 by Nicola radio, and teams took it in turns to stay at Camp 3 and monitor the radio twice a day. During this period the route up to Anthrodite hall was rebolted. On Monday, March 18, the diving team returned to Camp 3, and a day was spent hauling kit from the sump before most people headed to the surface for some rest.

During the following week, week four, most of the diving kit was carried out of the cave, and at the same time photos and videos taken. Week five saw the arrival of our de-rig team, and while they were getting ready to camp the rest of the diving kit came out. One final camping trip saw the cave de-rigged to the 620 Depot. After that, several long day-trips during week six de-rigged the cave

Sistema Huautla: San Agustin to Sump 9





CHRIS JEWELL



completely, leaving just the entrance ropes. Then Huautla veterans Bill Steele and Tommy Shifflett joined the trip, along with Herman Miller and Emily Zuber. They teamed up with the de-riggers and went to look at some other leads in the “old cave” near to Camp 1. The result was another 519 meters of cave surveyed over two trips. [See Bill Steele’s article in this issue.]

In total we estimate that something like thirty bags of diving and exploration kit (average weight of 16 kilograms per bag) were carried in and out of the cave. Thanks to a strong support team of more than thirty cavers from the U.K., Canada, the U.S., and Mexico all this was accomplished quickly and efficiently. Thanks to our sponsors for making this happen and thanks to the local people who have made us feel very welcome.

In total the expedition surveyed 2.7 kilometers of cave, and the new system depth is 1,545 meters, which means that Sistema Huautla is now the deepest cave in the Western Hemisphere once again.

CHECKING LEADS NEAR CAMP 1 OF SAN AGUSTÍN

BILL STEELE

I fully supported the British expedition to Sump 9 in Sistema Huautla and helped as much as I could. I suggested that they involve Ernie Garza, and Ernie was a huge help to them both in the preliminary 2012 expedition and the main one. I also requested that I be allowed to join the 2013 expedition for ten days at the end to check out a lead in the Camp I area at roughly 300 meters depth. Camp I is on the original deep route in Sótano de San Agustín, first explored by Texas cavers in 1966, and the camp was used during the 1968 expedition, made up mostly of cavers from Canada. Tommy Shifflett of Virginia, a veteran of Huautla expeditions going back to the 70s, has talked through the years about seeing a passage up on a wall in the Camp 1 area. I was interested and recalled the wind that can blow at times through the pits above Camp 1. I did not recall that air-flow being noticeable below that point.

Our team in 2013 was Tommy, Herman Miller of Texas, Emily Zuber of Washington state, and I. We came together in Oaxaca City and rode a ten-passenger bus to Huautla. There we visited a former American couple who have become Mexican citizens and live in Huautla, where they have adopted two Mazatec children. We bought some provisions and went on to the village of San Agustín in two taxis.

Those remaining on the British expedition were very cordial and had nice sleeping places reserved for us in the large room off the kitchen area. The expedition had been there for six weeks and the operation had been smooth. We learned that the cave had been derigged up to the base of the two entrance drops, which was exactly where we needed to go for our lead. We would go down the first two drops, and then instead of going straight ahead and up a breakdown slope to the Fool's Day Extension, discovered in 1987 and the most direct way to the bottom reaches of the cave, we would turn left and traverse the length of the Sala Grande and follow the original



deep, descending route.

On the entrance drop Herman Miller had difficulties with his short mini-rack with no hyper-bars. He was slow, and it tired him to rappel. We were going to have to come up with a solution before the next trip. We took rigging gear, including a Bosch hammer drill and bolting hardware. At the top of the first drop in the old route we discovered that we had forgotten the drill bits. We continued without the drill, with Elliott Stahl, an American who was on the British expedition, leading the way and rigging to natural points. We

used 11-millimeter PMI, so the rope's contact with the wall was of minimal concern. We did not take enough rope to get us to Camp 1 on this first trip in. There were side passages at the level we did reach, so we checked them out. Surprisingly, we came across phone line from some long-past trip. It was strung down from above, presumably down the wet route that parallels the drier route that I had taken on all prior trips and we used this time.

Back at the village that night we discussed what to do about Herman's rappel-rack situation. The solution was to borrow a Petzl bobbin from a Brit who had an extra one; Tommy used it, and Herman was loaned Tommy's longer mini-rack with hyperbar.

The next day we went back into Sótano de San Agustín with more rope and reached Camp 1. At the top of the drop down to Camp I Elliott spotted a walking passage across the top of the pit. I belayed him while he bolted a traverse to it. Then we descended to Camp 1 and looked around. The lead we were looking for, which Tommy was sure he had seen thirty some years before, was not to be found. I realized we needed the plan view of this area to see what had been surveyed in the 60s.

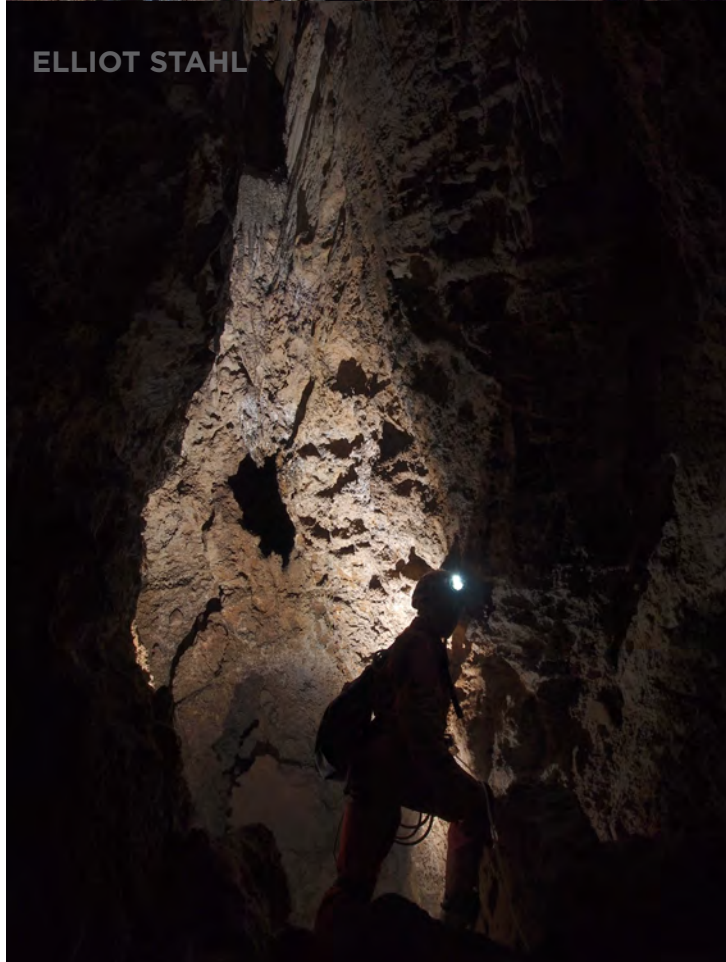
The next day, April 8, was a surface rest day, and we hiked into Huautla. Two of the Brits went with us, and from the top of the highest ridge I pointed out where the various entrances to Sistema Huautla are located. Once we got within sight of Huautla, I called Bill Mixon in Austin on my cell phone and asked him to scan the plan-view map of the Camp I area I knew had been published in the Canadian Caver and send it to me via e-mail. At an Internet café in Huautla I printed it.

Back at the field house that night we learned that Dave Ottewell and Helen Blyth had followed our ropes and gotten down to Camp I. They were excited that they had dug out a crawlway filled with sediment and gotten into virgin cave that led to the top of a short drop. They said they would also be going into San Agustín the next day with a rope to rig it.

Before we went into the cave the next day Ernie Garza arrived, having ridden buses from San Marcos, Texas, to Huautla and then a taxi to San Agustín, all in twenty-two hours. On the way down the cave we came upon Dave, Helen, and Christine Wilson, who told us that their lead had led to a deep drop with a lot of passage. Crossing the bolt traverse Elliott had done, we set seventy-



ELLIOT STAHL



six stations and surveyed about 300 meters of nice passage with some lovely flowstone on the floor. It terminated in a small room with no leads, but with air flow from cracks near the ceiling.

Two days later, Thursday, April 11, we were back in the cave and surveying the passages dug open by the Brits. We surveyed about 200 meters and determined that the deep shaft they had found was the very top of the Fishure series of pits that had been entered in years past from the side at Camp I. There is more to be surveyed in this area and also a possible lead across the top of the drop into the Fishure. Dave Ottewell and I are corresponding about doing that, perhaps in 2014.

The next day was our last day there. Emily, Tommy, Elliott, and I hiked down to Sótano del Río Iglesia, and I took them on a tour to see vampire bats, the tops of drops to the lower cave, and an

ancient ceramic pot I found in 2007 that's been left undisturbed. Herman left this day, bound for Oaxaca and his flight home the next day.

On Saturday Elliott, Emily, Tommy, and I took two taxis into Huautla and then a ten-passenger van toward Oaxaca City. Elliott and Emily got out at Cuicatlán to go to J2. Tommy and I went on to Oaxaca to fly back to the USA the next day. On the way, at dinner that night, and until we parted company the next morning, we discussed restarting the Huautla Project and having annual expeditions for the next decade. Our stated goal is to explore and survey Sistema Huautla until it is over 1,500 meters deep and 100 kilometers long.

FIRST CAVING IN HUAUTLA

JOHN FISH AND WILLIAM RUSSELL

The caves of the Huautla Plateau in Oaxaca first came to cavers' attention when deep sinkholes were observed on the Huautla and Tierra Blanca 1:100,000 topographic maps, as reported in a note in the Association for Mexican Cave Studies Newsletter, volume 1, number 7, July 1965. "No trips have yet been made to this area, all information being from topographic maps with a contour interval of 50 meters. This area will very likely contain caves deeper than any now known, as it contains a considerable area of internal drainage over 6000 feet above the surrounding lowlands." The 1966 trip report that follows, written by John Fish, and the area report, by Fish and William Russell, appeared in AMCS Newsletter, volume 2, number 3, May–June 1966, pages 57–67. They have been slightly edited. Participants were Ed Alexander, Bob Burnett, John Fish, John Kreidler, Charlie Jennings, Tommy McGarrigle, and Bill Russell. A subsequent trip took place in December 1966 and is reported in the November–December 1966 issue.

Ed, Bob, Charlie, and I left in my car late on Tuesday afternoon bound for the fabled Huautla plateau in northeastern Oaxaca. Bill Russell, John Kreidler, and Tommy McGarrigle got a late start and joined us in Huautla. Despite the many traumas of our drive to Huautla (hole in the gas tank the size of a nickel repaired with a Tootsie Roll, fog along the mountain roads), we arrived there at last only to have to wait a day in Huautla while I recovered from a severe intestinal infection. Bill Russell and group caught up with us and after putting Felix Seiser, a visitor from Austria who had come with Bill, on the bus back to the U.S., we drove on to the cave area, which starts about three miles east of Huautla. On June 4 we got our first look at the cave country we were seeking.

We had planned to drive to the end of the road and camp, but after passing several large sinkholes, everyone abandoned their cars and started checking the sinks near the road. Upon questioning the local people, Bill was directed to the bottom of a large closed valley in which a small stream dropped

into a pit about 250 feet deep, later named Sótano de San Agustín. The small town of San Agustín (hence the name of the sótano) lies 500 feet above the sótano in a divide between two huge dolinas. The San Agustín dolina is approximately one mile long and up to a quarter of a mile wide. It consists of a large central dolina with several smaller dolinas or sinks at each end, below the towns of San Andrés and San Agustín. The Río Iglesia dolina appears to be larger, perhaps the same length but considerably wider and deeper. In both dolinas water runs off volcanic hills or ridges and sinks into the limestone dolina bottoms.

Looking down from San Agustín we could see where the Río Iglesia dropped into a fissure below a large opening in the mountain. That afternoon Bob, Ed, and Charlie explored the entrance drop of Sótano del Río Iglesia and found that the main water passage, which took several hundred gallons per minute, was impassable. An overflow passage was easily accessible, though, and led to a drop. Since it was virtually dark we decided not to push the cave then.

Meanwhile Tommy and Bill both spotted a large entrance near San Agustín on the hill above it. This was subsequently called Cueva de San Agustín and goes down a series of slopes and drops to a deep pool of water. The cave appears to continue.

After a perusal of our topo maps the next morning, we decided to look over the area in general. In particular we wanted to go to Rancheria de Camerón, located along the southern flanks of the plateau, where a closed valley is shown. As the rest of us began our hike, Bill, Tommy, and John Kreidler headed along the northeast-trending closed valley to Tenango, several kilometers away. We found immediately that our topographic maps were incorrect in many details, especially relating to culture, so we made corrections as we went along. Many of the Indians who live in the isolated mountains speak only Mazatec, and at

times communication was a problem. We found Camerón that afternoon and discovered that the large valley became narrow and deep in a direction away from the plateau. It passed down a series of drops, then between 300-foot-high sheer limestone walls, and finally emptied into a broad valley below. Greatly disappointed, we began the long 8-kilometer hike back to camp. Except for the few caves found in the large San Miguel dolina (see cave descriptions), on this day we found no pits or caves on the southern flanks of the plateau other than a few shallow, filled sinks. On the other hand, Bill Russell and crew found several small sótanos, most of which were left unchecked, and a large cave with a stream entering it. The cave, Cueva de Agua Carlata, was explored as far as twilight penetrated, about 200 feet below the entrance. A large passage containing a good-sized stream led downward into darkness. They returned to camp having only partially seen the large valley containing the village of Tenango.

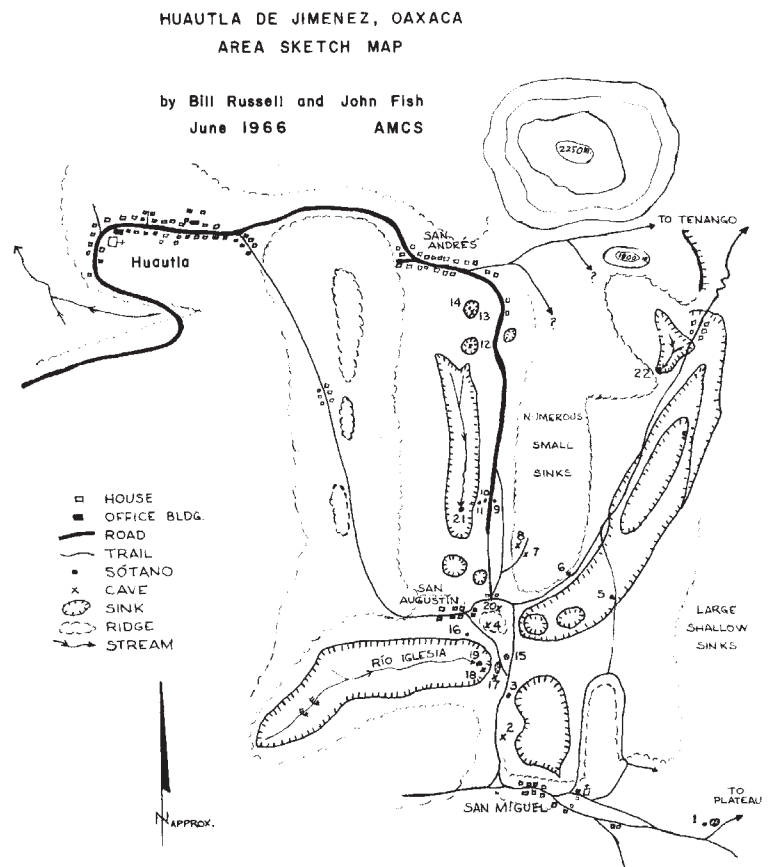
The morning of June 6 we decided to check out the sótano just below our camp, Sótano de San Agustín (see description). Although it was only a few hundred yards away, it took two to three hours to tie the rope off and for Bob, Charlie, Ed, and Tommy to hack their way down the vegetation-covered entrance drop. The entrance is a pit as large as that of Sótano de Huitzmolotitla, but not quite as deep. From the bottom a high fissure slopes steeply downward into a *big* room, where another stream emerging from breakdown joins that from the waterfall at the entrance, making it comparable to the stream in Río Iglesia. Ed and Bob continued onward and found that after a series of short, closely-spaced drops, they had used all of their rope and not yet reached the bottom. From the top of the next drop water could be heard falling and splashing far below.

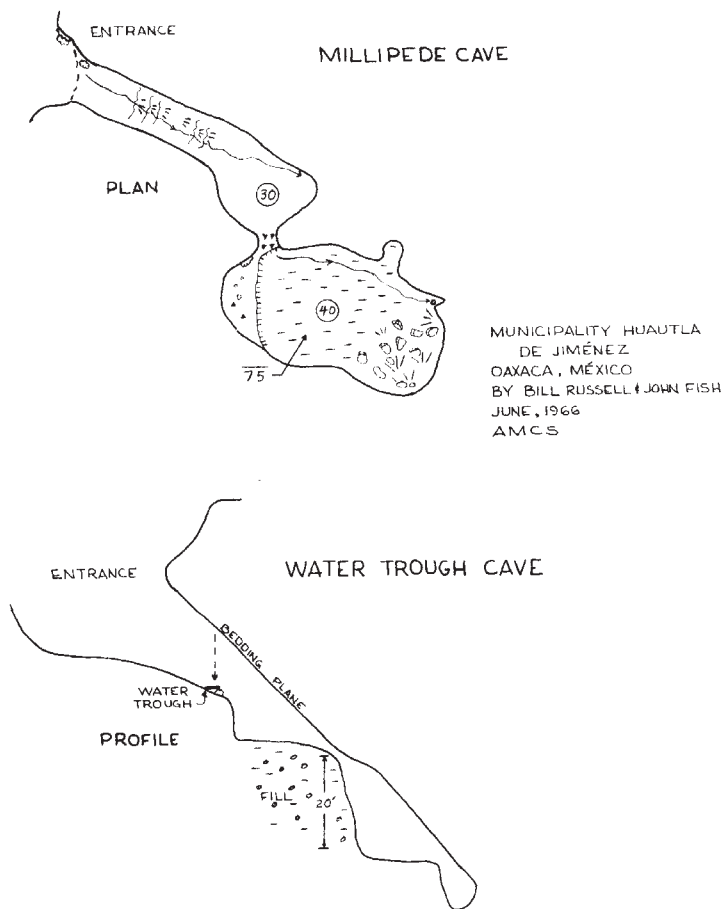
Since there already were enough people in Sótano de San Agustín, Bill, John, and I decided to check out what from a distance looked like a very promising pit. Much to our surprise, it turned out to be a cave later named Millipede Cave (see description). From this cave we got our only good collection of the whole trip, then returned to the car.

On June 7, our last day at Huautla, we devoted the day to a reconnaissance of the nearby areas of the plateau. As it was about a ten kilometer hike one way and we were at times uncertain of the

trails, we hiked only to the edge of the plateau. Among the features we saw were haystack hills, sinks, a large dolina about two miles across, and a pit that Bob found in which rocks fell free for five seconds, bounced, and fell five more seconds before hitting bottom. Another cave important to us, anyway, was a little spring we found at the edge of the plateau that replenished our water supply.

Back at the car we packed our gear and grudgingly left for Austin and then the NSS Convention at Sequoia National Park in California. After spending a night on the road with flat tires (both cars had flats) we drove into Tehuacán. The gas tank was repaired and the two cars parted company. Bill Russell's group stopped briefly by the gypsum area near Galeana then continued on to Austin. Bob, Charlie, Ed, and I visited a meeting in Mexico City of the Club Exploraciones de México, where we showed slides of the Gómez Farías area and discussed caving. Following a rumor of a 250-meter-deep pit near Taxco called Pozo Melendez, we found it to be only 320 feet deep. The cave was later found to have been reported in an old *NSS News*. We then headed for Austin, car trouble and all. It was a trip that will long be remembered by those who participated.





This report is a compilation of the information collected from the June 1966 trip to the Huautla area by AMCS members. The trip was essentially a reconnaissance to learn more about the area and its potential. This has been only partially achieved because of the large territory involved, but needless to say, the speleo-potential is tremendously good. Because of the nature of the trip, no caves were mapped. A sketch map of part of the region was made, and several caves were either partly or wholly explored.

The road to Huautla is traversable by truck; it is presently being extended beyond the point shown on the area map to the town of San Felipe Jalapa de Díaz. Also, another road is being built from the small town of San Jerónimo to Huautla, which will make the area northwest of Huautla more accessible.

A topographic map is included in this report [not reproduced in this reprint] as an aid in locating caves and for future trips to Huautla. It is a partial copy of two maps (the Huautla 14Q-i(11) and Tierra Blanca 14Q-i(12) quadrangles) produced by the Secretaría de la Defensa Nacional. It was these maps that were the first to indicate that the Huautla area contained large, deep cave systems. In general the topography is reasonably accurate,

but the culture is more frequently wrong than correct. Villages are often mislocated, and the names of villages as well as physiographic features are often different from those used locally.

HUAUTLA AREA: Small Caves (numbers refer to Area Sketch Map)

1. Pit near small sink along trail to plateau. Five seconds free-fall plus five more bouncing. Unexplored.

2. Cave along the west side of the San Miguel dolina, just below the trail near the pass to the Río Iglesia dolina. The cave was explored only to the end of the twilight zone and consists of a steeply sloping passage that appears to turn to the left about 80 feet inside the cave.

3. Cave along the trail on the west side of the San Miguel dolina. The cave is directly in the pass to the Río Iglesia dolina. It is a sink with a steep slope going down about 40 feet to an unentered pit.

4. Cave in side of hill about 0.5 kilometer southeast of San Agustín on the shortcut trail to San Miguel. This cave is just across ridge from Cueva de San Agustín and might connect with it. A steep slope leads downward from the entrance for about 70 feet to a 40-foot drop. The cave continues past the drop as a high fissure.

5. Pit under the trail between San Miguel and Río Santiago and east of the pass near the end of the road. The entrance is small and covered with rocks, but the pit enlarges to about 50 feet in diameter. Rocks bounce for six seconds. Unexplored.

6. Pit about 60 feet deep located on the northwest side of the trail to Río Santiago. Two horizontal entrances about 3 feet high and 4 feet wide lead from the trail to the pit.

7. Water Trough Cave. This cave is located near a trail leading to the ridge above the road near the southeast end of the San Agustín dolina. The entrance lies at the bottom of a shallow sink, and is formed along bedding planes. Inside the entrance is a hollowed-out log for collecting water from dripping formations. The cave contains much fill material that has created a couple of short drops before completely filling the passage. Note the straight ceiling. See sketch map.

8. Small cave in sink just northwest of Water Trough Cave. Cave is about 20 feet long, and 10 feet high and wide. It slopes steeply downward to a dirt choke.

9. Small cave in road cut above entrance to Sótano de San Agustín. A short breakdown slope leads to a small room at the bottom.

10. Sink just across the road from cave 9. A dirt pit drops about 20 feet and can be climbed. At the bottom is a small horizontal hole filled with water.

11. Pit just down hill from pit 10. The cave drops 30 feet to water from a small entrance Unexplored.

12. Cave in bottom of a large sink just off road at the upper end of the valley that drains into Sótano de San Agustín. The cave is small, sloping steeply to a dirt plug.

13. Pit in large dolina above the San Agustín dolina and just below San Andrés. A small climbable entrance leads to a few hundred feet of small passage containing a very small stream. Crawlway continues.

14. Pit in same dolina as number 13. The entrance is about 10 feet by 20 feet and drops 15 feet to a short crawlway.

15. Pit by small sink at east end of valley, above the Sótano del Río Iglesia, near the convergence of the trails to San Miguel. The entrance is roughly oval-shaped, 20 feet by 30 feet, and drops 120 feet to a dead end.

16. Pit high above the Sótano del Río Iglesia, towards San Agustín, but below the trail from San Agustín to San Miguel. The entrance is known to be small, 10 to 15 feet in diameter, but its depth is unknown. Unchecked.

HUAUTLA AREA: Large Caves

17. Millipede Cave. This cave is high above the Sótano del Río Iglesia, just below the divide between the Río Iglesia and San Miguel dolinas and to the right of the trail from San Agustín to San Miguel. It is formed in the collapse of a large solution pocket in the mountainside. The entrance is about 40 feet in diameter, quickly narrowing to 20 feet and sloping steeply (climbable) downward to a silt-floored room 75 feet below. A small duck-under through some formations leads to a shelf above the main floor of a room about 40 feet wide, 70 feet long, and 40 feet high. The floor is covered with dry, cracked mud, and has a little gully where water disappears into the floor. At the far end of the room a large pile of breakdown rises steeply to the ceiling, with no evident passageway through. On the shelf were found almost all of

the cave fauna collected on the trip. The fauna consisted mostly of crickets, millipedes, spiders, and phalangids. See sketch map.

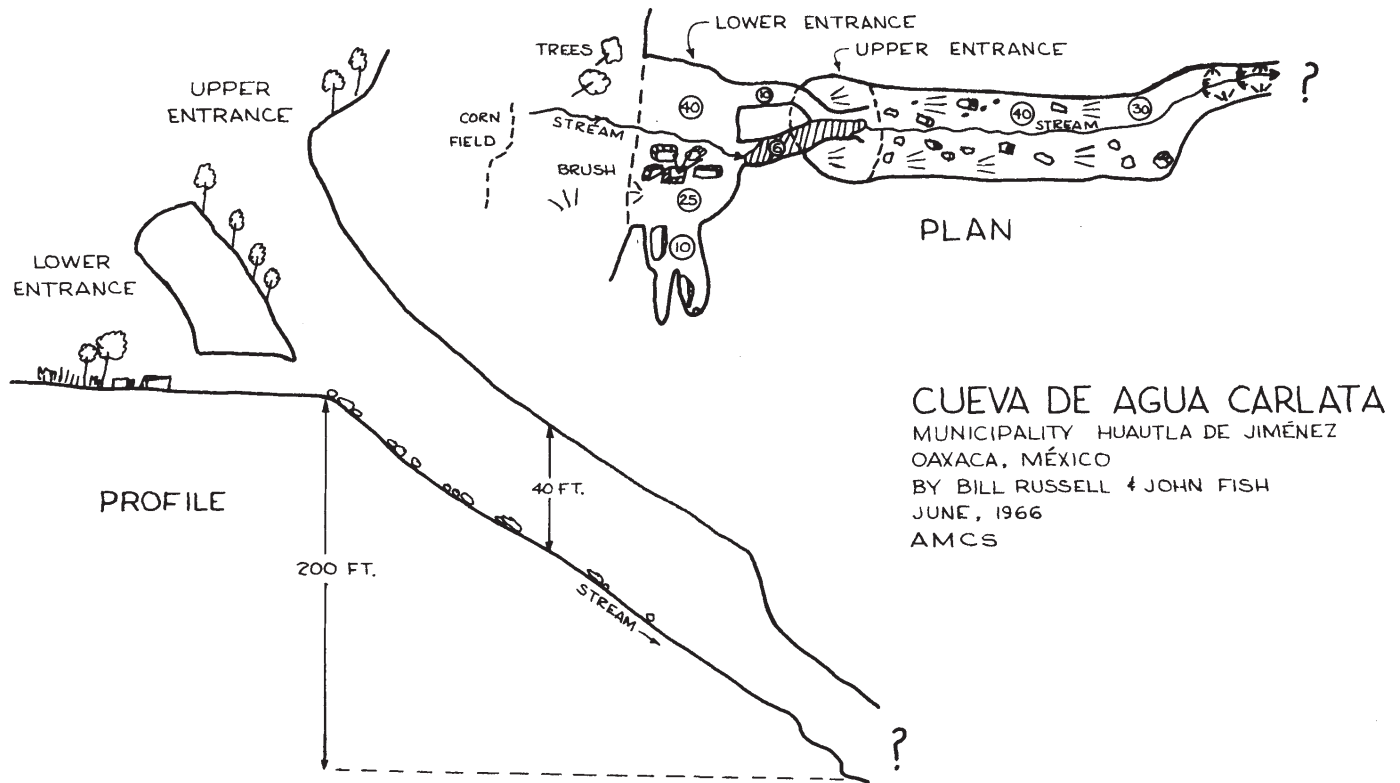
18 and 19. Sótano del Río Iglesia and Cueva del Río Iglesia. This system is located at the lowest point in the Río Iglesia dolina, which is southwest of San Agustín and perhaps one mile long. The Río Iglesia runs the length of it, tumbling off the volcanic mountains at one end and disappearing into the limestone sótano at the other end. The entrance pit at the waterfall is approximately 120 to 150 feet deep, but the large volume of water makes entering at this point impossible. In June the stream was about 4 feet wide and 5 inches deep, but this was before the rainy season had really begun.

Slightly above and 100 yards to the right of the waterfall is a large horizontal entrance to be same system. From here it is possible to approach the pit entrance by at least two routes. Immediately within the entrance, still in full daylight, a short passage leads to the left to a jungle-covered ledge across from and overlooking the waterfall. From this vantage point one gets a proper perspective of the large, slot-like canyon, about 150 feet high and up to 25 feet wide, that the river disappears into. The pit was rigged from this ledge.

Along another route from the horizontal entrance, a downward slope and a duck-under lead to a large room. No major passages leave the room, but a tiny stream issues from a narrow fissure, runs across the room, and continues down a series of several small, interconnecting fissures. It is possible to climb down these to a lower passage that runs for a short distance to where it joins with the entrance pit approximately 75 feet down.

From the tie-off point the drop is approximately 120 feet to a breakdown slope leading down to the base of the waterfall, which is a pool 30 to 40 feet in diameter. It was impossible to determine where the water continued from here, as visibility was limited by heavy mist. As one faces the waterfall, there is a large passage to the right (an overflow or former water route?) about 30 feet in diameter that was followed for several hundred feet. After climbing down several drops one reaches a large pool that must be traversed on the right. A short distance farther, a drop estimated to be 70 feet marks the end of present exploration. Water was heard at the bottom of the drop.

