AMCS
ACTIVITIES NEWSLETTER

Number 42 January 2020

AMCS

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

The Activities Newsletter seeks articles and news item on all significant exploration and research activities in the caves of Mexico. The editor may be contacted at the address below or at editor@mexicancaves.org.

This is a time of transition for the Association for Mexican Cave Studies. The death of longtime editor Bill Mixon, who devoted his life – talent, time, and home – to the success of the AMCS, is a tremendous loss. This issue was edited by Cait McCann, with an enormous amount of help and encouragement from a great many in the caving community.

If you haven't already, consider joining the the Association for Mexican Cave Studies group on Facebook to see and share the most recent news.

All previous issues of the Acvities Newsletter are available in print, as PDF files, or both, as are various other publications on the caves of Mexico. Contact sales@mexicancavestudies.org or visit the publications page of the website or order.

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Front cover
Ricardo Pacheco, part of the Grupo Chicomóztoc, in Sistema Cocohuastli.
Photo by Isai Otniel Hernández Navarro.

Back cover
Rigging Victoria Falls in the Rio Uluapan resurgence.
Photo by Adam Haydock.

Acknowledgments:
Many thanks to Peter Sprouse for guiding the AMCS along and asking me to serve as editor, to Grace Borgansser for countless hours teaching me to lay out articles, and to Katie Ahrens, Jessica Gordon, Susan Souby, Yvonne Droms, and Mark Minton for their help. Appreciation also goes to everyone who shared (and reshared) reports, photos, and maps for their patience as I very slowly cobbled together this first edition without Bill. I'm honored by the opportunity to continue this resource for the caving community. The next edition will be better!

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"Ojo de Júpiter" in Cueva de la Peña Negra *Kasia Biernacka.*

MEXICO NEWS

Compiled by Peter Sprouse

Chihuahua

On 24 February 2019, Dr. Rodolfo Martínez, owner of El Hundido in Jiménez, Chihuahua, died in the famous pit. The brake on his winch system apparently failed. His body was recovered from the 178-meter-deep pit the following day. El Hundido is a spectacular pit that drops into a lake that is 120 meters across and of unknown depth (AMCS Activities Newsletter 32). Dr. Martínez had constructed a gantry across the pit entrance and mounted a huge diesel engine on it. This powered a water pump for extracting water, and also a winch for lowering people in a "capsula". The capsula was made from an oil drum with a cone cap over it to protect the occupant from falling rocks.

Source: Peter Sprouse

Coahuila

In May 2018, a team searched for caves around Cerro Colorado, an igneous intrusion surrounded by limestone in the northwestern Sierra del Burro. A small shelter, Cueva los Nogales, was found to contain pictographs and a ceiling blackened by smoke.

Source: Peter Sprouse

Jalisco

John Pint has an article on Cueva de los Monos in the English-language Mexico News Daily. This beautifully decorated but difficult to reach cave is located in the protected Sierra de Manantlán Biosphere Reserve.

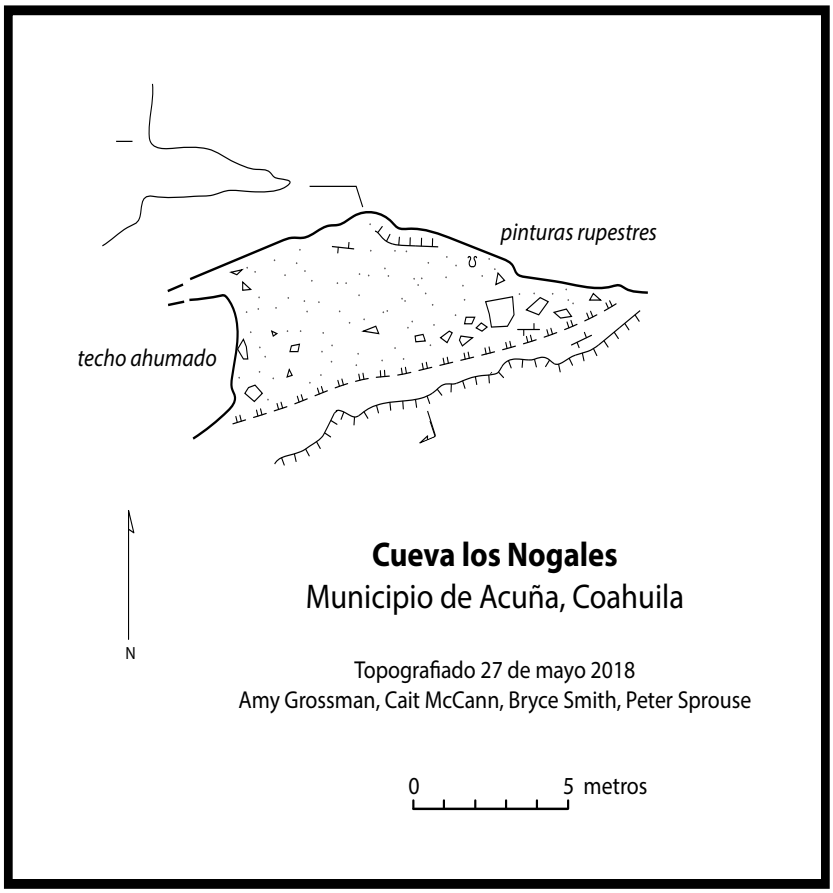
Source: https://mexiconewsdaily.com/mexicolife/a-hard-hike-to-jaliscos-most-beautiful-cave/

Michoacán

In 2015, Cinthia Marlene Campos did an initial visit to Cueva de la Huachizca in Salvador Escalante, Michoacán. It is located in a cloud forest at 2300 meters elevation. It is a basalt cave formed by a cooling crack. She was only able to explore 25 meters in at that time due to lack of equipment. In 2016 she returned with Chris Lloyd, Luis Rojas, and Alejandro Valdes-Herrera to explore and map the

Above: Body recovery at El Hundido. *El Heraldo de Chihuahua*

Below: Amy Grossman observing pictographs in Cueva los Nogales. *Peter Sprouse*



Plan
N
0
10 m
Entrance
Cueva de la Huachizca
Salvador Escalante, Michoacán Mexico
A Protractor Survey by: Cinthia M Campos, Christopher Lloyd, Alejandro Valdes-Herrera and Luis Rojas
PAPACSUM 2016
Elevation: 2287 m/n. m. Length: 94- 100m Depth: 18 m
SECCIÓN DE ARQUEOLOGÍA
CENTRO INAH MICHOACÁN
Legend
Bats and guano
Ledge passage floor
Pit
Archaeological material
Loose rock
Slope down
Sharp rocks and/or breakdown
Rock passage

Cinthia Marlene Campos in Cueva de la Huachiza. *Canadian Caver*

The Palomitas connection team.

cave. The cave consisted of a horizontal rift tilted 30 degrees off vertical. They noticed that the magnetic basalt rock was causing compass errors of up to 30 degrees, and subsequently devised a method to measure angle turns using a protractor and laser. Dates carved in the walls of the cave stretched back to the mid-1800s.

Source: Canadian Caver no. 86

Oaxaca

Derek Bristol posted a couple of nice YouTube videos about the 2018 Cueva Cheve Expedition.

Source: https://bit.ly/38rY3Vz and https://bit.ly/2Pb24WK

Proyecto Cheve and the USDCT push Sistema Cheve to 1520 meters depth. The 2019 Cheve Expedition has connected Osto Palomitas (Popcorn Cave) with Sistema Cheve to create the second cave in the Western Hemisphere with over 1.5 kilometers of surveyed depth. Palomitas was found in 1991 but wasn't pushed hard until the 1997 and 2003 expeditions, when teams pushed down to over 500 meters of depth while unknowingly coming within 100 meters of connecting to the Giants Staircase near Cheve Camp 1. A quick lead check of passages near Camp 1 during this year's expedition found a window that led to hanging ropes that were later determined to be Palomitas. Osto Palomitas is now the highest entrance to Sistema Cheve, which at the time of connection became 1520 meters deep and 49.7 kilometers long (since increased to 55 kilometers).

Source: Jon Lillestolen

Cavers with the Proyecto Sierra Mazateca continued their explorations in three different parts of the Cerro Rabón area of Oaxaca in January 2019. Their main goal was to explore within the municipality of San Miguel Huautepec, and although relations were good, it was being delayed somewhat by the authorities due to it being a new area, having a new president, and maybe bad timing. But they also had the newly discovered Sótano Río Oculto de Carlota to continue pushing by their fieldhouse, and Tony had another lead up his sleeve that was farther east, close to the Río Uluapan.

One of their local friends, David, had seen a large hole in the cliff east of Río Uluapan that flowed after heavy rains. He had made friends with the new landowner's managers. They had begun renovations on a modern house up from the parking lot, and offered the cavers a place to stay. Peter Zabrok led a bolt climb to get into the cliff-side entrance. It turned out this entrance was large and going, but had already been surveyed, and was most likely one of the various entrances to Xine Xao.

Meanwhile, permission was obtained in San Miguel Huautepec, and exploration of a new pit began. Base camp was moved back to Carlota, so going to San Miguel would be a closer drive. At the same time, they continued exploration in Río Oculto It turned out to be a great, wet, multi-drop cave, about 60 m deep and about 300 meters surveyed length. It still holds potential for more exploration, as the water flow indicates. And in Agua Colorada, at a much higher elevation, they found a new area full of pits. They surveyed seven pits, and have more in that area to explore. They hope to advance local relations, as the area is very promising and relatively untouched.

During this last period of active caving, on January 14th, a dear friend of the cavers died of a stroke. Waldo Amado García Romero befriended Tony Akers 24 years ago, and cavers have had the honor of living on his ranch and become a part of his large, extended family. He will be sorely missed. The caving team was able to be

there for the entire funeral, and cave exploration still went on, although not by everyone.

Source: Marion Akers

There will be an article in Diver Magazine (UK) for October 2019 about the 2019 Beyond the Sump cave diving expedition to Río Uluapan. See also the article elsewhere in this issue.

Source: Adam Haydock Facebook post 13 September 2019; https://www.beyondthesump.org/19-rio-uluapan.

The Proyecto Espeleológico Sistema Huautla 2019, held April 2 – May 4, was PESH's sixth annual month-long expedition. A total of 43 cavers spent from one to four weeks caving, mapping and studying Sistema Huautla and other caves of the drainage basin. Over four km of new passages were explored and mapped in Sistema Huautla, bringing its mapped length to 88.7 kilometers. Three entrances were added to bring the total number to 29. The depth remains the same at 1560 meters, the deepest cave in the Western Hemisphere.

In Sistema Huautla exploration continued in the Sótano de Agua de Carrizo and La Grieta sections. In La Grieta cavers camped at Camp 2, Camp 3, and at the "elbow" between Camps 2 and 4. From there a new passage was found named Blowhard Blowhole, which may connect to Nita Nashi next year. Nita Nashi, which was explored to 640 meters deep in the early 80s, was rigged to –350 meters. In Carrizo Camp Hulsey was used again at the bottom of the TAG Shaft and leads from there to the connection point with La Grieta were checked and mapped. A lot of time was spent in the upper reaches of Hell's Hammer Hole and Tarantula Cave (both connected to Carrizo), which was where the three new entrances were added. At one point there were five concurrent underground camps with a total of 19 cavers.

Biological collections were made and delivered to a professor of biology at UNAM. A paleontologist with INAH spent time with the expedition and hopes to be able to examine Pleistocene megafauna bones next year. Fernando Hernández, a geology graduate student at Western Kentucky University, spent the month of the expedition caving and conducting his hydrological research.

Finally, a new area in the northwest corner of the karst drainage basin, was searched for caves and a promising one was found. Named Cueva de Elysium, it was explored to 5.6 kilometers in length and 415 meters in depth with promising leads. Fluorescein dye was introduced in a stream in Elysium by Fernando Hernández, with a positive trace made to the La Grieta section of Sistema Huautla.

2019 PESH team. *Matt Tomlinson.*

Source: Bill Steele

There was an article on Sistema Huautla in the English-language Mexico News Daily by caver-reporter John Pint. It is written for a non-caving audience, but is interesting for cavers as well.

Source: https://mexiconewsdaily.com/mexicolife/the-most-magnificent-cave-on-earth

Puebla

At the beginning of Mexpé 2015, Mi Cueva was found on the east flank of Cerro Zinzintepetl, near the village of Tequixtepec. After three exploration trips, a 100 meters pit was descended, reaching a depth of 230 meters. In parallel, another entrance was explored, named Nuestra Cueva. It connected in the bottom third of the 100 meters pit in Mi Cueva. At the bottom of that pit, a river passage was explored, eventually stopping the team at a siphon at –270 meters. The resulting system was named Sistema Colectiva. A third entrance near Mi Cueva was explored and soon connected to Mi Cueva as well.

Farther to the south, another cave was discovered in a dolina. Named Cueva de las Chicas, this cave was explored and led to a connection with Sistema Colectiva in the main passage at the bottom of the 100-meter pit. As the 2015 expedition reached its end, this cave remained rigged due to having two good leads to return to.

In 2018, Mexpé base camp was set up in Tequixtepec. The first objective in Sistema Colectiva was to check the two leads left in Cueva de las Chicas in 2015. While relocating this entrance in the dense jungle, two more entrances were found. One of them, a horizontal entrance blowing good air and named Cueva de los Chicos led to a connection, after about 500 meters, with the terminal passage in Mi Cueva at a depth of 270 meters.

In Cueva de las Chicas, finally relocated, exploration of the first of the two leads, a muddy and awkward fossil passage, eventually led to a connection with Mi Cueva. Unfortunately it was upstream of the terminal sump. The second lead was checked, and it led to a connection with Cueva de los Chicos by means of a tricky, unstable shaly pit that dropped the team into the main river just before its connection with Mi Cueva.

One last lead was checked: the second entrance discovered early on in the expedition. It turned out to be a 30 meters pit that soon connected with Cueva de las Chicas.

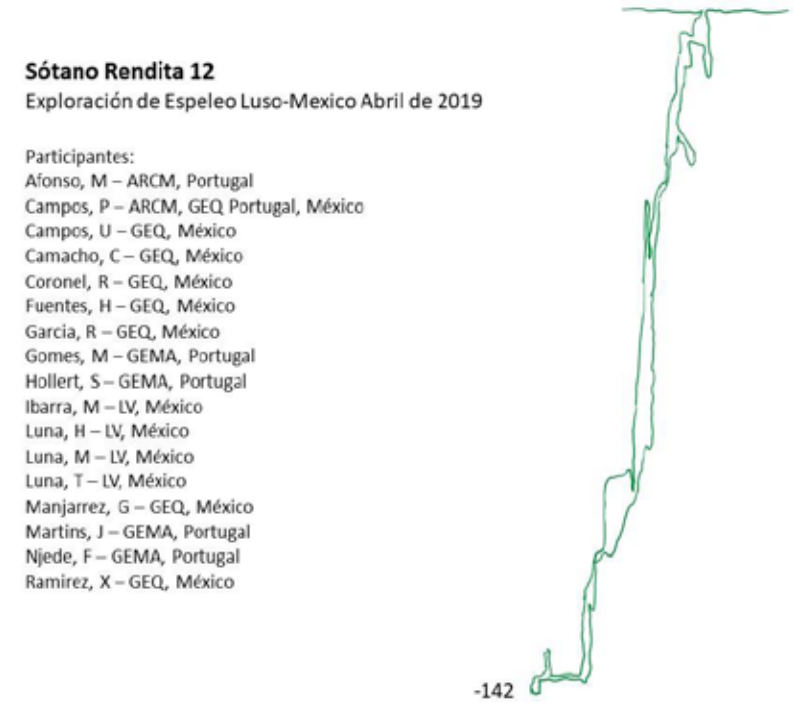
Over two expeditions, Sistema Colectiva, albeit quite modest compared to nearby Sistema Tepepa (28 kilometers) reached a length of 3.45 kilometers with a depth of 279 meters. It seems unlikely to grow. However, a few hundred meters southwest of Sistema Colectiva, various dolinas were noticed toward the end of the 2018 expedition. These dolines, in addition to some other caves being explored near the village of Tequixtepec, warrant another exploration camp—possibly a Mexpé 2020?

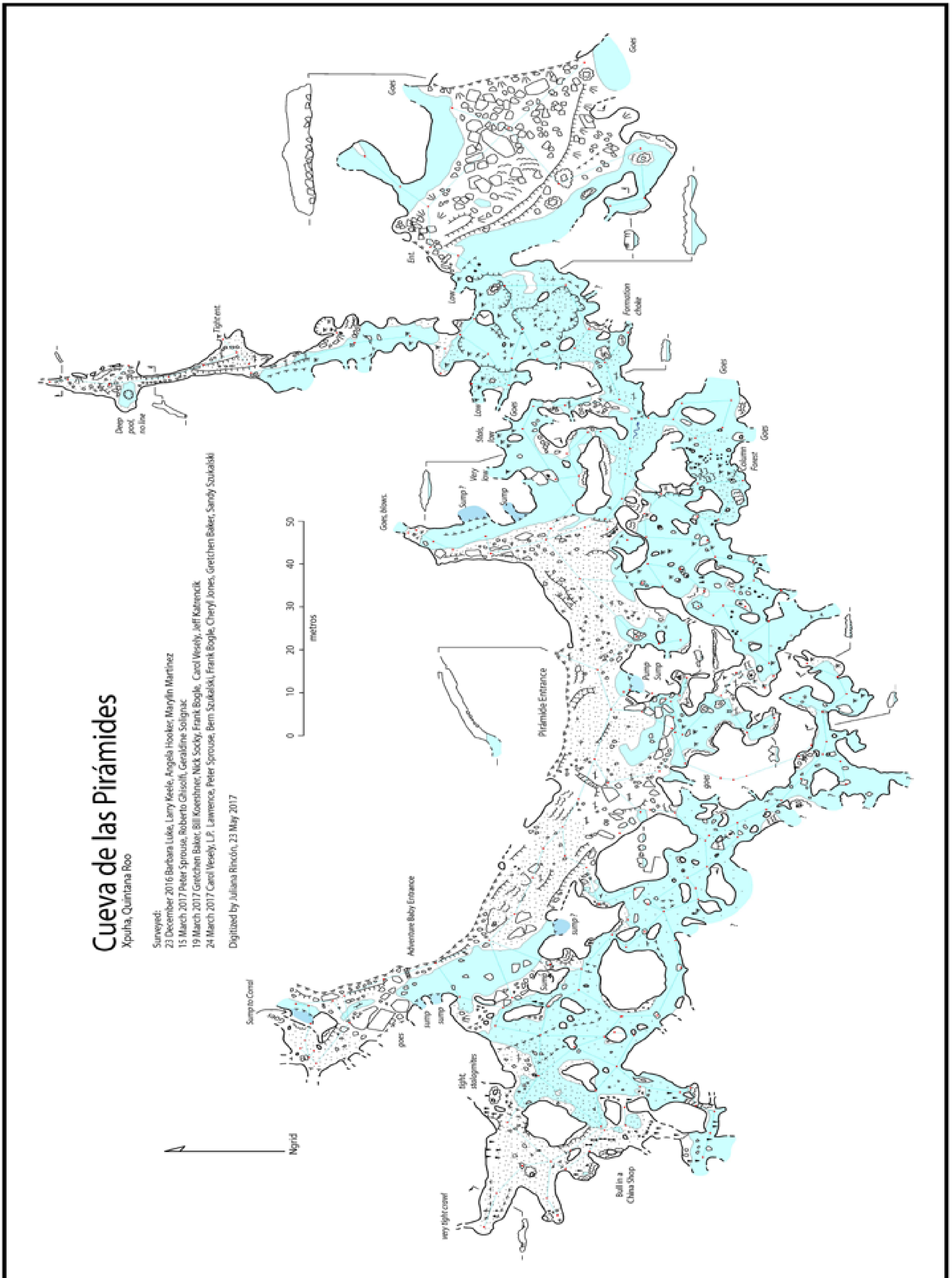
Source: Sous Terre 27, 2018. Summarized from French by Yvonne Droms.

Querétaro

Cavers with the Grupo Espeleológico de Queretaro have explored Sótano de Rendita in northeastern Querétaro to a depth of 142 meters. They were joined by two groups from Portugal, Alto Relevo Clube de Montanhismo and Grupo de Espeleologia e Montanha de Aveiro, along with the Mexican group Luna Vertical.

Source: Paulo Campos




Cueva de las Pirámides
Xpuha, Quintana Roo
Surveyed:
23 December 2016 Barbara Luke, Larry Keele, Angela Hooker, Marylin Martinez
15 March 2017 Peter Sprouse, Roberto Ghisolfi, Geraldine Solignac
19 March 2017 Gretchen Baker, Bill Koerschner, Nick Socky, Frank Bogle, Carol Vesely, Jeff Kalrencik
24 March 2017 Carol Vesely, L.P. Lawrence, Peter Sprouse, Bern Szukalski, Frank Bogle, Cheryl Jones, Gretchen Baker, Sandy Szukalski
Digitized by Juliana Rincón, 23 May 2017
0 10 20 30 40 50
metros
Ngrid
Pirámide Entrance
Adventure Baby Entrance
Sump to Corral
Goes, blows
Deep pool, no line
Tight ent.
Formation choke
Column Forest
Pump Sump
Bull in a China Shop
very tight crawl
tight, stalagmites
Goes

Quintana Roo

During 2017, divers from the Centro Investigador del Sistema Acuífero de Quintana Roo conducted exploration in Sistema Ox Bel Ha and Sistema Sac Actun. In Ox Bel Ha, about 4500 meters of new passages were explored and surveyed from the Cenote Hamaca, Cenote Xeh, Cenote Esmeralda and Cenote Yax Kai entrances. In Sac Actun, 3600 meters was surveyed from the Cenote Fenómeno entrance in an unsuccessful attempt to make an underwater connection to Sistema Dos Ojos. This connection was made separately by the GAM team (Mexico News, AMCS Activities Newsletter 41).

Source: CINDAQ 2017 report

Cueva de las Pirámides is a dry cave that is part of Sistema Ponderosa, a 22.8-km-long system that is mostly underwater. Pirámides was mapped December 2016 through March 2017 (see AMCS Activities Newsletter 40). In January 2018, Pirámides was connected to Cenote Kantun Chi and Cenote Saskaleem Ha, both of which lead to underwater segments of Sistema Ponderosa. From the Kantun Chi entrance, they mapped east along a cave-tour route to the Grutaventura entrance. Separate maps from these efforts are presented here, with some overlap.

Source: Peter Sprouse

In February 2019, Centro Investigador del Sistema Acuífero de Quintana Roo and the Mexico Cave Exploration Project conducted a 4-day exploration in Sistema Ox Bel Ha. They spent 18 hours underwater resulting in over 1500 meters of new exploration, and 600 meters of resurvey. Cenote Bevo was connected in and will provide a nice jumping off point for future efforts. The Mnemo survey device was used with excellent results.

Source: CINDAQ Facebook post 18 February 2019.

Above:
New connections in Quintana Roo. *Peter Sprouse.*

Cenote Siete Chingones.
Kent Stone.

Divers and paleontologists studying Pleistocene remains in Hoyo Negro, a natural trap in Tulum, have identified several extinct mammals previously known only from South America. These remains date from 38,400 to 12,850 years before present. It is postulated that the ursid Arctotherium wingei and canid Protocyon troglodytes may have migrated north through the Panama Isthmus due to landscape and ecological changes from Pleistocene glaciation.

Source: Blaine Schubert and co-authors; https://royalsocietypublishing.org/doi/10.1098/rsbl.2019.0148

Cenote Siete Chingones in the municipality of Benito Juárez was discovered in 2019. Initial dive exploration experienced poor visibility to a depth of 18 m, where it changed to a thin, white sulphuric cloud. At 20 meters depth the water became crystal clear. Divers kept circling around the interior of the rim until Kent Stone saw a large crack in the wall with tunnel shooting off to the right. They probed a small bit and proceeded along the crack until it opened up and went up and to the right. Jean Michel Liboiron returned to continue the exploration; no report as yet.

Source: Kent Stone

Measurements of water surface elevation (WSE) in cenotes and lagoons of the Yucatan Peninsula can be used to inform hydrological models, and to estimate hydraulic gradients and groundwater flow directions. Measurement of the water depth of these bodies can also improve current knowledge on how lagoons and cenotes

connect through the complicated submerged cave systems and the diffuse flow in the rock matrix. Unmanned aerial vehicles (UAVs) were used to measure WSE, using a radar and a global navigation satellite system (GNSS) on board a multi-copter platform. GNSS accuracy was enhanced using a differential base station. Water depth was measured using a tethered floating sonar controlled by the UAV. Accuracy of the WSE measurements was better than 5–7 cm, and accuracy of the water depth measurements was estimated to be ~3.8% of the actual water depth. UAV-borne technology was shown to be a more flexible and lower-cost alternative to manned aircraft. UAVs allow monitoring of remote areas that are difficult to access.

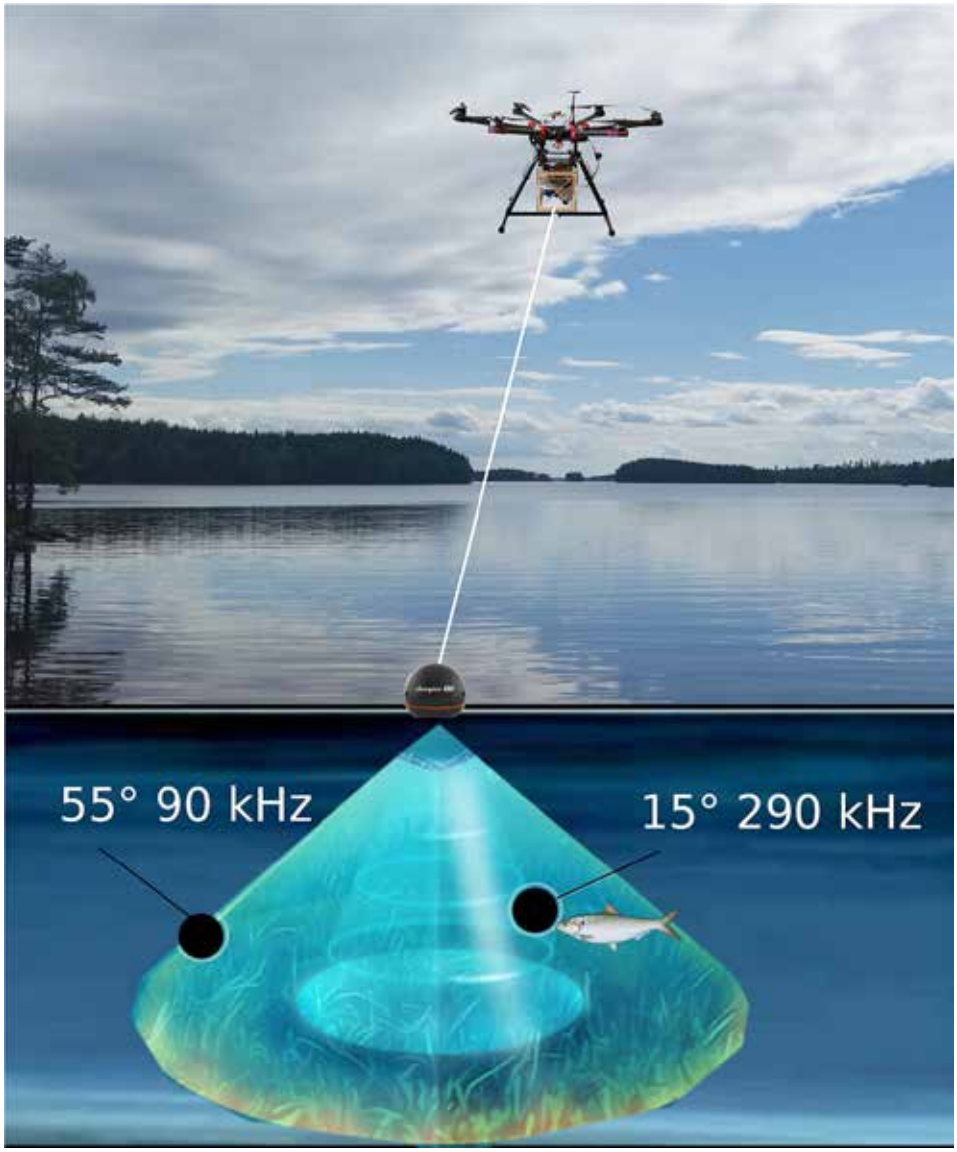


Diagram of multi-frequency tethered sonar.

Source: Filippo Bandini and co-authors. Unmanned aerial vehicle observations of water surface elevation and bathymetry in the cenotes and lagoons of the Yucatan Peninsula, Mexico

https://link.springer.com/article/10.1007/s10040-018-1755-9

Gruta del Tigre is a cave upstream of Xcaret that extends underneath Highway 307. It was mapped by Christian Thomas and the Fédération Française de Spéléologie in 2001. Much of this cave is now part of the Xplor adventure park, with hundreds of tourists a day swimming through a canal passage that was deepened by excavation. A section off of the tourist canal that is not open to the public was mapped in December 2016 and January 2017. Although it was not possible to tie this part of Xplor into the FFS survey of Tigre due to the extensive changes from development, this new survey appears to extend off of the southernmost point of the previous survey. The new survey effort resulted in 1853 m mapped, trending south and southwest from the tour route. Most of this passage was floored with water. In some areas, vehicles could be heard overhead, and small debris cones of material fallen from the ceiling indicated that the thin roof may collapse sometime soon.

Source: Peter Sprouse

A new species of extinct Pleistocene cat, Panthera balamoides, has been described from a humerus found in The Pit, a natural trap entrance to Sistema Sac Actun. Other remains recovered from the site include two felid clavicles that have been identified as Panthera atrox, while a humerus fragment from the Kim Ha cave near Tulum likely corresponds to Smilodon gracilis. Panthera balamoides lines up with other likely endemic mammals in the region, which suggest that at least northern Quintana Roo, if not the entire Yucatan peninsula, may have been ecologically isolated during the Pleistocene, due to the repeated expansion of grassland.

Source: Sarah R. Stinnesbeck and co-authors. Panthera balamoides and other Pleistocene felids from the submerged caves of Tulum, Quintana Roo, Mexico

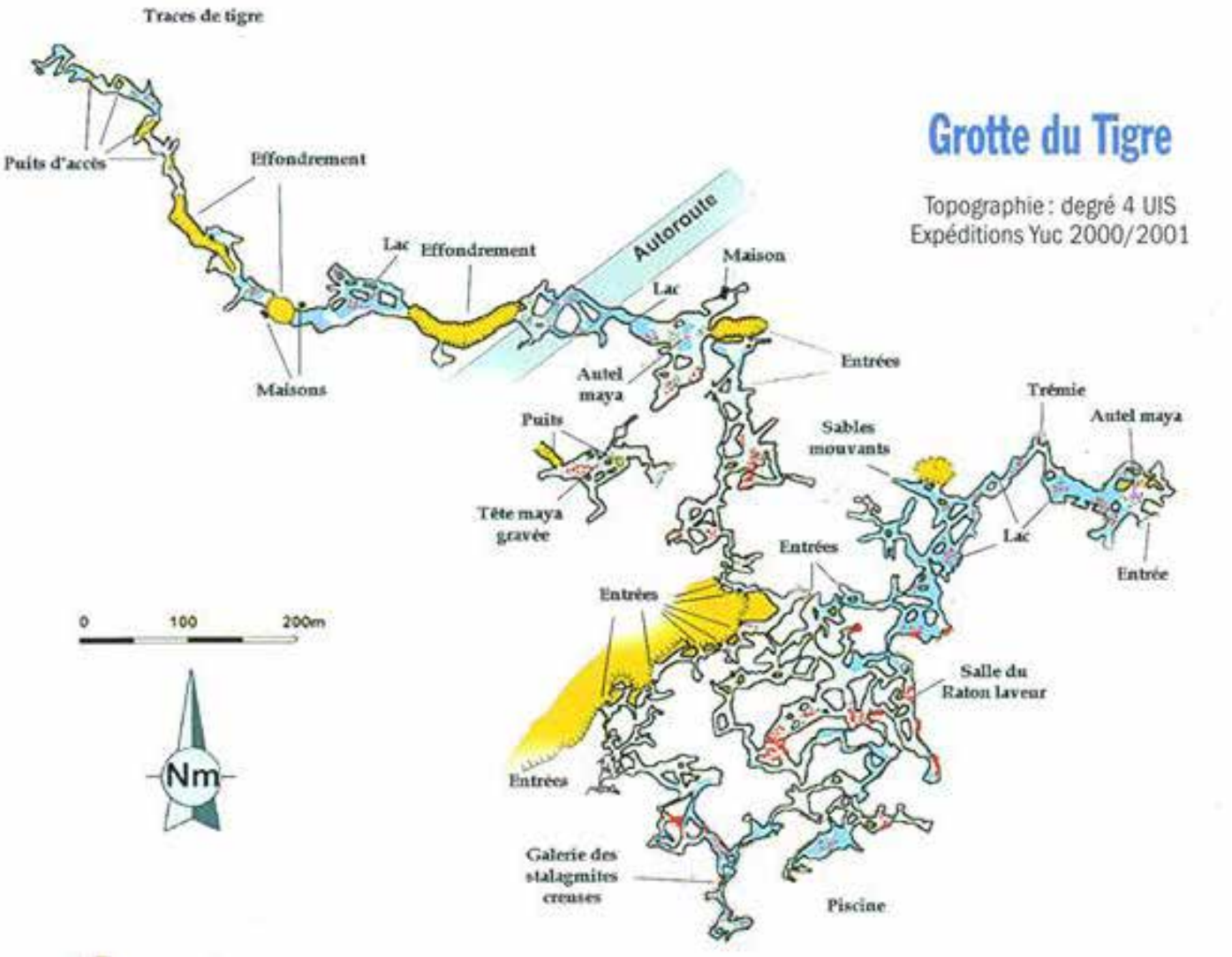
https://www.tandfonline.com/doi/abs/10.1080/08912963.2018.1556649

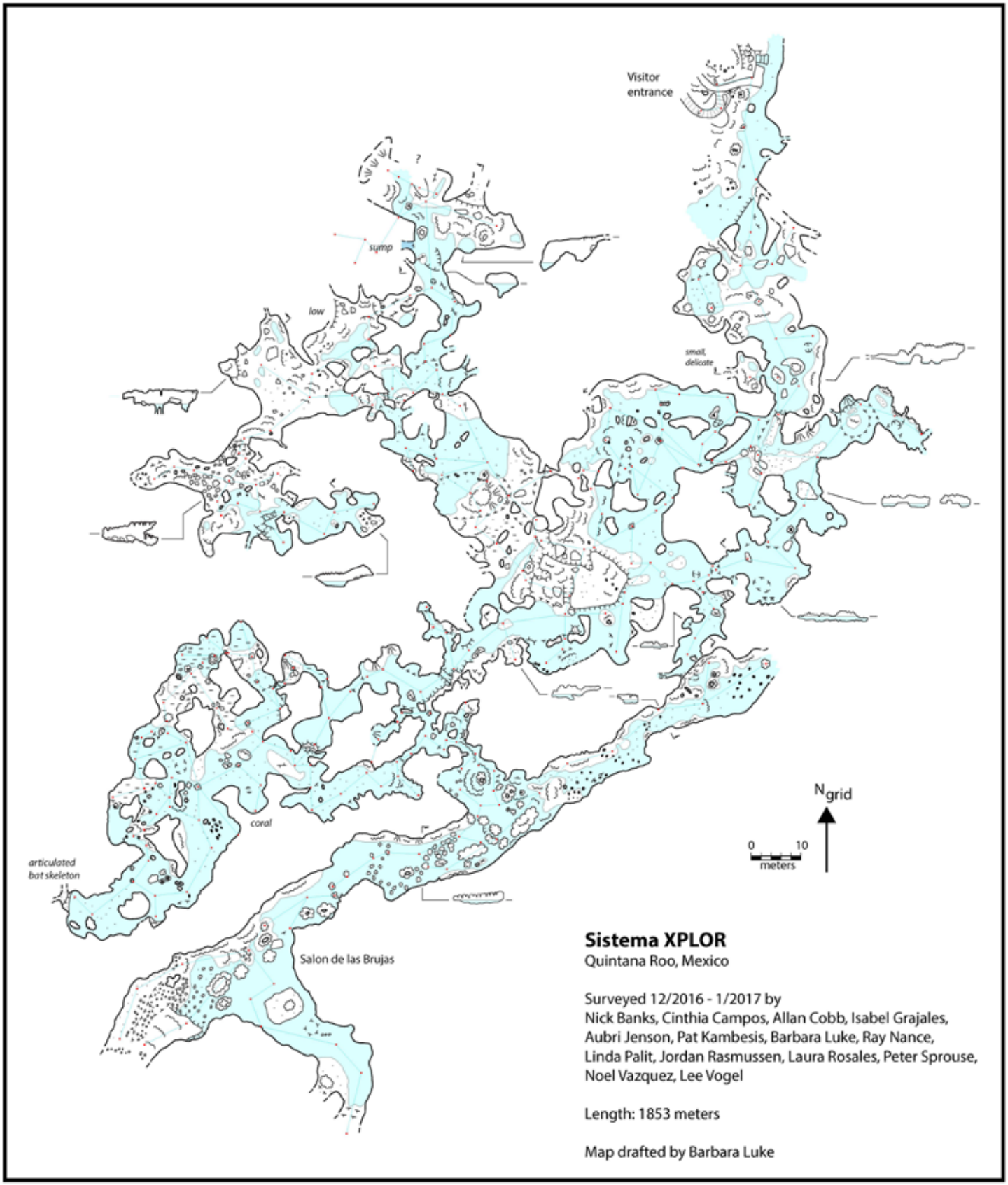
Yucatán

A team of archeologists led by Guillermo de Anda have opened up a cave previously sealed by archeologists in 1966. Beyond low belly crawls, Balamku contains 155 artifacts, some with faces of the Toltec rain god Tláloc. Also found were incense burners, plates, grinding stones, spindle whorls, and jade objects.