20. Cueva de San Agustín. This cave is located in



CUEVA DE AGUA CARLATA

MUNICIPALITY HUAUTLA DE JIMÉNEZ
OAXACA, MÉXICO

BY BILL RUSSELL & JOHN FISH
JUNE, 1966
AMCS

the side of the hill just to the east of San Agustín and is visible from the trail at the end of the San Agustín valley. The entrance is about 50 feet wide and 40 feet high, but the cave quickly narrows to a high fissure that leads from the right side of the entrance. The floor of this fissure slopes steeply downward to a drop of about 40 feet, formed where breakdown has wedged in the fissure. Below this drop the fissure widens from about 20 feet to over 35 feet and turns slightly to the left. The floor in this area consists of small breakdown and slopes gently towards a second, flowstone-covered drop. This drop is about 50 feet and leads into a continuation of the fissure. The fissure in this section is about 70 to 80 feet high and about 30 feet wide with a flat floor of compact dirt. Below the drop, drips and seeps have accumulated to form a small stream that flows along the right side of the passage to a third drop, of about 10 feet. Beyond this drop the cave continues for another 200 feet before dropping again, this time into a deep pool of water. The passage does not end, but the water prevented exploration.

21. Sótano de San Agustín. This sótano lies at the lower end of the long dolina stretching from San Andrés to San Agustín. The dolina is made up of a large central sink and several smaller sinks at

each end just below the towns. The San Agustín dolina is roughly one mile long, one-fourth mile wide, and 500 feet deep. Streams running off of the volcanic ridges throughout the dolina drain into the sótano over a 250-foot waterfall.

The entrance is estimated to be 120 feet across, 70 feet wide, and 250 feet deep. It is best to enter on the side opposite the waterfall, which would be a free drop through water, even though it is necessary to clear out a path through vegetation in order to rappel. From the bottom a high fissure passage goes back under the waterfall. A stream flows down a steep canyon that requires a handline and enters a very large room, so large that the first explorers momentarily got lost on the way out of the cave. Another stream emerges from breakdown to join the main stream. This room turns left over breakdown and short climbable drops to where several small rooms led to the next series of drops. The first three or four of these drops are about 30 to 40 feet each and are separated only by plunge pools. Here exploration ended due to lack of equipment, but waterfalls could be heard below.

22. Cueva de Agua Carlota. This large cave is located about 3 kilometers east of San Agustín on the northwest side of the main northeast-trending

valley. The cave is best reached by following the trail from San Agustín to Río Santiago until the east-facing entrance is visible. The entrance is at the base of a ridge that is about one-half kilometer west of a small village called La Providencia. Between the town and the cave is a small valley containing numerous springs that form a sizable stream and flow into the lower cave entrance (see cave map).

The lower cave entrance forms a large shelter about 150 feet wide, 50 feet deep, and 50 feet high. To the right as one enters the cave and up a short breakdown slope are two walking-size passages that lead for about 150 feet. One ends in dirt fill and breakdown, while the other narrows to a dirt-filled crack. From the back of the lower entrance two

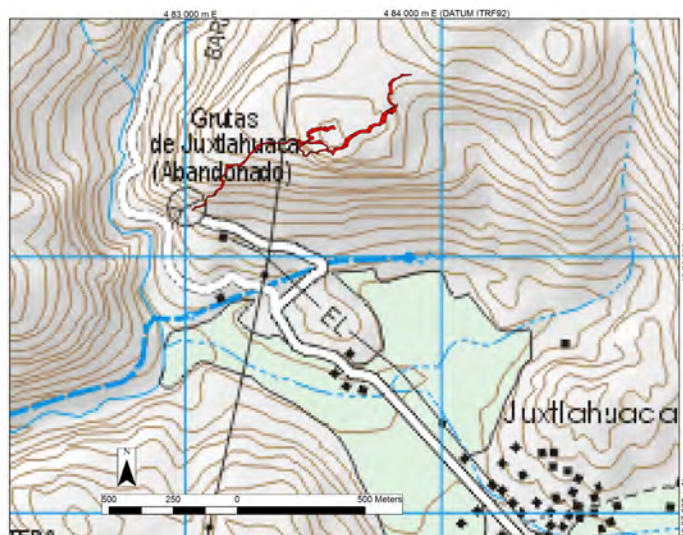
passages connect with an upper entrance. Below this upper entrance a large passage about 50 feet wide and 40 feet high slopes steeply downward past the level of the lower entrance. The stream entering the lower entrance flows through one of the connecting passages and down a series of rapids and cascades. About 300 feet from the upper entrance there is a slight jog to the left, and the passage becomes smaller, steeply sloping, and elliptical, approximately 30 feet high and 20 feet wide. The stream flows over two short drops to the top of a 10 foot waterfall, with another waterfall visible just beyond. The cave is unexplored beyond this point.

NEW CAVE SURVEY AT GRUTAS DE JUXTLAHUACA, MEXICO

LAURA ROSALES

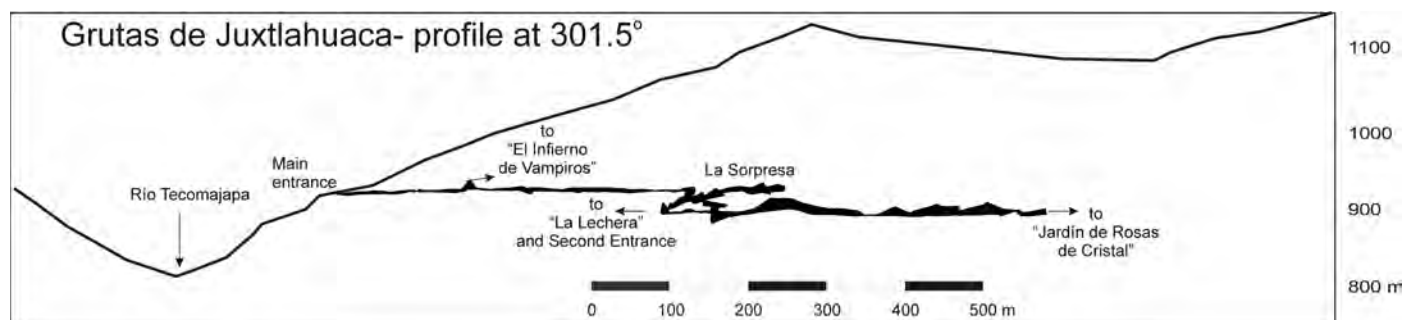
Grutas de Juxtlahuaca is a tourist cave in the Municipio of Colotlipa, Guerrero, Mexico. This cave is very well decorated and contains paintings and drawings attributed to the Olmec culture, based on their style and iconography. The cave was initially measured by Andrés Ortega, professor in Colotlipa, to determine its length. It was surveyed with compass and tape in November 1971 by Jess Corson, Enrique Ortega, Charles Roy, Kathleen Roy, and William Steele. The resulting detailed plan-view map of Grutas de Juxtlahuaca was drafted by Terry Cox in 1972 and published as a loose insert in *Association for Mexican Cave Studies Newsletter*, volume 5, number 1, 1974. (See <http://www.amcs-pubs.org/maps/0057.pdf>.) A partial re-survey of the cave was completed in June 2011 by Keith Christenson and Laura Rosales to locate a passage named La Sorpresa that was not included in the original map. The location of La Sorpresa is important because of recent paleoclimate work there by Dr. Matthew Lachniet, from the University of Nevada Las Vegas, and Dr. Juan Pablo Bernal Uruchurtu, from Centro de Geociencias, Universidad Nacional Autónoma de México, to reconstruct the paleoclimate in southwestern Mexico.

The resurvey of the cave was continued in late September and October 2012 using a hand-held compass, a clinometer, and a laser distance meter by Barbara Luke, Hugo Salgado Garrido, Ramón Espinasa Pereña, Ruth Diamant Adler, Sofía Espinasa Diamant, Ramón Espinasa Closas, Sergio Eduardo Nuño Licon, and Laura Rosales Lagarde



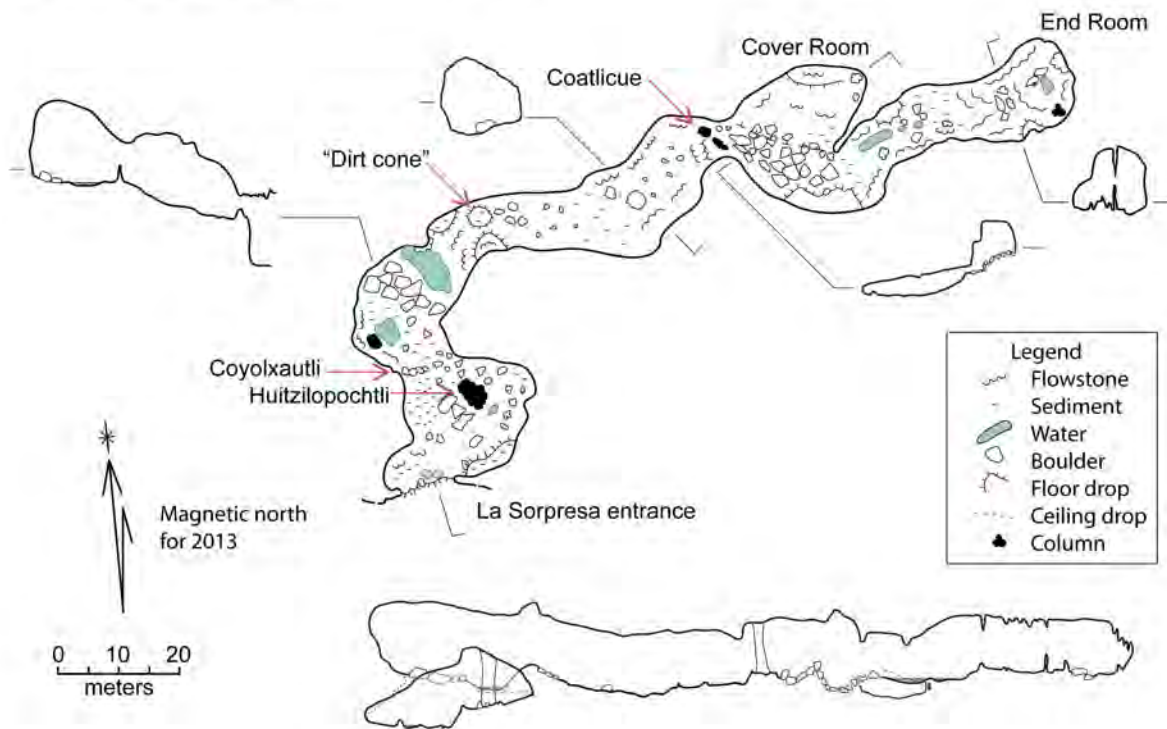
to relate the cave to the surface topography, produce a detailed map of La Sorpresa, and obtain the cave's profile. The data from the 1971 survey were apparently lost in a fire, so it could not be used for this purpose. The resurvey in the cave did not extend to the end of the cave, so the plan and profile included here shows mainly the location of La Sorpresa passage within the front half of Juxtlahuaca Cave. Juan Pablo Bernal named some of the most prominent speleothem formations in La Sorpresa.

Various software programs and steps were followed to produce the maps here. In the case of the plan view of Juxtlahuaca, the 2011 and 2012 survey data were first plotted with the Walls program. Secondly, the resulting plan-view map was overlaid in a drawing program on the 1971 map at the same scale and oriented to fit the line-plot as well as possible. Last, the passage outline of the 1971 map



Juxtlahuaca Cave
 Guerrero, Mexico
 La Sorpresa passage

Surveyed using distometer, tape and Suunto instruments
 on October 5, 2012
 by Laura Rosales Lagarde, Barbara Luke, Hugo Salgado.
 Drafted by Barbara Luke with edits by Laura Rosales L.



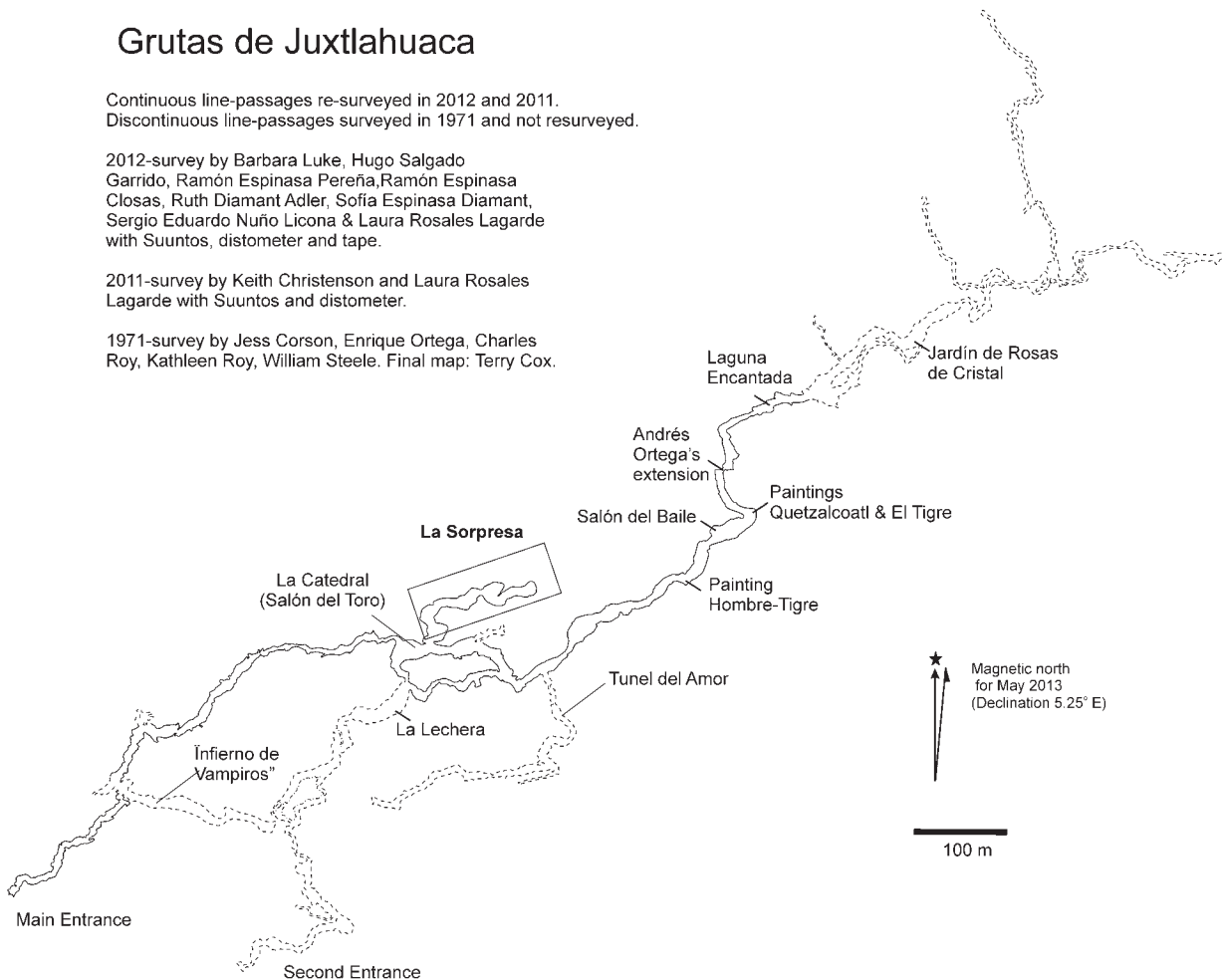
Grutas de Juxtlahuaca

Continuous line-passages re-surveyed in 2012 and 2011.
 Discontinuous line-passages surveyed in 1971 and not resurveyed.

2012-survey by Barbara Luke, Hugo Salgado
 Garrido, Ramón Espinasa Pereña, Ramón Espinasa
 Closas, Ruth Diamant Adler, Sofía Espinasa Diamant,
 Sergio Eduardo Nuño Licona & Laura Rosales Lagarde
 with Suuntos, distometer and tape.

2011-survey by Keith Christenson and Laura Rosales
 Lagarde with Suuntos and distometer.

1971-survey by Jess Corson, Enrique Ortega, Charles
 Roy, Kathleen Roy, William Steele. Final map: Terry Cox.



was cut in the fewest segments practical to adjust to the plan view drawn by Walls. To orient the cave relative to the surface topography, the georeferenced 1:50,000 topographic map from INEGI was overlaid in Arc GIS by the plan view of Juxtlahuaca Cave exported from Walls. The resulting image was used to obtain the surface topography above the cave profile created by Walls. The line plot of the La Sorpresa passage was overlaid in a drawing program by the in-cave sketches drawn at a known scale, and drafted. The La Sorpresa passage has 190 meters of surveyed length, which, when added to the length surveyed in 1971, produces a total of 5288 meters of surveyed passage in Juxtlahuaca Cave.

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ASTYANAX INTERNATIONAL MEETING 2013

WILLIAM R. ELLIOTT

I retired as the Missouri Department of Conservation's cave biologist in 2011, but recently I got re-involved in cavefish work in Mexico. I was invited to speak at the AIM 2013 (Astyanax International Meeting), March 17–21, 2013, at Hotel Taninul, Ciudad Valles, San Luis Potosí, Mexico. My wife, Gayle Unruh, accompanied me. This was like a trip into both the past and the future.

The meeting drew forty people, mostly university geneticists and behaviorists, and a couple of old cave biologists, Luís Espinasa and me. We hailed from the U.S., Mexico, France, China, Japan, Israel, Germany, Slovenia, and Brazil. The AIM group is very active because *Astyanax* cavefish are easily bred in the lab, and they are an interesting model of cave-animal evolution.

I started caving as a University of Texas biology student in 1967. Soon I was collecting invertebrates and mapping caves in Texas and Mexico. Bill Russell taught me how to map caves, and James Reddell amazed me when he reported that some of my inverts were new species. I was recruited by Dr. Robert W. Mitchell to attend grad school at Texas Tech University and join his research on *Astyanax* cavefish. I started this work for Bob in the summer of 1969. Don Broussard, Jim McIntire, and I spent six weeks working in many caves

around Ciudad Valles in the Sierra de El Abra. A number of cavers and biologists joined us. We also descended into Bee Cave near the northern end of the cavefish range, Chamal area, Sierra de Guatemala, near Ciudad Mante. Our task was to map cavefish caves and collect fish. During this work I discovered a new species of troglomorphic cave scorpion while mapping Sótano de Yerbaniz.

I earned my MS and PhD under Bob Mitchell. Later I did a lot of work in the Sierra de Guatemala. I have studied many aspects of cave biology. My career also took me to many caves in Texas, Belize, many western states, Alaska, and finally Missouri.

Before I went to AIM I had a bibliography of 217 papers on cave *Astyanax* going back to their discovery in 1936, but in recent years 40 or 50 more papers have appeared. The AMCS and AIM folks largely were unaware of each other, but I hope we can change this. The major labs are led by William R. Jeffery, Sylvie Rétaux, Suzanne McGaugh, Josh Gross, Richard Borowsky, and Ernesto Maldonado, who have been involved in organizing these meetings. AIM works in the Huastecan region of San Luis Potosí and Tamaulipas, including the Sierra de El Abra, Sierra de Guatemala, and part of the Sierra de Nicolás Pérez, from Ciudad Valles to Gómez Farías.



The keynote speaker was Suzanne McGaugh, Washington University, St. Louis, who talked about the DNA-sequencing project she is leading, in which the cave and surface *Astyanax* genomes will be decoded. There were twenty-four papers and seven posters given. I gave the concluding paper on my studies of caves and blind fishes in northeastern Mexico from 1969–1981, with a lot of vintage photos and maps of caves, geology, and hydrology.

AIM started in 2009 with an initial conference at Hotel Taninul, followed by meetings in 2011 and 2013 at the same place. I obtained PDF copies of the meeting programs, which they have allowed AMCS to post on its website. Over the three meetings they have hosted sixty-nine papers, seven posters, and one round-table discussion, but no proceedings were published. The research labs publish their papers in various journals.

On Wednesday, March 20, we took a field trip by bus to Cueva del Río Subterráneo near Micos, an interesting cave with an evolving population of eyed and eyeless *Astyanax* fish. Luís Espinasa led us along the edge of a karst valley of sugar cane fields to the cave, passing by Cueva de Otates on the way. Since a 5-meter cable ladder drop was involved, we divided into two groups, half of us lingering outside to eat our lunches. The Mexicans and French expertly belayed us up and down the pitch, and we slogged our way through a succession of pools inhabited by fish. Espinasa and Rétaux netted some fish for a small, in-cave



SIERRA DE EL ABRA
ROBERT W. MITCHELL

behavioral study in small inflatable pools. The air quality became progressively worse toward the end of the cave, with elevated CO₂ and reduced O₂, but we managed to have some fun anyway. I took some GPS fixes on the entrances Subterráneo and Otates. Later I found my 1974 surveys of Cueva de Otates, next door, and Cueva de Lienzo, across the valley. Unfortunately, we don't think anyone ever mapped Subterráneo, although there is a sketch map. These three Micos cavefish sites are interesting because the geneticists have detected some gene flow out of the system into the surface fishes. Possibly two of the caves may act as estavelles, disgorging as well as taking water, but no one has actually observed that yet. I would like to recruit some cavers to map Subterráneo.

Besides the cavefish, a highlight of the day was when I caught a *Pteronotus* bat just inside Subterráneo. I'm not sure which species it is yet. We measured and photographed it, and I released it. We also visited the cascades at the village of Pago Pago on the way back.

In my presentation on Thursday I looked back forty-five years to the way we did field work in the twentieth century, culminating in the big *Astyanax* paper in 1977. This ecological/hydrological/biological paper has been an important source of information to many cavefish researchers. If only GPS had existed back then! We did not discover Mexican topographic maps until the late 1970s. I had prepared a large dataset of cave locations, and part of the talk was a video flight or "tour" in Google Earth, showing the locations of all known cavefish and non-fish caves in the area. The data are being translated into WallsMap format by David McKenzie.

I had not been in the El Abra since 1974, or



CUEVA DEL RIO SUBTERRANEO
BY SYLIE RÉTAUX

- Transcriptome analysis in Astyanax mexicanus blind cavefish and sighted surface fish.* Hélène Hinaux, Julie Poulain, Corinne Da Silva, Céline Noiro, William R. Jeffery, Didier Casane, and Sylvie Rétaux.
- An analysis of gene expression level changes across development in surface and cavedwelling fish.* Joshua B. Gross and Michael Matthews.
- Divergence and Speciation in Astyanax of the Sierra El Abra.* Richard Borowsky.
- Hybridization and the colonization of the cave environment by fish.* Amy Cahill, Maria Yurgel, and Luis Espinasa.
- Genetic structure of Astyanax mexicanus at Mexican Atlantic slope.* Sarai Esquivel Bobadilla, Francisco J. García de León, and Richard Borowsky.
- Paradigm shifts and pendulum swings regarding the origin of Astyanax cavefish: What about geology?* Luis Espinasa.
- An integrated transcriptome-wide analysis of cave and surface dwelling Astyanax mexicanus.* Allison Furterer, Brian M. Carlson, Bethany A. Stahl, and Joshua B. Gross.
- Compared phylogenies of monogeneans parasites and their host Astyanax mexicanus.* Ana Ofelia Santacruz Vázquez, Rolando Barcenás-Luna, and Fausto Arellano-Carbajal.
- An analysis of structural mutations in the gene Mcl1 in surface and Granadas cavedwelling Astyanax aeneus.* Joshua B. Gross, Amanda J. Krutzler, and Luis Espinasa.
- Caballo Moro breaks Dollo's law: Recuperation of vision in a blind cavefish population.* Luis Espinasa and William Jeffery.
- Development of the olfactory system in Astyanax cavefish and surface fish.* Maryline Blin, Yoni Bibliowicz, and Sylvie Rétaux.
- Molecular systematics of the genus Astyanax (Characiformes: Characidae)—starter edition.* Rubens Pazza, Luiz Antonio Carlos Bertollo, Lurdes Foresti de Almeida-Toledo, and Karine Fehner Kavalco.
- Characterization of two trophic ecotypes of Lake Catemaco through diet analysis of stable isotopes.* Ma. P. Bermúdez-González, A. Bautista, and C.P. Ornelas García.
- Role of α -crystallin in Astyanax cavefish eye degeneration.* Li Ma and William R. Jeffery.
- HSP90 as a capacitor for the evolution of eye loss in cavefish.* N. Rohner, D. F. Jarosz, M. Taipale, J. Kowalko, M. Yoshizawa, W. R. Jeffery, R. L. Borowsky, S. Lindquist, and C. J. Tabin.
- Development and genetics of the Astyanax sclera: An optic tissue organized by the lens.* William R. Jeffery, Pooja Doshi, Masato Yoshizawa, and Kelly E. O'Quin.
- Quantitative genetic analysis of retinal degeneration in the blind cavefish A. mexicanus.* Kelly E. O'Quin, Masato Yoshizawa, Pooja Doshi, and William R. Jeffery.
- Pigmentation loss in cave animals: A high-resolution study of destructive genetic mutations.* Bethany A. Stahl and Joshua B. Gross.
- Adaptive changes in vibration attraction behavior and its sensory receptors promote eye degeneration and disparity between the nuclear and mitochondrial genomes in Pachón cavefish.* Masato Yoshizawa, Kelly E. O'Quin, Go Ashida, and William R. Jeffery.
- An evaluation of eyelessness in cave-dwelling Astyanax mexicanus using RNA-seq technology.* Aaron L. Stahl, Bethany A. Stahl, Elke Buschbeck, and Joshua B. Gross.
- Fragmentation, fusion, and asymmetry in the craniofacial skeleton of Astyanax mexicanus.* Amanda J. Krutzler, Lauren E. Bruns, and Joshua B. Gross.
- Transgenesis methods in Astyanax.* Laurent Legendre, Yannick Elipot, Hélène Hinaux, Stéphane Pere, Frédéric Sohm, and Sylvie Rétaux.
- Unravelling continuous eye growth in teleosts by studying blind cavefish.* Manuel Stemmer, Laura-Nadine Schuhmacher, Nicholas S. Foulkes, Cristiano Bertolucci, and Joachim Wittbrodt.
- Isolation and characterization of V1r pheromone receptor gene in cave and surface variants of Astyanax mexicanus.* Oscar Manuel García-González and Fausto Arellano-Carbajal.
- Statistics on Astyanax husbandry in the Gif facility.* Stéphane Pèrè, Yannick Elipot, Laurent Legendre, Hélène Hinaux, and Sylvie Rétaux.
- Parallel evolution within the Astyanax genus in Mesoamerica.* Claudia Patricia Ornelas García, Carlos Pedraza-Lara, Marta Barluenga, and Ignacio Doadrio.
- Olfactory evolution in cave-dwelling Astyanax mexicanus.* Jonathan Bibliowicz, Yannick Elipot, Maryline Blin, and Sylvie Rétaux.
- Metabolic regulation of sleep in A. Mexicanus.* Alex C. Keene.
- Feed or fight: Developmental origin of a behavioral shift in blind cavefish.* Sylvie Rétaux, Yannick Elipot, Lise Prunier, Hélène Hinaux, and Maryline Blin.
- Astyanax: Looking back 45 years.* William R. Elliott.

the Sierra de Guatemala since 1981. I shared my ideas on what ought to be done to further cavefish research. I emphasized that the caves are not dots on a two-dimensional map, but complex, three-dimensional spaces with dynamic hydrology. I recommended a new expedition to relocate Sótano de Soyate, northeast of Los Sabinos. We explored and mapped Soyate in 1969 and collected cavefish from the deepest base-level point in the Sierra de El Abra, about -234 meters. Soyate had a very large population of cavefish, but our collections never got into the sampling stream for cavefish genetics. I believe this may be the unrecognized “metapopulation” of cavefish for the southern El Abra. Several biologists may team up with cavers to investigate the Soyate population in late 2013.

The AIM researchers still value the maps, descriptions, and insights about geology, hydrology, and the origin of the cavefish published by Mitchell, Russell, and Elliott, 1977. A PDF of this monograph and others may be found at www.amcs-pubs.org/other/otherpubs.html and my website, <http://mocavelife.com/>. Some of the researchers were familiar with AMCS Bulletin 1, *Caves of the Inter-American Highway*, by Russell and Raines, but few knew about John Fish’s 1977 dissertation, *Karst Hydrology of the Sierra de El Abra, Mexico*, published as AMCS Bulletin 14 in 2004. My job was to familiarize them with cave exploration and mapping and point them to some interesting caves.

Bob Mitchell passed away in March 2010. We originally had big plans to publish a series of papers describing all thirty cavefish caves, with my cave maps; that was not realized, but we did publish the monograph. A few maps were published in caving publications.

With the help of TSS and AMCS I have been

able to retrieve my many field books, survey notes, and some maps archived there. We are scanning them, and I intend to re-draft the lost maps that somehow disappeared forty years ago. Over the next year I may produce about twelve cavefish cave maps and some area maps.

Thanks to Logan McNatt, Bill Mixon, David McKenzie, and others for helping me find my Mexico and Texas field books in the TSS and AMCS files. Bill also had two of my larger inked maps, of Sótano de Yerbaniz and Cueva Chica, which will be scanned so I can update them. David McKenzie is re-training me on Walls, WallsMap, and Adobe Illustrator 10. Thanks also to Linda Mitchell and Sharon Mitchell, Bob’s widow and daughter, who shared important letters and photos with me and the AMCS. Bill Mixon has scanned more than a thousand of Bob’s field-trip slides, including some photos of Richard Albert’s airplane and caver crew, including Bill Russell, Tom Albert, and Don Broussard. Those flights were important in finding new caves in 1969 in northeastern Mexico, including cavefish caves on the west side of the El Abra and megapits on the eastern crest. The ones on the crest, deep as they are, do not reach water, so they lack cavefish.

PDFs of the program and abstracts of the conference, as well as those for the 2009 and 2011 conferences, are on the web at www.amcs-pubs.org/other/otherpubs.html.