Source: Gena Steffens;

https://www.nationalgeographic.com/culture/2019/03/maya-ritual-balamku-cave-stuns-archaeologists/




Visitor entrance
sump
low
small, delicate
coral
articulated bat skeleton
Salon de las Brujas
N grid
0
10
meters
Sistema XPLOR
Quintana Roo, Mexico
Surveyed 12/2016 - 1/2017 by
Nick Banks, Cinthia Campos, Allan Cobb, Isabel Grajales, Aubri Jenson, Pat Kambesis, Barbara Luke, Ray Nance, Linda Palit, Jordan Rasmussen, Laura Rosales, Peter Sprouse, Noel Vazquez, Lee Vogel
Length: 1853 meters
Map drafted by Barbara Luke

LONG CAVES OF MEXICO

Cave	State	Legnth
Sistema Sac Actun (+Dos Ojos)	Quintana Roo	371958
Sistema Ox Bel Há	Quintana Roo	271026
Sistema K'oox Baal (+Tux Kupaxa)	Quintana Roo	100431
Sistema Purificación	Tamaulipas	94889
Sistema Huautla	Oaxaca	88707
Sistema Xunaan-Há (María Isabella, 3B) - Tixik K'una - Templo	Quintana Roo	60445
Sistema Cheve	Oaxaca	55007
Sistema Yok Ha' Hanil (Río Cristal, Pool Tunich, Río Secreto, Río Escondido)	Quintana Roo	51911
Sistema Toh Há	Quintana Roo	47746
Sistema Garra de Jaguar (Jaguar Claw)	Quintana Roo	47279
Cueva del Tecolote	Tamaulipas	40475
Sistema Cuetzalan (Chichicasapan+San Miguel)	Puebla	37676
Sistema Oztotl (Rosetta-Tepetzala)	Puebla	34188
Kijahe Xontjoa	Oaxaca	31373
Sistema Tepepa (Ehécatl+Niebla+Xalltégoxtli+Pozo 4)	Puebla	29401
Sistema Caterpillar	Quintana Roo	28253
Sistema Soconusco - Aire Fresco	Chiapas	27793
Sistema Sand Crack	Quintana Roo	26746
Sistema Nohoch Pek	Quintana Roo	25161
Sistema Coyolatl-Esperanza (TZ57)	Puebla	22221
Sistema PonDeRosa (Pondazul, Edén)	Quintana Roo	22167
De Gamile Chine Xao (Chjine Xjo, Xine Xao)	Oaxaca	19515
Sistema Aerolito	Quintana Roo	18288
Sistema Nohoch Kai	Quintana Roo	17498
Sistema Zapote (Toucha-Há - Vaca Há - Ich Tunich)	Quintana Roo	16768
Sistema Doggi	Quintana Roo	16308
Entrada Caapechen (Cenote Manatí)	Quintana Roo	15638
Cueva de Alpazat	Puebla	15200
Sistema J2 (Ozto J2 (Faustino, Barbie) + Last Bash (Hija Puta))	Oaxaca	14840
Sistema Murena - Aak Kimin (Yal Ku Lagoon)	Quintana Roo	14269
Sistema Dos Pisos (Ka'p'el Nah)	Quintana Roo	14176
Sistema Sac Muul	Quintana Roo	13674
Sistema Camilo	Quintana Roo	13442
Sistema Sac Kai (Paachil Nah)	Quintana Roo	13209
Sistema Zumpango (+ Sistema Texcoco)	Quintana Roo	13204
Sistema Chango Místico	Quintana Roo	12006
Pixan Bel	Quintana Roo	11899
Sistema Atepetaco (Miquizco + Viento + Mama Mia)	Puebla	11876
Cueva Quebrada - Sistema Dos Coronas	Quintana Roo	11555
Entrada Boca Paila	Quintana Roo	11402
Sistema MOAC	Quintana Roo	11369
Sistema Cupul Ha	Quintana Roo	11153
Atlixicaya	Puebla	11120
Sistema Chac Mool (Chac-Mol - Mojarra)	Quintana Roo	11103
Sistema Río La Venta	Chiapas	11020
Sistema San Andrés	Puebla	10988
Sistema Quijada de Jaguar (Jaguar Jaw)	Quintana Roo	10900
Cueva de la Mano	Oaxaca	10841
Sistema El Puente	Quintana Roo	10474
Actun Káua	Yucatán	10360

DEEP CAVES OF MEXICO

Cave Name	State	Depth
Sistema Huautla	Oaxaca	1560
Sistema Cheve	Oaxaca	1524
Cueva Charco	Oaxaca	1278
Sistema J2 (Ozto J2 (Faustino, Barbie) + Last Bash (Hija Puta))	Oaxaca	1229
Akemati - Akemasup	Puebla	1226
Kijahe Xontjoa	Oaxaca	1223
Sistema Nogochl (Olbastl Akemabis - El Santito)	Puebla	1182
Sistema Ocotempa (OC3 + OC11)	Puebla	1070
Soncongá	Oaxaca	1014
Sistema Tepepa (Ehécatl + Niebla + Xalltégoxtli + Pozo 4)	Puebla	968
Sistema Purificación	Tamaulipas	957
Guixani N'dia Kijao (Guinjao)	Oaxaca	955
Sistema Perrito (Nia Quien Nita + Nia Nga'co Nita)	Oaxaca	906
Resumidero de la Joya Jonda (Hoya Honda)	San Luis Potosí	895
Nita Chó	Oaxaca	894
Sistema Oztotl (Rosetta -Tepetzala)	Puebla	878
Sótano de El Berro	Veracruz	838
Sótano de Trinidad	San Luis Potosí	834
Hard Rock Cave	Oaxaca	830
Resumidero El Borbollón	San Luis Potosí	821
Las Tres Quimeras	Puebla	815
X'oy Tixa Nita	Oaxaca	813
Yuá Nita	Oaxaca	789
Nita Ka	Oaxaca	760
Sistema H31-H32-H35	Puebla	753
Sonyance	Oaxaca	740
Nita Xongá	Oaxaca	739
Aztotempa	Puebla	700
Sótano de los Planos	Puebla	694
Sótano de Alfredo	Querétaro	673
Cueva Santo Cavernario+Tototzil Chichiltic	Puebla	667
Sistema de los Tres Amigos (Te Chan Xki)	Oaxaca	659
Sistema Cuetzalan (Chichicasapan+San Miguel)	Puebla	658
Cueva Tipitcli (Tipitli)	Puebla	653
Sótano de Tilaco	Querétaro	649
Nita Nashi	Oaxaca	641
Cuaubtempa Superior	Puebla	640
Oztotl Altepetlacac (Cueva Paisano)	Puebla	638
Sistema Soconusco - Aire Fresco	Chiapas	633
Sistema Atlalaquía	Veracruz	623
Cueva de Diamante	Tamaulipas	621
Sistema Coyolatl-Esperanza (TZ57)	Puebla	620
R'ja Man Kijao (Nita)	Oaxaca	611
Sistema Coatlicue-Tlalocan	Puebla	600
Nita He	Oaxaca	594
Meandro Que Cruce (Meandre Qui Traverse, H54)	Puebla	588
Olbastl Koltik (Sótano Tío Chueco)	Puebla	587
Yometa	Puebla	582
Sótano de las Coyotas	Guanajuato	581
Sistema Los Toros	Nuevo León	576

DEEP PITS OF MEXICO

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

CUEVA LA ZUMBADORA

Jessica Gordon

On October 7-8, 2018 a group of us went to the quaint little town of Lamadrid, Coahuila, Mexico in order to gain access to Cueva la Zumbadora. The cave is named for the rumbling sound from the waterfall inside the cave. In March 1997, divers James Brown and Tom Morris had explored and mapped the submerged passage upstream of the waterfall, but they hadn't mapped from the entrance of the cave to the sump. Our mission was threefold: (1) map the cave from the entrance to the sump; (2) conduct a biological inventory of the cave; and (3) collect water samples to determine if aquatic salamanders (Eurycea sp.) or Mexican blindcats (Prietella phreatophila) could be detected using environmental DNA (eDNA) techniques.

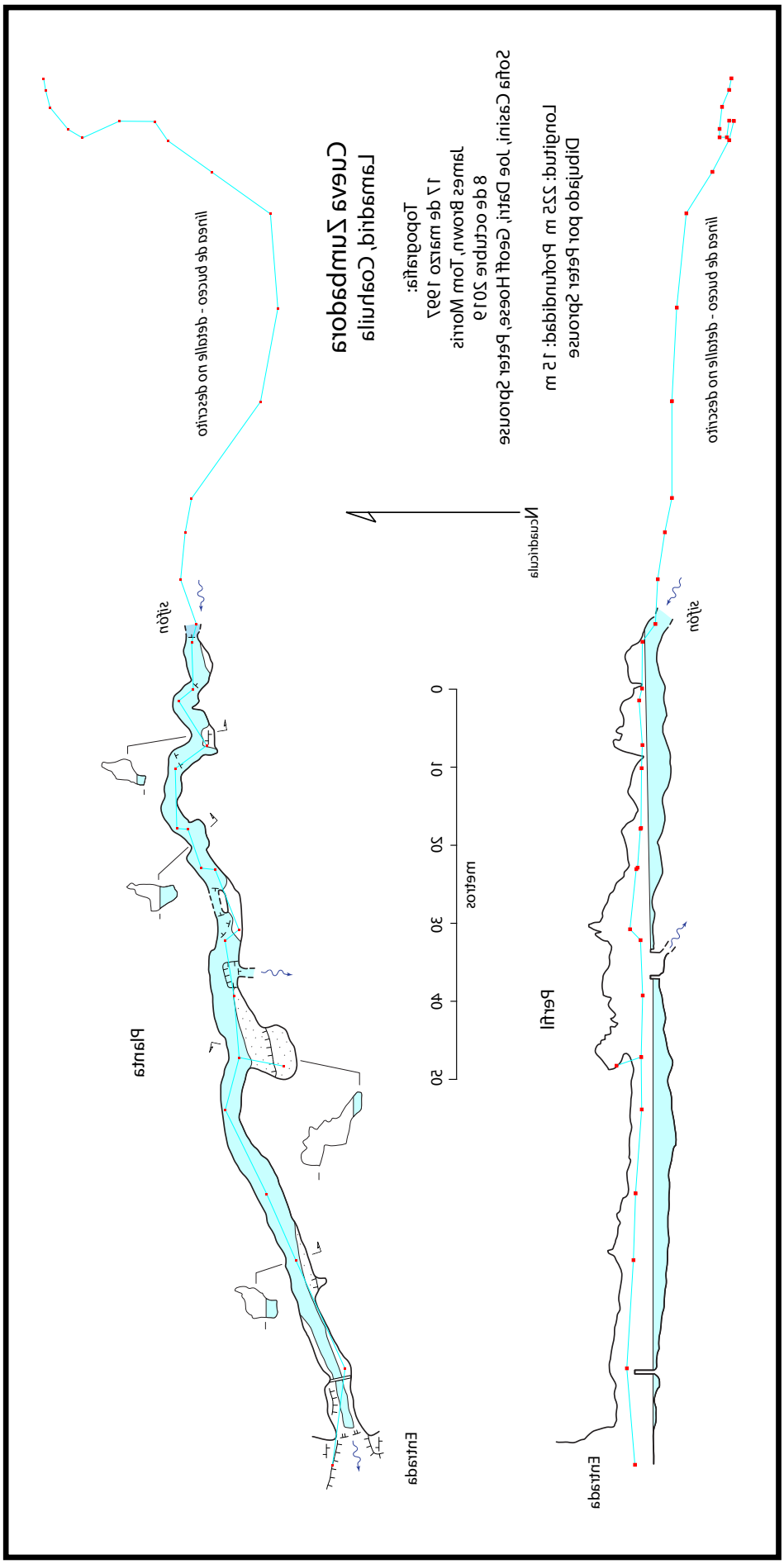
Entrance to Cueva La Zumbadora. *Peter Sprouse.*

We were excited to explore the only known locality for Speocirolana zumbadora, a stygobitic cirolanid isopod. This endemic species is only known from one damaged specimen that was collected from Cueva la Zumbadora (the specimen is described in Botsaneau, Iliffe, and Hendrickson 1998). We wanted to try to collect more specimens for potential molecular analysis.

Jessica Gordon searching for aquatic salamanders, cirulanid isopods, and Mexican blindcats. *Geoff Hoese.*

Caving in Mexico teaches you the value of patience, endurance, and four-wheel drive. We experienced a few bumpy roads and flat tires along the way. It took a couple of days to get the key to the many locked gates between us and the cave, and arrange guides who could enable us to gain access to lands we had to travel through to get to the cave. When we first arrived in Lamadrid, a drunk stumbled up to us and kindly offered to be our guide, but we decided to wait for our previously arranged contacts. Some of our team had to return home during our second day of waiting so they were not able to go to the cave with us. While we were waiting on the curbside on the second day, a family invited us into their home.

The family was excited to hear we were going to Cueva la Zumbadora. They told us how much they enjoyed going to the beautiful Cascada de Lamadrid, the waterfall in the arroyo downstream from the cave. They


Cueva Zumbadora
Lamadrid, Coahuila
Topografía:
17 de marzo 1997
James Brown, Tom Morris
8 de octubre 2019
Sofia Casini, Joe Datri, Geoff Hoese, Peter Sprouse
Longitud: 225 m Profundidad: 15 m
Dibujado por Peter Sprouse
Norte cuadrícula
0
10
20
30
40
50
metros
Planta
Perfil
Entrada
Entrada
sifón
sifón
línea de buceo - detalle no descrito
línea de buceo - detalle no descrito

Making new friends while waiting by the side of the road. *Jessica Gordon.*

showed us photos of the waterfall, let us see their incredible collection of fossils from the area, and shared stories of their family's history on the land and father's involvement in building the canal to divert the water to their town. There had been an attempt to divert the water from the cave. However, when they realized that the water was the same water that traveled underground and provided the main water source for Lamadrid, that project was abandoned. The family couldn't believe we had planned to hike all the way to the cave. They told us what an incredibly long hike up the mountain it would be and that we were crazy to consider it. Fortunately, there were two routes to the cave. One route involved what sounded like a death march up the canyon from the waterfall. The other route entailed driving on a rocky, four-wheel-drive road up and down mountains for several hours, passing through many locked gates, and then hiking down to the cave from above.

A little before 12:45 p.m., the guides arrived with the infamous key. We drove out of town and started down a rocky road through the Ocotillo Mountains. We realized the importance of the key as it enabled us to get through approximately ten locked gates. We crossed seven streams as we went up and down the stunningly beautiful mountains and various montane ecosystems.

We made it to the ranch around 4:20 p.m. and started our hike along the windy creek down to the entrance of the cave. To enter the cave, we climbed over a dam wall. Peter Sprouse started sketching the cave, while Joe Datri and Sofia Casini set stations. Amy Grossman and Crystal Datri assisted Jessica Gordon with collecting water samples that would later be analyzed for eDNA. After collecting the water samples, Amy and Crystal exited the cave while Geoff Hoese and Jessica continued their search for cirolanid isopods, Mexican blindcats, and other cave creatures.

There was a strong current and rapids near the waterfall. Geoff and Jessica carefully navigated through the water to the sump located upstream of the waterfall. Geoff dove underwater and found the guide line from the divers who had previously mapped a portion of the submersed passage. When the mapping team caught up with the biology team, Geoff described where he found the guide line. Peter came up with a creative way to connect his new survey to the underwater station. He asked Geoff to take a piece of guide line underwater to the submersed station while Sofia held the other end of line at the last station she set, which was the station closest to the sump. When Geoff returned from his free dive, we measured the length of the line from the last station above water to the underwater station by stretching it out from two points above the water and using the DistoX2 to measure the distance. Then, Geoff pointed the DistoX2 from the last station above water to the first station underwater to determine the azimuth and inclination.

Our surface crew, consisting of Aimee Beveridge; Ben, Eliot, and Geo Reynolds; Patrick Datri; and Sarah, Stephen, and Jacob Howard had a wonderful time splashing and swimming in the creek while the rest of the team explored the cave. We hiked back to the vehicles at sunset and made it back to the main road around 11 p.m. We did not find cirolanid isopods, aquatic salamanders, or Mexican blindcats on this trip, likely due to high water flow, but we are optimistic that we will discover some on our next adventure.

Un grupo de espeleólogos y sus familias regresa a Cueva La Zumbadora en Lamadrid, Coahuila. Sus metas incluyeron topografiar la cueva desde la entrada hasta el sifón, cumplir un inventario biológico, y recolectar muestras de agua para probar la presencia de especies kársticas - salamandras acuáticas (Eurycea sp.) o bagres ciegos (Prietella phreatophila) - usando ADN ambiental.

THE CATFISH CAVES OF ACATLÁN, OAXACA

Reviving cave surveys from long ago

William R. Elliott

Northern Oaxaca's Municipio Acatlán de Pérez Figueroa has at least three blind catfish caves. These interesting caves were explored and studied in the 1970s, but the survey notes were lost or forgotten. Based on rediscovered notes and plots, I recently drafted the maps of Cueva del Nacimiento del Río San Antonio (CNRSA) and Cueva de Las Maravillas. A third cave nearby, Cueva de la Finca, needs re–mapping.

The three catfish caves are in a low sierra south of Acatlán, with elevations of 100–650 meters, but it is not named on maps from INEGI, the Mexican mapping agency (see area map). To the northwest the range is called the Sierra Tlacuiloteca. Two rivers flow through the pass containing the small town of Las Maravillas. Río Cosolapa and Río Juan Sánchez both flow from near Almolonga to near Acatlán, then through a pass to join at La Junta. The Cosolapa then turns south and empties into the northern part of Miguel Alemán reservoir 16 kilometers away (off the area map). Río San Antonio resurges on the south side of the ridge near Campo Chico at Cueva del Nacimiento del Río San Antonio, and flows southeast for 6 km to the northeastern side of Miguel Alemán. So, the Cosolapa/Juan Sánchez and the San Antonio rivers are separated by a ridge, but in karst there could be groundwater connections, and the rivers are close together in the La Junta area. During floods the waters may mix in the valleys. This situation may be the ancestral source of catfishes and crustaceans that colonized the local caves.

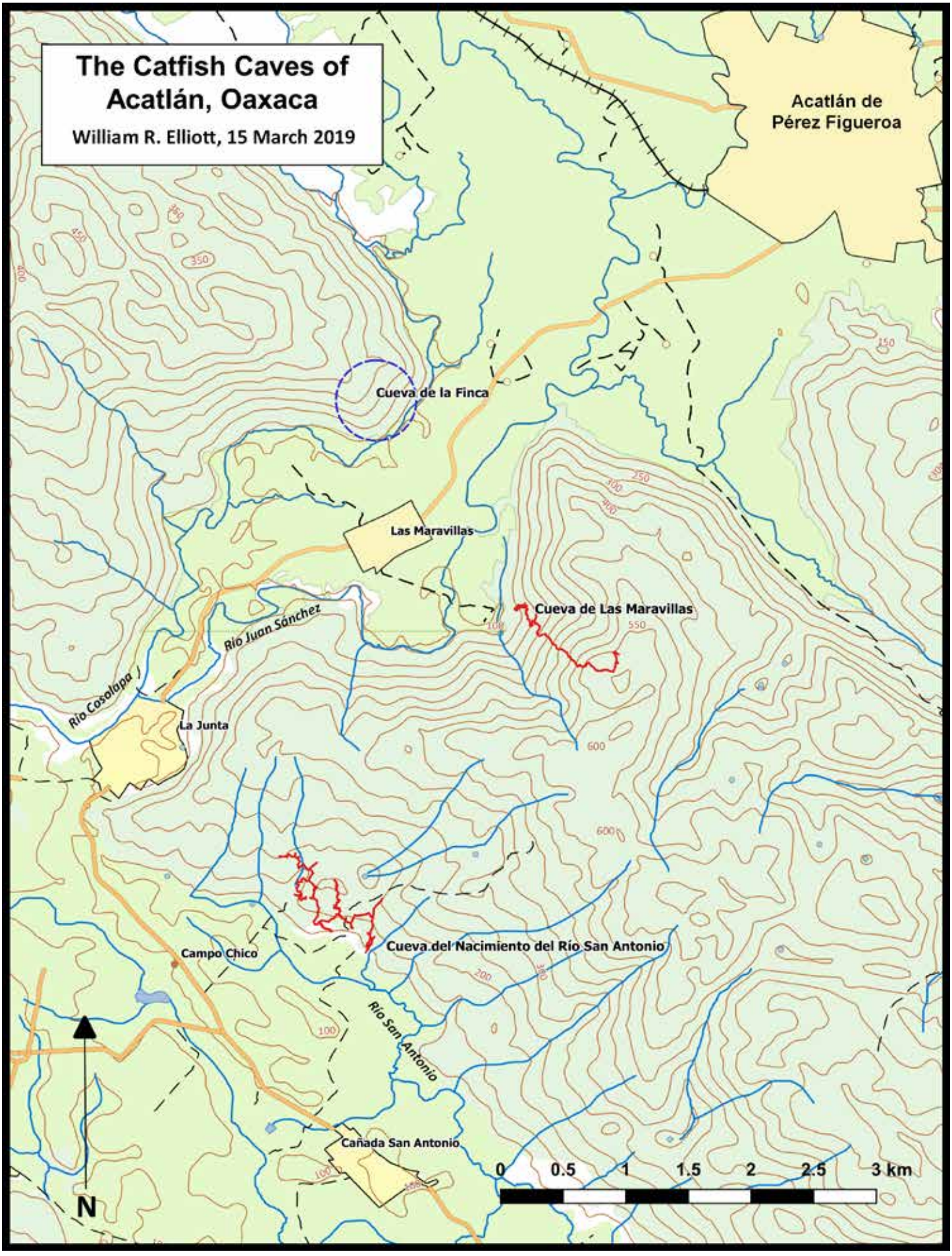
Another resurgence cave, Cueva de Almolonga (Juan Sánchez), is 10 kilometers northwest of Actalán, but no catfish have been reported there yet.

Included here are two cave maps and two area maps from my GIS project to help readers understand the area's hydrogeology. The northern part of the area is covered by the INEGI 1:50000 topographic shapefile, Vicente Camalote E14B68, and on the south by Tierra Blanca E14B78. I used WallsMap and QGIS programs for regional mapping. I hope this article will inspire cavers to map Cueva de la Finca, add to CNRSA and Las Maravillas, and search for other catfish caves.

Cueva del Nacimiento del Río San Antonio

I helped map CNRSA in 1973–74. This is an important cave for several reasons, and some of us have long wanted to see the map published (Reddell and Elliott, 1974). Logan McNatt discovered David McKenzie's notes from Survey 1 and a pencil draft of the whole cave in his papers after David's untimely death in 2017. Logan

Rhamdia reddelli, cave catfish, 69 mm long, 1977. *William R. Elliott*


The Catfish Caves of Acatlán, Oaxaca
William R. Elliott, 15 March 2019
Acatlán de Pérez Figueroa
Cueva de la Finca
Las Maravillas
Cueva de Las Maravillas
Río Juan Sánchez
Río Cosolapa
La Junta
Campo Chico
Cueva del Nacimiento del Río San Antonio
Río San Antonio
Cañada San Antonio
N
0 0.5 1 1.5 2 2.5 3 km

and Bill Mixon scanned the pencil draft on a large scanner. I was able to process Survey 1 in Walls from scanned notes. Survey 2, which I was on, was never found, so I did a virtual desktop survey from the image of the pencil draft to recreate the Survey 2 notes, except that inclination data and cross–sections were absent. However, the back of the cave has a series of level pools, and there is little vertical change there. My recreated survey does not precisely fit the hand–drafted map, but it is a good map with many details. I finished a digital draft after many months of work using Walls and Adobe Illustrator.

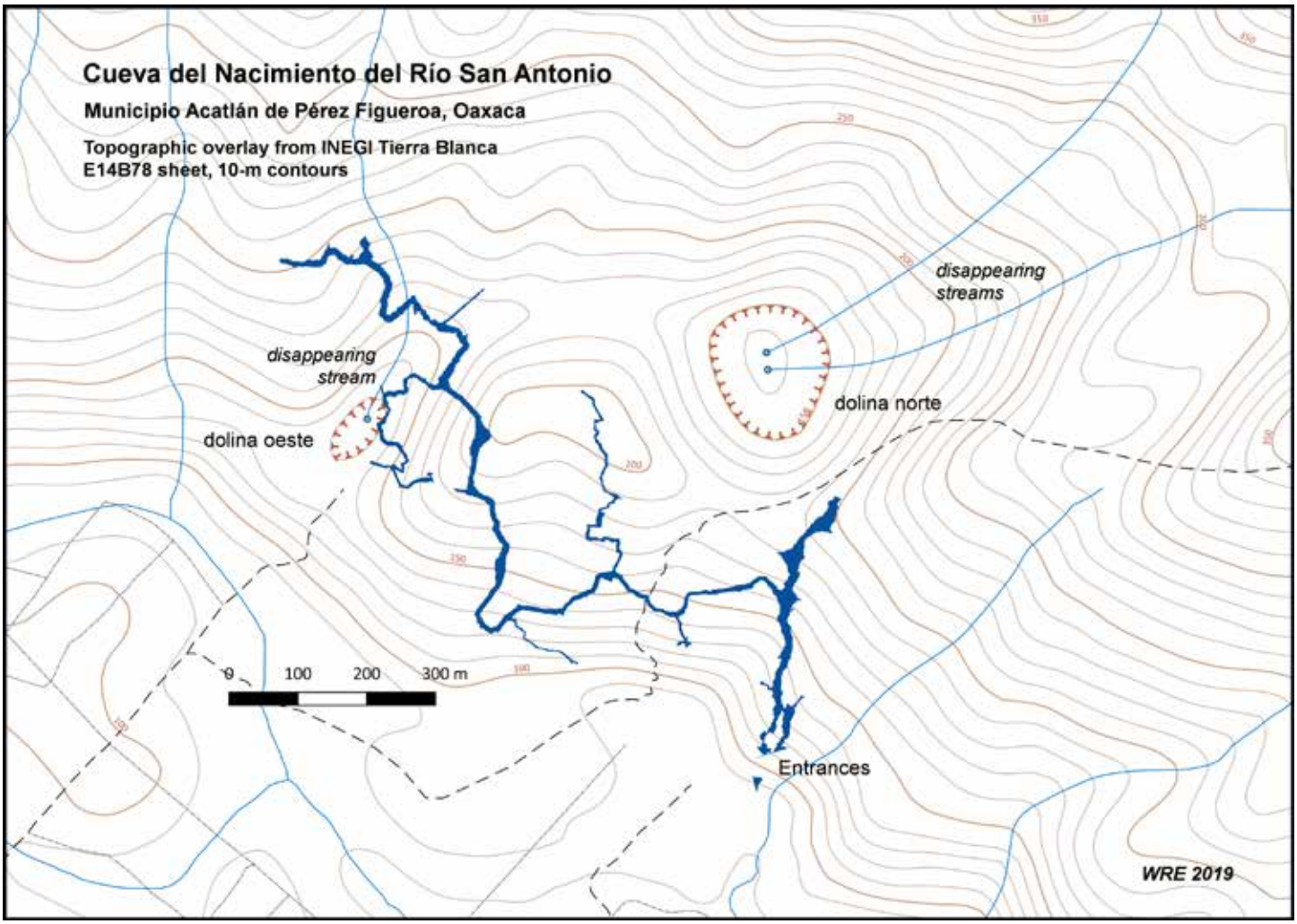
The team of David McKenzie, Stuart Murphy, James Reddell, Mary Butterwick, and Martha Helen McKenzie (David's sister) explored the cave and collected catfishes and other fauna in late 1972. Survey 1 began on January 4, 1973; Suunto and tape were used to map about half of the cave. The team was guided by a report from Peter Strickland and Jim and Julie Rodemaker describing how to get past a blockade in the entrance passage.

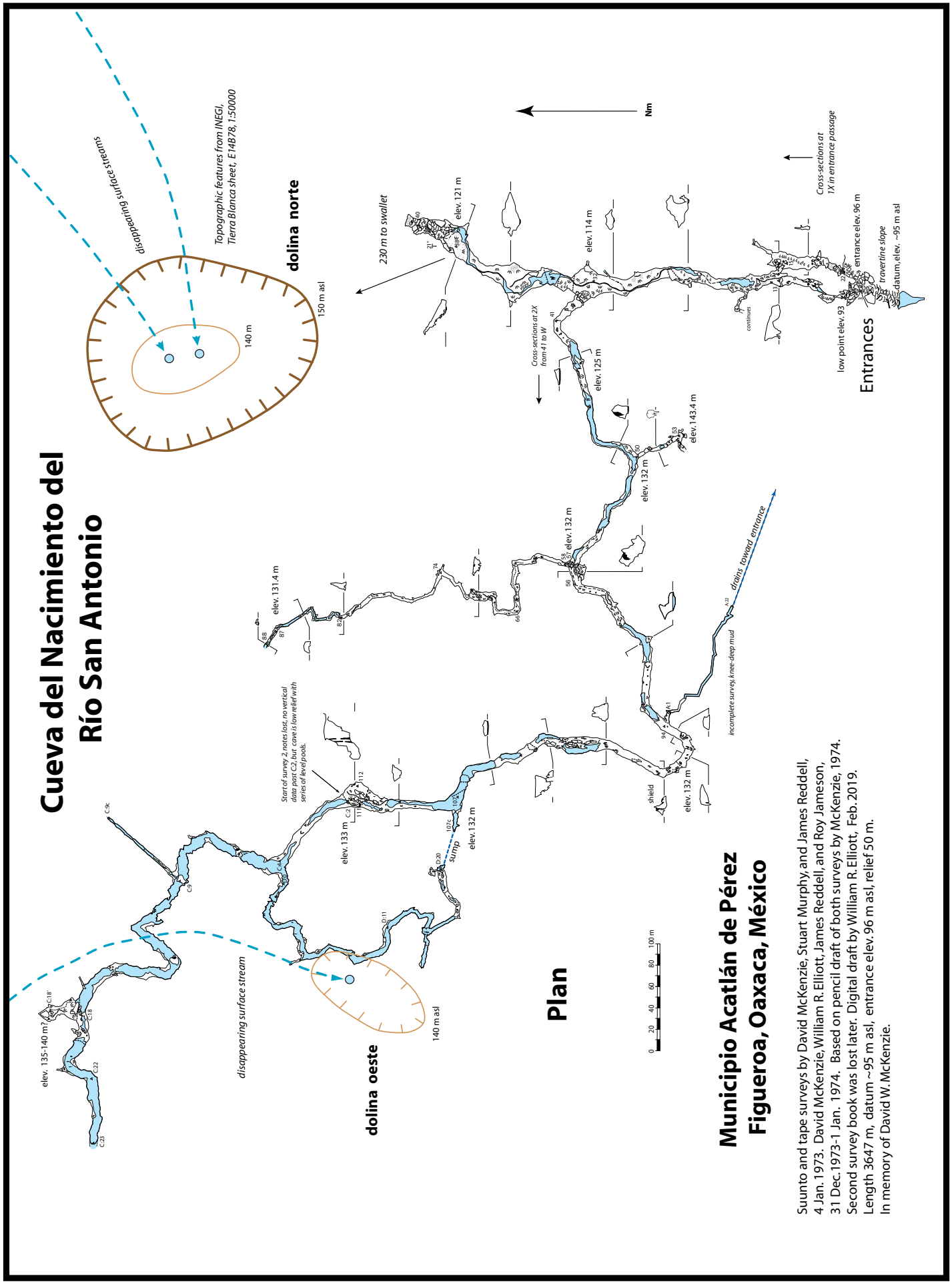
Survey 2 was by David McKenzie, William R. Elliott, James Reddell, and Roy Jameson, on December 31, 1973– January 1, 1974. I remember this grueling trip to a beautiful cave with endless pools, lots of speleothems, and blind catfish and crayfish! I especially remember slogging into knee-deep, sucking mud, shown on the cave map as Stations A:1 to A:22. This passage drains toward the entrance, and represents the cave's bottom sump, which is filling with sediment. The Survey 2 notes were lost later, but maybe they will turn up with further searching. During a search for them I found the missing notes for Cueva de Las Maravillas (below).

The cave begins at two dry entrances a few meters up a travertine slope from a pool, which is considered the nacimiento. The survey datum is at the north edge of the pool at about 95 meters asl (above sea level). The left entrance elevation (Station 3) is at 96 meters asl, and total relief within the cave is about 50 meters. The right entrance is close by, but higher at about 124 meters asl (Station 22). I have marked key survey stations on the map for future surveyors. These stations may not be legible on the printed map, but PDFs of these cave maps allow one to zoom in, and they will be available for those who are interested.

A few meters inside the left entrance is an access to the water course, the low point of the cave, which apparently accepts drainage both from the major "dolina norte" past the end of the entrance passage, and the sucking mud sump at A:22. Dolina norte is a large swallet for two disappearing streams, according to INEGI's topo map (see cave map and topographic map overlay).

The main passage of this attractive cave extends for about 120 meters to





Suunto and tape surveys by David McKenzie, Stuart Murphy, and James Reddell, 4 Jan. 1973. David McKenzie, William R. Elliott, James Reddell, and Roy Jameson, 31 Dec. 1973-1 Jan. 1974. Based on pencil draft of both surveys by McKenzie, 1974. Second survey book was lost later. Digital draft by William R. Elliott, Feb. 2019. Length 3647 m, datum ~95 m asl, entrance elev. 96 m asl, relief 50 m. In memory of David W. McKenzie.

a deep lake containing many blind catfishes and crayfishes. Beyond this lake a shallow stream extends for 350 meters in a passage 10 to 30 meters wide and up to 11 meters high. Several major side passages that contain secondary streams occur throughout the cave and bring the total length of the cave to 3647 meters.

In the western section of the cave, at Station D:11, there must be water input from what I call "dolina oeste," seen on the topo map. The bottom of this dolina must be close to stream level.

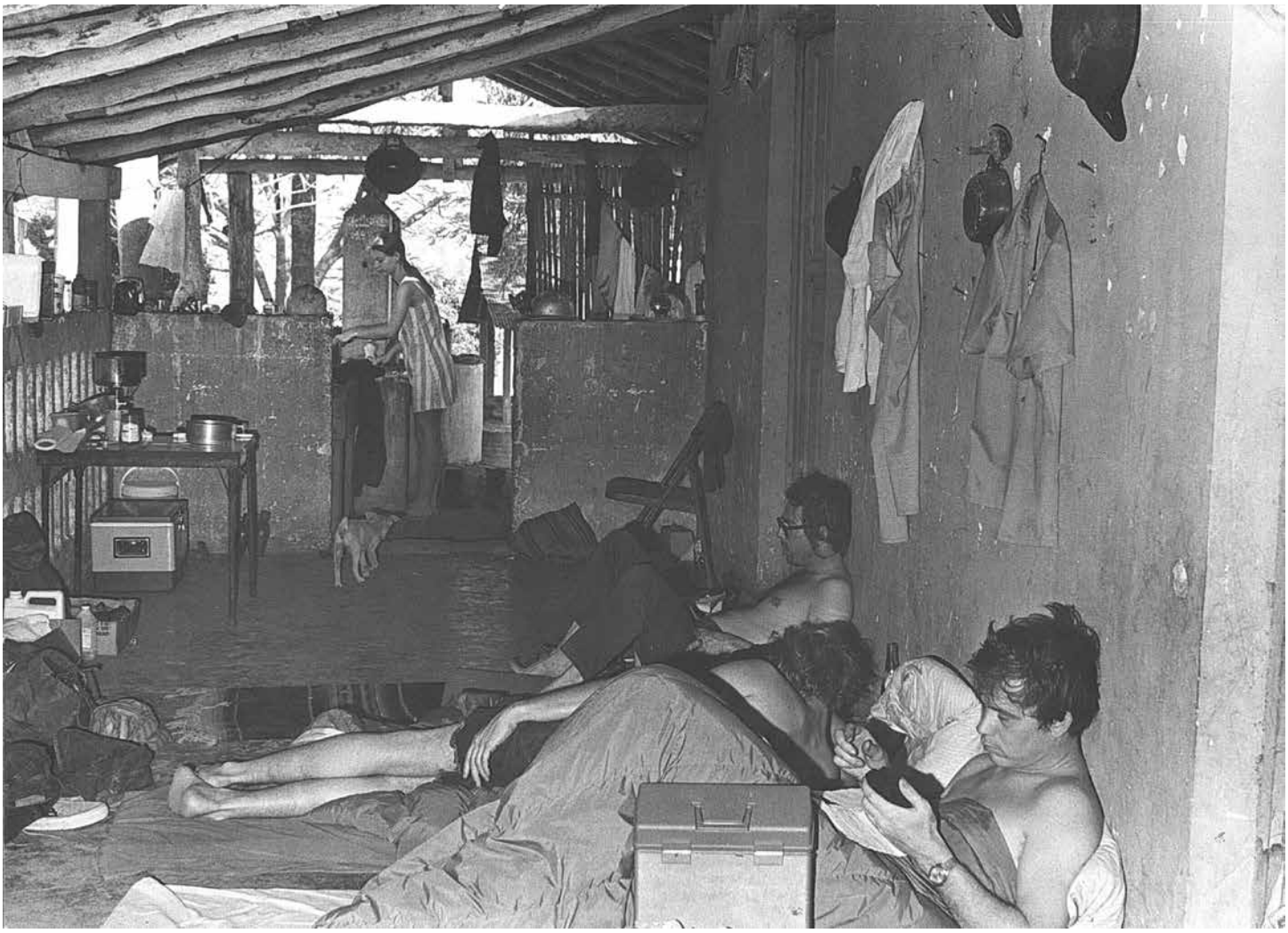
CNRSA is close to the surface. The dry, left–hand passage leading to Station 53, must come close to the surface at a calculated 143.4 meters elevation. I had calculated the entrance location from Mejia–Ortíz's 2005 study on cave crayfishes. This indicates that we may have the entrance located too far south, as this portion of the cave would otherwise project out of the overlying contour line at 130 meters! So, the entrance may be at least 30 meters north of where I placed it now.

The main stream floor is generally of sand and gravel with areas of flowstone and bedrock. Both air and water temperatures were 23.5° C. The catfish usually occur in the deeper ponded portions of the streams, especially in areas under bat roosts (Reddell, as reported in Miller 1984, with my corrections). This is a great cave, but unfortunately we have no photos of it, and we need a GPS fix!