ROBERT W. MITCHELL, 1969

**CUEVA DEL REY CONDOY
OAXACA, MEXICO**



**PHOTO ESSAY
PHOTOGRAPHER: ELLIOT STAHL**

















UEYOLBASTLE

When we spoke with the engineer at the Protección Civil de Ajalpan, he told us a story about a sótano in the community of La Esperanza, where they had had to go to look for a lost person. He told us that the people in the community took him to a large pit, where when he looked over the edge the floor appeared to be covered with grass, but when he observed it more carefully with binoculars he realized that they were in fact “pine trees.” He finished his story by telling us that a week



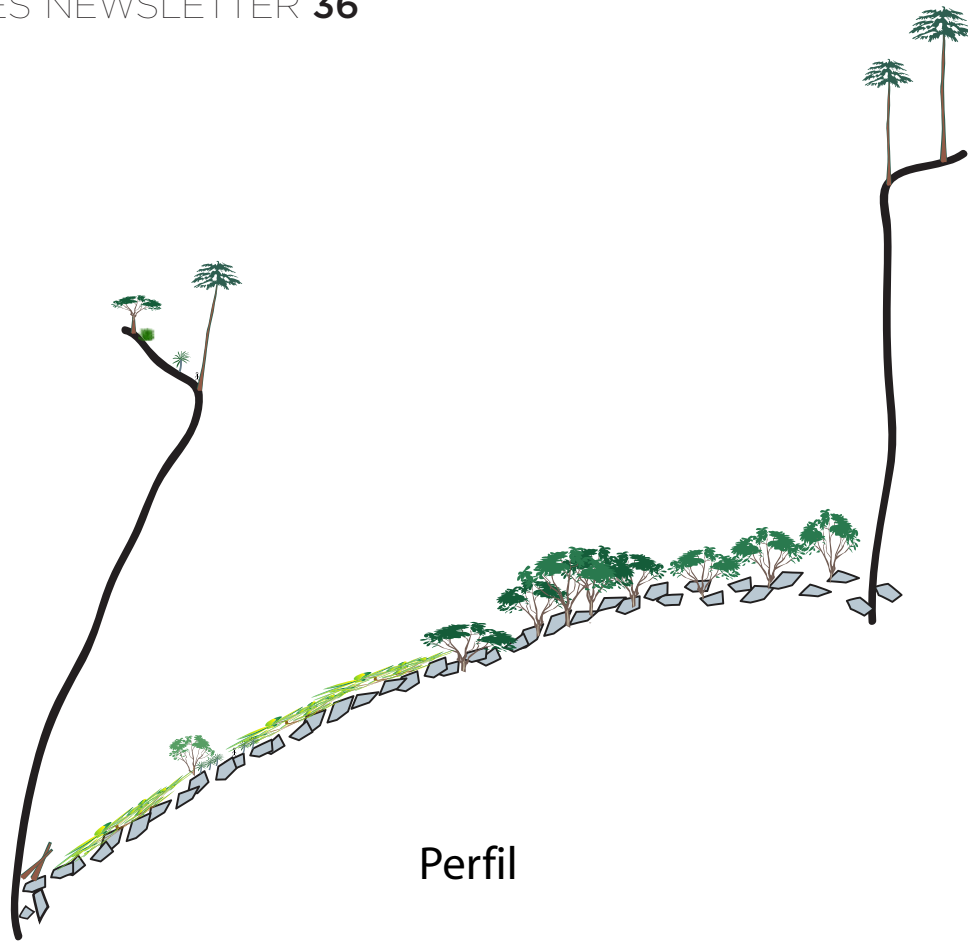
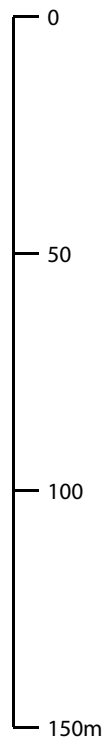
GUSTAVO VELA

GUSTAVO VELA
TRANSLATED BY AL WARILD

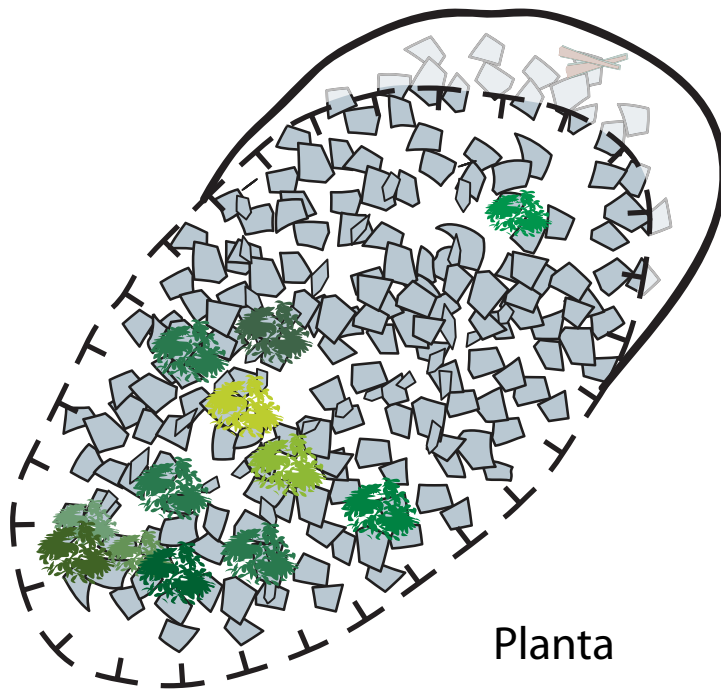
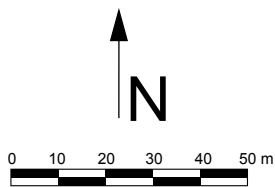
later they found the poor missing guy crushed under a fallen branch. He’d been cutting a tree in a remote part of the forest, and nobody could hear his calls for help, if in fact he had been able to call. At least his family was happy to have their loved-one’s remains, and the *protección civil* agent was also happy that he didn’t have to descend the sótano looking for him. We wondered about the story for a few weeks (Wow! We’ve got to get up there and see this with our own eyes.) until mid-April, when we got time to get up there and take a look.

When Al and I arrived in the locality of La Esperanza (Hope; with so much misery in this lost corner of the sierra, they didn’t need hope to keep going, but blind faith), the very accommodating political head of the community offered to take us there the next day. He also told us that a few years before a French group had descended the sótano, but the community had been upset because they had gone there without first asking permission. As we had asked first before going up the hill, they were happy with us. As is the way in the sierra, it turned out that the sótano is in fact in the neighboring community’s land, but they did presumably have permission as they were living in the village. Of course, we weren’t so happy that somebody had beaten us to the sótano, but as we were already there we thought we might as well take a look anyway. When we finally arrived at the entrance, we realized just how big, beautiful, and impressive this entrance actually is. Surely the French had found it on Google Earth; it’s clearly visible if you know where to look.

And so we began the task of finding a good spot to descend, and with an entrance some 100 by 150 meters, we had plenty of options—a few too many, really. Al took a look at the tree that we were told the French had used, but seeing how badly the rope rubbed, he moved to another spot. He descended some 80 meters through steep scrub, rebelaying off several trees. Once he was ready



Perfil



Planta

Ueyolbastle

(Sótano Grande)

La Esperanza/Tecpanzacualco, Ajalpan, Puebla, México

X: 0709951 Y: 2046227 Z: 2390, NAD27 Mexico

Profundidad topografiado: 154 m

Explorado y topografiado por los miembros de la expedición Tzontzecuiculi 2013 con DistoX, Suuntos & Auriqa

to descend the final drop it was obvious that the rope wasn't long enough. As he came back up for more rope, the huge rocks that he kicked off convinced him to move to yet another, safer spot. And so it was Gustavo's turn to rig from a tree on the lower edge, where there appeared to be a free drop to the bottom. After putting in a few anchors on the steep slope leading to the overhanging edge and hanging the rope from the "perfect" tree, he lowered the rope only to find that it didn't reach from there either. Damn! He called for Al to bring more rope, and he passed at the tree and went on down to add his rope to the one that had been 20-odd meters short.

Once on the bottom, we did a quick circuit to see if there was any way on, finding nothing but a small pool of clear water to drink. What luck! We hadn't brought much water with us, it was hot as hell outside, and we were climbing in full sun. Most importantly though, we did verify that the grass on the bottom was in fact mostly bamboo scrub with a few taller bushes, 3 to 4 meters high, against one wall. We didn't find any pine trees. On the way up we took measurements for the map.

Back in town Gustavo wrote to the French cavers, but as their answer was somewhat vague, we finished the map. The sótano is 154 meters deep. We really wanted to call it Olbastl Ocotl-



Zactl (Sótano Pino-Pasto, Sótano Pine-Grass), but had to respect the local name that it already had: Ueyolbastle (Sótano Grande, Big Hole).

SUMMER CAVING IN THE RIVIERA MAYA

BEV SHADE, DEVRA HEYER, AND PETER SPROUSE

From August 10 to 26, 2012, a group of cavers from the U.S. and Mexico continued the survey and exploration of the extensive and beautiful caves of coastal Quintana Roo. This two-week trip was part of an ongoing effort to find and document primarily dry caves in an area of the Yucatan Peninsula of Mexico that is undergoing rapid development. There are challenges to cave exploration in this area—caves are hidden by thick and spiky jungle, which makes entrances hard to find. Due to the major tourist boom in the area, lots of jungle is being cleared, but then many caves are destroyed by construction or quarrying.

The dry caves in this area are horizontal, sliding along in the approximately 12 meters between the ground surface and the water table. But what a 12 meters it is! Spacious, well-decorated river caves extend for kilometers, dotted with oasis-like skylights where sun-spangled jungle dips down

into cool subterranean rivers.

After settling into our set of rented houses in the neighborhood of Chan Chemuyil, our trip started with an evening swim on August 10 in Casa Cenote. Casa Cenote is the final resurgence of Sistema Sac Actun, located just north of Tulum. There are several other resurgences along the way, where water briefly flows along the surface before going underground again. The last comes out offshore of a beach; a blue hole about 8 meters across is located in the surf. The fresh water flow out of the cave was quite strong, pushing me back when I dove in. The mixing of fresh and salt water makes it difficult to see into the hole, but it was wonderful to feel a connection to so many kilometers of cave upstream.

The next day our explorations started in earnest. Over the next two weeks we worked in several areas, sending out teams to multiple destinations



AIDA FERREIRA AND TERRI SPROUSE SURVEYING NEAR THE ANDAMIO ENTRANCE TO SISTEMA DOS ARBOLES BY PETER SPROUSE •

every day. Most people took a day off here and there, and we did a day of whale shark watching, but mostly we were surveying like crazy. I'll describe these activities heading southwest down the coastline from Playa del Carmen.

Sistema Río Escondido: This cave is located very close to the well-known cave tour called Río Secreto, which takes place in a parallel system called Sistema Pool Tunich. Gustavo Vela had started the survey, but it is an extensive cave, and one of our objectives on this trip was to put a big dent in finishing the survey. We spent several days with multiple teams in this cave, finishing the survey at the south end of the cave, then working from the Shaman Entrance toward our recent southern survey as well as north toward passages surveyed on the previous trip. In addition, one team spent a day at the north end of the system (aka Cenote Maravillas or Dino's Cave), pushing the survey south toward the surveyed areas near the Shaman Entrance. Gil Harmon also spent some time chopping trails outside of several entrances that are only known from inside the cave, in search of new caves, of which he found several. To the northwest, survey was also carried out in the Tres Escalones entrance to Pool Tunich, working both upstream to the northwest and downstream to the southeast.

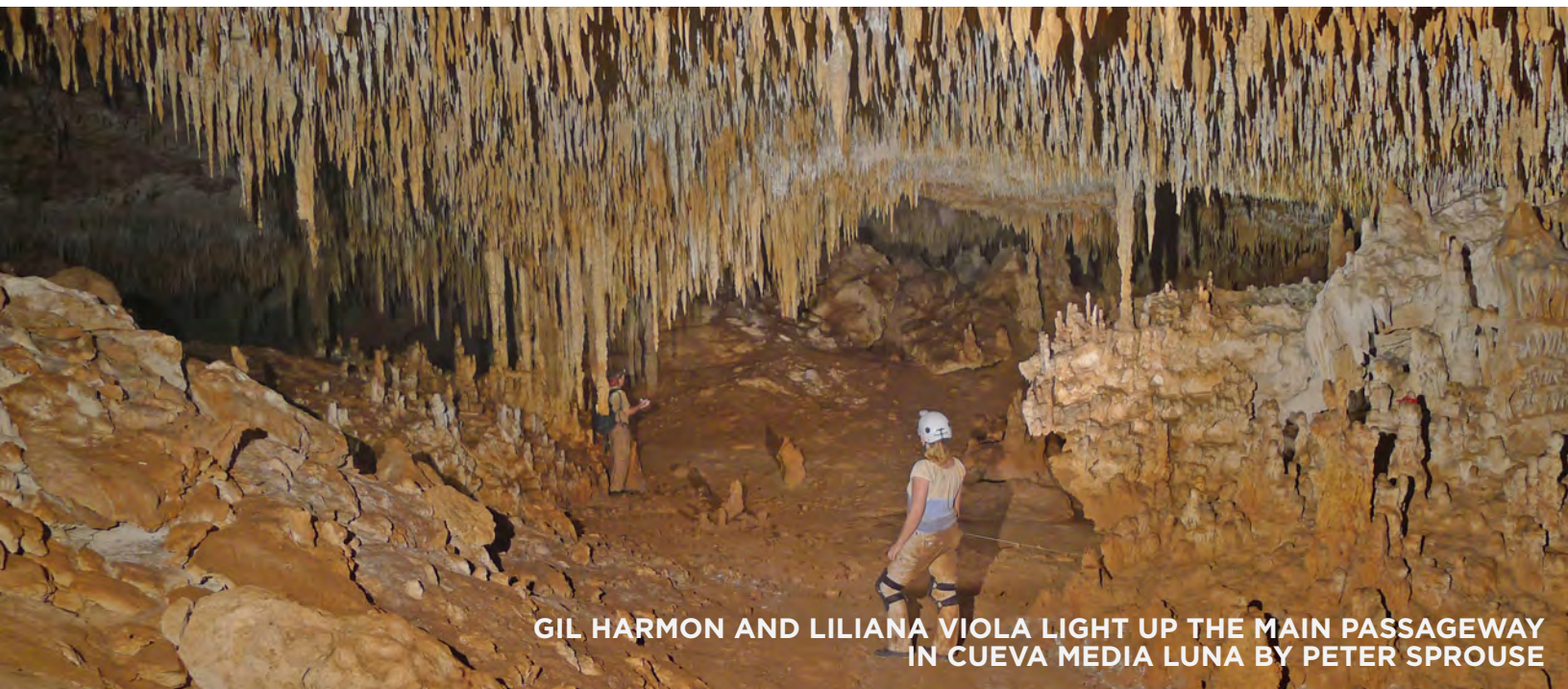
An attempt was made to push a lead in the southwest part of Sistema Sac Muul that had been left the previous November. When the cavers suddenly emerged in a huge rock quarry, they realized that a considerable section of the cave had been quarried away, along with another cave, 984-meter-

long Gruta Escondida de Tara.

Toward the coast from Río Escondido the next system is Sistema Dos Arboles. We got in a day of surveying in this cave with two teams, working around the Clownfoot and Andamio entrances. This system crosses under the highway near an ATV park close to the coast. We had found an entrance we named Sistema Trono adjacent to the highway in February, and Aída Ferreira had begun a survey of it. We continued the survey in hopes of being able to connect to Dos Arboles. Several areas of collapsed passage related to highway construction prevented this.

Directly west of the Paamul community lie several cave systems located and explored on previous trips: Sistema Paamul, Sistema Muévelo Rico, and Sistema Menéalo Sabrosito. Sistema Paamul was pushed westward to its end in increasingly smaller remnant caves, while Sistema Muévelo Rico was pushed southwest to several new entrances. In mapping surface sinkholes, we discovered and surveyed a cave sandwiched between Menéalo Sabrosito and Muévelo Rico, called Cueva Dona for its donut-like shape in plan view. Cueva Tres Días, located about 300 meters south of Sistema Muévelo Rico, was explored and surveyed. Unlike the other large systems on the property, this cave was rather low and stuffy. It was named for how long the survey was expected to take, but since only two days were spent in it, that has yet to be determined.

Close to the town of Puerto Aventuras, we had the opportunity to visit the boutique jungle lodge of Taninah. While there, we surveyed a cave on



GIL HARMON AND LILIANA VIOLA LIGHT UP THE MAIN PASSAGEWAY
IN CUEVA MEDIA LUNA BY PETER SPROUSE

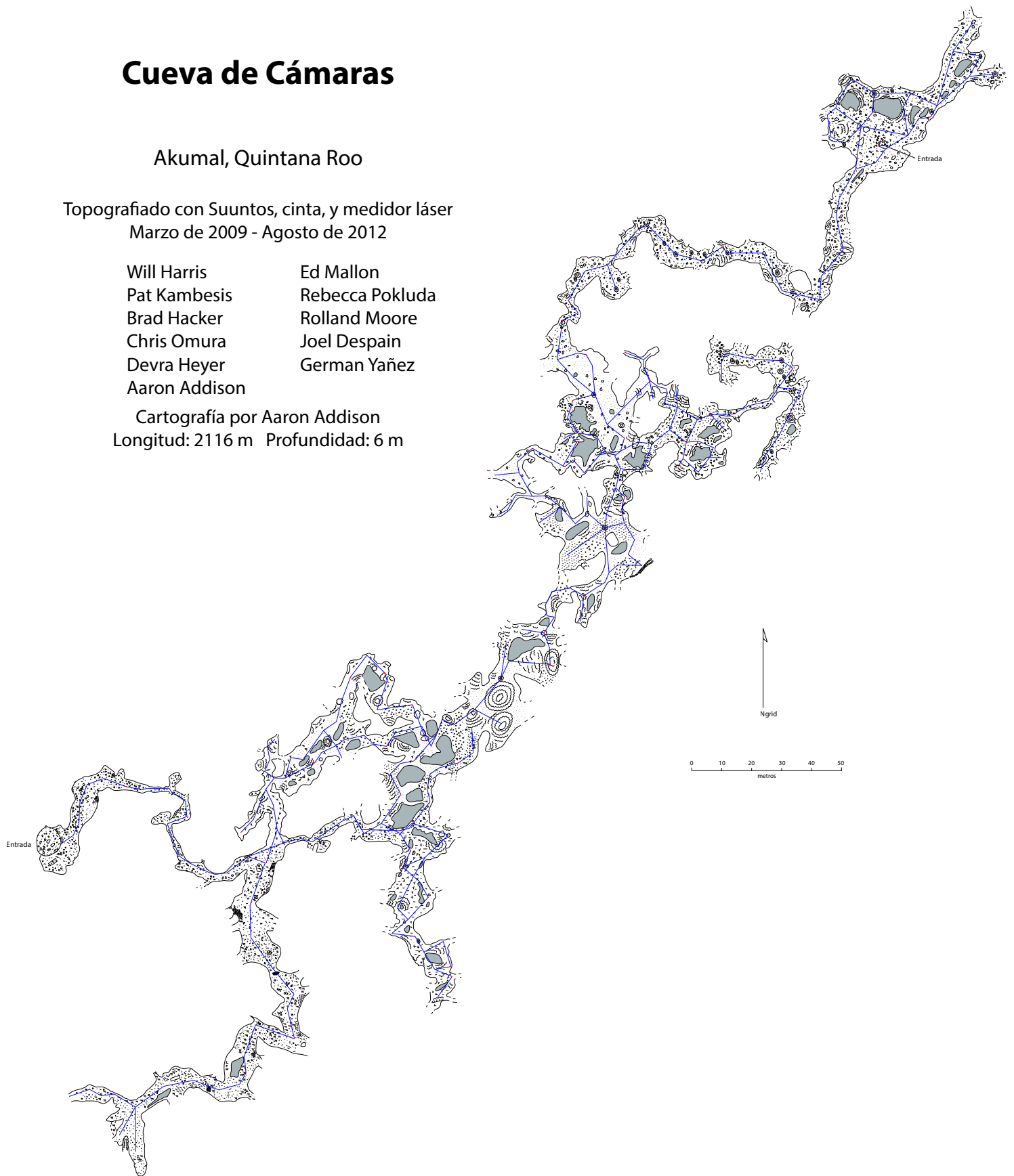
Cueva de Cámaras

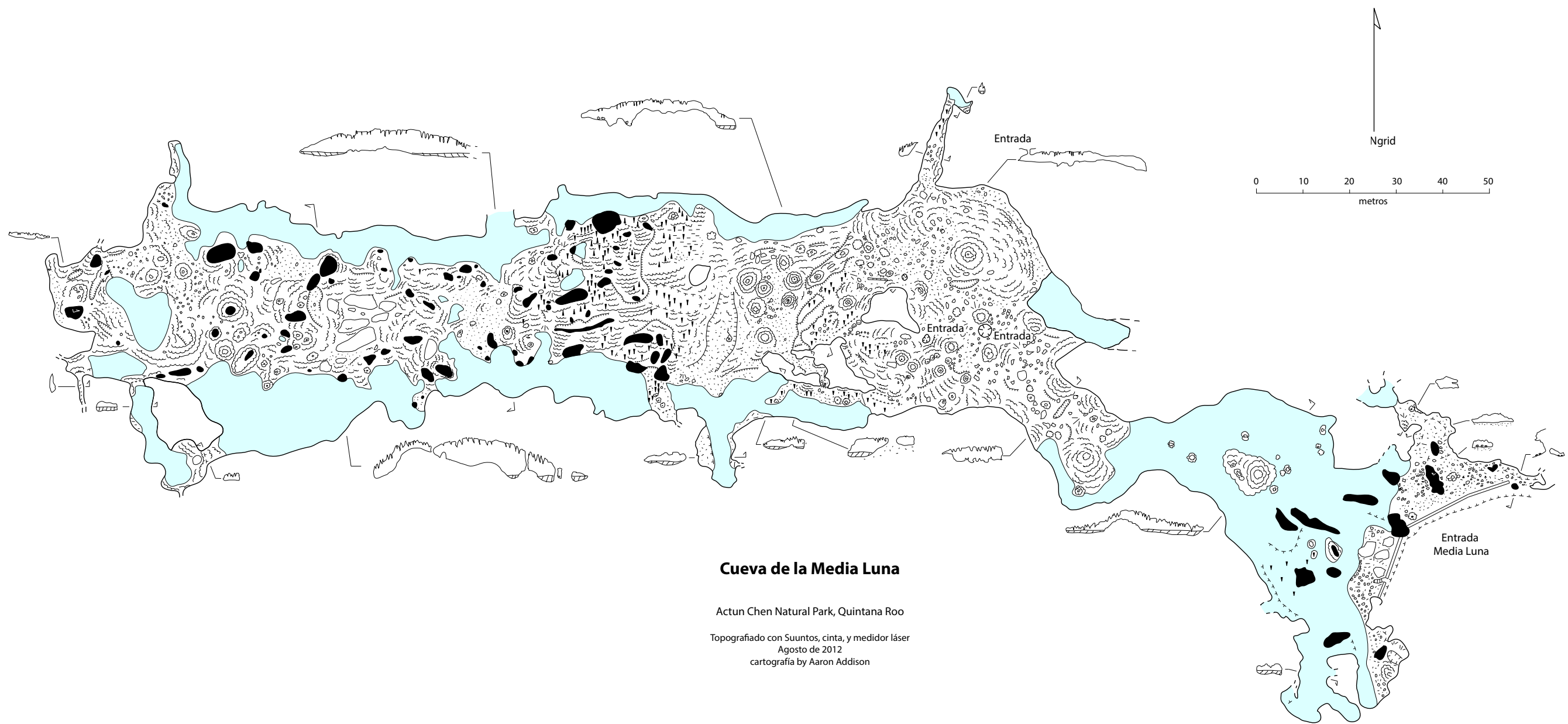
Akumal, Quintana Roo

Topografiado con Suuntos, cinta, y medidor láser
Marzo de 2009 - Agosto de 2012

Will Harris	Ed Mallon
Pat Kambesis	Rebecca Pokluda
Brad Hacker	Rolland Moore
Chris Omura	Joel Despain
Devra Heyer	German Yañez
Aaron Addison	

Cartografía por Aaron Addison
Longitud: 2116 m Profundidad: 6 m





Cueva de la Media Luna

Actun Chen Natural Park, Quintana Roo

Topografiado con Suuntos, cinta, y medidor láser
Agosto de 2012
cartografía by Aaron Addison

Entrada
Media Luna

Sistema Sac Actun

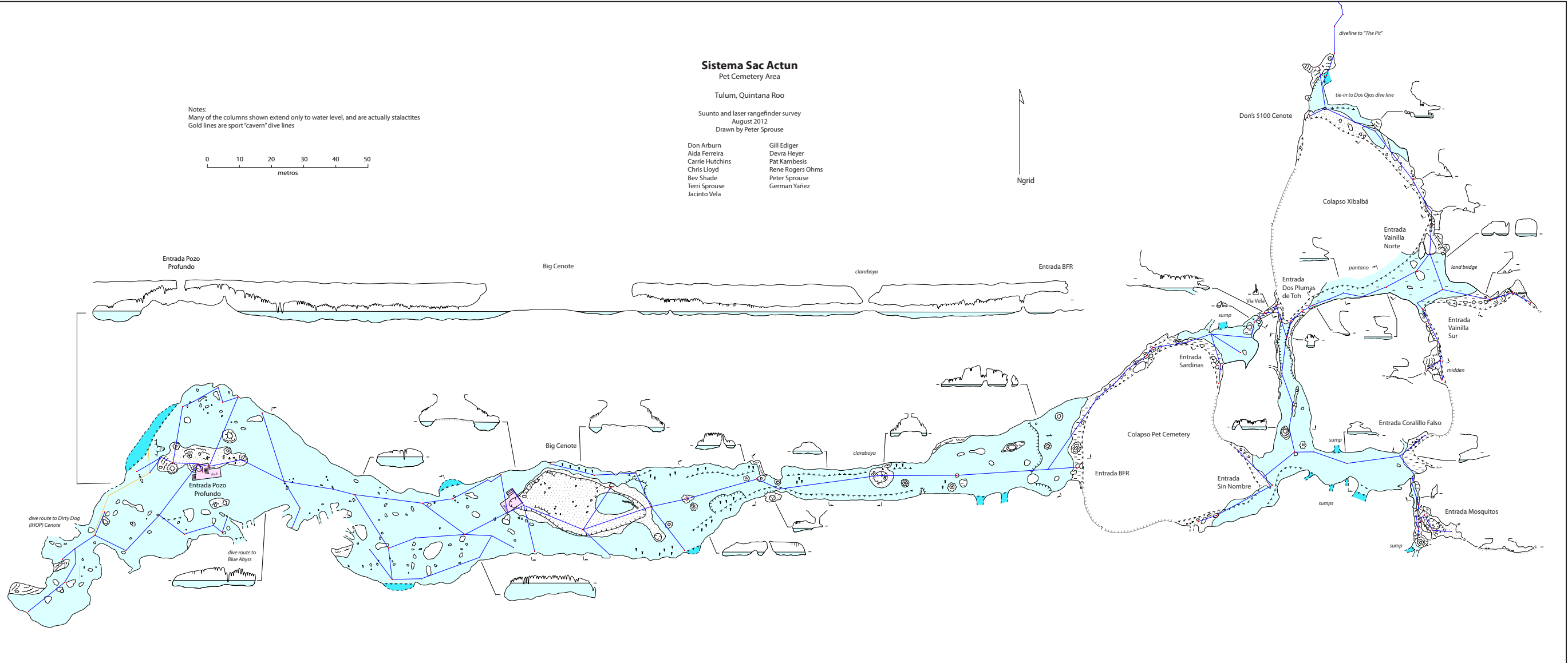
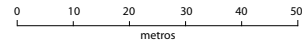
Pet Cemetery Area

Tulum, Quintana Roo

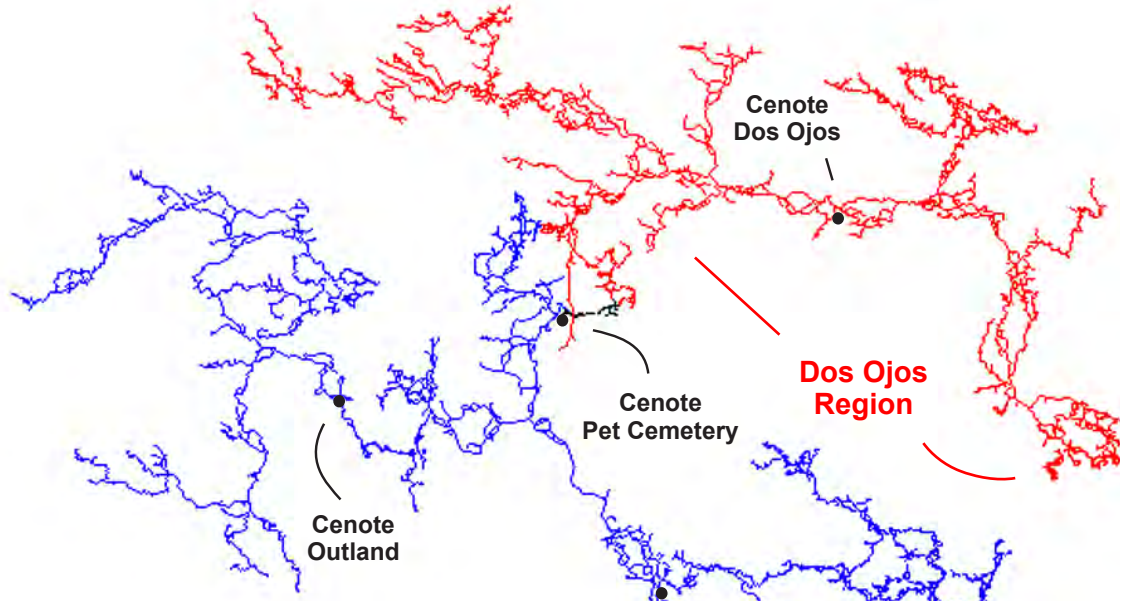
Suunto and laser rangefinder survey
August 2012
Drawn by Peter Sprouse

Don Arburn	Gill Ediger
Aida Ferreira	Devra Heyer
Carrie Hutchins	Pat Kambesis
Chris Lloyd	Rene Rogers Ohms
Bev Shade	Peter Sprouse
Terri Sprouse	German Yañez
Jacinto Vela	

Notes:
Many of the columns shown extend only to water level, and are actually stalactites
Gold lines are sport "cavern" dive lines



Nmag
2012



Sistema Sac Actun

Municipio de Tulum
Tulum, Quintana Roo
México

Length: 303356.8 Meters
Depth: -125.2 Meters

Sac Actun
Region

Cenote
Nohoch Nah Chich

Cenote
Muul Ha

Cenote
Manati

Cenote
Sac Actun

Cenote
Naval

Cenote
Nohoch Kin

Cenote Calavera
(Temple of Doom)

Cenote
Abejas

2 Kilometers

October 2012
Quintana Roo Speleological Survey

the premises. The cave is right in the middle of the accommodations and has been heavily modified, including a stone stairway, several recirculating pumps to make permanent waterfalls, and a water slide. We were initially horrified at the modifications, but after trying out the water slide we decided that things could be worse. We had so much fun on the water slide we really had to tear ourselves away to continue our searching for new caves.