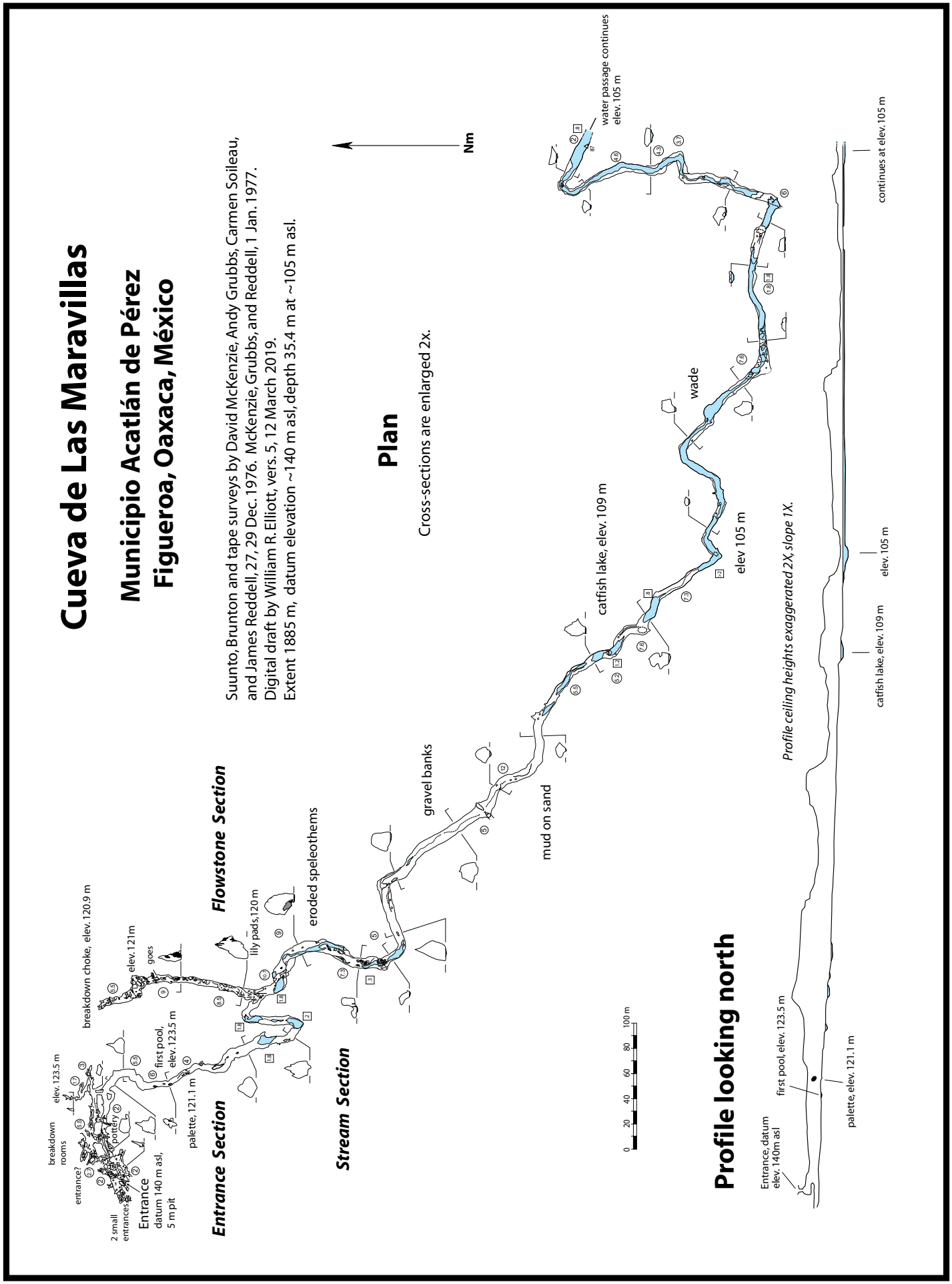
Cueva de Las Maravillas

In October 2018, I was scanning David's old field books in the AMCS collection at the Texas Speleology Center, Driftwood, Texas. I found an unlabeled survey of a large water cave in two notebooks. I scanned the notes and sent them to James Reddell, who recognized the survey as Cueva de Las Maravillas, another catfish cave. It is located about 4 kilometers southwest of Acatlán de Pérez Figueroa near the village of Las Maravillas. This cave was mapped in 1976-1977. It is not completely certain that this survey really is Las Maravillas, as it lacks any names or clear dates, but the notation "catfish lake" was a big clue, and it is about 700 meters inside the cave, matching Doyle Mosier's record of his catfish collection in April 1984.

From Reddell's notes, the first survey was by David McKenzie, Andy Grubbs, Carmen Soileau, and James Reddell, on December 27 and 29, 1976. McKenzie, Grubbs, and Reddell returned for the



Cavers camping at Campo Chico, 26 December 1972. Left to right: Mary Butterwick in kitchen, James Reddell, Stuart Murphy, and David McKenzie with his Hewlett Packard hand computer. *Marty McKenzie.*


Cueva de Las Maravillas
Municipio Acatlán de Pérez
Figueroa, Oaxaca, México
Suunto, Brunton and tape surveys by David McKenzie, Andy Grubbs, Carmen Soileau, and James Reddell, 27, 29 Dec. 1976. McKenzie, Grubbs, and Reddell, 1 Jan. 1977.
Digital draft by William R. Elliott, vers. 5, 12 March 2019.
Extent 1885 m, datum elevation ~140 m asl, depth 35.4 m at ~105 m asl.
Plan
Cross-sections are enlarged 2x.
Nm
Entrance Section
Entrance
datum 140 m asl,
5 m pit
2 small entrances
entrance?
breakdown rooms
elev. 123.5 m
pottery
first pool, elev. 123.5 m
palette, 121.1 m
breakdown choke, elev. 120.9 m
elev. 121 m
goes
Flowstone Section
lily pads, 120 m
eroded speleothems
Stream Section
gravel banks
mud on sand
catfish lake, elev. 109 m
wade
elev 105 m
water passage continues
elev. 105 m
0 20 40 60 80 100 m
Profile looking north
Profile ceiling heights exaggerated 2X, slope 1X.
Entrance, datum
elev. 140m asl
first pool, elev. 123.5 m
palette, elev. 121.1 m
catfish lake, elev. 109 m
elev. 105 m
continues at elev. 105 m

second survey on January 1, 1977. I completed the digital draft. The extent (total length) of the cave is 1885 meters with a depth of 35.4 meters at the final Station 87 (see on map), about 105 meters above sea level.

Reddell wrote me these notes from his field books on the Acatlán area:

10 March, 1973: *Taken to Maravillas by the owner of Camp Chico (near Cueva del Nacimiento del Rio San Antonio).*
27 December 1976: *We found Cueva de Las Maravillas and mapped 2730 ft. [832 m] of the main passage, getting back to deep water.*
29 December 1976: *Went to Cueva de Las Maravillas. Mapped over 1000 ft. [305 m] of side passages and left.*
1 January 1977. *In the afternoon David, Andy, and I went to Cueva de las Maravillas. We mapped about 2500 ft. [762 m] to an area of 1 ft. [0.3 m] clearance and deep water. We swam through and explored 500–800 ft. [150–240 m] of large passage to a siphon. That survey ended in very deep cold water, and we were so cold we quit mapping, but explored it on inner tubes through a low spot in the ceiling and into a huge, very high dome room with the only way on being underwater. The high dome room had dry land on one side.*

Reddell's length estimates total 1899 meters, close to the measured length of 1885 meters. And there may be another 240 meters of cave to map!

Maravillas begins at a 5-meter pit entrance on the hillside at about 140 meter elevation, into a joint-controlled, fractured, series of breakdown rooms, 2-5 meters high. Some pottery was seen here, along with two or three other small entrances.

The main passage trends south downslope with cross-sections 4-5 meters high and 10-15 meters wide. Cross-sections are enlarged to 2X on the map for legibility. This "Entrance Section" comes to the first pool at 150 meters from the entrance, at 123.5 meters elevation. Soon after that is a palette or shield formation. In another 80 meters the "Stream Section" begins with a series of pools 0.2 to 1.8 meters deep. A sharp dogleg leads to an intersection with the northbound "Flowstone Section," which goes 120 meters to a breakdown choke. The passage here is 5-10 meters wide and 9 meters high, with rimstone, lily pads, and massive calcite.

From the intersection, the Stream Section continues southwest past large, eroded speleothems, and down gentle slopes to intermittent pools, and sand/gravel banks. At 700 meters from the entrance, "catfish lake" was noted, with an elevation of about 109 meters and depth of 1.2 meters. This must be the first catfish pool in the cave, recorded by Doyle Mosier in 1984. The Stream Section continues generally southeast, with wading to swimming depths, and ceiling heights of 1.8 to 7.6 meters.

About 400 meters from catfish lake the passage turns north-northeast for 200 meters, then it turns southeast for 36 meters to the final station, number 87. The water passage continues 0.8 meters deep for about 240 meters to a high dome room and a sump.

We have a rough area location map by David, putting the cave above the base of the ridge about 1 kilometer southeast of Las Maravillas. After comparing this location map with Mejia-Ortíz's 2005 area map, the depth of the cave, and the local hydrology, I tentatively placed the cave entrance at an elevation of 140 meters asl, not far above the base of the hill, but the location could be within a radius of 200 meters from there (see area map).

There may be a sumidero at the south edge of the valley and 450 meters from Río Juan Sánchez according to INEGI's shapefiles for the area, which include a layer for disappearing streams. The orientation of the cave is baffling, as it starts at a dry pit entrance on the hill, then slopes down to water passage, which heads east away from the flood plain. Perhaps it turns and resurges to Río Juan Sánchez somewhere along the base of the ridge.

Cueva de la Finca

Peter Lord and the Kirkwood cavers from Austin mapped Cueva de la Finca near Acatlán in 1976–1977. This is an important cave, one of the three known blind catfish caves in that area, with Rhamdia reddelli. We only have a rough location for Finca, across the valley from Cueva de Las Maravillas. Finca is in the AMCS long caves list at 1876 meters. There is no map for the cave in the AMCS.

According to a news report by Bill Russell (1977), in December 1976-January 1977 Jim Rodemaker, Loretta Poer, Freddie Poer, Pete Strickland, Preston Forsythe, Shari Larason, Bill Mayne, Gilbert Peña, Barbara MacLeod, Lisa Wilk, Graham Jordan, and Maxine Miller took the Kirkwood 4-wheel-drive caver school bus from Austin and drove via Ciudad Valles to Acatlán. The group made a detailed map of the Burial Chamber in Cueva de Culebra, and then joined with Bob Thrun and Peter and Sue Lord to map "almost a mile" in Cueva de la Finca near Laguna Verde (not on area map). The rest of their trip was to Cueva de Caballo, Sótano Bonito, and then to Zoquitlán, Puebla. I have tried to contact Peter Lord in Villahermosa, Tabasco, about the survey, but have not been able to reach him.

In 2018 James Reddell summarized his notes on Finca for me:

Friday, December 31, 1976: *We went to the large Cueva de la Finca that Peter Lord and crew are mapping… The collectors were James Reddell, Andy Grubbs, David McKenzie, and Joel Hallan. I did not say that Rhamdia was collected, but my species list includes it (a sight record perhaps). It did have blind crayfish and two species of blind shrimp, so it makes sense for the catfish to be there. It is possible that Doyle Mosier collected fish in the cave in April 1984 when he collected in Maravillas and presumably San Antonio.*

Another Potential Catfish Cave?

Another resurgence cave, Cueva de Almolonga, lies 10 kilometers northwest of Actalán near Almolonga. Also known as Cueva de Juan Sánchez and Nacimiento del Río Cosolapa, and maybe Manantial la Pedrera, it empties into the Río Cosolapa 400 meters southwest of Almolonga. It does not resurge into the Río Juan Sánchez, which actually flows out of the southeast side of Almolonga only 1 kilometer away. Tom Byrd et al. mapped it as "Cueva de Juan Sánchez" (Byrd 1976), a 2-kilometer-long stream cave with bats, but no catfish were reported. A British expedition mapped it and the nearby Cueva de Juan Sánchez 2, but few details are available from their obscure report (The Black Holes Expedition, ca. 1990). These caves deserve another look for catfish and other cave animals.

Surveying History

David drafted the entire CNRSA survey in pencil by hand in 1974, using latitude and departure (x, y, z) on a grid sheet. He owned the earliest Hewlett–Packard hand computer, which allowed him to do trigonometric data reductions using a simple routine. Techniques have improved greatly in 50 years. In analyzing his notes I sensed how David struggled with the CNRSA survey. This was at the end of the era of mapping Mexican caves in feet with Bruntons. The team had a Suunto compass and a clinometer, and they started in meters, then soon switched to feet as David was better at estimating distances in feet. They surveyed down the center of the passage instead of point-to-point on the wall. Unlike today no LRUD (left, right, up, down) distances were recorded; David noted wall and ceiling distances on the sketch. The target height generally was not explicitly stated, so I struggled to accurately process the data in Walls, using "height adjusts." Vertical control was not quite up to today's standards, but it is a good map of the cave nevertheless. Unfortunately, depth/relief values are not stated on the pencil draft, and cross-sections from Survey 2 are missing, as those notes were later lost. In Maravillas the first survey used Suuntos but also a military Brunton in mils, used for backsights, but it was not used in the second survey. I have noted key survey stations on both maps in case someone wants to continue the surveys.

David did a lot of surveying, and he developed Ellipse, a mainframe program to process cave surveys, which was used from 1977 to the mid-1980s. He developed Net4 in the 1980s, then with John Fogarty they developed Caveview in 1990. He created Walls in the mid-1990s for PCs, which solved many problems in surveying, particularly for Actun Kaua, a huge maze cave in Yucatán. He also developed WallsMap, a GIS for cavers in Texas and Mexico. He was a great innovator who helped many cavers make better surveys.

Rhamdia Catfish Ecology

Of the 13 known species of cavefishes in Mexico, four are Rhamdia catfishes: R. reddelli (Oaxaca, the subject of this article), R. laluchensis (Chiapas), R. macuspanensis (Tabasco), and R. zongolicensis (Veracruz). Details may be found in Elliott (2018) and at the website Subterranean Fishes of the World, ***https://cavefishes.org.uk/***

Mosier (1984) reviewed cave–dwelling Rhamdia catfishes, Family Pimelodidae, in the AMCS Activities Newsletter. Cave Rhamdia have been known from Mexico since 1936. In 1972, James Reddell and others collected the first troglobitic Rhamdia in the Acatlán region of Oaxaca. Since then, "bagres" (catfishes) exhibiting various degrees of eye development and pigmentation have been found in several caves throughout southern Mexico. A cave-adapted form, Rhamdia laticauda typhla, was described from Belize. Epigean species of Rhamdia occur through southern Mexico northward to Veracruz on the Atlantic slope and to the Río Tehuantepec basin on the Pacific slope. All of the known cave populations are on the Atlantic slope.

Mexican species of Rhamdia can be divided into two distinct species groups: The Rhamdia guatemalensis species group contains the common and widespread R. guatemalensis, which occurs on both slopes, and two epigean species in Chiapas. The Rhamdia laticauda species group consists of R. laticauda and R. reddelli on the Atlantic slope, and R. parryi on the Pacific slope. For his dissertation, Mosier studied the evolutionary genetics of all Mexican species of Rhamdia, emphasizing the cave-dwelling forms.

Troglobitic Rhamdia have been collected from two caves in the Acatlán region. Cueva del Nacimiento del Río San Antonio is the type locality for Rhamdia reddelli, which is closely related to Rhamdia laticauda. In April 1984, Mosier and Gloria Camacho de Montiel collected R. reddelli in catfish lake, Cueva de Maravillas. According to James Reddell, an undescribed form is found in the pools farthest from the entrance of Cueva de Las Maravillas; it has a long ribbon–like caudal fin. Troglobitic Rhamdia were also seen in Cueva de la Finca, but apparently not collected.

James Reddell sent specimens of CNRSA catfish to the famous ichthyologist, Robert Rush Miller, who described the new species as Rhamdia reddelli in James' honor (Miller 1984). Adult catfishes are 70 to 100 milimeters long, with no visible eyes but small flecks of pigment in the skin. My photo of the species in this article was a 69-milimeter catfish collected by Robert W. Mitchell and Linda Mitchell in 1977, which they brought back to his lab at Texas Tech University. I was a newly minted PhD associated with Mitchell's lab. The fish formed more pigment after being well fed for six months in a tank exposed to ambient light, but it did not become fully pigmented, probably because of a genetic limitation.

As reported by Reddell in Miller (1984), the ecology of the San Antonio cave is as follows:

"A rich invertebrate cave fauna is associated with the catfish. Four species of troglobitic crustaceans inhabit the cave: Potamalpheops stygicola Hobbs (Decapoda: Alpheidae), Macrobrachium villalobosi Hobbs (Decapoda: Palaemonidae), Procambarus (Austrocambarus) oaxacae reddelli Hobbs (Decapoda: Cambaridae), and Speleomysis olivae Bowman (Mysidacea: Lepidomysidae). All have since been collected in other caves in the vicinity of Acatlán. A second species of mysid, Antromysis (Antromysis) reddelli Bowman, has been collected from a nearby cave and can be expected to occur in Cueva del Nacimiento del Rio San Antonio. A specimen of the alpheid shrimp Potamalpheops stygicola was disgorged by a catfish upon preservation. The rarity of shrimps and mysids in pools containing catfish is doubtless related to predation by the fish on the crustaceans. The cave is also inhabited by a possibly troglobitic clam, which is abundant in various parts of the cave but awaits study. The terrestrial fauna is extremely abundant and includes troglobitic trichoniscid isopods, nicoletiid thysanurans, millipede, spiders, and opilionids."

Luis Mejia-Ortíz studied cave crustaceans in Oaxaca for his dissertation, detailed in his 2005 AMCS Bulletin. From that publication I was able to get the approximate coordinates of the entrance of CNRSA and also the general locations of Cueva de Las Maravillas and Cueva de la Finca.

How did the ancestors of these cave catfishes get into the caves? The hydrogeology of the Acatlán karst does not work the same as in the Sierra de El Abra in northern Mexico, where the stream-capture model rules for Astyanax cavefishes (Elliott, 2018). I see no obvious examples of large stream captures in the Acatlán area, where an entire stream goes down a sótano, swallowing a fish population underground. Rather, we see river level springs. Possibly, the entrance of Cueva de Las Maravillas was an ancient stream capture when the adjacent valley was much higher on the hillside. However, I am inclined toward a spring invasion model in the case of these Rhamdia. They lived in the adjacent rivers, as they do now (Miller 1984), but being bottom dwellers, they migrated into springs at river level. Later, these systems became relatively elevated as the valley bottoms cut downward, stranding the cavefishes inside. There is enough recharge from the dolinas on the ridges to keep these spring systems flowing, especially after storms. Ultimately, the caves may dry out and erode, and the cave catfishes may die out, but the groundwater system keeps deepening too, so they could survive for long periods of time.

El autor usa dibujos y apuntes recientemente reencontrados para documentar cuevas en el estado de Oaxaca explorados en los años 70s como parte del estudio del hábitat de los bagres ciegos. El municipio de Acatlán de Pérez Figueroa, tiene por lo menos tres cuevas con bagres ciegos confirmados y los archivos presentados sugerir que hayan muchas más por la región para alentar a la siguiente generación de biólogos e espeleólogos.

SEA CAVES OF SAN CARLOS

Jessica Gordon and Peter Sprouse

While on a visit to Sonora for the 2019 Congreso Nacional Mexicano de Espeleología, our group consisting of Aimee Beveridge, Jessica Gordon, Geoff Hoese, Cait McCann, and Peter Sprouse heard about sea caves at San Carlos, west of Guaymas. So we headed for a local beach club to rent some kayaks. Before us lay a bay encircled by cliffs, with the Islote de Jama in the middle and the iconic Cerro Tetakawi to the west. After getting a description of where the caves were, we pushed off into the Sea of Cortez. We paddled along the east side of the bay and soon came across our first cave.

Area map

The entrance was in a cleft in the cliff face, and entry looked inviting. There was a gently sloping cobble beach inside the entrance that made for an easy landing. The cobbles sloped up to the back wall of the cave, with quite a collection of a variety of colorful sea shells at the back. While in the cave, residents of a vacation house over the cave told us that this place was called Shangri La, so that is what we named the cave. We mapped it in a couple of shots and put to sea again.