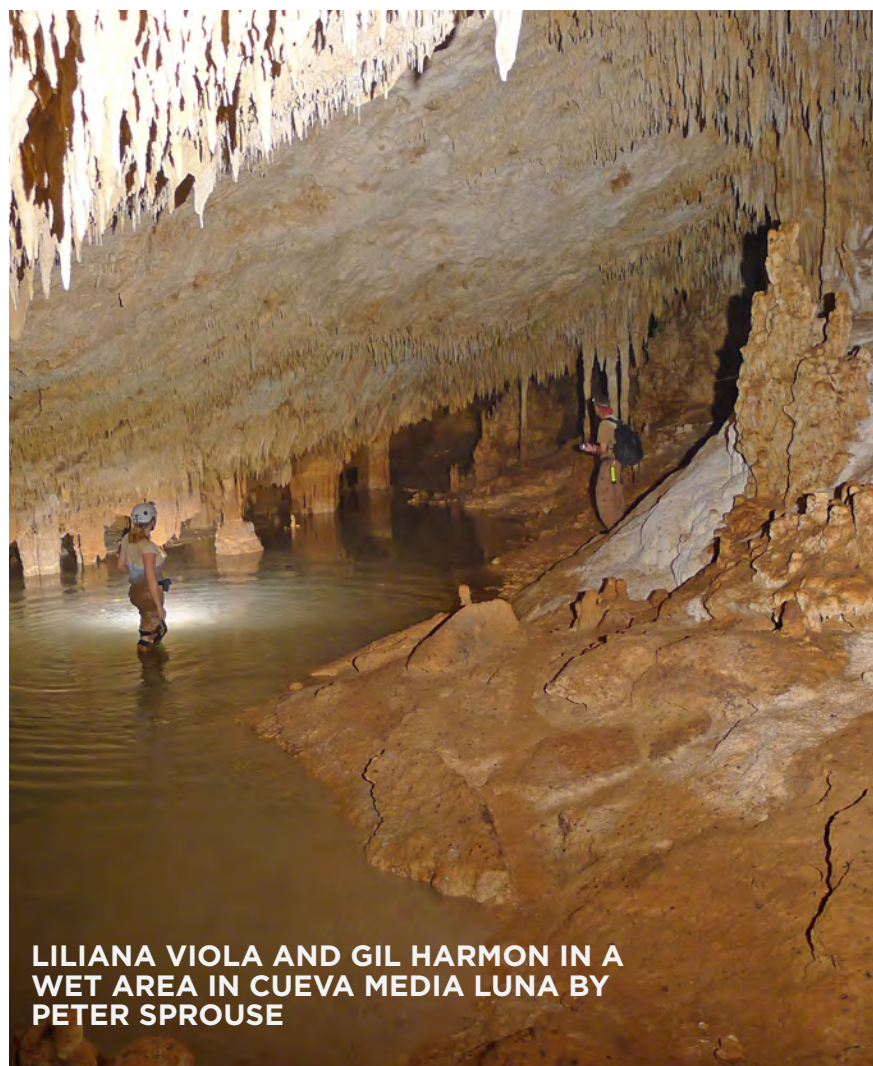
At Akumal, several trips were made into Cueva de Cámaras, a cave that Aaron Addison had begun mapping in March 2009. This is located on the low ridge west of the highway, and it was unusual for the area in that it lacked water and had only one entrance. On this trip another entrance was reached in the northeast arm of the cave and the length increased to 2116 meters.

At the Actun Chen Natural Park, we surveyed Cueva de la Media Luna, a well-decorated maze of columns that stretches about 300 meters west from an entrance with an impressive headwall. To our dismay, on the last day of survey we found that the cave had been previously mapped, but we finished our efforts in case we could discover some additional passages and produced a map which we had promised to the landowner.

Sac Actun is well known as one of the great Yucatecan underwater caves. However, there is also some lovely dry passage associated with several of its entrances. On this trip, we surveyed the “dry” (non-diving) passage associated with the Pet Cemetery Cenote, also known as Mystic River or Nohoch. This part of Sac Actun did not have a proper cave map. In the course of these efforts, we connected the Pet Cemetery passages with the Sardinas Entrance, the Coralillo Falso entrance, the Colapso Xibalba, the Dos Plumas del Toh entrance, the Vainilla Norte and Vainilla Sur entrances, and most notably Don’s \$100 Cenote, which is an entrance to Sistemas Dos Ojos. A detailed account of that connection can be found in the December 2012 issue of the NSS News (The Sac Actun – Dos Ojos Survey Connection, by Devra Heyer and Peter Sprouse, p. 12–17).

PARTICIPANTS

Aaron Addison, Gabriela Cel Delgado, Gill Ediger, Aída Ferreira, Gil Harmon, Adam Haughey, Quinn Haughey, Devra Heyer, Carrie Hutchins, Christine Loew, Pat Kambesis, Chris Lloyd, Ben Morgan, Kathleen O’Connor, Rebecca Pokluda, Ron Rutherford, Kevin Rutherford, Peter Sprouse, Terri Sprouse, Edmund Tucker, Deysi Uc Puc, Jacinto Vela Celestino, Liliana Viola, German Yañez



LILIANA VIOLA AND GIL HARMON IN A WET AREA IN CUEVA MEDIA LUNA BY PETER SPROUSE

AUGUST 2012 QUINTANA ROO EXPEDITION SURVEY TOTALS

<i>Cave name</i>	<i>Feb 2012 survey (m)*</i>	<i>Total cave length with previous surveys (m)</i>
Cueva de la Media Luna	1670	
Sistema Sac Actun (Pet Cemetery area)	1342	303,357
Cueva de Cámaras	1227	2116
Sistema Trono	993	
Sistema Río Escondido	644	5533
Sistema Muévelo Rico	558	1065
Cueva Tres Dias	296	296
Sistema Dos Arboles	291	7082
Cueva Dos Ojitos	209	209
Nen Tun Ha	187	187
Sistema Pool Tunich	81	14650
Cueva Sin Lonche	54	54
Cueva Huerfano de Maravillas	37	37
Cueva Chinche Besucona	32	32
Cueva Dona	31	31
Cueva Hormigas en Pantalones	24	24
Sistema Menéalo Sabrosito	22	400
Cueva Nueva de Memo	17	17
<i>expedition total</i>	7951	

*not including re-survey amounts



CHRISTINE LOEW, GIL HARMON, AND
DEVRA HEYER REACH THE QUARRY
DESTRUCTION IN SISTEMA SAC MUUL BY
PETER SPROUSE

2013 - A BUSY TIME IN THE QUINTANA ROO JUNGLE

**BY EXPEDITION
MEMBERS**

PHILIP RYKWALDER AT THE ENTRANCE TO POOL TUNICH BY DAVE BJUNNELL

INTRODUCTION

Philip Rykwald: Members of the Paamul Grotto, including American Gil Harmon, explored many kilometers of cave passage outside the town of Paamul, south of Cancún, starting in the early 1990s. The goal of Peter Sprouse's project is to map in detail these caves, including Sistema Sac Muul, Sistema Pool Tunich, Sistema Río Escondido, and more. When connected they will be one of the world's longest systems, and if the 310-kilometer Sistema Sac Actun is any indication, it is just a matter of time.

Tales of the deep, swallowing pits of Mexico first drew me south of the border, and after scaring the pants off myself with scalding-hot rack bars and struggling to heave hundred-pound ropes out of massive pits in San Luis Potosí I spent a few years caving around the country. Tabasco, Chiapas, and Querétaro were visited, followed by the big-sky states of Sonora, Coahuila, and Chihuahua and their dusty desert caves. Later came the vertical water caves in Veracruz and the monstrously deep caves of Oaxaca that test your everything. Essentially most of Mexico seemed like caving playground, save the Yucatán peninsula, which in my mind was for cave divers.

When Peter Sprouse started a caving project near Cancún, nightmare images of beaches crammed with pasty-white tourists and towering resort hotels popped up—not my idea of fun. I pride myself in going where most bikini-clad vacationers never dream of, and having a great time in the process. Flying to a major tourist destination was not on my list. There are mishaps and misadventures along the caver's path, granted, but epic memories are also born, such as Cipro hallucinations, encounters with fer-de-lances, mysterious jungle diseases, and the fluttery feeling of sidestepping political unrest and narco-traffickers. I bet most Mexican tourists have never been driven out of town by a machete-wielding crowd—too bad for them.

Aside from inflated airport food prices and the perplexity of flying with snorkeling gear instead of my beloved vertical gear, the experience of caving in Paamul, Quintana Roo, was amazing. Water caves are among my favorite types, and the area does them in style. At first glance it is clear that Quintana Roo is an all-around bizarre setting for cavers. The tottering sugarcane trucks that

chug along many Mexican roads are replaced by sleek Audis, and drivers are polite and even use their headlights at night, a novelty. Bikinis are sold alongside tequila at roadside *mercados*, and every evening there is a sweet sunset silhouetted with palm trees. Gone are the hours and days of grinding slowly up treacherous, dusty mountain switchbacks, changing flats in the mud, and building bridges with chainsaws and axes. With a major international airport a short drive away and most caves within walking distance, there is little driving. And then there is the novelty of being beachside. Bikinis and biceps, tequila and flip-flops.

Even with seemingly unending passages, beautiful water swims, wonderful snorkeling, and warm caves, one word sums up caving in Paamul: maze. The passages connect and reconnect so frequently that navigating is intimidating to the point that cavers need to be comfortable being lost, because it is unavoidable. Even the most skilled among us was more than slightly terrified about getting lost. I ventured out on my own once, and after only two turns I was lost to a disturbing degree. Feeling like frightened children in a confusing mall suddenly without our parents, we cavers traveled in tight packs and still made scores of navigation blunders. To combat the extreme mazes encountered (i.e., get out alive) the first generation of Paamul cavers ran many kilometers of string throughout the caves and conducted line surveys. Although the technique sounds hokey, it actually increases safety dramatically and reduces, but doesn't eliminate, the chance of people getting lost. Directions might read, "Follow the yellow string in the Sac Muul entrance to the black line. Take it to the orange line and get off on the green one and look for station MU342." Often the best route to remote passages involved a combination of caving and jungle hiking—in one entrance, out another, back in again, and so forth. It felt like a cave version of a subway system.

I should point out that any survey in such a dense maze is a major undertaking. None of the survey efforts in the area should be diminished, even the initial string surveys, because managing data from such an exhausting system is difficult. The caves have hundreds upon hundreds of loops, five-way junctions are common, and on any day our survey tied in with dozens of previous stations, creating even more loops. Scrupulous data and

survey management is absolutely essential. After the initial string survey by the Paamul cavers, a second generation of mappers came in and started sketching. Snow-birding Calgary cavers mapped in Sistema Sac Muul, followed by Mexico City caver Gustavo Vela in Sistema Pool Tunich and Sistema Río Escondido in the late part of the last decades. Peter's survey is the third in the area and aims to accomplish detailed drawings. His teams have resurveyed many previous efforts, creating the most comprehensive survey of the caves to date. It is his hope that through continued exploration most, if not all, of Paamul's caves will connect. But despite all the surveying efforts there is far more unmapped passage than mapped.

The Paamul cavers and the Maya cavers that came before them did a very thorough job of exploring the caves, despite the expansiveness of the mazes. In a week's worth of caving I traversed perhaps 5 kilometers of passage and not a centimeter was virgin, though we even dug three times—all led to places with footprints. Though untouched passage in the area is rare, there are many years of surveying still to come. Each day in the area is exciting—survey teams return with news of more

passage, connections made, and new entrances found in the jungle. When a new cave was found, it might be surveyed to perhaps 300 meters, but just a few days later it would be extended to a multi-kilometer maze and connected into the main system. The next day another new cave would be found, resetting the process. There are currently dozens of entrances and over 70 kilometers of passage in this one area, with much, much more to be found. Ultimately most caves will connect, either above or below water, to form one of the longest and most confusing caves in the world.

The Paamul caves are very shallow, less than 30 meters deep, and there are many entrances. Rope drops are short, and cable ladders are more common than vertical gear. Over the course of a week's trip nearly 10 kilometers of passage were surveyed, and to give you an idea of the caves we include below a short summary of a few.

POOL TUNICH NORTHWEST

Patricia Kambesis: Peter's directions seemed rather vague at first, "Just walk up the road a bit until you see a gate on the right. Follow the road on the other side of the gate and the entrance will



PHILIP RYKWALDER SKETCHING IN
NORTHERN SAC MUUL BY DAVE BUNNELL

be obvious.” Along with Liliana Viola and Juan Izquiero, I found the gate, got on the road on the other side, and peered into the thick jungle. With no machetes, we were a bit deflated, since there could be no success without one in the jungle. We continued walking up the road and looking into the jungle in hopes of seeing an obvious and easily accessible entrance and were delighted to find one, not in the jungle but at the end of the road, a big, obvious hole in the ground with a wooden staircase leading down into darkness. And so began our December 2012 work in the north end of Sistema Pool Tunich, while other teams worked elsewhere in the system.

At the bottom of the stairs was a large room festooned with a conglomeration of tree roots over breakdown that made an island surrounded by water in the middle of the collapsed passage. We started with a perimeter survey to find the going arms of the cave and quickly learned that the north end of the room eventually leads to deep water. Since this was a no-wetsuit day, we left that section for another time.

The passage leading to the south led to a large chamber with a small root-filled skylight and one

section containing pottery, the namesake for the Vasija Entrance to Sistema Pool Tunich. The room was floored with crystal-clear blue water, most of it shallow enough for wading. Graceful white columns and hundreds of stalactites decorated the chamber and turned the walking passage into stoopway in some places. Small alcoves and sub-chambers were hidden by thick stalactites, but we found and mapped most of them. Our day ended when wading turned to swimming in water floored with thick layers of white calcite rafts.

As is typical on these expeditions, once a sketcher starts working an area, he develops a vested interest in continuing to work and ultimately finishing that area. So I fully expected and welcomed the opportunity to continue the survey from the Vasija Entrance, and I returned with Gavin Elsley and Zuzka Musilova. Picking up from my last survey station we were able to stay relatively dry, which is actually unnecessary in the warm caves of the Yucatan. That desire to remain dry likely comes from the fact that all of us usually work in parts of the world where cave water is a lot colder and less friendly. But there did come a point when it was time to don the wet-



suits, as the passage ahead was mostly swimming.

Our survey took us through long stretches of the clear, bluish water so characteristic of the caves of this area. This particular section had no side leads or alcoves, which seemed odd compared to other sections of the cave. Gavin and Zuzka were fast and efficient surveyors, and while they looked for places to set stations, I packed away the survey book in a dry bag and swam from station to station. Ultimately we came to an area that was thick with columns and stalactites that dipped into the water. Although it looked like the cave might be closing down, the good airflow said otherwise. After a few snaky shots around columns and under stals we found ourselves coming up on the shore in a very large breakdown chamber. At the far end Gavin found some red flagging tied to a rock. That we could still smell the Sharpie ink told us that another survey team had been here, likely within the hour. We connected our stations, likely closing a big loop with legs of survey from other entrances of the cave. We headed out, actually looking forward to the series of swims in beautiful cave passage.

My next venture into the northern reaches of

Pool Tunich was via the Tres Escalones Entrance with Andrea Corlett and Gil Harmon. Our marching orders for this trip were to find and map the end of the cave, a reasonable objective since Gil had been there before. Though we expected to be swimming most of this trip and had brought wetsuits and dry bags, we started out without, as Gil assured us we could wade most of the way by keeping to the underwater shelves that edged the deeper water. Though it had been years since Gil had been in this section of cave, he successfully navigated us to our objective, and we began with some clean-up survey and making ties to existing stations. Once the shelves ran out, we donned our wetsuits and swam or waded our way from station to station.

We encountered a little bit of passage complexity, mostly because of the islands of flowstone, columns, and stal that populated the cave. Gil became uncertain of our route, and while he scouted ahead, Andrea and I enjoyed the beautiful passage and did some of our own recon. On the back end of our formation island I noticed that there was a lot of wind, meaning either that there was a lot more cave, a big entrance was near, or both. We hoped for the latter. While Andrea swam into a dark, windy passage, I took an alternate route that opened into a huge breakdown chamber with two large entrances. This had to be the route, as we had mapped all other options.

When we finally regrouped with Gil, our concern was that there would not be enough time to map to the end of the cave, this was the last caving day of the expedition. I made the “executive decision” to leave survey of the big room and entrances for the next expedition, and we focused our efforts on making it to the end in the time we had left. Our mellow, laid-back survey turned into a very efficient but somewhat maniacal push to the end. With Gil in the lead and Andrea on instruments we speedily cruised through swimming, walking, and sometimes climbing passage. Though there were a number of significant alcoves on both sides of our passage, we did not stop to survey them, though we did leave good tie-in stations. When the passage took a definitive western turn we knew we were close to the end. Thirty or so minutes later found us swimming around in a large chamber with underwater leads. We set our last station at the “end” of the cave just above where water-filled passage begins. If there were



A TEPESCUINTLE SKULL IN SISTEMA RIO ESCONDIDO



any times that I wished to be a cave diver; this was one of them. But it wouldn't be long before Alan Formstone dove this sump.

During the March 2013 expedition I returned to the Vasija Entrance with Bill Stephens and Jon Sumrall. We tackled the northern wet leads, and Jon heroically swam to the end of the deep water, setting our last station at the beginning of yet another sump. As it turns out, this is where Alan's dives in Weeping Angels ultimately connected to Sistema Pool Tunich.

I was anxious to finish the northern end of Pool Tunich and to have a good look at the large room and two entrances that were left from the December expedition. However, since Gil had led the way last time, I was not confident I could actually find my way back. Typically, we can upload line-plots to our smart-phones and use those for route finding. But I didn't want to risk dropping my phone in water, not an "if" but more likely a "when," so opted to take pictures of the line plots with my waterproof digital camera, and this worked beautifully. This team, made up of Dave Bunnell, Philip Rykwald, Jon Sumrall, and me, made our way to the survey destinations with the help of my digital camera. And while I

scouted the way, Dave stopped to take photos of the beautiful passages floored with blue water, calcite rafts, and lots of stal.

Once at the big entrance room, we split into two teams, with Philip and Dave working the room and Jon and I mapping out the entrance to a surface collapse and into the second entrance. While Philip and Dave got stuck with huge, mazy breakdown, Jon and I had found smaller but much wetter passage. We were able to thread the survey line through a flowstone formation island and shortly found another connection to dry passage and the beginning of another underwater lead. Though I wanted to pick up the many alcoves left from my previous survey of the area, time once again got the better of us, so these leads remain for the next expedition.

Where is the actual northern end of Pool Tunich? Underwater leads continue to head north, and there is likely another several kilometers before we hit that regional structure called the Holbox Lineament Zone that currently terminates all known caves in the region. And there are likely more entrances hidden in the jungle that lead to other sections of cave that we don't even know about yet.

DOWNSTREAM TOWARD THE BEACH

The flip-side of Pat's story is the ongoing saga of pushing and uniting caves heading for the coast. For the March 2013 trip, the first order of business was to fill in the missing gap in the resurvey of Sistema Río Escondido. This would enable us to draw that section of the map and determine the prospects for future exploration in that area. Working from the northwest end of the system, Laura Rosales and I mapped downstream through some very lovely passage heading toward

but the line plot showed they had not made the connection, surfacing somewhere new instead. Our tactic in March 2011 was to examine the perimeter of the 150-meter-wide surface collapse that separated the two caves. Gill Ediger and I each followed a side of the collapse with the plan of uniting on the far side. My search located only a shelter remnant, but Gill hit paydirt. He found a wide entrance containing Maya walls that we named Sac Xuux (White Wasp). This headed northwest toward Pool Tunich in a spacious water passage. Subsequent pushes ended up finding the end of the diveline from 2011, completing the survey connection to Pool Tunich.

The discovery of Sac Xuux had reduced the gap between Pool Tunich and Río Escondido from 200 to 54 meters.

From the downstream limit of Río Escondido there was a string of disconnected caves leading toward the sea, and we wanted to keep working those connections as well. The first was very close, a cave previously line-surveyed by Gil Harmon. We named this Naj Woolis (Round Room) and found it to be a pleasant maze with interesting possibilities.

Considerably closer to the coast we had another opportunity to explore undocumented caves on the ATV park site where Sistema Kana Kiwi and the southern section of Sistema Dos Arboles are located. This property consists of 2 square kilometers of undeveloped jungle coastline just south of Playa del Carmen, known to have numerous caves and unrestored Maya ruins. We spent a drizzly day being guided to a number of entrances. Ryan Reid, Laura Rosales, and Mario Zabaleta got to ride ATVs far back into the park to a cave that is part of the park tour, Cueva del Arbol. They found this cave to be extensive and were not able to finish it. Dave Bunnell and I were



the Shangri-La area. We passed a dive lead on the left side that hinted at future discoveries. Ryan Reid and I pushed this survey with plans to tie into a team, Andy Belski, Dave Bunnell, and Jon Sumrall, coming upstream to meet us from the Shangri-La area. This was accomplished, though some side surveys remain.

Another focus was trying to connect Sistema Río Escondido with Sistema Pool Tunich, a big domino waiting to fall. Gustavo Vela had hoped to orchestrate that in 2010–2011 with some dives conducted in downstream Pool Tunich by Alex Álvarez and Danny Riordan. They dove for several hundred meters and came up in air-filled passage,

joined by Dutch hydrogeologist Sietse Bos on a recon hike to a number of interesting entrances. One of them turned out to be Sistema Trono, but just to the south we were shown a new one, Aktun Xuux (Wasp Cave). We got 210 meters out of this one, with a continuing crawlway headed toward Trono.

We anticipate working for several more years before the string of caves toward the coast are either all connected or played out. Either way, they are a lot of fun.—Peter Sprouse

WEST SIDE EXPLORATIONS

Andy Belski: The looks are priceless when you tell your non-caver friends that you are taking your ten-year-old son out of school and into the jungle in Mexico for ten days to survey a cave system. The looks all seem to be followed by a delayed diatribe of how dangerous Mexico is, followed by, “Why the hell would you go to a Caribbean paradise to crawl around in a dark muddy hole?” I would typically laugh and smile while saying, “It’s not dark. I have a Scurion!”

Since I was six years old I had heard about Peter Sprouse’s projects in Mexico, and I jumped at the opportunity to be a part of this one. It has the potential to be the longest horizontal cave in the world, the twenty-minute approach hikes have little elevation gain, and is only twenty minutes from the Caribbean beaches. Our adventure began when our caving buddy Larry Stewart landed his plane in Kalispell, Montana, to pick up my son Talon and me at the community airport. We quickly fueled up and loaded the plane with large bags of caving and camping gear and took off heading to the international airport in Denver, Colorado. This included flying over and through Glacier National Park and Yellowstone National Park during the first three hours. Unfortunately it also included another three hours of flying over the prairie of Wyoming. Talon counted antelope and looked for UFOs out the plane’s window.

We rolled into our jungle base camp at the Cleoxxo with moments to spare before the chain over the *ejido* road was locked for the night. Evidently this is to keep the locals out of the area and additionally works well to protect the entrances of the caves. This also means that you have to be back from any off-ranch adventures prior to the gate being closed or risk the wrath of the off-duty gate keeper.

Throughout the week we worked in many parts of Sistema Sac Muul, but the exploits of this story will be contained in the adventures of Yuk Ha and The Hobbit House.

Yuk Ha. Team 1: Andy Belski, Talon Belski, Bill Stevens. Team 2: Patricia Kambesis, Jonathan Sumrall. Like most adventures, this one sucked me in after dinner and beers while hanging out at Cleoxxo. It had the ring of good fun, a large unmapped system away from the primary Sac Muul area, with its own river and multiple entrances. Surprisingly, it only took a minute to get my son Talon and me onto the trip. (This should have been my clue)

After breakfast the following morning we drove to Paamul to meet our guide Gil Harmon, who had discovered the cave not long before. He had volunteered to take us to the main entrance of the system.

Following a 180-degree turn off a Mexican equivalent of an interstate to a four-wheel drive road down a power-line, the standard march through highway trash, and a minor stomp through the



THE NAMESAKE VASIJA NEAR THE VASIJA ENTRANCE TO SISTEMA POOL TUNICH BY PAT KAMBESIS

jungle, we arrived at our GPS destination, a beautiful entrance with the immediate opportunity for waist-deep water. Gil had named the cave Rancho de Ranas, for its frog-like nature I suspect.

We broke the team up into two groups and dove in. This wasn't the standard blue-green water with white calcite rafts and beautiful flowstone. It was muddy chest-deep water with a nasty sulfur smell and twined with roots. We actually had to set stations on the roots with the hope that they were not the dreaded *chechen* poisonwood tree. The passage commonly required you to swim to a station, only to find that the station was on a soda straw 6 inches above the mud. This made for some interesting gurgling shots.

After six or seven hours of surveying, we all came together and decided that the word of the day was *yuck*. Thus Rancho de Ranas became Yuk Ha, Ha being water and Yuk being Yuck.

We did leave some great leads, and I imagine my next trip to the Yucatan will require me to return to push these "wonderful" leads.

The Hobbit House. *Team 1: Andy Belski, Talon Belski, Larry Stewart.* A couple of times throughout the week I had heard mention of the Hobbit House. In my mind it was either a maze complex built for a three-foot-tall creature or a wonderful rounded, roomy cave with many corners and passages. After a thirty-minute chop-hike through the jungle, we made it to the sinkhole. Imagine rolling from the jungle down a wall of 45-degree breakdown to a flat-floored room with 6-meter ceilings and formations everywhere. My second definition of the Hobbit House seemed to be more applicable.

We decided that since Gil had already scoped this one out, we might as well take a look and set up our survey. What we found was a really cool horizontal walking maze with many roots, formations, columns, tarantulas, and scorpions. The scorpions were 6 to 8 inches long and fairly nasty looking. Fortunately they were quick and not interested in hanging out with the survey team. Although two survey trips found nearly 700 meters of passage, it appears that this cave has sealed itself shut and does not connect to nearby Sistema Sac Muul. We did leave an extensive unexplored maze (of the first Hobbit Hole description) that might still go somewhere. Only the next trip will tell.

All in all, this is a wonderful area to cave. It is good for all types of cavers and presents its own

challenges to each. It is here, deep in the jungle, that you will actually outgrow your love for homemade guacamole. You will drink lukewarm beers until 10:30 at night while entering the day's data in preparation for tomorrow. You will walk away wondering if that passage you left behind—yeah, the one that required crawling—might go to some new borehole.

I look forward to returning.

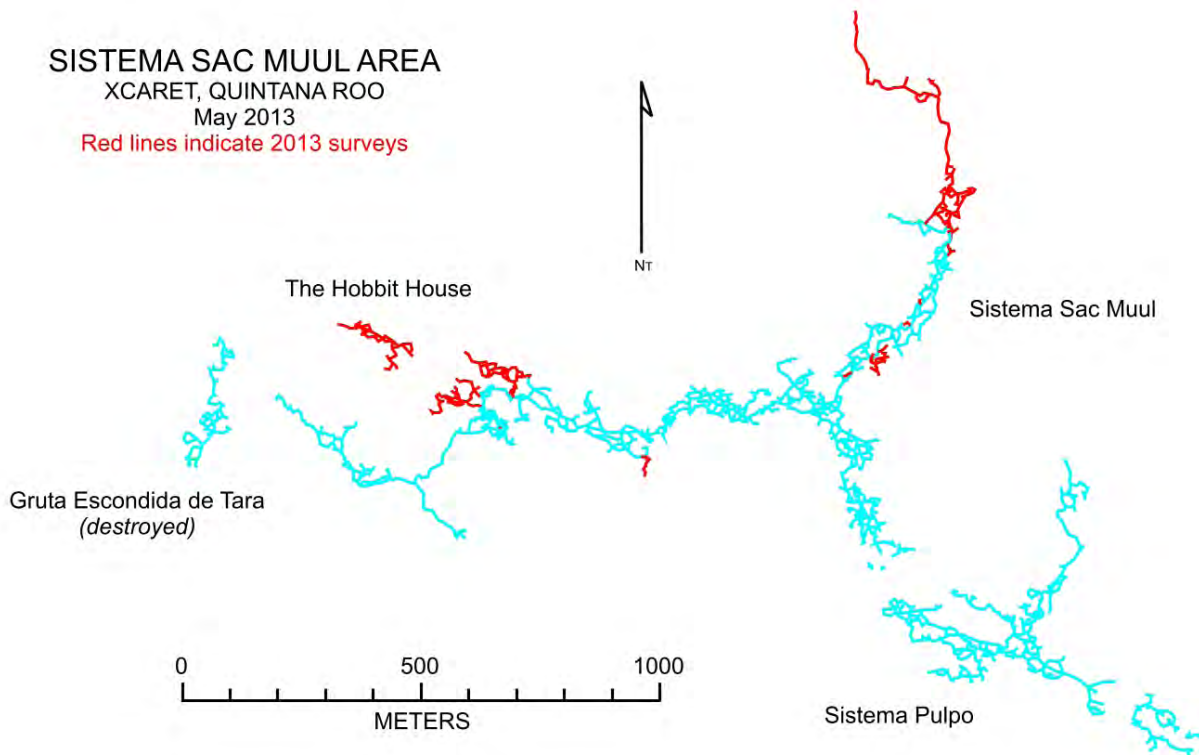
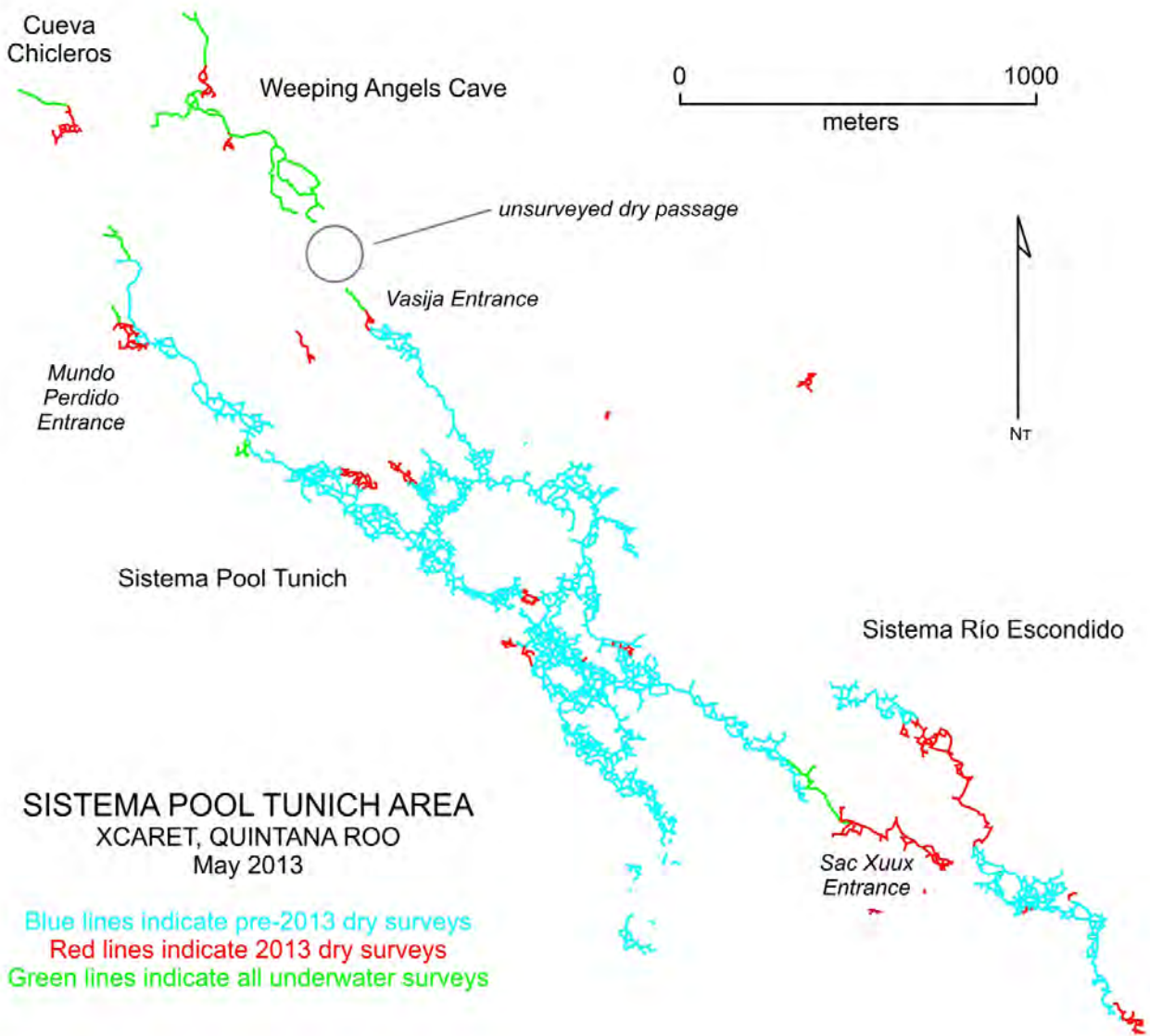
SUC MUUL NORTH

Ray Keeler: This was the first time our group had worked in the northern part of Sistema Sac Muul since November 2011. Drafting of the survey notes from that expedition had revealed some gaps and discrepancies between the surveys of various teams in confusing areas. Cleanup sketching was needed, and the first day of cleanup was by one survey team consisting of Gil Harmon, Larry Stewart, and me. We used the Big Roots Skylight, an overhung climb-down entrance, but discovered that ants had taken over the fallen tree needed for access and exit, so we used another combination of climb-down and jump. We went north, cleaning up three areas of the sketch before finding that one wall was not shown because it was actually not there. With additional survey, the wall was found and connected, and it was called a day. We left by the more distant main entrance due to the ant issue.