Peter Sprouse kayaks away from Cueva Swell Ride. *Jessica Gordon.*

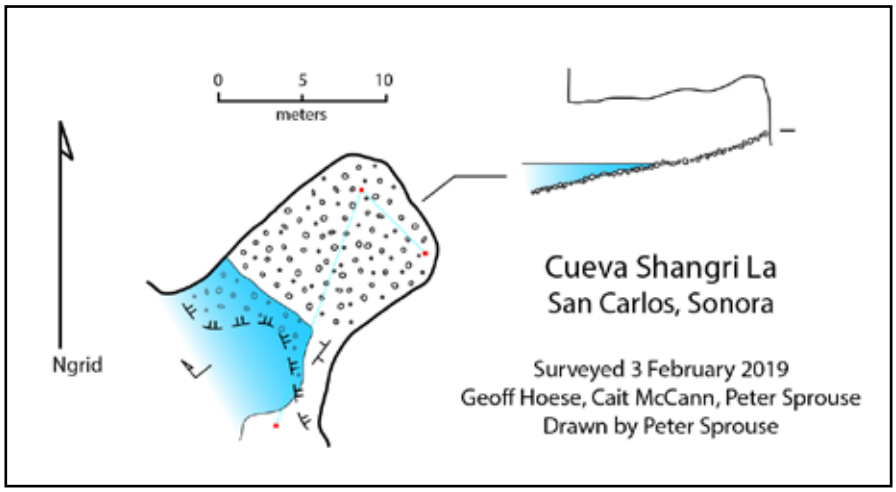
At the tip of Punta Shangri La we found our next cave, which extended right through the point to another entrance. The wave action was stronger here, and we didn't see a good place to take out our kayaks on the rocky cliff skirt of the west entrance. So we paddled through the deep sea channel inside the cave to the east entrance, bobbing up and down in the swell while avoiding banging into the walls. That exhilarating experience inspired the name Swell Ride Cave. On the east flank of the point the waves were milder, and we were able to get out of our boats onto ledges and drag them above the wave zone. We had to step carefully to avoid black sea urchins.

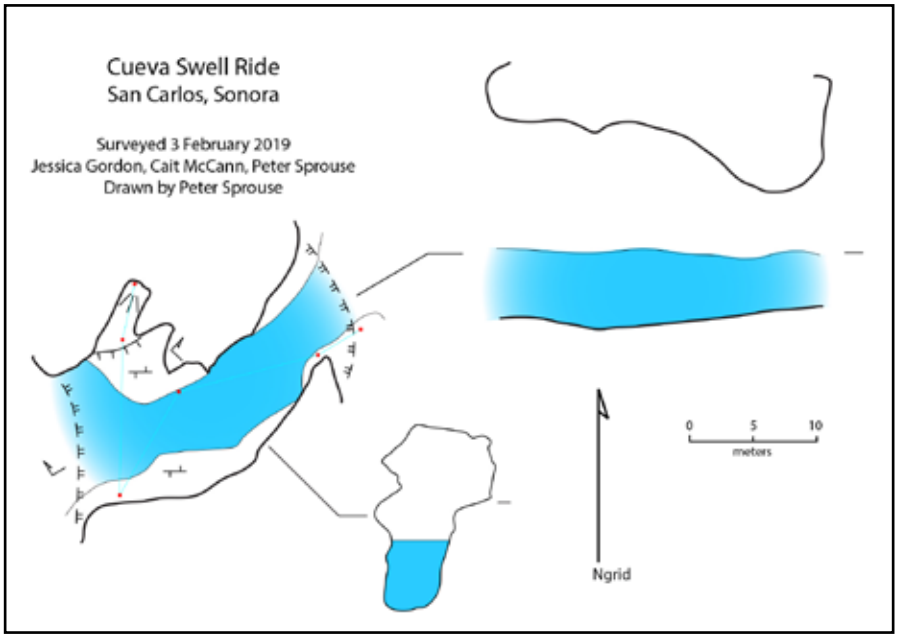
The water rushing through the cave made mapping a challenge, as there weren't sufficient ledges on which to climb through in order to set stations. Cait scrambled around the point on the surface to try to set a station on the west side that Jessica could shoot to while hanging on the ledge of the cliff near the east entrance. However, the distance between potential stations along the southern point was too great to be able to see the laser with all of the ambient light coming from both entrances. Aimee dropped Geoff off on the north side of the western entrance to find a better station option. Jessica was able to slowly follow the laser dot from a nearby point all the way to Geoff's target. Then, Peter and Jessica scrambled around the point to join Cait at the west entrance. Cait set a station

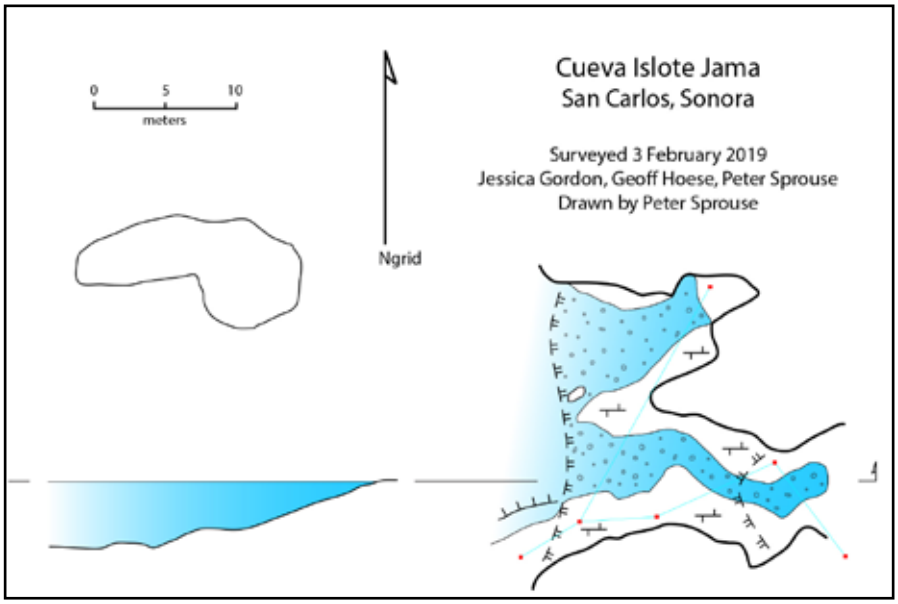
that enabled us to shoot back to Geoff. Then, Geoff climbed up a cliff for us to shoot to one of our final stations. Aimee ferried Cait across the water to take Geoff the crayon to mark the stations with and the DistoX to shoot to the final station in an alcove. During that process, Aimee noticed that her and Geoff's tandem kayak was taking on water and starting to sink. Cait helped her pull it ashore to try to drain it. Once they had it ashore, it started to drain, but then the swell caused the water level to rise above the kayak and fill it with water again. Geoff plugged the hole while it was submersed and unplugged it when the water level lowered so the kayak could drain. As we were mapping the cave, a kayaker paddled through, followed by four sea-worthy swimming dogs. That was a new one for us.

To the west of us was our next objective, the big island of Islote Jama. As we approached, we could see a tall triangular arch piercing the south end of the island. There was a deep cleft leading into the entrance, and landing was easy in this area protected from waves. When we got to the entrance we found a number of visitors already there, who had disembarked from yachts. While they jumped off ledges into the water for sport, we tried to aim our DistoX around them to complete the survey. We named this Cueva Islote Jama. The view west through this entrance framed the Tetakawi Peak in a spectacular way.

As we pushed off once more, the sun was getting low in the sky, and we lacked the time for any more mapping. But we were able to paddle around the next island to the south, Roca San Nicolimaás. Roosting pelicans and cormorants stared at us as we paddled by another through-trip cave, but we didn't put ashore. From there, it was time to head to the mainland in search of fish tacos.







Un grupo de amigos hacen mapas de tres cuevas por el Mar de Cortés durante una visita a Sonora para el Congreso Nacional Mexicano de Espeleología.

BEYOND THE SUMP EXPEDITIONS 2018

Return to the Cueva de la Peña Colorada

by Andreas Klocker with input from Adam Haydock, Alejandra Mendoza, Chris Jewell, Fernando Hernandez, Gilly Elor, Matt Vinzant, Teddy Garlock, and Zeb Lilly

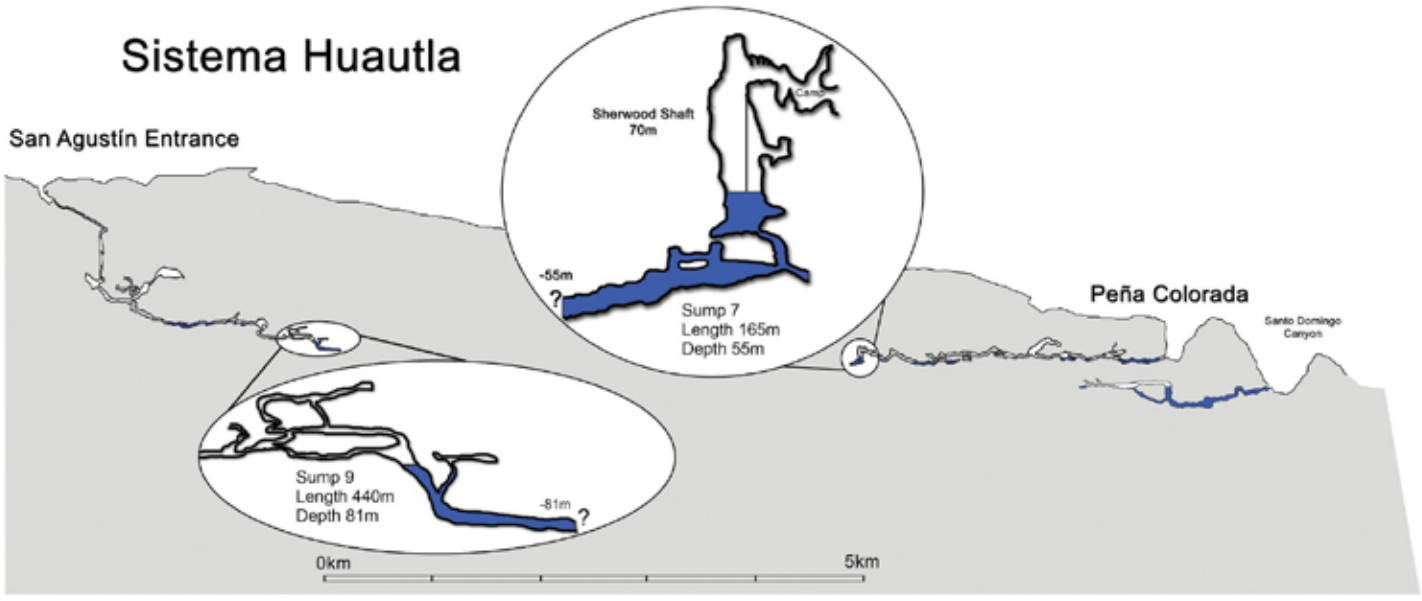
Sistema Huautla in Oaxaca is one of the world's most spectacular deep caves. It is currently 1,560 meters deep and about 85 kilometers long. The most downstream part is known as Sump 9, or "The Mother of all Sumps" that had been discovered on an expedition led by Bill Stone in 1994 (AMCS Activities Newsletter 21). It was only in 2013 that cavers returned to Sump 9 on a British expedition organized by Chris Jewell. On that trip Jason Mallinson and Chris Jewell pushed Sump 9 to a depth of 81 meters at 440 meters penetration, with the underwater tunnel barreling off to greater depths (AMCS Bulletin 21).

One of the great mysteries of Sistema Huautla is its connection to the active resurgence in the Santo Domingo canyon some 10 kilometers away. This resurgence has been confirmed by dye tracing and has been the subject of several expeditions, each of which has increased the known length of the cave and reduced the gap from the end of the line in Sistema Huautla's Sump 9. In 2001, Jason Mallinson and Rick Stanton explored and surveyed the underwater resurgence for just over one kilometer to an airbell where a passage was seen heading off 10 meters above water level, but the upstream continuation of the underwater river remained a mystery (AMCS Activities Newsletter 25).

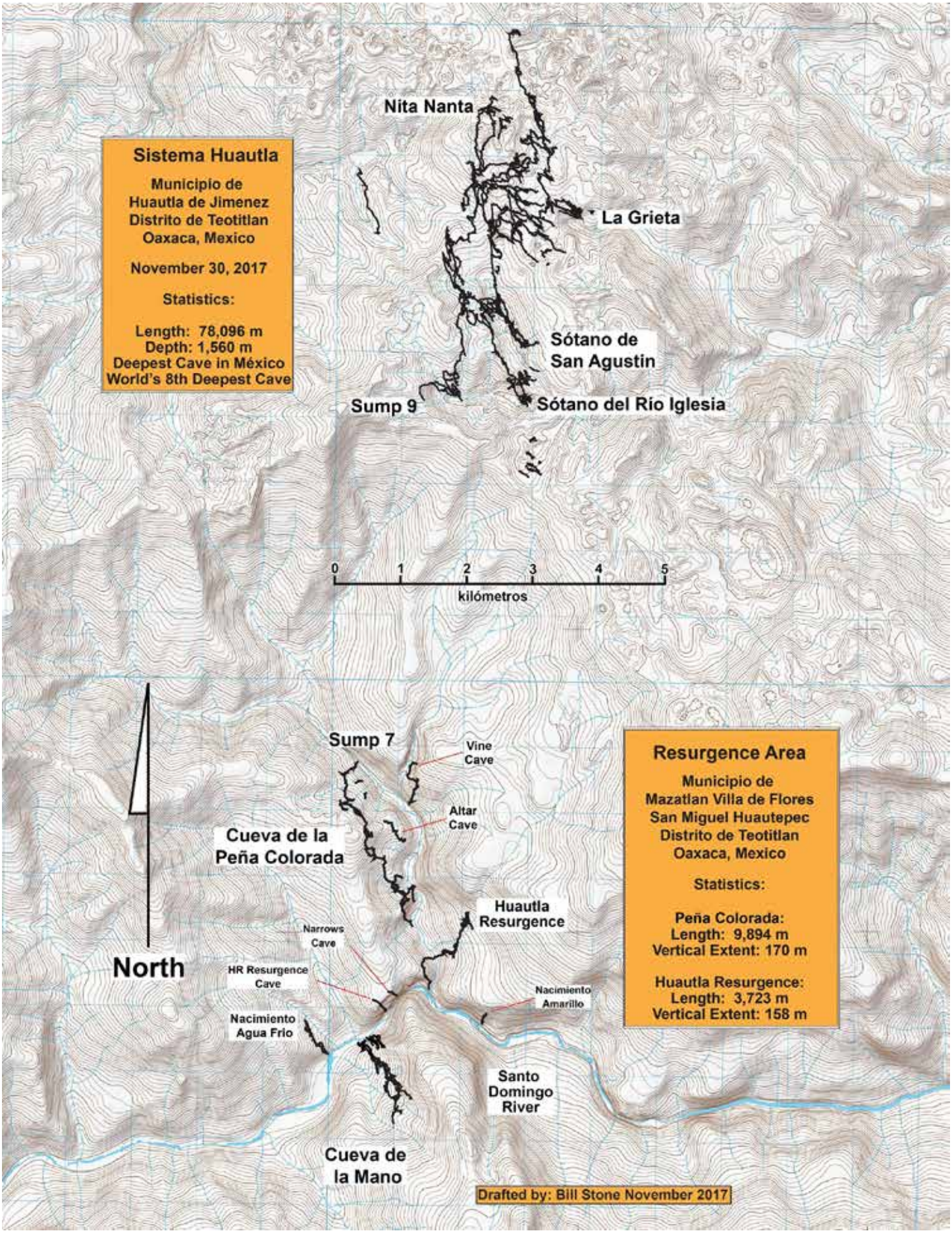
In 2016, Andreas Klocker and Zeb Lilly started Beyond the Sump Expeditions to continue Bill Stone's efforts to connect Sistema Huautla with its resurgence. In both 2016 and 2017, the main goal of the expedition was to continue exploration in the Huautla Resurgence, and find the way on from where Jason Mallinson got to in 2001. While both these expeditions significantly increased the length of this cave, finding some of the most spectacular cave passages in this region, the main way on was complex. Following the underwater continuation towards Sistema Huautla remained elusive (AMCS Activities Newsletters 40 and 41). Consequently the 2018 expedition focused on Cueva de la Peña Colorada, which is hypothesized to be the overflow resurgence to Sistema Huautla, and hence could provide a short-cut connecting into Sistema Huautla between the known upstream system and its resurgence.

The 1984 Peña Colorada Expedition

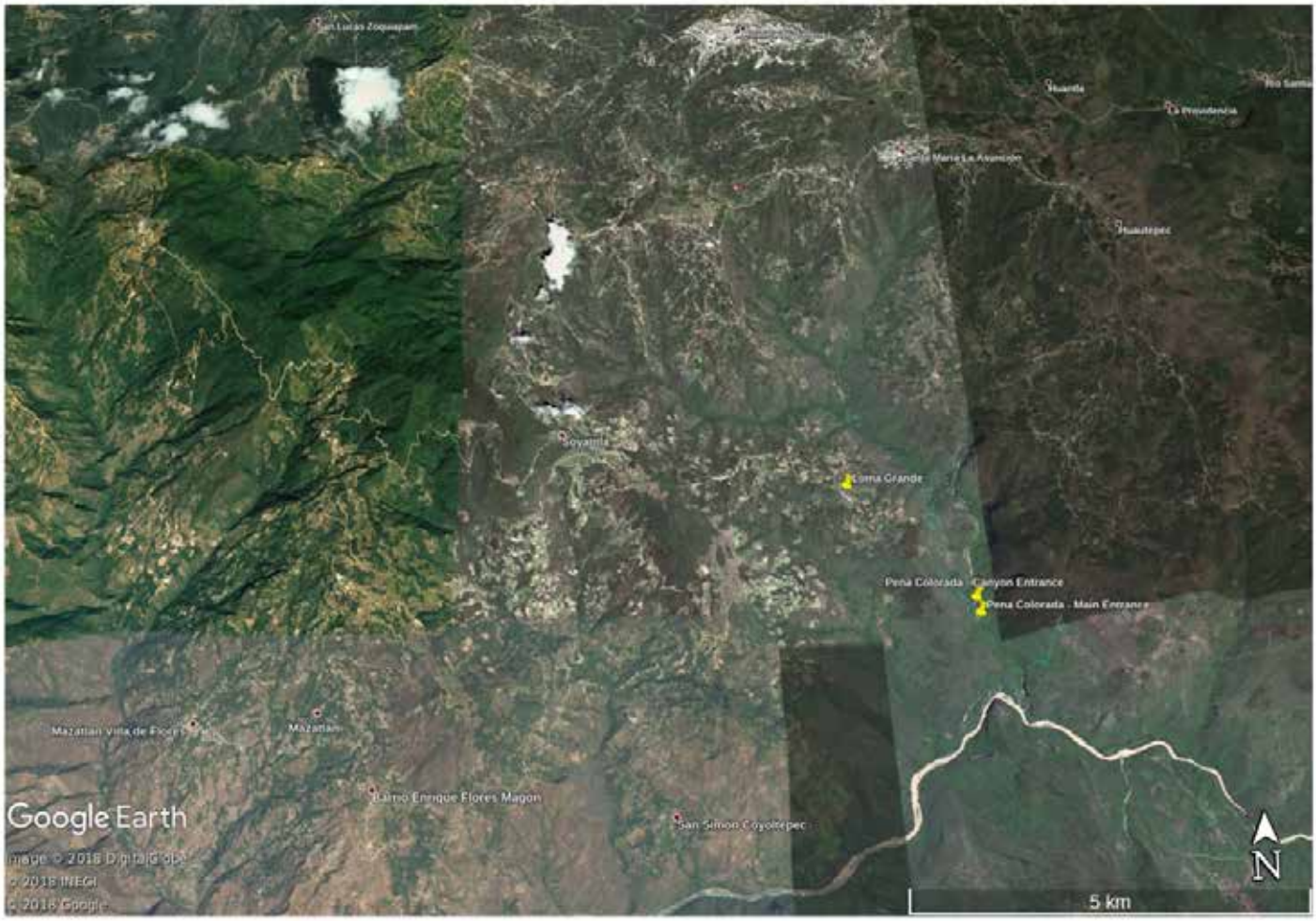
Over three months in 1984, a team led by Bill Stone explored Peña



A schematic showing the main underwater leads which are thought to connect Sistema huautla with its resurgence. The left shows Sistema Huautla reduced to the quickest way to reach Sump 9 from the surface, via the Fools Day extension in San Agustín. The right shows both Sump 7 in the Cueva de la Peña Colorada and the Huautla Resurgence.



A line map of Sistema Huautla, the Huautla Resurgence, and the Cueva de la Peña Colorada. Each square represents a kilometre in distance. *Map drafted by Bill Stone.*



A map of the wider region with pins showing Loma Grande, the base for our expedition, and both the main and canyon entrance of the Cueva de la Peña Colorada.

Colorada roughly 5 kilometers into the mountain, requiring them to tackle several sumps and establish the first subterranean camps beyond sumps ever (AMCS Activities Newsletter 14). The team transported all camping gear through these sumps, until they were finally stopped by Sump 7.

Sump 7 started just beyond Camp 2 at the bottom of a 55 meter drop, with no place at water level where the cave explorers could have put on their dive gear. They had to descend this vertical drop with the dive gear attached to them. Nevertheless, after an epic effort to get into the sump, the team finally managed several exploration dives. The sump quickly reached a depth of over 50 meters, but due to the divers using air rather than deep diving gas mixes such as helium, they quickly hit their logistical limits.

The divers reported a large passage continuing north underwater, leading them to believe that this cave might connect to Sistema Huautla. Since then the hypothesis has been that the Peña Colorada is an overflow resurgence to the system which is only active during the wet season. However, this hypothesis had never been proven using dye tracing. The hope for 2018 was that, after not finding the way on underwater in the Huautla Resurgence in 2016 and 2017, Peña Colorada might be a shortcut into the elusive underground river between Sistema Huautla and its resurgence.

The 1984 expedition was an immense logistical challenge. Two hundred Mazatecs were hired along with 65 burros to transport the 8 tons of provisions, camping, caving, and diving gear down into the Peña Colorada canyon. Using the team's supply of 72 light-weight composite dive tanks, two divers finally reached Sump 7 with only 5 tanks, since all other tanks were needed to get everyone through the first six sumps to Camp 2, the second subterranean camp located just above Sump 7.

It was clear to Bill Stone that new technology was needed to overcome these logistical challenges, and it was after this trip that he started to develop the now-famous CIS-Lunar rebreather. Rebreathers are complex pieces of dive kit - at that time only available to the military - which recycle the oxygen metabolised by the diver and extract the CO_2 produced by the diver, and hence are much more efficient than the open-circuit dive gear used on the 1984 expedition.

But Bill Stone never returned to the Peña Colorada, and until 2018, 34 years later, no other team stood up to the immense challenge of exploring

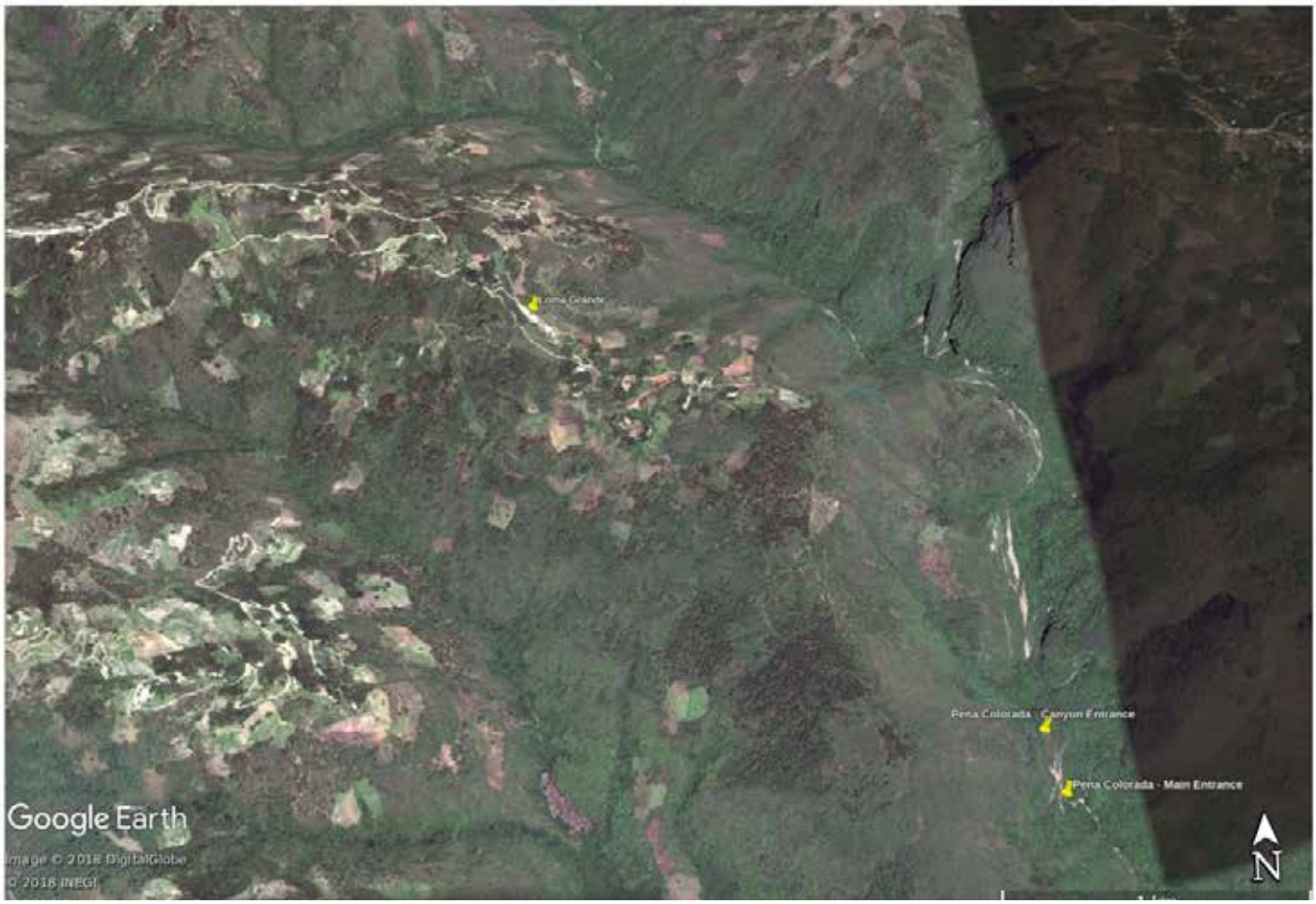
this remote sump. So now our plan was to return to Sump 7 and continue exploration toward Sistema Huautla.

Assembling the Team

One of the big challenges of exploring a cave such as Cueva de la Peña Colorada is to put together a team with the right skill set. For a cave such as the Cueva de la Peña Colorada, a large team of support divers was necessary to put a very small team of exploration divers into the final sump. The support divers would need to have extensive experience in both dry caving and cave diving. They had to be able to deal with techniques used to ascend and descend ropes on vertical drops in dry parts of the cave, have plenty of endurance to keep hauling gear down a 700 meter deep canyon, 5 kilometers into a cave, on trips which would sometimes would last more than a week underground. The need for a large team of support divers with caving and cave diving experience is rare, as not many caves have passages beyond sumps as extensive as those in Peña Colorada.

The push divers needed all the qualifications of the support divers, plus the ability to do long and deep exploration dives. Survey data show that Sump 7 in the Cueva de la Peña Colorada and Sump 9 in Sistema Huautla are at the same vertical level within survey errors, pointing towards the possibility of Sump 7 being very long and deep. Finally, surface support team members were needed to manage local politics, interactions with local residents, and translating.

Luckily the full crew of the 2017 expedition to the Huautla Resurgence returned in 2018, meaning several people on the trip with previous experience of caving in this region were on the trip. In addition, a large group of cavers from the UK and Ireland came along, most of who are part of the UK's Cave Diving Group (CDG) and have extensive experience in working beyond sumps. Several cave divers from Florida joined, very experienced in diving Florida's long and deep springs, but quite new to dry caving techniques. The team was topped off by several strong cavers from Canada and Poland. As in previous years, this expedition could not have happened without the help of Alejandra Mendoza, who dealt with local politics and the locals for us, assisted by Alma Estrada Rodríguez, a school teacher in Huautla, and Fernando Hernández, a Mexican working on his master's degree in the US.



A close-up map of the region with pins showing Loma Grande, the base for the 2018 expedition, and both the main and canyon entrances of the Cueva de la Peña Colorada.

The members of the team were: Adam Haydock (USA), Adam Walker (CAN), Alejandra Mendoza (MEX), Andreas Klocker (AUS/AUT), Andrew Atkinson (UK), Charlie Roberson (USA), Chris Jewell (UK), Connor Roe (UK), Dane Motty (USA), Dave Watts (UK), Fernando Hernandez (MEX), Gareth Davies (UK), Gilly Elor (ISR/USA), Jim Warny (IRE), Josh Brackley (UK), Laura Trowbridge (UK), Matt Jenkinson (UK), Katie Graham (CAN), Kyle Moschell (USA), Matt Vinzant (USA), Maxwell Fisher (UK), Michael Waterworth (UK), Mirek Kopertowski (POL), Teddy Garlock (USA), Tomasz Kochanowicz (POL), and Zeb Lilly (USA).

Dive gear

From old trip reports of the 1984 expedition, and several conversations Zeb and Andreas had with Bill Stone, it was clear that just organizing all the gear needed for a serious dive attempt in Sump 7 would be an epic challenge. In 1984 expedition the team hit the limits of the dive gear available at the time, so to be successful, this expedition needed to overcome those challenges. While some of the support divers used open-circuit dive gear, most divers on this trip used manual, non-electronic rebreathers, lightweight and easy to repair. As in 1984, lightweight composite tanks were used which are very lightweight, however these needed much weight to sink when diving. The advantage of these tanks was that only the tanks needed to come out of the cave to refill, while the lead weights could stay in. And while the tanks used to get to Sump 7 were all filled with air or Nitrox, the tanks used in Sump 7 were filled with Trimix, to be able to maintain a clear head when diving at 50 meter depth and beyond.

To facilitate gearing up for Sump 7, and to avoid having to climb up a 55 meter vertical drop above the sump after a big dive, a platform was used, similar to portaledges which climbers use to sleep on big walls. In case Sump 7 turned out to be very long and/or deep, Lithium-powered scooters and a decompression habitat were kept in the field house, ready to go into the cave.

Travel

The trip started when Zeb, who lives in Virginia, after months of preparing gear at his place, finally started the drive in his Ford F350 full of gear towards Florida. At a similar time Andreas left his home in Hobart, Australia, to fly into Jacksonville where Zeb picked him up from the airport. In Florida they met up with Matt Vinzant, a highly experienced Florida cave diver who was going to join the expedition as exploration diver, and Gilly Elor, one of the support divers. Over a few days they did several practice dives in Florida's amazing springs, and prepared over 70 4-liter Nalgene bottles filled with cave food to be used in the two underground camps for the whole team on the way to Sump 7.

Two days after leaving Florida, Andreas, Zeb, and Gilly arrived at the Mexican border, a bit later than planned due to a minor mechanical hiccup when the fuel pump of the van, the second expedition vehicle, failed. At the border they met Alejandra "Alex" Mendoza who helped with the border formalities since none of the others spoke fluent Spanish. After the border crossing the next stop was Monterrey where Zeb and Gilly flew back to the US to work in their day jobs for a few more weeks before joining the expedition, and Alexander Buess, a German cave diver living in Mexico, and Andreas continued driving the two vehicles south.

A of couple hours past Monterrey the head gasket of the van suddenly decided that it needed replacement. After a stressful evening finding a tow truck, a mechanic, and the next morning a rental car big enough to carry all the dive gear from the van, the team was finally on the road again. After two days of driving the team finally made it to Huautla.

Local Politics

(by Alejandra Mendoza)

The first time Andreas and Alex arrived at Loma Grande, the agent of the village, Rafael Carrera, agreed with the expedition plan. He would allow the divers to explore the Peña Colorada, and offered a place to stay in his house for them, with the only condition being to get a written permission of the municipal president of Mazatlán Villa de Flores, Misael Martínez.

Misael Martínez is a young man with an open mind, a quality hard to find in small Mexican villages. President Misael agreed with the expedition as well, but he needed a reunion to communicate it to the other members of the cabinet. Unfortunately, many of them did not agree with the project and this delayed the permission letter.

Despite an unplanned trip to Oaxaca City, about 7 hours away, the document was still not in hand when the first group of divers arrived. This was remedied the next day divers started to carry all the equipment into the cave. But about two weeks later, a group of native people arrived at Rafael's house with sticks and machetes, arguing that the foreigners were there to kidnap their children, to take possession of their land, and steal the gold inside the cave. Alex had to return to Loma Grande to try to fix this tension between the locals and the team, but these issues turned bigger and bigger. Some of the locals believed that rich white people would give Rafael lots of money, making these locals very jealous. They started a coup leading to a new agent taking over, who took the agency and acted like authority in some official events that took place. Rafael's family ended up being isolated from the rest of the town.

As president, Misael must travel to

Oaxaca City once or twice a week, in addition to the visits to the agencies within the municipality, so each time the team went to Mazatlán, the president was not there, and the secretary was unhappy with Rafael, blaming him for all the things gone wrong. It was a communication issue with people in the town, because he never held a meeting to inform others about the foreigners' plans. As natives were very introverted, they never joined activities in town and nobody attended the local meetings, which is why Rafael decided not to do a meeting.

Secretary Celso promised to go to Loma Grande to give a talk to calm down the people, but he never arrived. As Alex had to return to Mexico City again, Fernando, who was there doing hydrological studies, could stay longer to try to get an agreement between locals and foreigners, but that did not happen, and the locals gave the foreigners just a couple of days to get out with all their equipment. When Fernando moved to Huautla, leaving the team without a native Spanish speaker, the atmosphere in the team turned delicate and stressful.

Finally, after a couple of days, President Misael arrived at Loma Grande with all the authorities and a lot of police. He talked with the people and ordered them to leave the divers alone so they could finish their exploration.

Setting up the cave

After a fortnight of time spent driving and dealing with politics, the first large group of cavers, mainly Brits at this stage, arrived in Huautla via bus from Mexico City. Since the written permission to access the cave was a bit late, a day was spent in Huautla shopping and fixing the rear window of the truck which did not survive the long trip through Mexico. The next day, with the permission in hand, the team moved into the accommodations in Loma Grande,

unloaded all the gear from the trucks, and stored it in the very limited space available to us in one small building. Soon after they were ready to start moving large amounts of gear towards Sump 7.

It was first necessary to descend 700 vertical meters down into the Peña Colorada canyon, transport the gear 5 kilometers through the cave through five sumps to Camp 2, just above Sump 7. For about two thirds of the descent down the canyon it was possible to use horses owned by the locals to carry most of the load. The steep canyon trip was one of the main challenges for most expedition members. Then it was time to get gear into the cave and through the sumps. Both Connor Roe and Andreas started relining the sumps for the others to follow. Luckily Sump 2 was very short, but too long to breath-hold dive, followed by a gear haul over a huge pile of large boulders before reaching Sump 3. This sump seemed like it would be relatively straightforward, but visibility was poor and two dives were needed to reline this sump.

The next day Chris and Connor returned and managed to find the way on. On the far side of the sump they had to rig a 15-meter steep climb for the team to follow with large amounts of gear. Chris, Connor, and several others then continued on with the plan to establish Camp 1. Unfortunately they were stopped by high water levels, which turned the Grande Lagoon, which in 1984 was a swim with sufficient air space, into a short dive. Since it was late in the day, they decided to create a temporary camp before the lagoon.

It was on the next trip when Gareth Davies, Andrew Atkinson, Connor, and Andreas entered the cave and pushed through the Grand Lagoon to establish Camp 1 on the far side.

The day after establishing Camp 1, everyone helped carry Andreas' dive gear to Sump 4, where he then started to reline Sump 4 and 5, which were separated by a short lake. On this dive he found enough remnant pieces of dive line from the 1984 expedition, which acted as bread crumbs to find his way through this complex sump in one go.

After relining, Andrew and Andreas continued through Sump 4 and 5, shuttling large amounts of gear, with the goal of establishing Camp 2. This turned out to be a very long day, and since Andrew and Andreas became increasingly tired, they tried to find a temporary camp spot on the way to Camp 2. However the cave passage to Camp 2 was either wet, had loud waterfalls close by, or was otherwise unsuitable for a camp. Hence they pushed on, and finally established Camp 2 very close to Sump 7, where they put up several hammocks as there was no flat ground to sleep on. In the meantime the others spent several days hauling gear from Sump 3 to Camp 1, and over the long stretch from Camp 1 to Sump 4.

The Push

After Andrew and Andreas exited the cave it still took almost a week until enough gear arrived at Sump 7, including the platforms used to gear up for the dive. Nevertheless, 34 years after its discovery it was finally time to put the first two divers, Chris and Connor, into Sump 7. Chris describes the first dives into Sump 7:

It is hard to describe the feeling of finally diving a sump you've dreamt about for years. Excitement mixes with nervousness and you know it has taken a lot of effort to get to this point – now you need to not mess it up!

With Connor laying the line, I followed him across to the far wall of the spacious shaft. With visibility around 5 meters, it should have been easy to navigate, but the scale of the underwater cave still meant our lights often failed to reach the walls. After picking our way through a boulder choke, we descended to 33 meters and entered a large horizontal passage which matched the description from the previous explorers.

Following this passage steadily down we noted several alternative passages, but instinctively we headed deeper along the largest tunnel. At the lip of a small pit we peered down into the depths before descending to a rock and gravel floor at 51.5 meters depth. A little farther ahead, however, the large passage stopped abruptly in a pile of well consolidated boulders jammed against each other.

We couldn't believe it – the cave couldn't end like this, surely we had missed something! Retracing our steps while decompressing we scoured the walls for the missing way on, but nothing could be found except the previously noted side passages which we decided to leave for the next day.

This was bad news for the expedition. The long-hoped for connection between the Cueva de la Peña Colorada and Sistema Huautla suddenly fell to pieces. Nevertheless, a week later Zeb and Andreas planned to head back to Sump 7 to give it another go - maybe Chris and Connor just missed the way on.

Supported by Katie Graham and Max Fisher, Andreas and Zeb finally headed back into the cave a few days later. After spending a night at Camp 1, they reached Sump 4, where they were surprised by much higher, and still rising, water levels, with Andreas' rebreather, placed on the last trip about 5 meters above the sump, now floating in the sump pool. After rescuing the rebreather they headed back to Camp 1, and on the following day decided to go back to the surface to assess the situation. A few days later Andreas and Mirek entered the cave to meet Tomasz at Sump 3, and then spend a night at Camp 1 before continuing on to Camp 2. The following day Zeb, Gilly, and Charlie entered to follow the first team into the cave. Due to the limited number of hammocks in Camp 2, only Zeb continued to Camp 2 a day later to join Andreas for further exploration dives in Sump 7.

As the time for Jim Warney from Ireland and Adam Haydock to return home came, they both left Loma Grande to spend a night in Huautla.

Adam notes:

Jim and I were having beers in Huautla and as we watched the rain start to downpour, I noted that rainfall occurs more often at this elevation and it should stop soon. But as we continued to walk through town and talk with some of the cavers from the nearby Cheve expedition led by Bill Stone, the rain kept up coming and streams of water ran down the sloped streets of Huautla. I mentioned to Jim that this is not good. All of these towns and respective hills shed this water into Sistema Huautla, yet I didn't imagine huge problem it would cause.