The next day two teams were sent in. Marion Smith, Dave Bunnell, and I continued with map-drafting corrections and clean-up survey. Marion, being from Tennessee and *very* tired of the winter cold, decided he was overheating and took his helmet off. This was a bad decision in the passages with countless hangy-downies. He tripped on a sticky-uppy, clipped his head on a formation, and bled a lot. After much swearing (and pictures) the survey continued. Marion had a solid headache.

Pat Kambesis's team of Pat, Jon Sumrall, and Gil went to resurvey the right wall of the end of the survey and continue north. They broke out into large walking passages and left several walking leads. They reached the known water passage that continues in large, clear-pooled rooms. The objective here was to resurvey this northern section and reach the northernmost entrance, found by Gil Harmon years before.

On the third day we sent three survey teams out to the end of the survey, where the walking



passages continued in several directions. Dave, Philip Rykwald, and Laura Rosales continued in the water passage going north. They did not survey all the way to the northernmost entrance. Pat and Bill Stephens took the right side of the walking leads at the end. Marion and I took the left-side leads and onward to the rear. We tied back into a November 2011 survey in a nice, walking side passage. All met up at the appointed time and caved out.

On the fourth day Dave, Marion and I did additional cleanup survey in the middle of Sac Mul North, while a second team of Larry and Barbara Luke continued mapping in the northern lakes. They stopped mapping at a split in large walking and then checked forward to find the northern entrance.

Gil and fellow Paamul Grotto caver Rick Nelson decided to chop a jungle trail to the northern entrance via a very old GPS location, taken when selective-availability was still turned on and hence inaccurate, and re-found the 75-meter-long entrance sink after much zigzagging and hacking. They took a new GPS at the entrance and decided it would be easier to go out through the entire cave than suffer the hike out through the jungle.

Philip, Dave, Larry, Andy Belski, Aida Ferreira, and others completed the northern-end mapping effort two days later by using the new, more accurate GPS location, hiking through the jungle, and surveying to the tie-in. They also walked the sides of the sink to see if there were any other entrances continuing north. Unfortunately there were none.

WEeping ANGELS

Alan Formstone: Gil Harmon first introduced me to Weeping Angels Cave at the beginning of 2013. It didn't have a name back then, which is pretty normal for a Gil lead. He was pretty confident that the cave was going somewhere underwater and that I should take a look. And so one fine sunny morning we headed out with our machetes in hand and dive masks in bags to see what was what.

Weeping Angels is a pretty cave, large passages with comfortable, wadable water. There is an abandoned Maya corn-grinding stone at one of the entrances, and a very pleasant peace lies about the whole place. The main dry passage is fairly short, leading ultimately to a large sump that

on first inspection revealed a large black arch of water that ate the beams of our lights and simply begged to be dived.

A few days later we were back, this time with a couple of 40 cubic foot tanks that fit nicely in a rucksack, along with the rest of the dive paraphernalia that is the bane of the underwater cave explorer. There is something wonderful about slipping into the unknown underwater, the excitement of the exploration enhanced with the relief of the weightlessness. A calm washes over you as you tweak for neutral buoyancy and stretch out muscles fatigued from the strain of the journey in. As I settled and kicked gently forward into the overhead, the world around me collapsed as I saw a dive line marked with an unlabeled arrow. The disappointment was overwhelming. Someone else had been here before me. I tied my exploration line into this old line and kicked on forward through a forest of nasty, grabbing roots descending from open water. The sump was short, perhaps 7 or 8 meters. The line ended abruptly, and I surfaced into a huge dome room with a dry island. Gil needs to see this, I thought, and I quickly returned to get him. I gave him one of my tanks for security, though he certainly didn't need it, and we passed through the sump so he could check out new room while I pushed on underwater.

The upstream underwater passage was obvious and massive, and it contained no line. With virgin cave ahead, I aimed my reel and the adventure started, and what an adventure it was. Over the course of four dives the cave revealed its upstream secrets. Finally the upstream pinched into massive breakdown piles in places, low, helmet-scraping passages provided plenty of drama, and all too soon all the easier leads died away. Sketching out the dry passage revealed a possible dirty leads downstream. With other projects on the go, Weeping Angels was put on the back burner.

But I eventually returned to satisfy my curiosity about the much-talked-about downstream possibilities for tying into the super-massive Sistema Pool Tunich, less than 2 kilometers away. I expected that the downstream route would go for a ways, but not at all the way that it did. A tiny, dirty entrance led to massive rooms with leads in all directions and a dry exit that would be later connected to a downstream cenote that would be the next center exploration efforts.

As I got closer and closer to the Vasija Con-

nection, the cave became trickier. Surfacing in a new cenote amongst troops of coatis and a very suspicious *tayra* (a giant ferret-type animal), I located a difficult-to-get-to lead in the direction I wanted. It was difficult in the sense that I had to manhandle my dive gear through dry cave and short sumps, an effort that I really wanted to avoid at all costs. I spent a few subsequent dives scraping my gear and helmet, trying to find a better way to push, but to no avail. I eventually gave up and succumbed to the inevitable relaying of cumbersome and heavy equipment through dry passage in my wetsuit booties.

What I expected would be the connection dive quickly met a dead end. So near but so far. I worked my way backwards and around obstructions, not really expecting a way through, until eventually seeing open water ahead. I remember the feeling of annoyance as I surfaced, expecting to carry gear out of the water again. Swimming through the passage and looking above, I suddenly spotted a survey flag. It's worth seeing how I react to the flag on the YouTube video from my helmet cam. [To see Alan's videos on YouTube, just search on his name.] Eighteen dives, many ticks, endless relaying of tanks, a lot of machete slashes, and a connection made.

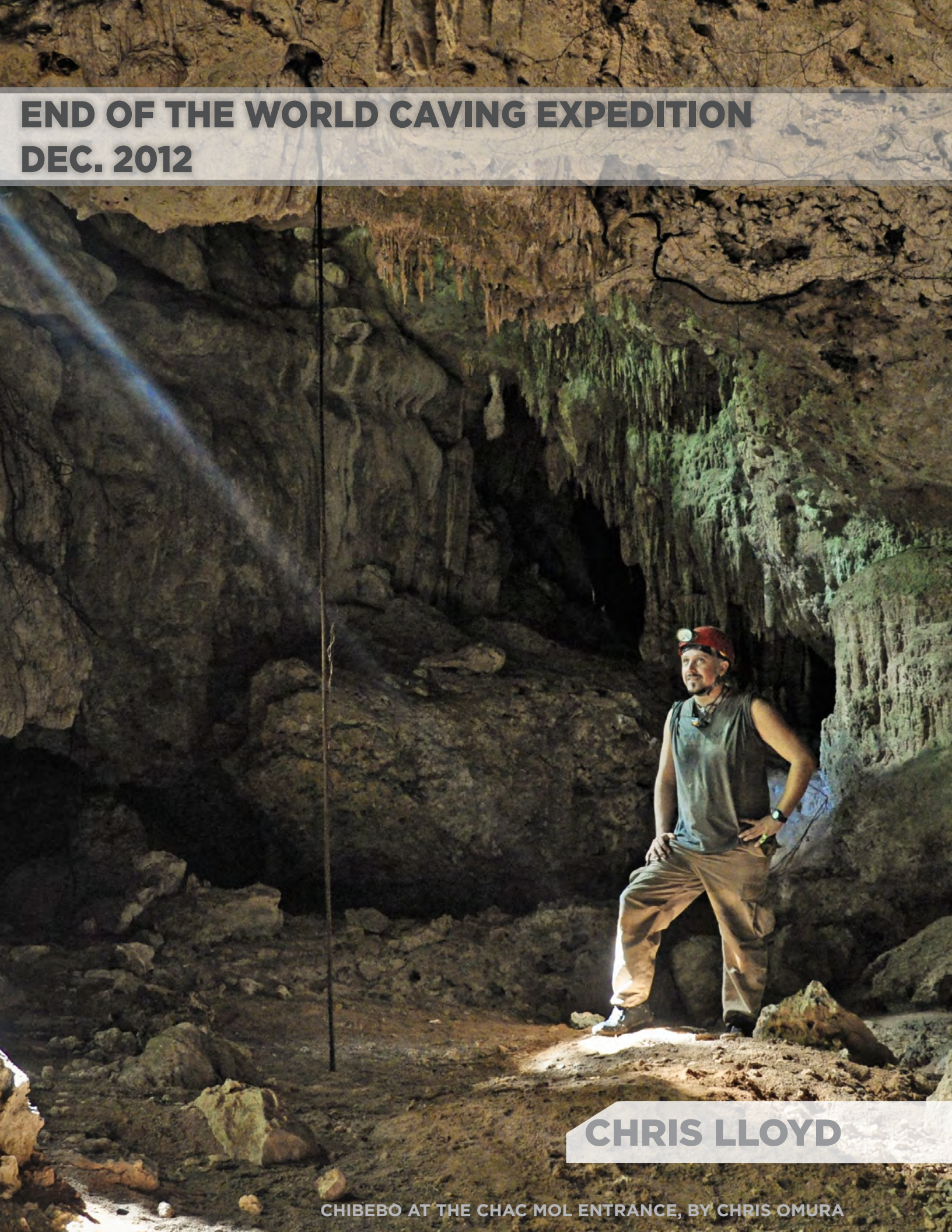


MARION SMITH ENCOUNTERS A STALACTITE BY RAY KEELER

It's difficult to describe how achieving such a goal feels to a solo cave diver. There is nobody to high-five and congratulate. The moment is quite lonely and noticeably so, and even though still immensely exciting, there is a feeling of anticlimax. I murmur something to the camera, but the moment is finished. The work is mainly done, bar the survey back and the huge mapping task ahead. Still I feel good!



THE CREW, MINUS A FEW BY DAVE BUNNELL

A photograph of a man, Chris Lloyd, standing in a cave. He is wearing a red helmet with a headlamp, a dark sleeveless shirt, and khaki pants. He is looking towards the camera with his hands on his hips. The cave walls are dark and textured, with numerous stalactites hanging from the ceiling. A thin vertical rope or wire runs down the left side of the frame. The lighting is dramatic, with a bright spot on the ground where the man is standing and a beam of light from the left.

**END OF THE WORLD CAVING EXPEDITION
DEC. 2012**

CHRIS LLOYD

CHIBEBO AT THE CHAC MOL ENTRANCE, BY CHRIS OMURA

“Dry” caving in Quintana Roo has been taking off in the last few years, with more and more passage surveyed in every trip, but with the end of the world approaching, time was running out. So lead organizer Peter Sprouse did his best to try and get everything done before the end came by inviting some thirty people and declaring that 20 kilometers of survey was the goal. That seemed pretty ambitious, but considering that we had connected two caves on our last trip to create the second-longest cave in the world, we needed something to up the ante. We had done over 10 kilometers on one trip previously, so 20 kilometers was possible, but seemed so far away. With sketching standards so high and the cave passage so large and complex, each survey team would do well to get 300 meters surveyed in a day. But with thirty-eight people in the end, we did end up with a lot of survey teams. As it turned out, we fielded at least three teams everyday from the fifteenth of December through to the twenty-ninth, peaking at nine teams on a few days. A total of ninety-two survey trips were made, so the meters rolled in.

In past expeditions accommodations had been farther south, in or near Akumal, but this trip arrangements were made to camp out in the jungle right over the main cave we would be mapping, Sistema Pool Tunich. The cave was originally found by American ex-pat Gil Harmon about twenty years ago, and Gil had made a line-plot survey of the main routes over the years with various friends from their nearby community of Paamul. They named it Río Cristal, and before long the owner of the Pool Tunich entrance tried to commercialize it by building a bar inside. Others recognized a better use for the cave, and thus the Río Secreto tour operation began some seven years ago. They utilize

“THESE ARE GREAT, I GOT THEM FROM A DUMPSTER, AND MY TOES ONLY CAME OUT AFTER ALL THE CALCITE RAFTS PILED UP UNDERNEATH THEM”

—JUAN LADEN

several kilometers of the system for wild-cave tours, issuing tourists with wetsuits, helmets, and lights, without any installed in-cave lighting. To gain access to the cave the tour operator made a deal with the landowner, the same fellow who was renting us camping space and cooking for us on this trip. So this trip had no commuting to the cave, other than a 100-to-200-meter walk from camp in just about any direction to reach one of numerous entrances. A previous attempt had been made at making a proper map of the cave after Gil’s line survey, but was lacking in quality sketching and follow-through, so our group had volunteered to re-survey everything. We quickly realized that it was going to be a big job when the first couple of days of survey added 2 kilometers to the cave without really touching the previously surveyed area. If the cave continued in the same manner we would surely double the previous 14 kilometers of length.

The first couple of days the group was sketcher-poor, so only three survey teams could be as-



ZUZKA, BY PETER SPROUSE

sembled; they had up to four people each. The first day the groups collected 703 meters of survey, which bumped up to 1248 meters the second day, once they got used to things and each other. Once the next wave of arrivals came in, the group became sketcher-rich, and Peter used that to best advantage.

On the seventeenth we were up to five survey teams, with everyone going in the Tuch entrance. Tuch means belly button, or center of the body in Mayan, and is aptly named, being fairly central in the whole cave. This was my first day of caving, and Aaron Addison delivered me to my assigned area, which covered part of one of the tour routes. It was only about five minutes' caving from the entrance, but did require a short swim to get to, at least for the shorter people. To clarify the term "dry" caving: here it means that one does not need scuba gear. Occasionally teams managed a totally dry day, but typically the water was over your knees, and in some parts, particularly in the southern portions of the cave, swimming was the norm for at least part of the day. Cave temperature was very comfortable, around 20 degree C,

so light pants and a tee shirt was normal cave attire for most people, unless one was going to be in deep water most of the day, when wetsuits were advisable. My first day was fairly typical, with a couple of large rooms centered around a tall flowstone mound crowned by a roof-supporting column and flanked by small lakes. There were some side passages that lowered to just walking height and were 2 to 10 meters wide. My side passages ended soon, but it did happen to a number of groups that they would pop into a side lead thinking just to knock it off, and then end up there for the rest of the day, and possibly the next. Mid-day I gained an extra survey member when Tania Ramírez (the general manager of the tour operation) stopped by to help us for a couple of hours. After Tania left, we then picked up Mauricio, one of the many Mexican tour guides, for the last few hours. Mauricio then took us out a slightly different route to avoid the deep water and back to camp.

(They have guides from at least three other countries as well, to cover many of the languages of the various tourist groups.)

THE ALTAR ENTRANCE, BY SEAN LEWIS



**“I WANT TO GO BACK TO SOME-
WHERE LIKE KENTUCKY WHERE
THERE ARE WALLS”**

—SEAN LEWIS

On the eighteenth Gil suggested to Peter that he take a survey team in a different entrance more to the northwest to start branching out a bit from the central area. After caving with Gil in August, I knew he liked big pretty stuff, so I happily agreed to be his sketcher, and we took Gary Resch along to read instruments. This entrance was only 150 meters out of camp to the west and just 15 meters off the main access road. It did not look like much initially, being only 1.5 meters high and some 10 meters long, but it seemed to continue to the south past some trees. We ignored that direction and went in where there was an obvious trail, beginning our survey at the dripline. Beyond a short section of stooping, it quickly opened up, and we climbed down a ramp into a big chamber that just continued to get bigger as we went farther in. Before long we were in the Auditorium, one of the biggest

open spaces in the cave, some 30 meters wide and 8 meters high with a flat floor. The trail we had followed in was there because this chamber had been used for an Austrian boys choir concert a year before. It was quickly apparent that we were right underneath the main access road, as we heard the traffic running overhead. We ended up going right around that main room and out along a side room with a long lake before I ran out of space on my survey page in that direction. And so began what became a common practice: Instead of continuing to follow the line of the cave and jump onto a new sketching page, the sketchers chose to fill our pages first. This was somewhat annoying for the lead station setters, who were continually being told to come back and go in a different direction until the page was full, but this was needed for the goal of a high-quality map, and it all had to be drawn at some point anyway. With the over-sized survey books that Peter had found, it sometimes took a whole day just to fill in one page of sketching. To facilitate drawing, the sketch often spanned both pages, with the data being crammed in on the left side as small as possible. All drawing





SANDY IN SISTEMA POOL TUNICH,
BY SEAN LEWIS

was being done to scale and correctly oriented with a protractor. Aside from aiding in the final drafting, this allows the sketcher to confirm if loops are being closed accurately. If loops did not close within a meter or two, the team then went back to re-check the instrument readings right away, or the next day. If bad closures were not caught in the cave, they would be revealed that same evening as we entered each day's data every night. This also meant we had a daily running total and knew that after only four days we were up to 6136 meters of survey. The planned objective of 20 kilometers was now looking quite attainable.

The next day I returned to go in the same Auditorium Entrance, now with Gil and Heather Túček, where we continued on the concrete tourist trail that led us under the entrance into another spacious area with entrances visible all over. We had wanted to at least close the loop to the end of the lake we had surveyed, but did the usual "let's just finish this small side lead first" approach. We ended up popping up into yet another big area and finding the continuation of the main Auditorium entrance to the south that we had glimpsed the previous morning, which was more the size of entrance we were expecting, some 20 meters wide by 4 meters high. We could not go farther south and stay on my page, so we did manage to close the original planned loop and get back on the new concrete tourist trail heading off to the east. This trail is still under construction, and it is part of a planned expansion for Río Secreto's tour operation to make the cave experience more accessible for people who don't want to squeeze into a wetsuit and swim through the cave. While I personally like the wet parts better, this trail was quite well located to take in a series of beautiful

26 Dec. 12

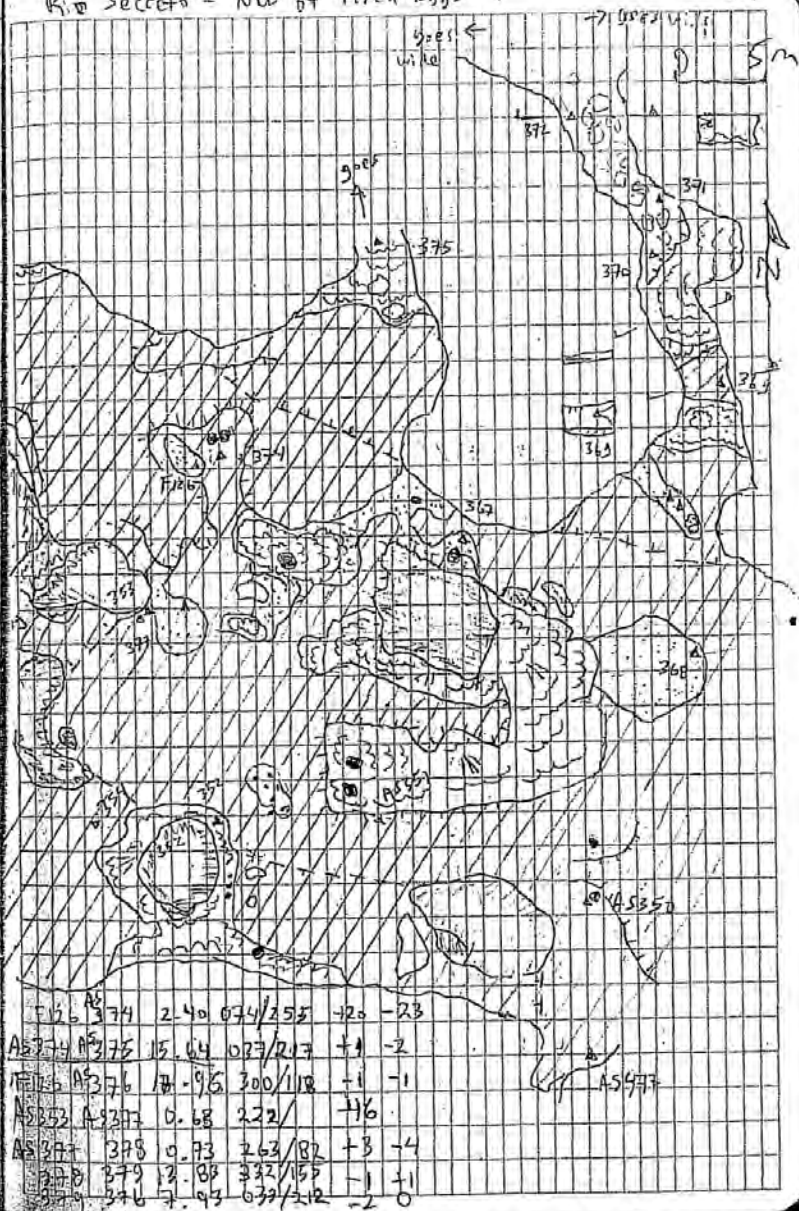
Rio Secreto - NW of Fried Eggs

11-1

Chris L. Derysi Ruki Uc Puc, Jacinto Vda

From	To	Dist	Az	1/-
AS 347	AS 350	8.99	00/182	-2/0
350	351	13.26	292/112	+1-3
351	352	9.52	269/87	-2-1
352	353	12.90	343/164	+1-1
353	354	12.57	196/16	-2+2
354	355	10.47	275/93	+1-2
355	356	11.80	232/51	0-2
356	357	5.79	276/95	-4+6
357	358	11.47	002/182	+2-4
AS 358	AS 359	10.61	253/170	+1-2

AS 359	360	5.07	320/138	+1-1
360	361	18.58	area page	
AS 360	365	8.54	237/56	+1-2
365	366	8.78	230/50	0/0
AS 363	F12	8.97	019/202	-4+3
F12	AS 367	16.36	105/287	+2-4
367	368	15.37	145/296	-3+3
368	AS 372	8.26	081/262	+1-2
368	369	15.56	006/187	+2-4
369	370	8.78	333/153	+1-1
370	371	3.30	004/184	+1-3
371	372	7.06	316/135	-1/0
372	373	61.93	330/149	



entrances from below. This time we brought in Aaron and his team to continue south of where my page had ended the previous day and see if he could work the other way around this large collapse and meet us on the other side. This collapse was quite unusual, in that normally when one drops into a collapsed doline on the surface the cave continues on in the direction away from the collapse, but here it went away, but also cut back under the collapse with very sizable passage. We spent the day filling that passage in, with most of the holes and all of the concrete trail covered. and we did manage to connect with Aaron.

Now, with the large Auditorium Entrance area taken care of, it was time to try and advance beyond. I headed northwest with Gil and Paul Bryant, while Aaron headed southeast with Chris "Batgirl" Omura and Andrea Corlett. Five other teams were in other parts of the cave at the same

time. Out past the large, dry space of the Auditorium there is a sizeable lake in the still-tall main passage and a lower side passage filling out the left side. Taking the main route up the lake kept us occupied the whole day and only advanced the cave some 100 meters in that direction, since the lake split into two branches with the common high flowstone-and-column complex in between. This area had an abundance of fried-egg-style stalagmites, with their classic yellow yokes, and a profusion of other stal (m's and t's). I spent the whole next day as well continuing the Fried Eggs section without even getting into any of the side passages. On the twenty-second Gil, Gary, and I finally tidied up the stooping passage on the left, spending the whole day in low, water-filled, beautifully decorated passage. In this area the ponds had not been disturbed in some time, and the calcite rafts were often solid layers like ice on a pond. We also saw some boulders with calcite

rafts plastered all over them, showing that past water levels had been at least 1.2 meters higher.

“WHO NEEDS A HOT TUB WHEN YOU HAVE HABAÑEROS?”

—PETER SPROUSE

By the twenty-third the central area around the tourist routes was getting pretty much wrapped up, and Peter asked me if I could go back and finish off the area where I had first started. So I undertook that task with Sandi Calhoun, and led Pat Kambesis and Batgirl into an adjoining area. Pat thought I was joking when I commented that I “thought” I could find my way back in there. It was all of five minutes from the entrance, so how hard could it be? We got to the Tuch Entrance at the same time as three other teams, and all headed in along the first part of the route that I remembered. As soon as we hit the water they went one way and I went another. And then another, and then another. It was pretty clear after five minutes that we were not where I had hoped we would be. But we couldn’t have gotten too far off track. Not in five minutes. So we went back. And back. And then around. And after some thirty or forty minutes of this we came across two of the other groups doing the same thing. So it was time to get out our smart-phone, which had an updated PDF with the line plot and all the station numbers on it. Sure enough we were way off from where we should have been. But even with the map, it took us another forty minutes to get back to where we were supposed to start surveying. Pat was not impressed. My survey cleaned up a few side leads, one of which connected back into the “main” passage right near a beautiful looking sump. Crystal clear, deep blue water led down into a 3-by-4-meter-wide opening heading off into a lower, submerged level. Sumps like this one will likely be the key for later connecting this whole cave into neighboring caves to make a hoped-for (by us at least) longest cave in the world.

Despite having five survey teams in that area, it was still not finished, so I went back again, this time with Paul. We followed the tourist route back out to the Perdidos Entrance. It being the twenty-fourth of December, the tourists were



BY JUAN LADEN

out in force, and we were continually passed by tour groups, with Spanish and English the least common languages. Some of the guides incorporated us into their spiel, while others left it to the tourists themselves to ask us what we were doing. Even following along a well-trodden route, we managed to find two more sumps that looked like nobody had been to before, as they were up and across a large chamber and into a side alcove with lots of large and loose rocks on the floor (a rarity compared to the normal almost-continuous flowstone everywhere). With our connection back to the Perdidos Entrance done, we headed out a bit early to prepare for a second shift, this time with Peter over into Sistema Río Escondido, which Peter had been working all week to gain access to. As they also had a tour operation of their own, they did not want us around while the tourists were there, so we had to wait until 5 p.m. to go in. There we picked up a survey I had left in August, and in a couple of hours I managed to fill a complete survey page with sketching, which was only possible because most of the floor was water and thus easy to draw.

**“I WOULD NOT TRADE MY ASS
FOR HIS EYE”**

**—KATIE GRAHAM COMMENTING
ON HER BRUISED BUTT AND SEAN’S
EYE, SWOLLEN BY A WASP STING.**

Christmas day was a caving day, of course. Seven teams went out for more meters, but all the locals were home nursing their hangovers. (Christmas Eve is the time of celebration in Mexico, and most families don’t start dinner till midnight, so it is a late night.) I was back to the northwest of Fried Eggs, while the rest were now spread out over many areas, continuing on where things were still going, which was still pretty much everywhere. The twenty-sixth was a slower day, with the first of the fly-ins flying out and many others wanting a beach day, but four teams still went out. I continued northwest this time, with Jacinto Vela and Deysi Uc Puc, two young cavers just up from the EspeleoZots club in Chetumal. The highlight of that day was that we surpassed the 20-kilometers survey mark, and we still had more days left in which to add length. The highlight of the day for Deysi was probably that Jacinto was willing and able to dive down and retrieve it after she dropped what turned out to be our only station-marker light into a deep pool of water.

On the twenty-seventh we were back up to full strength, with nine survey teams going out, and they turned in what turned out to be our biggest survey day of the trip, with 2659 meters completed. The twenty-eighth only had five teams out, but they still managed 2359 meters.

Groups were taking about having connected from one area to another, so things were finally starting to come together. The twenty-ninth, our last day, had eight teams out, and various legs were connected together. I continued northwest from the Ramón Entrance, which we had been able to leave by on the previous day, and managed to connect up with a previous survey that I had done coming in from farther northwest, but had left due to deep-water swims. So this was my first time doing a truly floating survey, and my plastic inflatable donut worked just fine—even if it did look quite ridiculous. I just pulled it up to my chest, and it supported my weight enough to keep my shoulders and arms out of the water, so by propping my elbows on the donut I could keep the book dry and write just fine. Propulsion was interesting, as I wanted to keep my hands dry, until I figured out that a normal bicycling motion of my feet would pull me forward without making waves or upsetting my balance. Jacinto, on the other hand, had to work harder to keep the instruments dry, write



the station numbers on the flagging, and stay still while floating to read the instruments when there was nothing to hook a foot onto. Fortunately we had a low ceiling in most of the swimming areas, so placing stations wasn't too hard. A truly fine way to finish off a spectacular trip in an amazing cave.

The total passage surveyed on the expedition was 27.7 kilometers. Most of this was within Sistema Pool Tunich. This article

focuses on my experiences; there was a lot of mapping in other sections of the system that I never saw. This includes southeast along the arms to the Botella and Quinto Elemento entrances and north to the Chac Mol and Vasija entrances. While we did not quite manage to survey everything known or connect to the nearby Río Escondido as we had hoped, we did likely see some parts nobody has seen before, and have a better appreciation for how big the cave really is. We still can't rule out a "dry" connection to Río Escondido, but it is likely that the sumps will be a key to that effort.



BY JUAN LADEN

EXPEDITION PARTICIPANTS

The fly-ins: Peter Sprouse, Aaron Addison, Gary Resch, Juan Laden, Andrea Corlett, Katie Graham, Sean Lewis, Sandi Calhoun, Heather Túček, Chris Lloyd, Andrea Croskrey, David Ochel, Terri Sprouse, Chris "Batgirl" Omura, Saj Zappitello, Matt Zappitello, Paul Bryant, Sofia Casini, Pat Kambesis, Gavin Elsley, Zuzka Musilová. The locals: German Yañez, Alan Formstone, Liliana Viola, Roberto "Chibebo" Rojo, Gil Harmon, Tania Ramírez, Rodrigo Pimienta, Mauricio Munguía, Hector Cahum, Antonio Alanis, Carine Gouila, Aida Ferreira, Jacinto Vela, Deysi Uc Puc, Europe Mercier, Juan Izquierdo, Mario Zabaleta.

EXPLORATIONS IN THE SUMIDERO DEL HIGO, SAN FERNANDO, CHIAPAS

KALEB ZÁRATE GÁLVEZ, GILBERT SALINAS PÉREZ, ALESSANDRA LANZETTA

KALEB ZÁRATE GÁLVEZ



The high plateau of the municipio of San Fernando constitutes an important limestone area near the capital of the state of Chiapas in southern Mexico. This area is characterized by a typical tropical-karst morphology, with blind valleys and dolines. The San Fernando plateau is delimited to the east by the vertical fault of the Cañón del Sumidero, to the north by the Río Grijalva basin, to the south by the valley of Tuxtla Gutiérrez, and to the west by the border of municipio Beriozábal. This limestone massif is also part of the same range that continues to the west toward the Cañón del Río La Venta area.

The area of San Fernando has been the subject of previous speleological investigations. The first reports, since 1985, were made by foreign expeditions, one Dutch and some Italian, which visited a few interesting caves of this area. Subsequently a French expedition occurred in 1987, but after this date no more speleological explorations were carried out in this zone until the year 2000, when Grupo Espeleológico Jaguar A.C. started a systematic cave-exploration project in this area.

Sumidero del Higo was discovered in May 2010 by members of the GEJ and the La Venta exploring team during the final days of an expedition to Cueva del Puercoespín (see *Speleologia* 64, page 44; see also *AMCS Activities Newsletter* 28, pages 104 and 185 for the first reports about the exploration of Cueva del Puercoespín). Apparently other local cavers had explored the entrance shaft of Sumidero del Higo, but their explorations didn't make it beyond this point and were not documented. That May GEJ made its first incursions into the cave, exploring a couple of shafts. The cave promised to have extensive development, but the arrival of the rainy season stopped the explorations. In November of the same year we returned to the cave with more equipment and longer ropes and continued with the rigging of new pits. That same November, during another joint exploration with the La Venta, we reached a depth of 200 meters, just beyond the bottom of

Pozo de los Cristales, the second-deepest shaft, 45 meters, that has been discovered to date in this cave. After this pit, an active passage with water continues down through a pair of short drops and finally, after a hundred meters, becomes a diagonal-shaped crevice. The water disappears long before reaching this point. From the Pozo de los Cristales, a window in the wall was observed on the left-hand side and 9 meters up, but we did not climb to it. On our way out from this last pit we took down any fixed gear. In total, 400 meters of passage had been surveyed within the cave thus far.

In January 2011 further visits were made in order to re-rig the final pits. In February a team made up of Christian Cisneros Pérez, Gilbert Salinas Pérez, and Kaleb Zárate Gálvez took part in establishing the first extended camp within the cave. Base camp was set up only two pits from the entrance, so that the gear would be more secure during projects in the cave. During this expedition the window in the gallery of Pozo de los Cristales was reached; it proved to be a nasty climb because the wall was covered in a layer of mud. Beyond the window the cave opened again, and to the right there was an crumbly, slightly inclined gallery with a slope towards the Pozo de los Cristales. On the other side, continuing to the left, we went down

into a short and narrow but dry meander that intersected a new, wider passageway. To the left, the gallery continued for a hundred meters to a low roof. This passage was narrow for about 10 meters, but finally opened into a big room known as El Bosque, where the exploration ended. This trip lasted three days and two nights.

The cave was visited once again in April 2011 in order to explore some of the passages that were not previously investigated. El Bosque is a huge room formed by the collapse of the roof, and consequently there is a large conical pile of boulders in the center of the room. Above the boulders beautiful speleothems are growing, including many tall stalagmites and some giant columns that were roughly 10 meters in height. Below the boulders it is possible to continue to a little drop that leads to the top of a big mud ramp that finally intercepts a new active passage. This is an important stream, with much more water than is in Pozo de los Cristales. On April 30 a new team (Francesco Sauro, Roberta Tanduo, Roberto Trevi, Greta Guidi, Giorgio Annichini, Stefano Guarniero, Christian Cisneros Pérez and Kaleb Zárate Gálvez) entered to survey and explore this new lead into active passage. It had a meandering shape, not unlike a small canyon, as it was high and narrow in some parts and low and wide in others. Upstream the cave stopped in a shallow sump. Downstream the cave was explored for almost 1 kilometer until the team reached a waterfall, the Sumidero Sigue Adelante shafts, that were not descended for lack of equipment. At 2:00 a.m. on May 1, after removing gear from the Sumidero del Higo, except for the window climbed in the Pozo de los Cristales, the team reached the outside world. During this season the explorations within Higo ended up surveying 991 meters of horizontal progression and 251 meters of overall depth.

In January and February of 2012 the rigging of the cave started again, and a new underground camp was established at -233 meters of depth on February 11-12. This was positioned as near as possible to the newly discovered active passageway, close to where the big muddy ramp ends. The idea was to save time, since it normally required three to four hours to reach this point from the cave's entrance. During February 25-26 and March 3-4 we continued surveying and the waterfall section was descended. Immediately following this a new shaft was discovered.





GALLERY "EL BOSQUE" BY FRANCESCO SAURO

Therefore we started to organize a new, extended-camp expedition. From April 2 through 8, with eleven cavers in two teams and seven days to dedicate to this project, this new, extended camp was created. This final exploration is detailed below.

THE EXTENDED EXPLORATION OF 2012

APRIL 2

The first team, consisting of Alessandra Lanzetta, Rodrigo Monjaraz Ruedas, Ulalume Hernández Arciga, Gilbert Salinas Pérez, and Kaleb Zárate Gálvez, entered the Sumidero del Higo at 1:00 p.m. Numerous kilos of equipment and food were brought into the cave so as not to run out in the coming days. At 8:00 p.m. the team arrived at base camp, located at a depth of 233 meters. The rest of the evening was spent re-establishing this camp.

APRIL 3

The team was divided into two groups. Three

went upstream to try to drain and pass beyond the sump. They started by digging the floor around the sump, which was made of sediment, principally sand and small stones. Finally the water level was sufficiently low to permit passage as long as the caver was facing upward. A small gallery was discovered that was approximately 1.5 to 2 meters high and 10 meters long. The water in this space reached to knee level, and then the passage ended in a new sump on the right-hand side of the gallery, so the explorations upstream were stopped here. As this team headed back they took pictures of the water passage downstream and were joined by A. Lanzetta and G. Salinas, both part of the second group, who had gone to rig and explore downstream. This group descended the Sumidero Sigue Adelante, which measured 10 meters in depth. Then tens of meters farther on a new drop was descended and named Pozo Extremo. Beyond these shafts, a waterfall was discovered spilling into the main passage from the left side of the cave. Downstream there were several small drops that could be easily down-climbed without ropes. Along the stream passage there were speleothems that nearly closed the passageway in some places, leaving only a small and narrow space to squeeze through. In these area we found it was necessary to remove our harness to get through. The cave continued, but it was necessary for the team to start heading back to the camp to eat and get some much-needed rest.

APRIL 4

The push team had been reduced to three people because two members of the party had started their long ascent out of the cave. The survey



UPSTREAM FINAL SIPHON.
KALEB ZÁRATE GÁLVEZ

team continued on downstream, and the exploration team continued on from the end point the previous day. The cave continued on in a meandering fashion, with small drops and some low spots under formations. Near the end of this section the narrow passage began to be choked by boulders. Then, over a mountain of mud, there was a large, 10-meter-high gallery with a beautifully immense stalactite in the center that hangs down until it almost touches the top of the mud mountain. The water ran through 25 meters of a low-roofed phreatic gallery and then disappeared abruptly in a sump similar to the one found upstream.

APRIL 5

Early in the morning another member of the group left the cave. At times throughout our expeditions members have had to leave for various personal reasons, often independent of caving difficulties. We were definitely feeling like we needed reinforcements at this point, and, thankfully, the arrival of the second team was scheduled for this day. Meanwhile the two cavers who remained continued working on surveying the cave. The waterfall found beyond the Sumidero Sigue Adelante was explored. It was necessary to climb the waterfall, which spilled from a narrow, meandering canyon. Alessandra was the only member who could pass through it, so alone she explored this new passage, the Meandro de la Cascada, for about 400 meters. She returned after roughly one hour, but the canyon continued. At 1:00 a.m. the next morning the two-member exploration party returned to the camp and found that the second team had not yet arrived. Unfortunately food supplies and extra batteries had run out.

APRIL 6

The team headed back to the Meandro de la Cascada and found over the top of the waterfall an easier access point where the meander widens a bit more, though the first part is still narrow, with sharp, jagged walls. About half of the canyon was surveyed, and it was pushed until the team arrived at another sump. Most of the meander is narrow, but the final part widens and is beautifully sculptured by erosion. The final sump is turquoise in color and measures roughly 1 meter in depth. The food for this day consisted mainly of nuts and granola. Around 1:00 a.m. the team returned to base camp to find the new team fast



KALEB ZÁRATE GÁLVEZ

asleep. This new group, consisting of Christian Cisneros Pérez, Juan Carlos Franco Guillén, Gabriel Alberto Franco Guillén, and Gabriel Merino Andrade, had arrived at 7:00 p.m. that evening.

APRIL 7

We started to work at noon because of the general fatigue that was felt from the previous day. The group was divided in three parts: two members went upstream to try to drain of the sump again, another two went downstream to survey the main passage to its conclusion, and the rest of the group went back to the Meandro de la Cascada to complete the survey. At 9:00 p.m. the four cavers downstream were gathered at the base of the Sumidero Sigue Adelante. The survey to the final sump in the main water passage had not been completed, so two of them came back for finish the survey, because it was the last day of exploration. At 3:30 a.m. they arrived in camp after derigging all fixed gear from the pits down-



FIRST SHAFT OF SUMIDERO SIGUE ADELANTE. KALEB ZÁRATE GÁLVEZ



KALEB ZÁRATE GÁLVEZ

stream. The other four were already sleeping in camp when they arrived.

APRIL 8

At 10:00 a.m. the majority of the team started the long, arduous ascent to the exit. Meanwhile the camp was dismantled, and around 2:00 p.m. the rest of the cavers began their return to the mouth of the cave, carrying with them kilos of waterlogged ropes and equipment. At 8:00 p.m. the final members were coming out of the Sumidero del Higo. The cave was left rigged from base camp to the entrance.

A month later, on May 5–6, team members Christian Cisneros, Barbara Macini, Gilbert Sali-

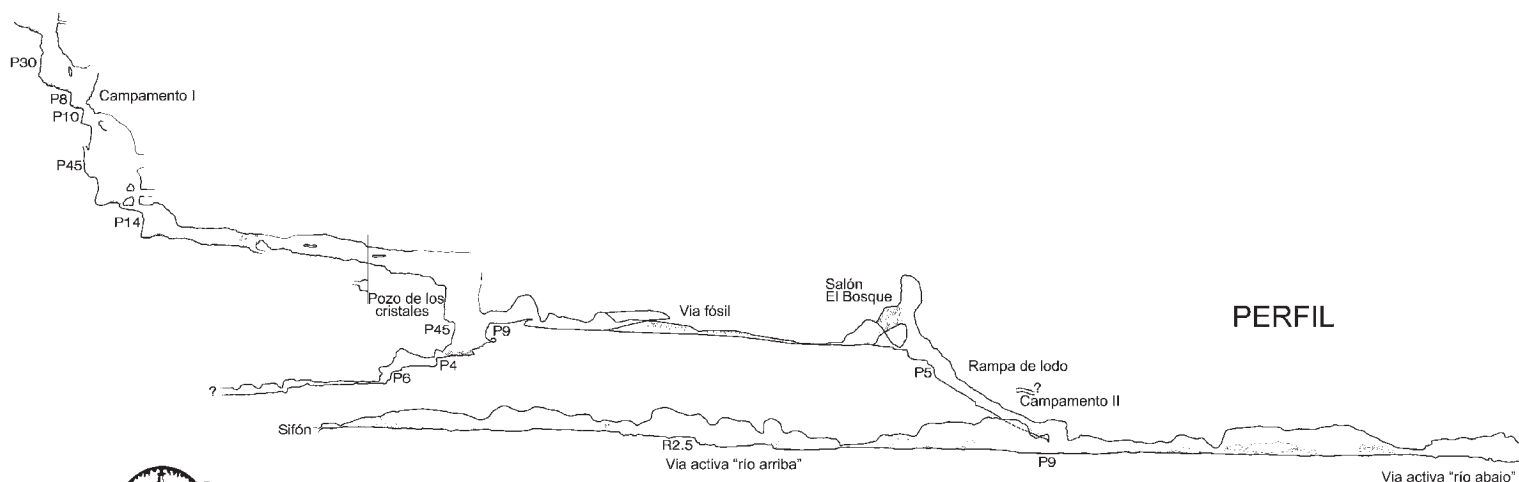
nas Pérez, Alessandra Lanzetta, and Kaleb Zárate Gálvez returned to Sumidero del Higo to derig the cave and survey on the surface between the entrances of Sumidero del Higo and the nearby Cueva del Puercoespín. A possible connection between these two caves has been expected to exist since the discovery of the Sumidero del Higo. Even though this connection has not been made, due primarily to the upstream sump, the plans show an undeniable link between the two caves, which are currently only separated by 15 short meters between the sumps of the two caves.

The explorations of Sumidero del Higo have thus far led to 3,057 meters length and 368 meters

depth. Currently, this is the deepest cave know in the San Fernando area. If the connection Puercoespín-Higo is made, the combined length will be more than 7 kilometers. [There is a much larger and more detailed map of Sumidero del Higo at amcs-pubs.org/maps/2643.pdf.]

We would like to give our thanks to the community of Benito Juárez, especially to Don Reymundo and his family, and to the *comisariado ejidal*. Equally we would like to thank to La Venta Exploring Team for their help and support during these trips. We thank Francesco Sauro and Calvin Smith for their comments on this manuscript.

The following is a comprehensive list of all who have participated in the exploration of this cave: Francesco Sauro, Carla Corongiu, Leonardo Colavita, Roberta Tanduo, Alessio Romeo, Roberto Trevi, Greta Guidi, Giorgio Annichini, Stefano Guarniero, Cyntia Reyes Hartmann, Gizzan Gibrand Tapia Ramírez, Luis Arturo Hernández Mijangos, Claudia Valeria Sánchez Flores, Gabriel Merino Andrade, Juan de Dios Rendón González, Gabriel Camacho Hernández; Christian Cisneros Pérez, Gilbert Salinas Pérez, César Andrés Pérez Bonifaz, Juan Carlos Franco Guillén, Gabriel Alberto Franco Guillén, Benjamín Chuy Siu Hau Soto, Sandra Inés Ocaña Hernández, Omar René Ortega Chavarría, Zenaído Ortega Chavarría, Rodrigo Monjaraz Ruedas, Ulalume Hernández Arziga, Alessandra Lanzetta, Barbara Mancini, and Kaleb Zárate Gálvez.



Grupo Espeleológico
Jaguar A.C.

LA VENTA
ESPLORAZIONI GEOGRAFICHE

SUMIDERO DEL HIGO

Benito Juárez, San Fernando (Chiapas, México)

Position WGS84: N16°54'31.0" W93°11'06.5"

Quota: 935 msnm

Development: 3057 m

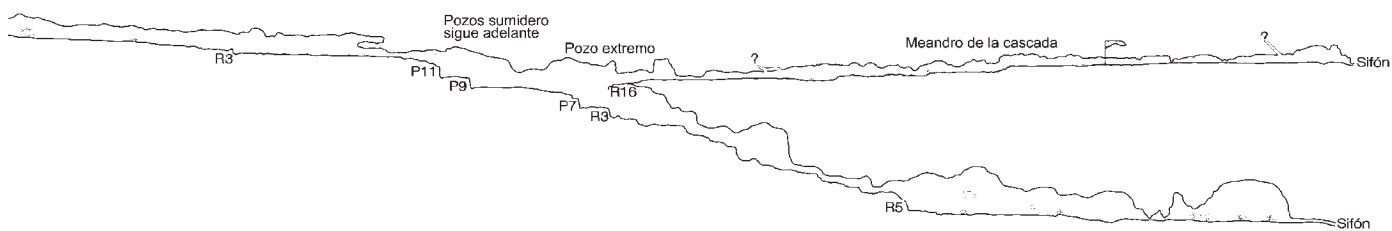
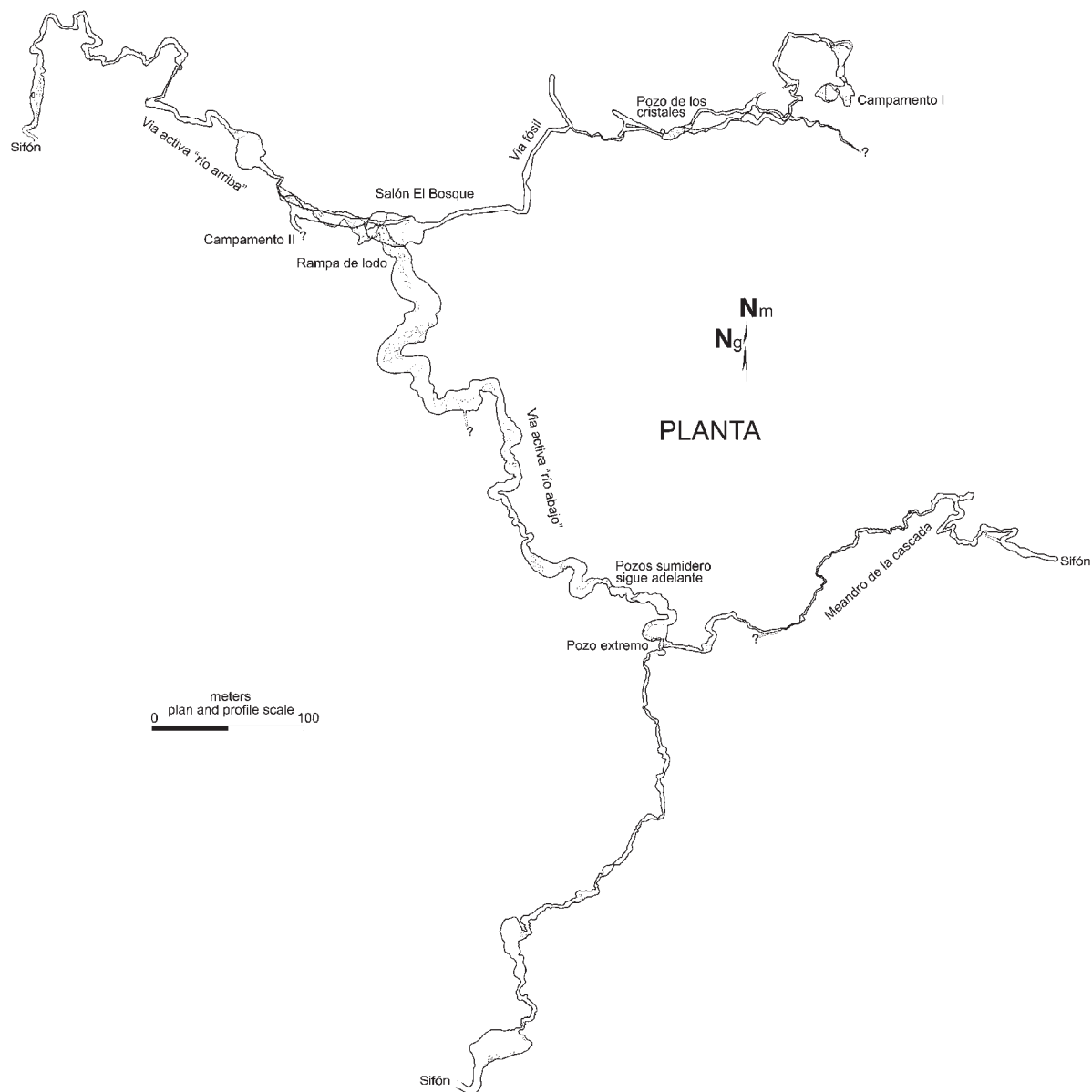
Depth: -368 m

Survey by F. Sauro, R. Tanduo, L. Colavita, G. Annichini, G. Guidi, S. Guarniero, A. Lanzetta, B. Mancini,

G. Merino Andrade, C. Cisneros Pérez, G. Salinas Pérez, B. C. S. Hau Soto, O. R. Ortega Chavarría, K. Zárate Gálvez

Grupo Espeleológico Jaguar A. C.-Asociación Geografica La Venta

November 27, 2010; April 30, 2011; February 12, 26, March 3-4, April 4-7, 2012



2013 TZONTZECUICULI EXPEDITION

GUSTAVO VELA
PHOTOS BY GUSTAVO VELA

*“There are men who fight for a day
and they are good.*

*There are other who fight for a year
and they are better.*

*There are those that fight for many years
and they are very good.*

*But there are those that fight their whole lives:
and they are the unpredictable ones.”*

- BERTOLT BRECHT

For our sixth season there, Al Warild, Franco Attolini, and I got together fourteen cavers in the Sierra Negra in the south of Puebla. We hoped to answer some questions about the area that we'd been exploring since 2007, but it seems that as time goes by we come away with more and more questions and fewer answers.

WEEK ONE

The start was a little complicated: two days in Tehuacán shopping and getting permission from the municipal head in Ajalpan, then as soon as we went up into the sierra the first cold front arrived, and with it, rain, low temperatures, and problems with the local

authorities. They wanted money for us to be in the area, and even though it wasn't much divided among the group, paying for nothing is a bad habit that some groups fall into, and things usually start going downhill from there. We promised to leave them some old ropes when we left. After all, in most communities in the sierra nobody asks for anything just to be there. Due to a phone failure, we could only get three mules instead of the twelve we needed, so only three of us could take loads up to base camp, enough to start making camp, while the rest of us stayed in the *Conasupo*.

The next day we had less rain and nine mules and could move our chattels up the mountain in the mud, slime, and cold. At least building the camp at 2300 meters was relatively fast, because our furniture from the year before was still in place. That is, all the wood that we'd used to make the kitchen and dining area was still intact. At last, on day five, the first group could head out to Suapili (Damsel) cave to find and re-flag the track and set up a rain-capture system. After three hours up and the same back in the rain, the group was soaked through.

On day six we all hid in camp as the rain poured



down. At least we collected 150 liters of precious water. Due to a long dry spell—which apparently had ended—the tiny spring was just a small puddle of brown water. On day seven, the sun was shining, and we could at last find a route up to the plateau at 2700 meters that we wanted to explore. We all returned with well-beaten feet.

WEEK TWO

Along with the sun came an incessant wind that shook the trees and wrecked our sleep for several nights. One group went out to the plateau at 2500 meters, where Jesus lost his sandal, the same area where the year before we'd found Olbastle Suapili, Damsel Cave. Three went up to bivouac in the entrance, with four more helping to carry the gear. Thanks to our ingenious design (i.e., good luck), our water collection system there had collected 20 more liters of precious, slightly discolored liquid. High in these limestone sierras, the only rivers are in your dreams. Once organized, they checked all the climbs and windows left undone from the year before, but none went anywhere. Next day they returned to base camp, and a second group went up to check one last window and begin the derig. The poor damsel was dead.

Others went up to the 2700-meter plateau, and a few went to explore the big doline near Paisano, otherwise known as hell because of the huge concentration of scrub and spiny bushes that choose to live there. All they got were a few holes that went 30 meters or so and choked. Someone remembered there was a good-looking 40-meter hole near the route up to the plateau. It went 70 meters and stopped abruptly. The Damsel

group didn't do much better; after the window went nowhere, the new pits they found went only to 50 meters. The best of the day was TTW28, our best find in these first two weeks –60 meters. Incredible.

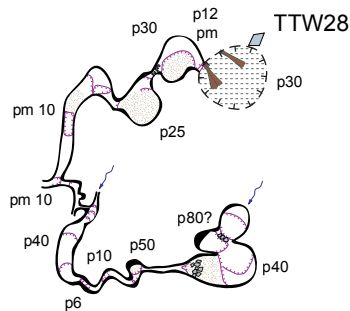
On the other side of the mountain near Damsel, we took a look at TT103 that had been found in 2012. To our surprise, it went, with a good breeze down to 36 meter, where we stopped at the top of a 40-meter pitch.

We began to get the impression that luck just wasn't on our side, considering that we'd been spiked, hurt, twisted, sun-burned, sweated, soaked, scraped, and tired, apart from lost, dehydrated, and left asking ourselves what on earth we were doing here. After two weeks of walking over the karst, all we had was a meagre –500 meter, a –700 meter, and a –600 meter . . . oops, sorry, I meant a –50, a –70, and a –60 meter.

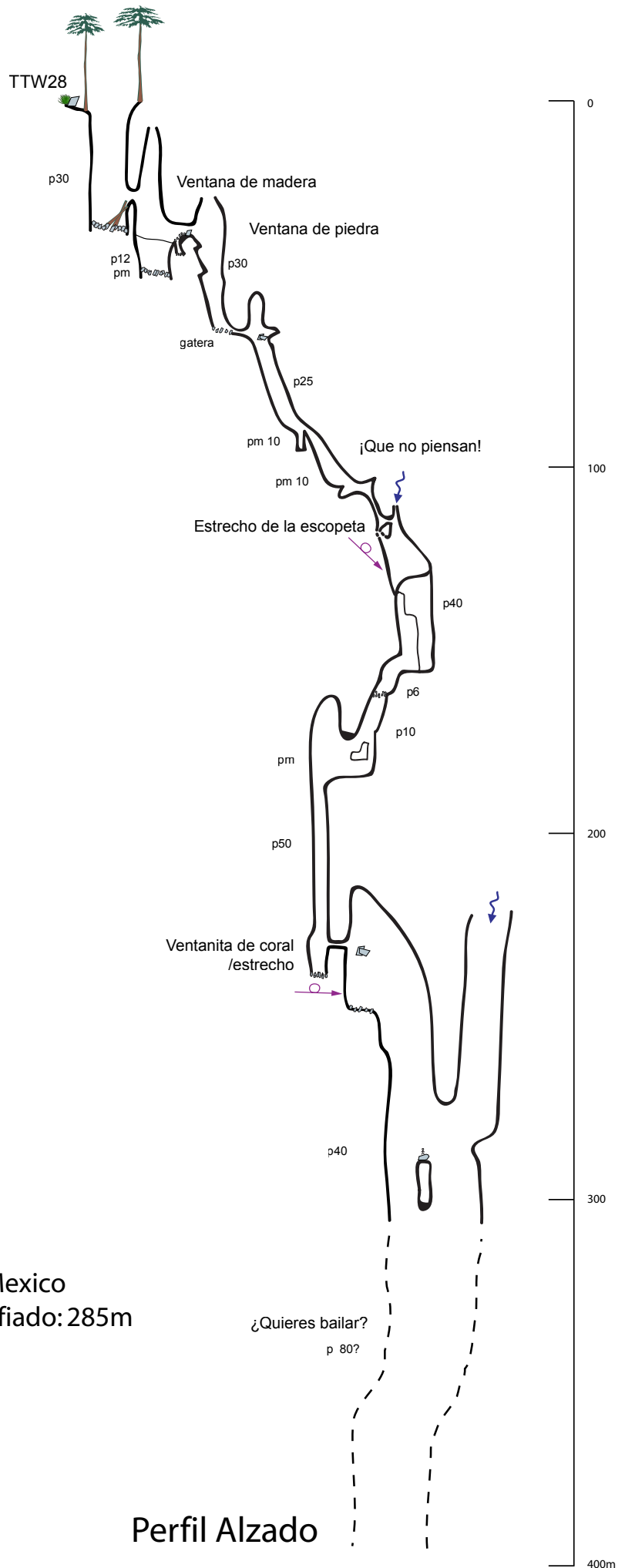
WEEK THREE

On Sunday we had a bit of a scare when two of the group hadn't returned by 7:00 p.m. as they had said they would. They'd left very early for a day trip to TT103 on a "path" that tortures the body and feet for three hours, before entering the cave to rig the 40-meter pitch that awaited them. To add a complication, the cave bifurcated at the bottom of the pitch. Which way to go? They took the right, as the left had no apparent continuation. Twenty-five meters down they hit a squeeze with a drop on the other side, but they couldn't fit through. When they got to the surface, the next cold front had come in, and the mountain was covered in fog as night fell. Returning in the dark, in the rain, they lost the way and had to backtrack





Planta



Perfil Alzado

Olbastl Tlanexilotl
 (Sótano de las Ventanas)
 Ocotempa,
 Puebla, México

X: 714745 Y: 2037589 Z: 2690, NAD27 Mexico
 Longitud: 383 m, Profundidad topografiado: 285m

Explorado y topografiado por
 los miembros de la expedición
 Tzontzecuiculi 2013
 con DistoX, Suuntos & Auriga

several times, even though it was well marked with flagging tape and the odd reflector. Back in camp, we were asking ourselves just how long we'd wait before going to look for them. Lucky for us, they arrived a 9:30, soaking wet but happy.

Next day the pair in TTW28 or Olbastl Tlanexilotl (Window Pit) returned in the rain. After another 50 meters it had become narrow, with no apparent way on, so they began to derig. During the next few days we hid from the rain, huddled in the kitchen, bored,

and eating like pigs in a mud-wallow. The only positive was that we collected 200 liters of rainwater.

On Thursday we emerged from the mud and recommenced exploration. A group returned to Tlanexilotl, rerigged, and realized that beyond the impossibly tight part was something that sounded like a 30-meter pitch. On Saturday they returned with a bigger hammer, and with a bit of work passed the tight spot and descended a 40-meter pitch followed by a 6-meter drop, but with no rope and a three-hour walk home, it was time to leave. Another group went to TT103. Instead of turning right to a sure squeeze, they took the left branch, which had an easy continuation tucked around the corner. Following the air, they went down one drop, then another, and stopped at a third.



As they were bivouacked nearby, they were back early the next day and continued to what looked like a 50-meter drop where they ran out of rope. The survey added 146 meters that day.

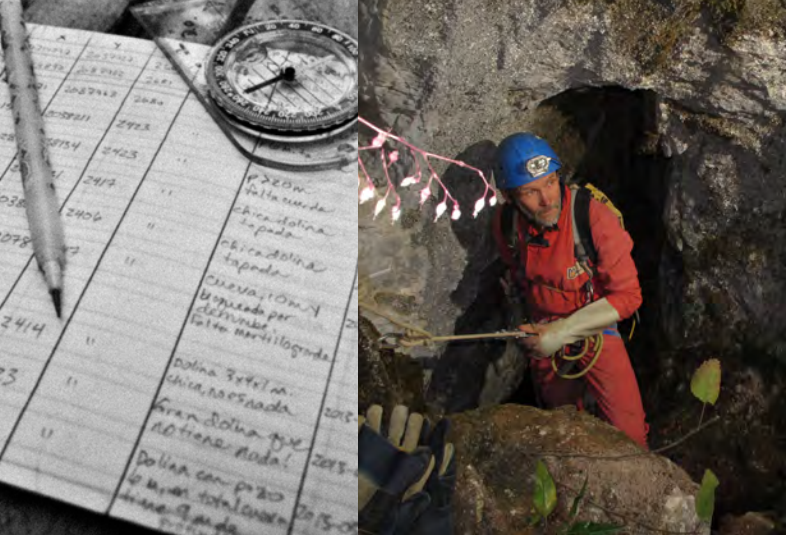
WEEK FOUR

By the last week there were only six of us left standing, but at least the scrapes and sunburn were starting to pay off. On Sunday the pair from TT103 returned with the news that our pit was 60 meters

and beyond it the cave didn't look so good. It became narrow and went down a few awkward small drops. At least the breeze was still there; the sediment was dried out to a fine, flour-like dust. So the next day two more took the long walk up to continue the push—and returned the next day with the bad news. Yes it continued, a short way, sort of, down a couple of small drops, then some really tight passage to nothing. The air slid off down an impossible tube. Three o'clock in the morning, 256 meters deep, and nothing left but to derig.

At the same time others went to Tlanexilotl to drop the 6-meter pitch and three more, stopping at the top of a 40. Good air, and plenty of enthusiasm, but no more rope, so time to do battle with the rocks and scrub for three hours. A day later the 40 became 53 meters to a completely blind pit. What? How? All this for nothing! Not possible! Where does the air go? Tlanexilotl is Nahautl for window, so one was found 8 meters up. With the help of a hammer it was just passable, but not headfirst, you'd never get back out. Feed the feet in, curl in a ball, and roll forward to continue. Five meters doesn't sound like much, but five meters covered in Velcro-like coral and with a nasty rock sticking out at the end is a long way. Exhale and slip through. Two anchors on the other side and down to the end of the rope that wasn't long enough. Back home the total said 226 meters, and going well.





By Thursday everyone was ready for Tlanexilotl again, but cold front number 37 arrived and pinned us down for another forty-eight hours. On Saturday we got our chance. The party descended a 12-meter drop and started down the next. Forty meters down it was obvious that we didn't have nearly enough rope. The last rope hung in space, and a rock fell for another four seconds. With Palm in hand, Auriga said we were at -285 meters.

On Sunday the last group climbed up to Tlanexilotl hoping to explore at least a little more, but the accumulated fatigue from bashing scrub for a month didn't leave enough room for enthusiasm to do a deep trip down a big pit. They contented themselves with bundling up the ropes and removing the anchors.

The very last bash was to pass the squeeze in TT103. Optimism or madness I don't know, but they got through and it went nowhere. Oh well, derig that too, but at least TT103 was done. No need to start next

year on a bad note.

There are years, and years. Some give good results and others not. In 2013 we definitely had a season that didn't give us much that went very far. We checked out eighty dolines and pits, and the only one that ever looked any good was Tlanexilotl. Given the density of deep caves just a few kilometers away, it is surprising and frustrating that we've now checked so many features and almost none continue. If you added up all the caver-hours we'd invested in searching for caves on Tzontzecuiculi, we'd surely have spent much more time in the scrub than in the caves. So much limestone and so few caves. Curiously, looking at the profiles of Damsel and TT103, both stop at the same level. Is there *something* there that kills caves, or have we just not yet found *the* cave?

This year was also exceptionally wet. In total, we lost six days in the month sitting out cold fronts. We only saw six or seven rattlesnakes instead of the usual



fifteen. How much more prospecting before we find *the* cave? How many more pits before we get beyond the entrance drop? Our best option is Olbastl Tlanexilotl.

Tlanexilotl kana miktlantli 2014? (Window to the underworld 2014?) We'll be back.

This project could never have been possible without the team. Without the laughs, the tears, the sweat, and occasionally the blood, but above all the efforts of our friends who gave their enthusiasm and time, this project would never have got underground. To all of you, thank you.

Participants (in alphabetical order)

Lorenzo Armas (Mex)
 Franco Attolini (Mex)
 Rodolfo González (Mex)
 Jennifer Hopper (U.S.)
 Alejandra López (Mex)
 Ramses Miranda (Mex)
 David Ochel (Alemania)
 Hasan Ortiz (Mex)
 Guillaume Pelletier (Quebec)
 Bev Shade (U.S.)
 David Tirado (Mex)
 Gustavo Vela (Mex)
 Ángeles Verde (Mex)
 Al Warild (Australia)

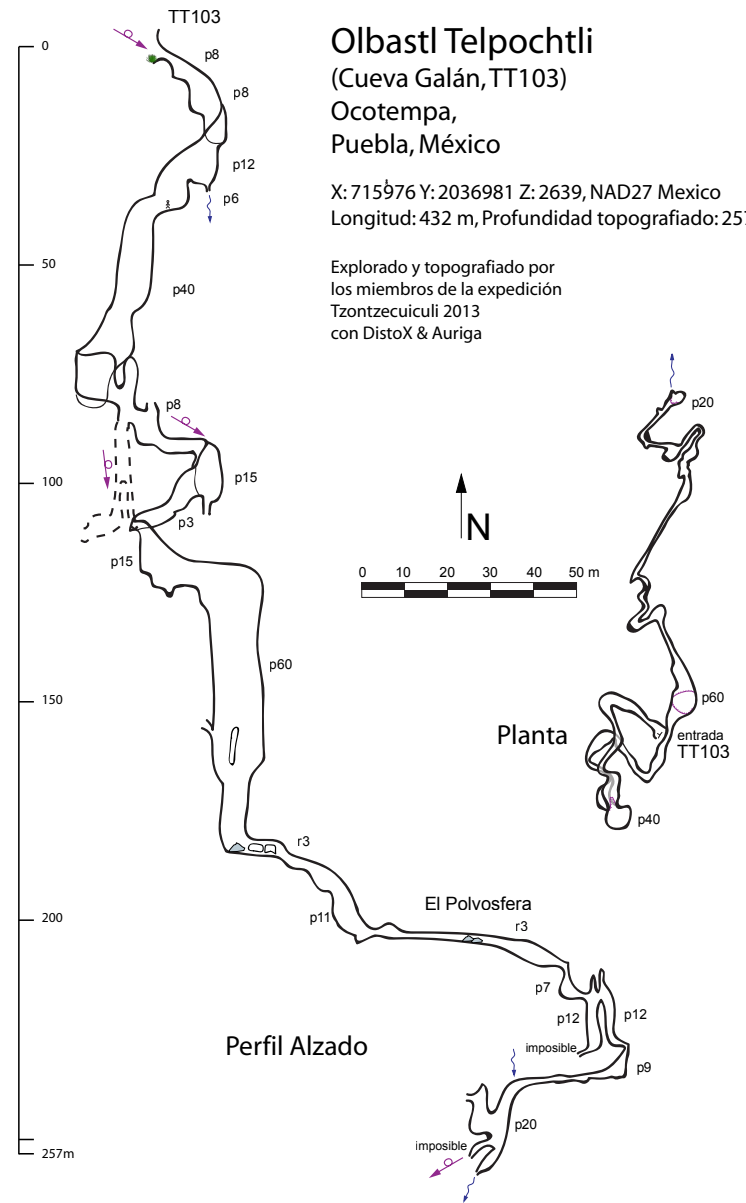
Olbastl Telpochtli

(Cueva Galán, TT103)

Ocotempa,
 Puebla, México

X: 715976 Y: 2036981 Z: 2639, NAD27 Mexico
 Longitud: 432 m, Profundidad topografiado: 257m

Explorado y topografiado por
 los miembros de la expedición
 Tzontzeuciculi 2013
 con DistoX & Auriga





**ANTHODITE HALL
SISTEMA HUAUTLA, OAXACA**

**PHOTO ESSAY
PHOTOGRAPHER: ELLIOT STAHL**







USING THE MICROSOFT KINECT TO CREATE A 3-D CAVE MAP

JON BEACH

In March 2013 we field-tested a semi-automated 3-D cave mapping system based on the Microsoft Kinect. The system takes advantage of Kinect's portability and flexible implementation to create 3-D maps of the cave environment. The system we implemented was used to create a 3-D map of 30 meters of Cueva de Playas in Veracruz. (see "Mexico News" in this issue). The process to capture the data was comparable to traditional tape and compass mapping but the post-processing was quite labor intensive. In all the final product is quite impressive, but the system requires some modification in order to be truly useful in the field.

The Kinect was released by Microsoft in 2010 as an add-on to their popular Xbox 360 game system. Its primary use is to sense the location of players and allow them to use their body positions as an input device or "controller." The Kinect does this by producing a 3-D image of the area directly in front of it and using specially designed software to identify body position.

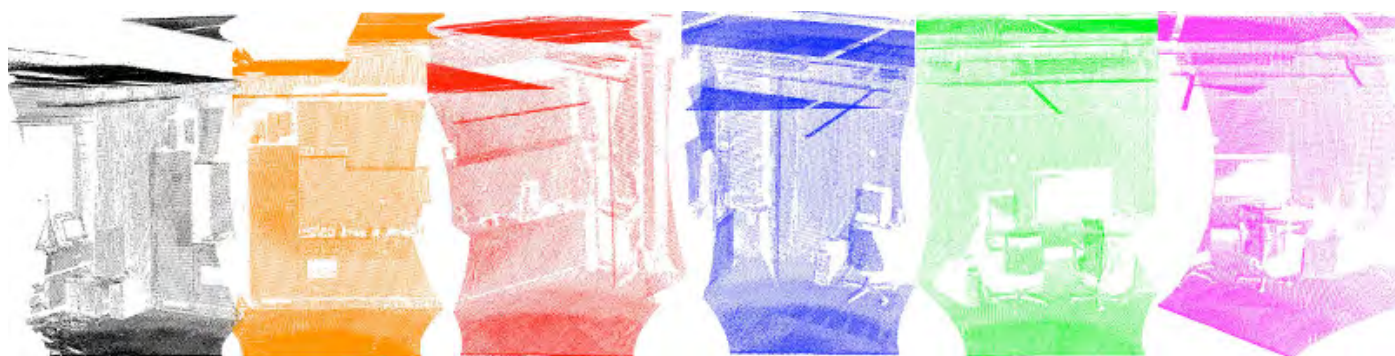
The Kinect accomplishes this feat by using a process called structured light analysis in which the Kinect projects near-infrared light in a pseudo-random pattern in front of the device. An IR camera that is offset from the IR projector images the scene with the IR pattern projected onto it. Based on the relative position of the imaged IR pattern, software in the Kinect determines the distance from the camera to objects in the field of view. The Kinect has an effective range of about 20 to 25 feet depending on how reflective the surface of the object is. The Kinect also has a standard RGB

video camera. For more information see www.dmi.unict.it/~battiato/CVision1112/Kinect.pdf.

Once the camera has determined the distance to the objects in front of the camera it converts that information into a 640-by-480 pixel depth-image. A depth-image is simply an image in which each pixel not only contains the X and Y coordinates of a normal digital image but also contains information on how far from the camera the object that pixel represents is. The Kinect can also layer the RGB color video images over the depth image.

The Kinect sends depth-map data through a USB cable to a computer. There are a number of applications that can import, save and manipulate Kinect depth image data. In this case we used the Point Cloud Library (PCL) for acquisition of the depth images. PCL is an open source set of programming libraries and comes with a number of pre-made applications that can interact with the Kinect. For more information see pointclouds.org. We used the KinectPCLviewer tool to capture individual depth images from the Kinect.

Once depth images have been captured, the most vexing issue that must be overcome is stitching them together into an accurate 3-D map. When the Kinect captures a depth image, each image represents what is directly in front of the camera at the time. If the camera is moved between successive images, what one ends up with is a series of images that need to be linked to form a full 3-D representation of the area of interest. In order for a number of images to be linked, they must be run through some form of a registration



process.

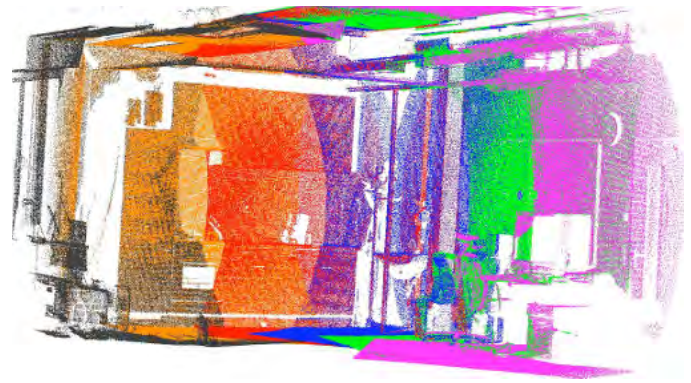
There are a number of semi-automated and automated registration processes that have been developed by a wide array of groups and companies for a variety of applications. Automated registration programs take successive 3-D images in real time and link them into an ever-growing global map. A room or interior space can simply be scanned with the Kinect and a 3-D map created in real time. There are a number of commercial and open source automated registration programs available today. These programs tend to be computationally intensive, requiring high-end computer power. Additionally, most automated registration programs rely on both the depth image and the RGB video image to register successive images in real time. These programs have little use in a cave, as the lighting required to light the scene



would be prohibitive.

There are also numerous semi-automated programs and tools that can be used to register 3-D images after the images are captured. These are less computationally intensive. In this case we chose to use the open-source program called Cloud Compare. It provides two ways to align 3-D images together. It has a manual point-picking process and a automated Iterative Closest Point (ICP) process. We experimented with both options and settled on the manual point picking process. To use the process, corresponding points from two image are manually identified and the program then aligns the images. It is a labor-intensive process but provides significantly better results than ICP.

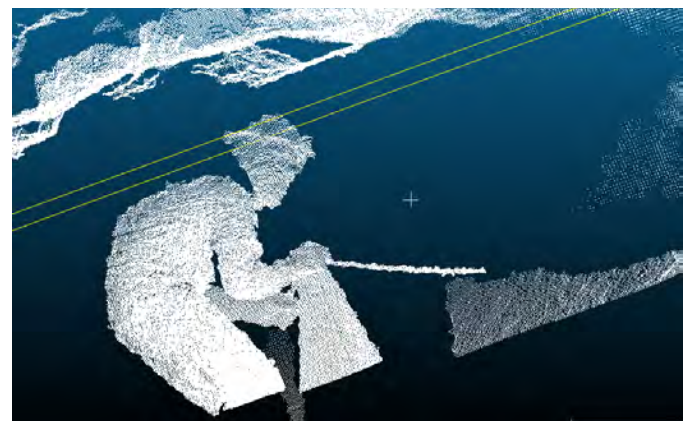
In order to be able to manually select points that overlap between images we designed a system where we used common triangular wet-floor signs. The signs were set up in the cave every 10 feet and used as stations. We took a series of twelve to fourteen depth images in a 360 degree circle



around each sign. This allowed us to do two things. First, using easily distinguishable features on the sign (the three corners of a side) greatly improved our ability to manually identify identical points between different images. Second, by placing the signs 10 feet apart we were able to register different stations together.

To use the entire system in the cave everything needed to be portable. We converted the Kinect from AC plug-in power to DC battery power. The conversion was straight forward and only involved cutting the cord and then splicing in a 12-volt battery pack. In this case we used a battery pack based on 8 AA batteries. Field tests indicated we could get about three hours of effective use from a set of high-end AA batteries. The wet-floor signs are of the collapsible variety, so we were able to pack four of them with us in our luggage. To run the entire system we brought a mid-range ASUS laptop with an Intel Core i3 processor with 6 GB or RAM.

The data-acquisition process in the cave was relatively quick. It took a little over 45 minutes to acquire all of the images for eleven stations. We had to work through a number of issue, including water dripping from the ceiling onto the computer, dirt, and cramped spaces. To alleviate these we had a small metal camping table that we set the computer on when we took images. We also carried a roll of paper towels and several rags to clean





our hands with.

Once back in the U.S. it took quite a bit of time to register the images together into a single 3-D map. On average it took about 60 to 90 minutes to register all of the images around a single station. The variability comes from a bug in the Cloud Compare program in which about 33 percent of the time the program will randomly invert images during the registration process. This error forces closing the program and a redo of that registration step.

While the system worked well overall, there are still some issues to be addressed. These fall into two broad categories, data acquisition and data processing.

For data acquisition the issues primarily revolve around the cave environment. First, the test was conducted in a cave that had passageways that were 3 to 5 meters wide and taller than 1 meter. This provided the space necessary to set up the sign, maneuver the computer and Kinect around the wet floor sign, and ensure the Kinect is far enough away from the sign to capture a full side, which is required to pick up the three points to register images with. Second, the 20 to 25 foot range of the Kinect would make capturing 3-D images in a room taller than 30 feet impossible. Finally, this system will only work in relatively dry and clean caves. While a ruggedized laptop can be obtained, there is no ruggedized version of the Kinect, and it will likely not respond well to large amounts of mud or water.

In terms of data processing, the primary issue is the size of the wet-floor sign and the time required in post-processing. During the registration process it became clear that using the three corners of the triangle formed by each side of the sign as the common points between images introduces its own error. The distance between the three points on the sign is not that great relative to size of the images. There are 2 feet between the top and the bottom corners of the triangle and 1 foot between the bottom corners. This relatively small distance

in relation to the entire image means that the small discrepancies that occur when two points are identified as identical between two images is magnified.

To overcome these issues rugged equipment and variety of differently sized signs would help. And a different way of laying out the signs could help with the registration error. But the post-processing requirements are quite time consuming, and a system that automatically registers the 3-D Kinect images in the dark cave environment would be best. There is a group of programmers that developed an automatic registration tool called KinFu Largescale that apparently does not require the RGB image and therefore large amount of light in the cave. This could potentially be used in the cave environment. The tool is still in development and requires a laptop far more powerful than we currently have. Additionally, as more and more people create new tools for the Kinect something may become available that could be appropriated for use in cave mapping.

Beyond the Kinect there are some recent entrants in laser-scanning technology that may work as cave-mapping tools. Typically laser scanning is very expensive and quite cumbersome. But, after coming back from Mexico we became aware of a consortium in Australia and the UK that recently developed a backpack-wearable 3-D laser scanner called Zebedee (<http://www.3dlasermapping.com>). Zebedee maps indoor spaces as the user walks around and holds the laser scanner on the end of a randomly rotating wand. No word yet on cost or ruggedness.

The Kinect has the potential to become a powerful cave-mapping tool. While it likely won't completely replace tape and compass, it could augment the standard toolkit and speed up the normally glacially slow process of cave mapping while adding a new level of detail that is currently very difficult and expensive to obtain.

INHABITANT OF IXTACXOCHITLA RETURNING HOME
AFTER A DAY'S WORK. DAVID CILIA GARCÍA.

EXPEDITION IXTACXOCHITLA 2012



RAMSÉS MIRANDA GAMBOA
ANGELES VERDE RAMÍREZ
ULISES RIVERA ARROYO

In December 2012, twenty-five members of the Asociación de Montañismo de la UNAM visited the region of Ixtacxochitla (from Náhuatl, white flowers), in Puebla state, to continue the exploration and mapping of caves. We decided to take a large group of people because the trip would last only ten days, and in this time we had to complete the remaining objectives from 2011, and it was necessary to spend at least two days after arrival and before departure to install and uninstall the whole camp. Simply, there was little time and much to do. We left Mexico City on the night of December 14 and arrived to the base camp, at Cueva Tlaloc, on the night of December 15. We stayed seven days at the foothills of Cerro Tzizintépetl (or Zizintépetl) and returned to Mexico City on December 23 because many of the cavers wanted to spend the holidays with their families.

This time we had two teams. The first and most numerous, nineteen people, installed the base camp in the cave and finished the work remaining in the 2011 caves [see *AMCS Activities Newsletter* 35, pages 77–88], and the second group, six people, remained in the village to prospect for new cave entrances and make preparations for a documentary on the people in the region,

because interaction with nature and caves is part of their daily lives.

The specific objectives were to finish the mapping of Ayaucalli, Ilama Coatl-Tomabak, and Chaneques that were not finished in 2011 due to weather and logistics, to prospect for new areas around the base camp and Ixtacxochitla village, and to enjoy our holiday with friends in these beautiful places.

We prospected toward the Tzizintépetl massif to find new cave entrances, but the karst morphology did not let us advance long distances; progress through the fissures and cracks was too difficult and dangerous.

Ayaucalli had been discovered previously, but the mapping could not be finished because of a cold front at the end of 2011 expedition. We had been very excited about this cave since its discovery; the sinkhole is huge, and also one of the first rooms has very large dimensions. It has a total length of 1411 meters, with a horizontal extent of 1356 meters and a depth of 202 meters. The descent starts with an 80-meter slope down to the northeast. Right after the slope there are four pits, of 6, 17, 22 and 11 meters. Then, we climbed up to a huge room, approximately 110 meters long and 75 wide. Next to the Great Sa-

**HUGO SALGADO AT AYAUCALLI'S FIRST DROP.
DAVID CILIA GARCÍA.**





Group: Grupo Espeleológico Universitario GEU
 Topographic Chart: Coyomeapan E14B77

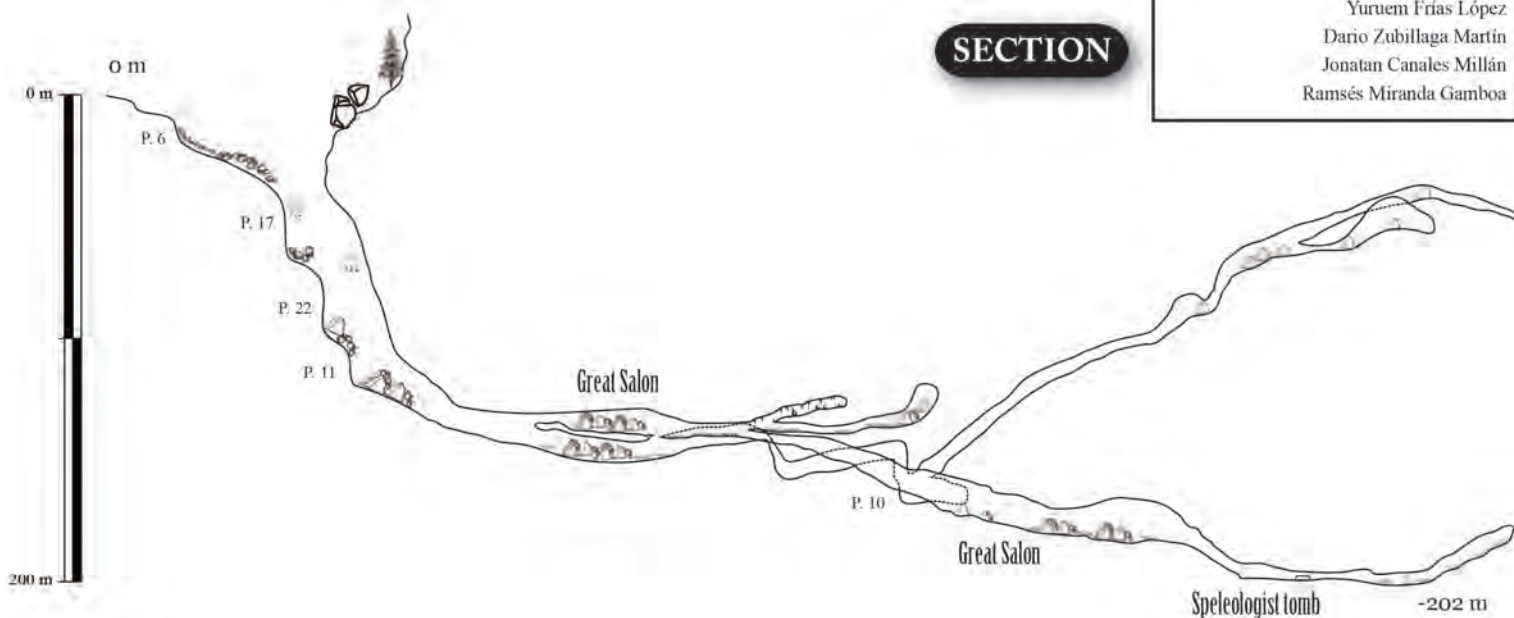
Depth: 202 m
 Length: 1411 m

Ayaucalli (The House of Fog) Ixtaxochitla, Puebla

Suunto & tape survey 2011 and 2012 by:

- Edgar Soto Valdés
- Myriam A. Miranda Gamboa
- Hugo E. Salgado Garrido
- Ulises Rivera Arroyo
- Lorenzo Ortíz Armas
- Omar Arroyo Salazar
- María de los Angeles Verde Ramírez
- Verónica Ortíz Zavala
- Elizabeth Calderón Flores
- Itzel Cortéz Fernández
- Julio Cesar Díaz Montes
- Yruem Frías López
- Dario Zubillaga Martín
- Jonatan Canales Millán
- Ramsés Miranda Gamboa

SECTION



Suunto & tape survey 2010
 and 2012 by:

- María de los Angeles Verde Ramírez
- Hugo Salgado Garrido
- Verónica Ortíz Zavala
- Elizabeth Calderón Flores
- Itzel Cortéz Fernández
- Vitza Cabrera Manrique
- Hasan Ortiz Montalvo
- Alejandra López Portillo-Chávez
- Julio Cesar Díaz Montes
- Victor Bravo Reyna
- Ramsés Miranda Gamboa
- Arturo García Gómez
- Héctor Guzmán García

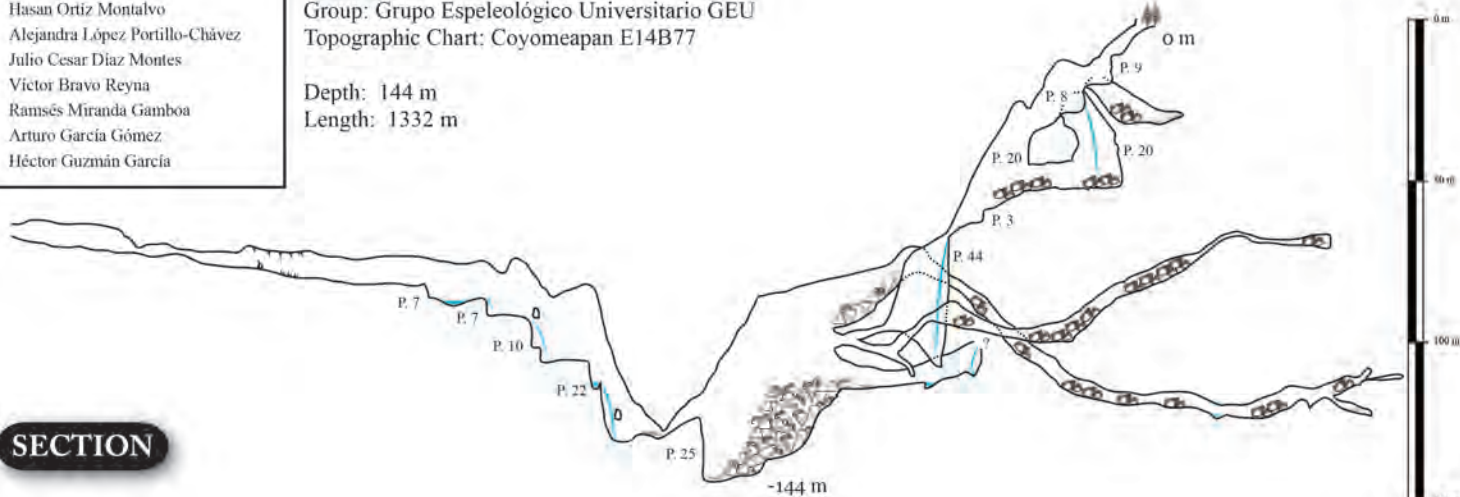


Group: Grupo Espeleológico Universitario GEU
 Topographic Chart: Coyomeapan E14B77

Depth: 144 m
 Length: 1332 m

Ilama Coatl-Tomabak (Old Snake) Ixtaxochitla, Puebla

SECTION



Suimio & tape survey 2011 and 2012 by:

- Edgar Soto Valdés
- Myriam A. Miranda Gamboa
- Hugo E. Salgado Garrido
- Ulises Rivera Arroyo
- Lorenzo Ortiz Armas
- Omar Arroyo Salazar
- María de los Angeles Verde Ramírez
- Verónica Ortiz Zavala
- Elizabeth Calderón Flores
- Itzel Cortés Fernández
- Julio César Díaz Montes
- Yamem Frías López
- Dario Zubillaga Martín
- Jonathan Canales Millán
- Ramsés Miranda Gamboa

Ayaucalli
(The House of Fog)
Ixtaxochitla, Puebla



Group: Grupo Espeleológico Universitario GEU
Topographic Chart: Coyomeapan E14B77

Depth: 202 m
Length: 1411 m



PLAN



PLAN

Suimio & tape survey 2010 and 2012 by:

- María de los Angeles Verde Ramírez
- Hugo Salgado Garrido
- Verónica Ortiz Zavala
- Elizabeth Calderón Flores
- Itzel Cortés Fernández
- Vitza Cabrera Mautique
- Hasan Ortiz Montalvo
- Alejandra López Portillo-Chávez
- Julio César Díaz Montes
- Victor Bravo Reyna
- Ramsés Miranda Gamboa
- Arturo García Gómez
- Héctor Guzmán García

Group: Grupo Espeleológico Universitario GEU
Topographic Chart: Coyomeapan E14B77
Depth: 144 m
Length: 1332 m

Suimio & tape survey 2012 by:

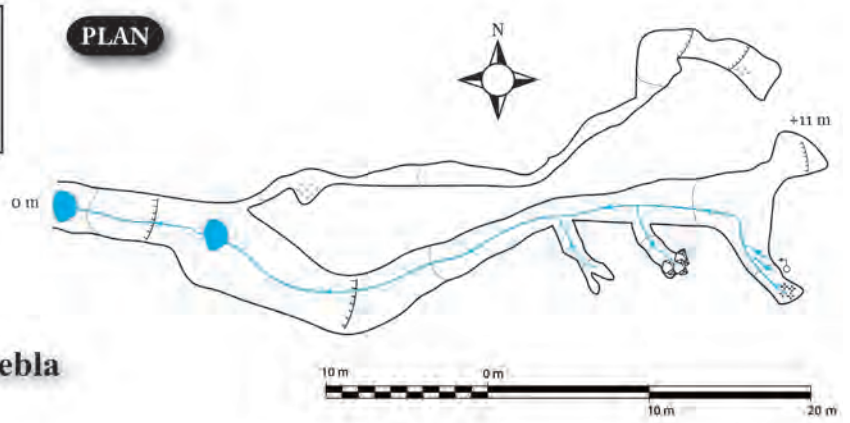
- Ramsés A. Miranda Gamboa
- Ulises Rivera Arroyo
- Myriam A. Miranda Gamboa

La llorona
Ixtaxochitla, Puebla



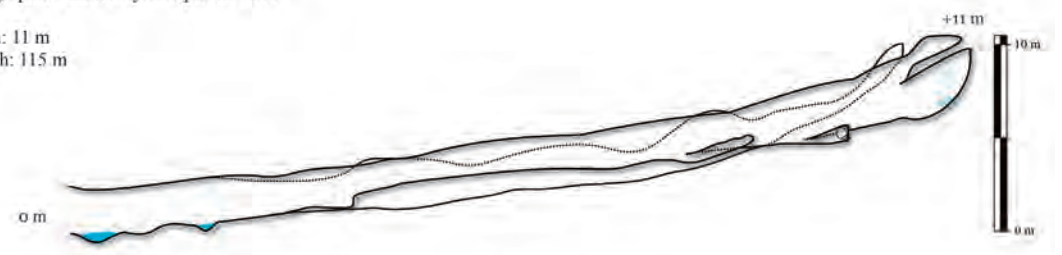
Group: Grupo Espeleológico Universitario GEU
Topographic Chart: Coyomeapan E14B77

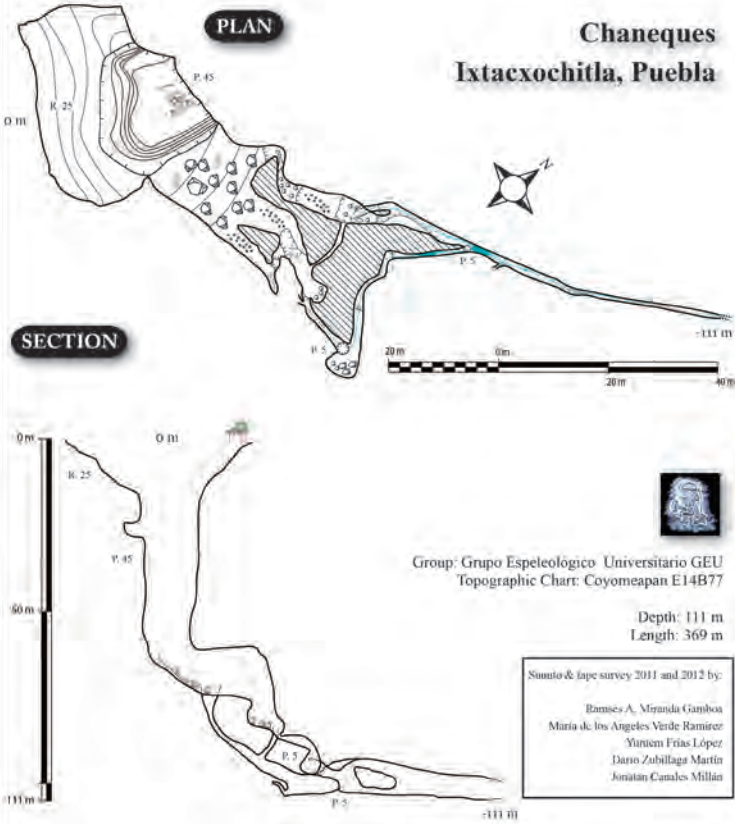
Depth: 11 m
Length: 115 m



PLAN

SECTION





Chaneques
Ixtaxochitla, Puebla

Unfortunately, we found some evidence of previous explorations in this place, probably carried out by the Société Québécoise de Spéléologie, but we cannot say if they completed survey.

The Ilama Coatl–Tomabak System (Old Snake) was explored in March 2010, but it was not until December 2012 that we finished the mapping and found another entrance that we called Tomabak. Ilama Coatl has five drops: 7, 7, 10, 22, and 25 meters respectively, and connects with Tomabak in a large room full of great blocks. From here we found four passages. One of them was at the top of a 10-meter cascade that we climbed up. At the top we found a little paper that showed that members of the SQS had been there. We think that they connected their CT-1-6 cave with the Ilama Coatl–Tomabak System in the large room, because none of the others passages showed evidence of exploration. Two of the passages are almost horizontal, and the fourth one comes from the Tomabak entrance. From outside to inside, Tomabak has five pits, 9, 8, 20, 3, and 44 meters respectively. The part of the system that we thought was unexplored has a total length of 1332 meters, with a horizontal extent of 1133 meters and a depth of 144 meters.

lon we found two chambers, one to the south, with a lot of speleothems, and the other, to the northwest, covered by mud, which has a curiously shaped mound that looked like a grave; we call it the Speleologist Tomb. This room was followed by a small passage. At the east of the Great Salon we followed a passage and found a final 10-meter pit.

Chaneques was found in 2006, but the cave remained lost for three years due the dense veg-

SUSANA KAJI ARRIVING AT THE GREAT SALON IN ILAMA COATL-TOMABAK SYSTEM. DAVID CILIA GARCÍA

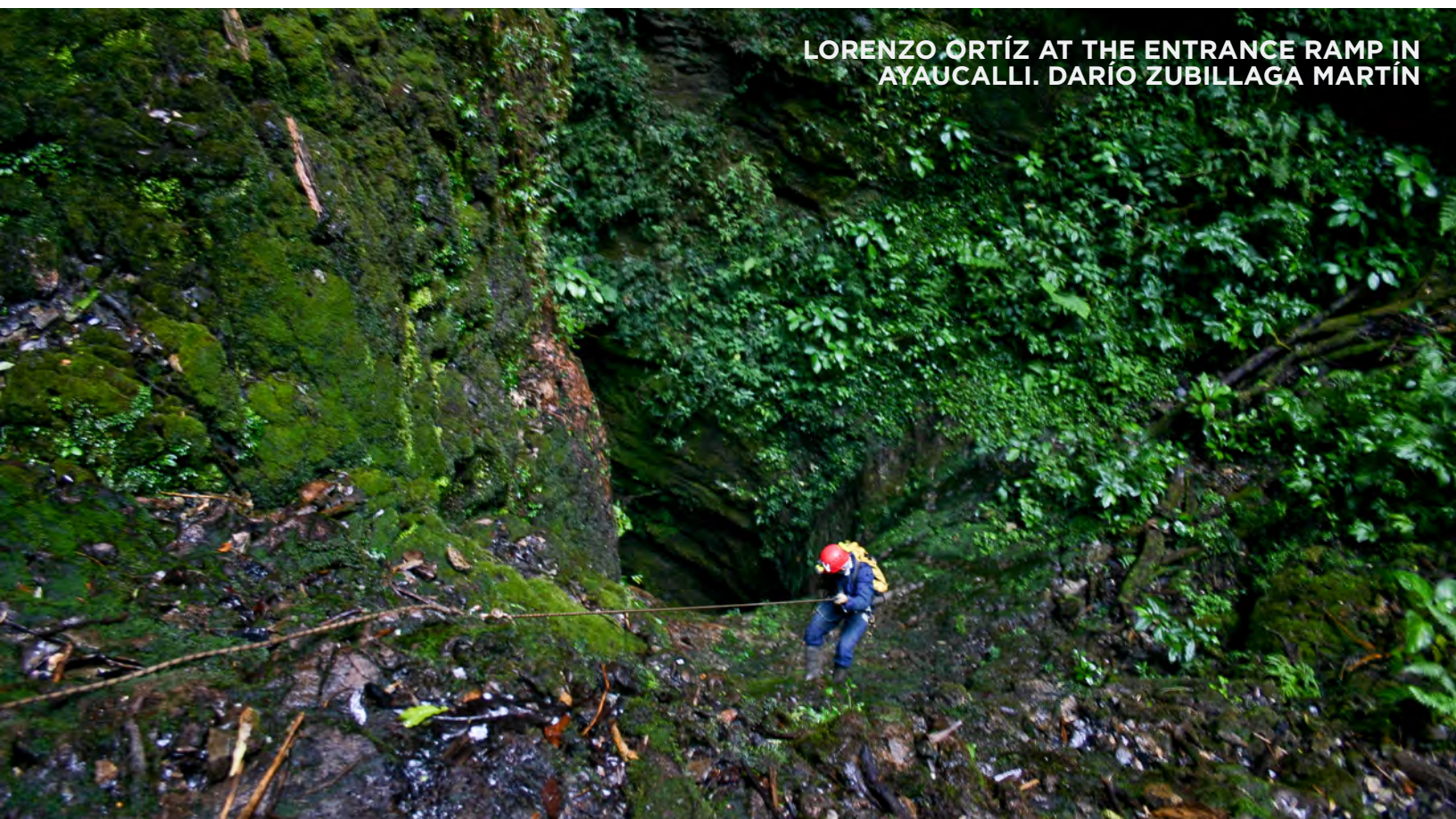


etation. It was found again in 2011, when deforestation exposed the area. According to the inhabitants' legends, the *chaneques* are entities that protect the forest, they are naughty, and it is necessary to ask permission to enter to virgin zones or caves, otherwise they can scare you. At the drop entrance of the Chaneques sinkhole, we found speleothems that look like little huts, where it is believed that these guardians live. It has a total length of 369 meters, with a horizontal extent of 237 meters and a depth of 111 meters. The 25-meter ramp entrance is in a wide sinkhole approximately 50 meters in diameter. The initial pit of 45 meters is very pretty and connects to a room that has two main passages that connect and end in a very narrow places where water flows. This cave has a couple of internal pits of 5 meters and is mostly dry, but has a couple of small resurgences and some drips. On rainy days the wide sinkhole captures rainwater and funnels it into both passages.

La Llorona is a little cave near the Tlaloc cave that is formed by two ascending galleries, one dry that is used by a little bat colony as home and the other one carrying water to the spring entrance. The cave is interesting due the great diversity of cave fauna. During this expedition we collected some specimens of arachnids for the Colección

Nacional de Aracnidos of the Instituto de Biología at UNAM. Rodrigo Monjaráz, a member of the expedition, studies at this institute. The cave is 11 meters deep and 115 meters long.

After several years of exploring the area, we realize that geology the region favors the formation of doline karst and an extensive underground network that functions as a natural drainage for heavy rainfall throughout the year. Most caves are semi-active, i.e. they carry large flows of water during the rainy season or in the presence of strong storms, which are very common throughout the region because the Sierra Negra receives much of the humidity from the Gulf of Mexico to the southeast. But the rest of the time the caves are quite accessible. The morphology of the caves is predominantly horizontal, with few deep pits, and they do not reach 300 meters deep. It is common to find long, winding, and narrow galleries that carry water through the karst. Also we found a large number of sinkholes of all sizes, and below them it is common to find large rooms. It is characteristic of the region that caves connect to form large systems. These features may be due to the fact that the cave resurgences are high in the mountains, so water has not had the opportunity to amass the velocity, volume, and energy to create great pits. In addition, we observed that the



LORENZO ORTÍZ AT THE ENTRANCE RAMP IN
AYAUCALLI. DARÍO ZUBILLAGA MARTÍN

rock at Ixtaxochitla is very weak, and maybe at ~300 meters there is a bed that prevents the formation of caves.

Two caves show evidence of the presence of SQS members, this group having exploring near the area twenty years ago, so we conclude that the areas of both groups have overlapped and it is unnecessary to spend our efforts in repeat work mapping while there are many other places to explore in the Sierra Negra or the rest of Mexico!

Ixtaxochitla gave us many things: joy, experience, exhausting but satisfying days, lots of laughter, teamwork, local friends and their ideologies, and in particular the opportunity to learn extraordinary things about the cloud forest that hides many wonderful caves. Thank you Ixtaxochitla!

We would like to express our gratitude to Javier Vargas Guerrero, AM-UNAM president, Arturo García Gómez, AM-UNAM director of speleology, and Rafael Reyes Márquez, treasurer, for their teaching and support in the realization of this project. We would like to thank, as well, Iván González for the loan of surveying equipment and the members of the GEU for their enthusiasm and collaboration during the explorations. Special thanks to Gregorio Cacho and his wife Juanita for their hospitality and kindness; they always made us feel at home.

Participants: Víctor Bravo Reyna, Vitzta Cabrera Manrique, Elizabeth Calderón Flores, Jonatan Canales Millán, Lydiette Carrión Rivera, David Cilia García, Itzel Cortéz Fernández, Julio Cesar Díaz Montes, Tepeu Eldae, Hannali Yuruem Frías López, Susana Kaji García, Alejandra López-Portillo Chávez, León Martínez, Myriam Miranda Gamboa, Ramsés Miranda Gamboa, Rodrigo Monjaráz Ruedas, Lorenzo Ortíz Armas, Hassan Ortíz Montalvo, Verónica Ortíz Zavala, Tonatiuh Paz, Ulises Rivera Aroyo, Hugo Enrique Salgado Garrido, Edgar Soto Valdés, María de los Angeles Verde Ramírez and Darío Zubillaga Martín.

En diciembre de 2012 un grupo de 25 espeleólogos de la Asociación de Montañismo de la UNAM se dieron cita durante 10 días en la zona de Ixtaxochitla para continuar con las labores de exploración y topografía de cavernas. Durante la campaña de exploración de diciembre del 2011 y enero del 2012 tres cavidades no fueron exploradas por completo debido a la falta de tiempo, así que los objetivos principales de esta expedición eran continuar con la exploración de estas cavernas y encontrar nuevas entradas en la zona. Además de estas labores, parte de los integrantes realizaron una serie de entrevistas y videos a los pobladores para conocer los mitos y leyendas de las cavernas de la región.



MYRIAM MIRANDA, VÍCTOR BRAVO AND ALEJANDRA LÓPEZ TAKING A REST IN THE ILAMA COATL-TOMABAK SYSTEM. DAVID CILIA GARCÍA.

EXPLORATION OF ACTUN JAALEB

grupo espeleológico  ajau

RAÚL E. MANZANILLA
TRANSLATED BY HAAS KRISTEN W. TAYLOR

On January 14, 2012, based on information from Lucio Cupul, a farm worker from the community La Estrella, the Grupo Espeleológico Ajau learned of the cave Aktun Jaaleb (Guinea Pig Cave or Paca Cave), located on the common land of the community of Buena Vista, in the *municipio* of Chemax, in eastern Yucatán.

The townspeople knew of the existence of the cave, as it was commonly used as a hunting ground for the *jaaleb* or *tepezcuintle* (*Agouti paca* or spotted paca), which is a small mammal that often seeks refuge in caves. The cave had not yet been totally explored, however, nor had it been visited by experts.

After completion of our first expedition, three more were carried out with the objectives of exploring and mapping the cave. The second expedition occurred on January 29, 2012, with the goal of surveying the cave's main passage and identifying possible leads. The expeditions that followed occurred from August 20 through 22 of that same year with the purpose of taking passage measurement. The surveying was completed on February 5, 2013.

During the work in the cave, many of the local townspeople collaborated, as well as Miguel Xacur, Pía McManus, María José Gómez Cobá, Fátima Tec Pool, and Raúl Manzanilla Haas, all members of Ajau; the French speleologists Christian Thomas, Odile Champart-Curie, Jeanne Private, and Gilles Carmine from Espéléoclube L'École Polytechnique; and American Kristen Taylor from the Richmond Area Speleological Society.

Aktun Jaaleb is without a doubt one of the most interesting discoveries in the state of Yucatán, not only because of its length, but also because of the pre-Hispanic cultural elements found inside it that show the ritual and sacred importance of this subterranean space for the ancient Maya people of the zone. With a length of 1,700 meters, it is one of a group of the longest subterranean cavities in eastern Yucatán that were registered by Ajau and the French group under the leadership of Christian Thomas between the years of 2006 and 2012. Others are El Pozo de Santa Rita and Madre Cristalina, which encompass 1,100 and 3,500 meters, respectively, in the community of Santa Rita in *municipio* Valladolid and Aktun Copó (Star

MARÍA JOSÉ GÓMEZ COBÁ



FÁTIMA TEC POOL



MARÍA JOSÉ GÓMEZ COBÁ



Cave) in the community of Cocoyol, with a length of 1,900 meters.

CAVE DESCRIPTION

Aktun Jaaleb has an entrance formed by a collapsed depression in the shape of a circle that allows for easy access into the cave on one side of it. This entrance leads to a semi-open main passage that the local townspeople utilize as temporary refuge when this area is affected by hurricanes.

The cave expands horizontally into large rooms, some parts of which are as wide as 30 meters and as tall as 20 meters in their highest sections. The cave was 1,409 meters long after the first stage of mapping; 291 more meters were documented on subsequent survey trips, arriving at a total length of 1,700 meters thus far.

The cave has two routes. The first runs northeast and does not go far. The size of the entrance to the first route is reduced by a wall constructed with large stones, which was made by the ancient Maya people. In front of it is a flat stone that could have served as a means to close off this access completely. This area is characterized by many collapses and some archaeological relics, like ceramic fragments. The second route is longer and runs southeast; it has confined spaces that lead to large cavities, like the *Bóveda de la Rana* (Frog Room), named because a common frog of the northeast of Yucatán and north of Quintana Roo, *Eleutherodactylus yucatanensis*, was found there. This place has drops, breakdown piles, and a small vertical entrance that allows the splendor of the sun to come in. An entrance to area was identified in the north that leads to an area with much dripping water. In some parts there are temporary shallow bodies of water, as well as an elevated concentration of carbon dioxide gas. Something of note here is the almost complete skeleton of a species of small deer known as the *yuk* (*Mazama pandora*), likely the victim of some type of feline predator, such as the jaguar, that hunts in the area.

Following the cave's main passage toward the southeast, one arrives at la Sala de la Navajilla (Knife Room). An intact pre-Hispanic obsidian knife and some fragments of others were found there. The room has an extremely flat floor, which makes for comfortable passage through it; some loose stones, however, are dispersed throughout. The walls are very white in some parts and are composed of formations, such as small flowstones

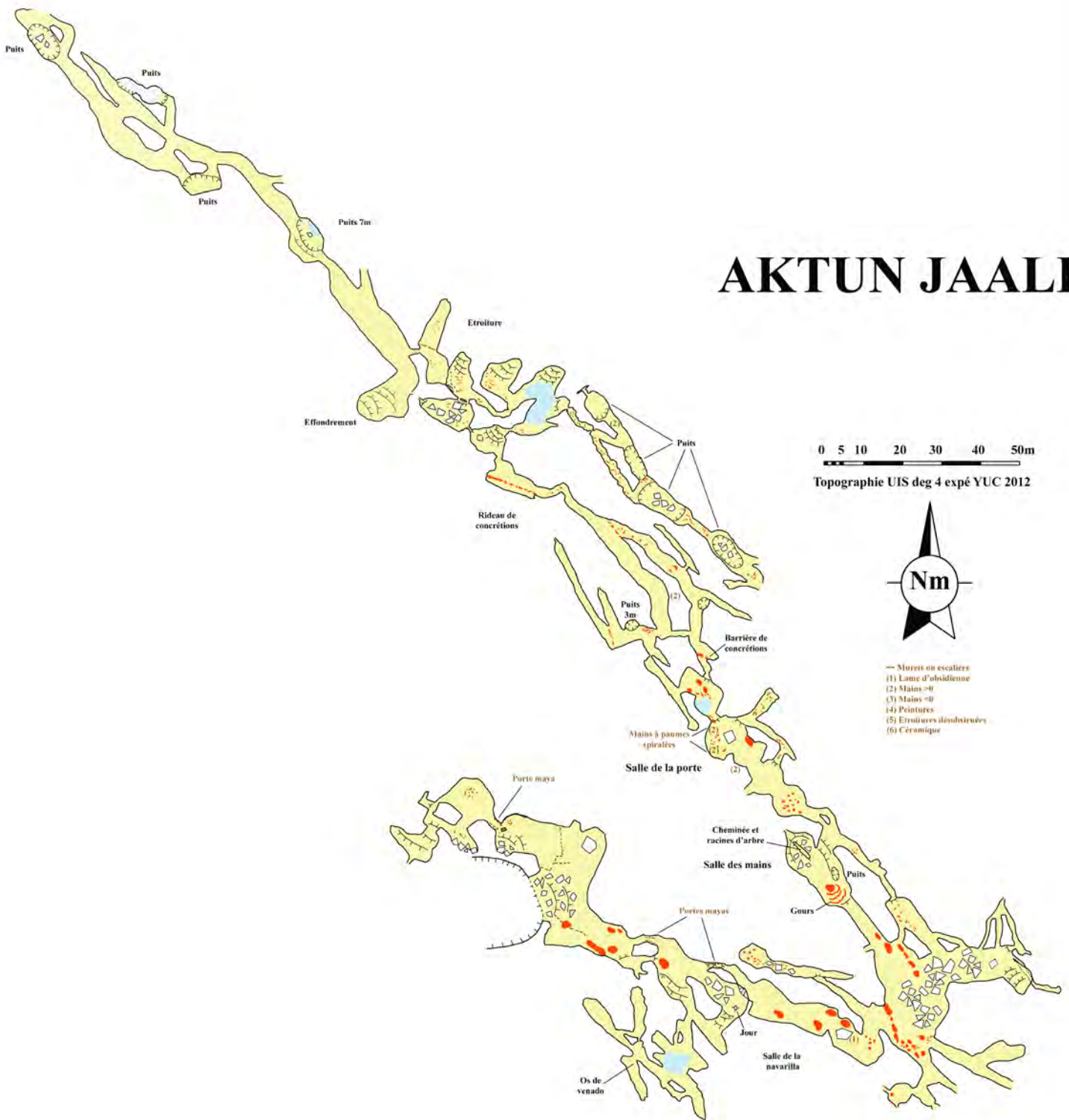
and some formations in the shape of curtains; stalactites and stalagmites are very scarce here.

The main passage continues in a section that runs north; this took us to a room with multiple columns, stalactites, stalagmites, and large breakdown piles in some parts. Various leads were identified here, and from here to where our survey ended, the main passage runs northeast. One of these branches is parallel to the main passage of the cave, but is not very long; another three passages were found to the southeast and north, but they were not explored.

Continuing along the main passage of Aktun Jaaleb, one arrives at the Sala de las Manos (Hands Room), which is characterized by a large number of hand prints that were made with pigments from carbon and red clay. This section has an area with a lot of dripping water, small depressions where infiltrating water accumulates, short drops, breakdown piles, and a small tunnel that is parallel to the main passage and merges with it a little farther along.

Continuing in the same direction towards the northeast, passing an area of breakdown and some off-white dry depressions, one arrives at la Sala de la Puerta (Door Room), which has a flat ceiling with few formations—just the occasional small stalactite, barely centimeters long. Large quantities of sharp stalactites, stalagmites, and small columns were found near the walls, however. A little farther along, beside a small, shallow body of water, two leads open up, running parallel to each other towards the northeast and eventually merging. The first lead is small and tunnel-like, with a low ceiling from which water drips, small stalactites and some stalagmites, very thin and brittle walls that divide other segments that do not develop into much of anything, a small place that is uncomfortable to pass through due to some sharp broken stalactites on the floor, and some carbon dioxide gas.

The second lead is more spacious and is large enough to be traveled through upright; it was a bit more difficult, however, because its concentrations of CO₂ were even higher. There is much water dripping in this part, which makes the floor a bit muddier, and as a result small, shallow bodies of water are found throughout. At the end of this passage, where it merges with the tunnel, the ceiling becomes lower and lower, to the degree that one had to lie down completely in order



AKTUN JAALEB

to continue on. Here, where the cave had been thought to end, two small holes were found that appeared to lead to more cave. The first goes to the northeast, where a body of natural water that is 60 centimeters deep was found, as well as two more leads, one of which abruptly bends to the southeast, and possibly merges at some point with the unexplored branches of the cave; the second bends to the southeast, becoming very small and tapering off. The second small hole is located between two columns and heads to the northeast. In

this part there are numerous natural formations, like sharp, active stalactites, stalagmites, columns, fragile curtains, and in some places large breakdown piles. All of this impeded comfortable advancement, as one had to drag himself through small spaces where the formations were located, as well as negotiate large pieces of breakdown, which had deep cracks and pits to traverse.

Past these obstacles, the cave apparently ends. In one of the northeast walls, however, a small, barely passable crack was found that went down

1.5 meters. This area has a compact red clay floor, some scattered stones, and thin, brittle beds of rock. The flat ceiling is between 60 and 80 centimeters high with no formations. After passing this very low place, one arrives at a slightly more comfortable section in which he can sit up, and where there are some small columns clustered in such a way that it was impossible to get by them to other parts of the cave. A very narrow way on was also identified here, but it was difficult to pass through due to its position and the form of its ceiling. Past this obstacle, the cave becomes more open and takes on the form of a tunnel that can be walked through, with the exception of some places where the ceiling becomes lower, where one must get down on all fours. In some places it was necessary to lie completely down, which was awkward, as the delicate formations, high concentrations of carbon dioxide gas, and broken stalactites on the floor made passing through slow, tiring, and painful. Two deep bodies of water were identified here. And though it was evident that the cave continued, our tiredness at this moment and the high concentrations of CO₂ made finishing exploration of this part of the cave impossible.

Things of note in this last section of the cave are cultural remnants that were identified as having been made by the ancient Maya, but the passages and accesses to get to this place are very small and too difficult for regular use by them. It is possible, then, that this cave could have a second, more comfortable entrance from the outside.

ARCHAEOLOGICAL RELICS OF PRE-HISPANIC ORIGIN

As in many caves in the Maya area, the subterranean cavities of Yucatán boast innumerable pre-Colombian cultural displays; Aktun Jaaleb is no exception.

Among the relics that were identified in Aktun Jaaleb are alignments of stones in the semi-open section of the first room, accesses blocked by flat stones that restricted the size of some spaces, an obsidian knife, and multiple ceramic fragments that were arranged on the floor with a purpose. In some places we observed charcoal left over from

fires. In other parts, we found markers that were made with broken stalactites or stalagmites that pointed towards the two deepest bodies of water in the last section of the cave.

Various rock paintings were also identified. They consisted of different designs, some in the form of anthropomorphs and zoomorphs and some with geometric and abstract shapes, as well as a lot of hand impressions on many of the cave's walls. All of these were carried out with carbon and red-clay pigments.

ACKNOWLEDGEMENTS

As the majority of Yucatecan caves are found within *ejidos*, Grupo Ajau has pushed itself to involve the people from these rural populations in its explorations, as these individuals are the ones in charge of taking care of and safeguarding the natural and cultural assets of these subterranean places. For this reason, I would like to thank the authorities and people of the community of Buenavista; if it were not for them, these hidden cavities in the Yucatecan jungle would have remained unknown. I would especially like to thank Felipe Neri Pat Balam, Placido Pool Caamal, Pedro Pool Caamal, Severo Pool Caamal, Teodoro Pool Canúl, Bernardo Pat Cen, José Mateo Chimal, Joselito Valdés Arjona, José Concepción Pat Cen, and Vinicio Felipe Pat Cen, as well as Lucio Cupul Sánchez from La Estrella. Their cooperation was important and necessary in each exploration, as well as that of Gerardo Cordero and Vanessa Romero, who accompanied Grupo Ajau on its first expedition.

El siguiente artículo trata sobre la exploración de la cueva Aktun Jaaleb, en el Oriente de Yucatán en México, durante el 2012 e inicios del 2013 por el Grupo Espeleológico Ajau (México), el Espeleoclube L'Ecole Polytechnique (Francia) y gente de las comunidades cercanas. Esta cavidad subterránea es importante no sólo por ser una de las más largas de la zona, sino por la evidencia arqueológica que los antiguos mayas dejaron en su interior.