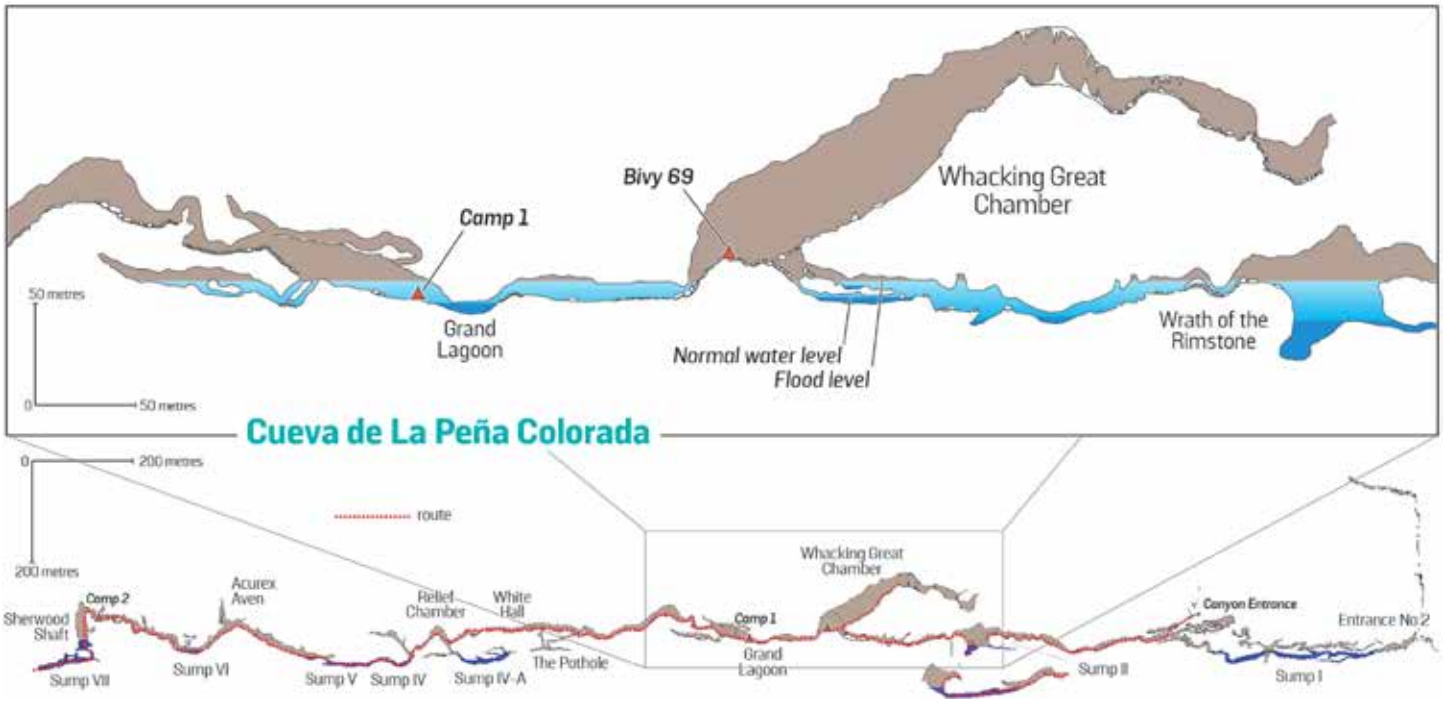
While Jim and Adam were observing the downpour on the surface, Zeb, Andreas, and several of our support crew were busy getting ready for another go at Sump 7. There was no way to communicate between the surface and those deep in the cave to warn them about the weather threat. After several days of transporting gear to Sump 7, Andreas and Zeb finally prepared their KISS Sidewinder rebreathers and slid off the platform into the sump. The visibility above the restriction, which ranges between ~20-30 meters depth, was less than 2 meters, but luckily it improved to ~7 meters below that. They followed Chris and Connor's line, and tried to find a way on from there, but sadly without success. After a 1.5 hour break on the platform Andreas decided to give it one more try, this time solo since Zeb had some issues with his gear. He checked out everything which looked like it could be a way on, surveyed the deepest part of the cave which Chris and Connor could not do on their dive due to a lack of time, and finally checked one more remaining lead which just reconnected in the passage we already knew. Sadly though, Sump 7 was a dead end.

The Flood

By this time, eight days after leaving the surface, Mirek Kopertowski and Andreas were seriously overdue for some sunshine and a cold beer. There were six cavers still in the cave. Dane Motty, Gilly, and Mirek were shuttling gear through Sump 3, and Matt and Zeb were assisting them at the vertical drop over Sump 3.

Andreas was lugging gear through the Grand Lagoon when the silence was suddenly broken by a deafening noise, as if giant water turbines had suddenly been turned on. The only explanation for the noise was that an unexpected downpour was rapidly filling the cave system. Andreas quickly ran to where Zeb was just coming up a rope hanging down the vertical drop above the sump, who immediately told him that the water level in Sump 3 had just come up by almost a meter. Those two things meant that they were in big trouble.

They decided to make a dash farther back into the cave to the Whacking Great Chamber, a cathedral-like space nearly a hundred meters high. There they would be safe from drowning, but the water was rising fast and a 10



centimeter low airspace lay between. Luckily Zeb had put a dive line through this. While they found safety in the Whacking Great Chamber, they were also a kilometer from the exit, with flooded parts of the cave separating them from both Camp 1 and the dive gear which was above Sump 3. Gilly Elor describes the time spent in between the two flooded passages that trapped the team in the cave for 69 hours.

We knew that in the Great Whacking Chamber we were safe from drowning, but as the water level continued to rise we began to speculate as to how long it will take to drop...or would it even drop. Could the high water level be the more normal state of Cueva de la Peña Colorada? What if it rained again?

This isn't a cold cave, so we knew that even though all we had were wetsuits and Matt's space blanket, hypothermia was a negligible risk. However, the only food we had was four granola bars between the six of us. The only action we could take once trapped was to lie still in the dark, conserving energy and batteries while attempting to keep warm, and hope that the water level would drop.

That first night, as the water level continued to rise, nobody talked. What would we have talked about? Our outside lives. I think we were all contemplating the possibility that we may not get out. Eventually the water level began to slowly drop. We continued to huddle in the dark, listening to the sound of the gurgling water and coming up with theories justifying why every noise was a good sign. As time passed, we also grew weaker from lack of food. After 48 hours we split two out of the four bars six ways. I think the trick in this situation is not to think or fantasize about the food you can't have.

In the meantime, Teddy Garlock, one of the support divers from New York State, had arrived in Loma Grande. At this time nobody on the surface knew what was going on in the cave. Teddy recalls:

The trip through Sump 2 was easy, and I was soon on the far side carrying two composite cylinders and large amounts of gear to resupply the six cavers currently living in the cave. The passage between Sump 2 and Sump 3 requires a lot of scrambling through breakdown piles in some impressive cave. When I arrived at Sump 3, I was a little taken aback by all of the Nalgene bottles floating in the sump pool. Then I heard the unmistakable sound of a solenoid firing and saw Tomasz's rebreather floating amongst the debris. Shit! Big problem.

My immediate concern was related to the dive guideline – missing somewhere in the flooded sump pool. My first attempt at finding the line involved wading in the shallow end with a mask and a light, hoping it was close. I soon added both of my tanks and tied in the only safety spool I had and began a lost-line search. My 25 meters of line was quickly exhausted as I swept from side to side, finding dive gear strewn across the bottom but no guideline. Using a second reel which I found in the submerged gear, I finally found the guideline and tied in.

After recovering all of the floating and most of the submerged gear I filled a dry tube with Nalgenes to resupply the others and set off alone into Sump 3. During the 15 minute traverse I experienced some mild narcosis, which was odd, since the passage was supposed to be only about 20 meters deep. After a while I arrived at the primary tie off on the far side of Sump 3, which much to my disappointment was also under a significant amount of water. Having used all of the spools I carried or could find I was faced with a simple decision: surface and hope the tie off had been placed in an area that would still have air space above it (and risk losing the line) or turn around and head all the way back out. I made the obvious choice and turned back, leaving a dry tube with food and batteries tied off on the line.

Two days later I returned to Sump 3 and noted the water had receded a good

8 meters. I made the dive alone and extended the guideline on the far side, surfacing in a huge air chamber with 6 headlamps staring back at me. Mirek was the first one I spoke with and he gave me a brief synopsis of their experience: "Three days we've been stuck in an air chamber, no food and only one space blanket. We're getting out right now". *With that, Mirek disappeared into Sump 3 and began making his escape.*

The Aftermath of the Flood

(by Matt Vinzant)

The team of six spent 69 hours trapped in the Whacking Great Chamber and were beaten down. Matt, Dane, and Zeb all suffered from intestinal issues. The dive out of Sump 3 and the subsequent hike back the field house was grueling. Dane was suffering from exhaustion and dehydration, Andreas developed a fungal infection on his feet from wearing wet boots for days, and Mirek could only drink one beer. Everyone spent the next day in Huautla, eating real food and calling home. There were no more cave camps after the flood, but everyday a team would make the round-trip hike to the cave to continue the derig.

Moral was low after Sump 7 didn't go, the flooding, and the mild medical maladies. The flood had isolated us from Camp 1, and much gear remained at camp and beyond. Five days after escaping the cave Zeb, Gilly, Teddy and Matt returned to conduct a recovery mission for all of the gear remaining beyond Sump 3. Zeb and Matt, assisted by Teddy and Gilly carried their KISS rebreathers over the Whacking Great Chamber where they found the formerly dry passage leading to camp still full of water. Visibility was poor, and Matt led the way running the guideline along the ceiling. There was an air bell halfway before the passage submerged again where the Grand Lagoon once was. We named these two surprise sumps Sump 3a and 3b.

Over thirty 4L Nalgenes, six sleeping pads, sleeping bags, stoves, and personal kit were abandoned in camp. Zeb and Matt made it to Camp 1 which was still 3 meters underwater a week after the flood. Expecting to surface in a pool full of camp debris and Nalgenes they found nothing. Sand had moved, the water had risen and fallen and the gear disappeared with the water. "It's all gone, flushed away I suppose," Zeb remarked.

Matt and Zeb continued to Sump 4 where cylinders and a regulator remained. They noticed high water marks, and shifted sand bars. The flood had overtopped the Relief Chamber at the top of Sump 4. They derigged the cave and recovered all of the equipment they could locate.

The next three days were spent ferrying gear through Sump 3 to Dive Base, and Dive Base before Sump 2 to the Horse Drop outside, which was the lowest point in the canyon the horses could get to. Thousands of kilograms of gear was returned to the field house, inventoried and loaded into the truck and van for the long drive back to the USA.

Dye Trace

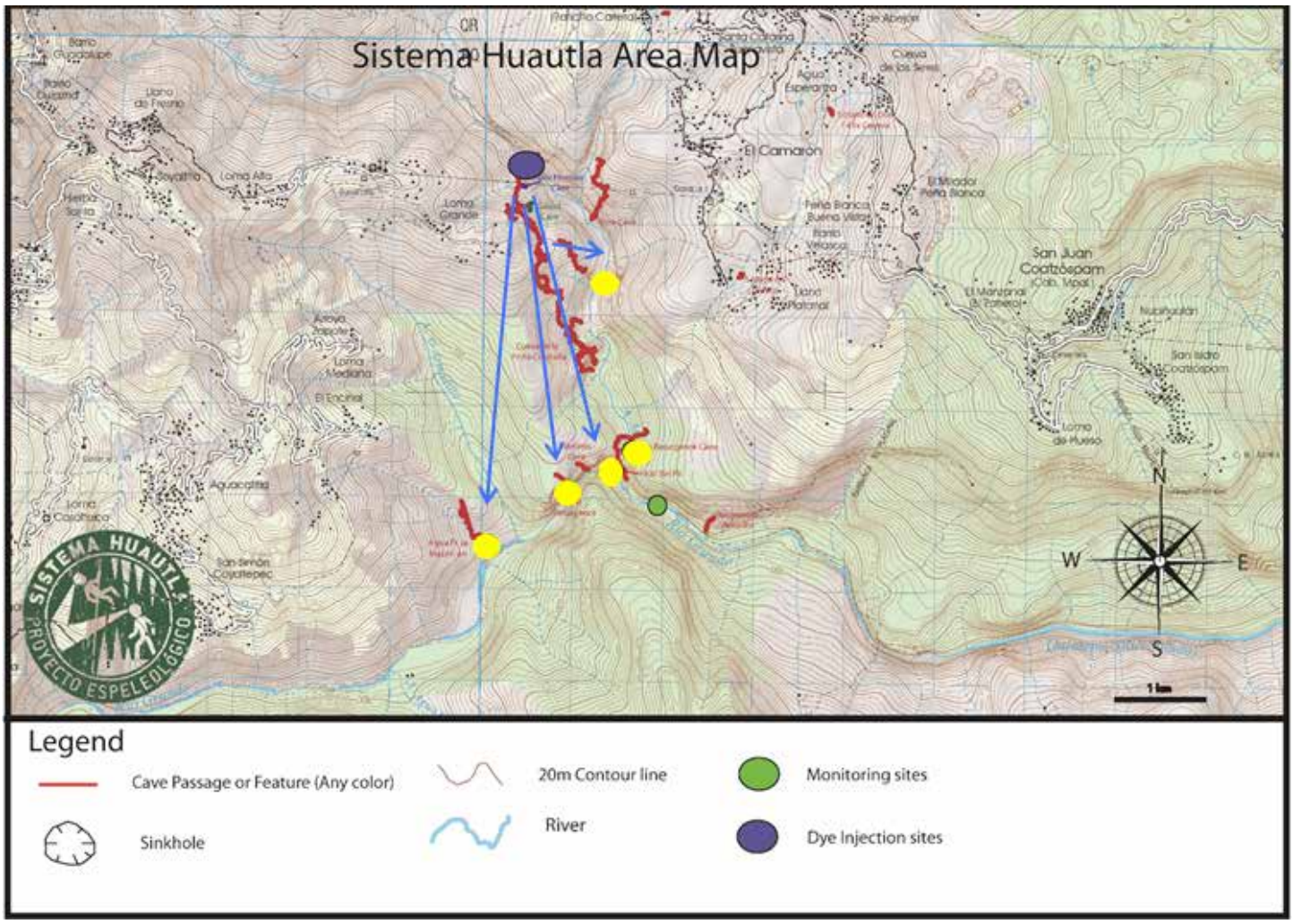
(by Fernando Hernandez)

The Peña Colorada Expedition provided an excellent opportunity to perform a dye trace to assess the relationship of Cueva de la Peña Colorada to other springs in the area. On March 17, 2018, the background receptors were installed at different sites along the canyon in order to detect any dye that may be present in the water before the trace. On April 7, three pounds of non-toxic Fluorescein dye were injected in Sump 7 by the divers. The divers report a very low to no flow on Sump 7 at the time of injection. Then on April 10, the heavy rain event hit the whole basin of the Sierra Mazateca. Dye receptors were retrieved on April 23, with the exception of one in the Peña Colorada canyon. See table below.

The results in this preliminary study characterize Huautla Basin as a multiple spring karst complex. The direct connection to the Huautla Resurgence still needs additional study to be concluded as a strong positive. The connection to Agua de Frio and Huautla Resurgence was significant and unexpected. Initial observations of Sump 7 showed no to very little flow, and the flood event of April 10 activated overflow conduits. The connection of Cueva de la Peña Colorada to Agua de Frio and Huautla Resurgence is possibly through these overflow routes. At normal base level it is highly unlikely that the cave is connected to these springs. It is hypothesized that the drainage basin for Peña Colorada used

Name	Feature Type	Placement Date	Retrieval Date	Result
Huautla Resurgence	Spring	004/02/2018	04/23/2018	Light Positive
Huautla Resurgence SD	Spring	04/02/2018		Light Positive
Agua Fria Spring	Spring	04/02/2018	04/23/2018	Heavy Positive
Agua de Fria HM	Spring	04/02/2018	04/23/2018	Heavy Positive
HR Resurgence	Spring	04/02/2018	04/23/2018	Heavy Positive
PC Spring	Spring	04/02/2018	04/23/2018	Positive
PC Canyon DS	Surface Stream / Swallet	04/02/2018	04/23/2018	Positive

Initial dye trace results showed positive detections at multiple sites.



to be bigger than the current basin for Sistema Huautla. As the water table lowered due to valley incision, basins got subdivided and flow to different springs. Nevertheless they are still connected through overflow routes which during the rainy season combine flowpaths, while in the dry season they stay on their own basin.

Support

This expedition could not have been possible without the valiant effort from the expedition team and the local community of Loma Grande and Mazatlán Villa de Flores. We also want to thank our supporters: KISS Rebreathers, Xdeep, Shearwater Research, Hennessy Hammocks, Nalgene, Light Monkey, Submerge Scooters, Otter Drysuits, Highline Ropes, Scurion, Apeks, OC Lugo, TFM Engineering Australia, DKG Drysuits, Transglobe Expedition Trust, the United States Deep Caving Team, Subsalve USA, Wilderness Lectures, Canmore Cave Tours, The Ghar Parau Foundation, Australian Geographic Society, and the National Speleological Society, and all of our generous donors that helped to make this expedition happen.

For more information have a look at our web page, https://www.beyondthesump.org , and for regular updates on our future expeditions follow us on https://www.facebook.com/CaveDive/.

Resumen de la expedición a la Cueva de la Pena Colorada en 2018. Con información de la última esfuerza a esa cueva in 1984, y un equipo muy experimentado en bucear cuevas, la meta principal fue probar una presunta conexión acuática entre el Sifón 7 de la Cueva la Pena Colorada con el Sistema Huautla. A través de una descripción del equipo especializado de buceo, la logística de todo, y los resultas preliminares de un estudio hidrogeológico, el articulo habla de cómo se superaron los retos de una grande inundación que les dejó unos miembros del equipo atrapados con pocos recursos.

PROYECTO ESPELEOLÓGICO SISTEMA HUAUTLA (PESH)

The Fifth Annual PESH Expedition, 2018: Halfway to a goal of ten annual expeditions

by Bill Steele, with contributions by Alma Rodriguez, Kyle Lassiter, Katie Graham, Steve Gladieux, and Amy Cantrell Morton

Caving in Huautla is much older than PESH, going back 48 years to 1965. Different groups of US cavers participated in waves: 1965-1969, Texas and Tennessee, Alabama, and Georgia (TAG) cavers; 1967-1971, Canadian, Texas and TAG cavers; 1976-1994, Huautla project cavers from the USA, Mexico, Australia, England; 1995-2007, occasional expeditions organized by Bill Stone; and the 2013 British-led expedition to dive Sump 9 at the bottom of the system. That 2013 expedition spurred participants Tommy Shifflett and Bill Steele to organize PESH, planning to conduct annual expeditions for a decade (2014-2023) to explore and study Sistema Huautla, Huautla de Jimenez, Oaxaca, Mexico, and other caves in the Huautla drainage basin.

Before the 2018 expedition, Bill Stone asked what our objectives were, and I sent him this list:

- Push Big Wind Cave (Nita Ntjao)
- La Grieta Camp 3 remaining leads and clean camp
- La Grieta Camp 4 remaining leads, climb Hoo Hah Dome, and clean camp
- Explore two new caves near Carrizo
- Push Nita N'Tau
- Continue looking for new caves in the San Andres agencia
- Work on permission to look for caves in Agua de Cerro and Cerro Ocote jurisdictions.
- Explore caves owned by man in Llano Verde
- Check out Grutas de San Antonio
- Map Cueva de los Seres
- Make biological collections
- Collect stalagmite for dating
- Dye trace to Peña Colorada

He remarked that the list could take 20 years, but I'm pleased to report that we accomplished these objectives,

First group photo of the 2018 PESH team.

and some continue well enough to be carried forward on our list of 2019 objectives. The 2018 expedition ended with Sistema Huautla as the deepest cave in the Western Hemisphere, tied as 9th deepest cave in the world, 85 kilometers long (53 miles) and 1560 meters deep (5,118 feet), now with 26 entrances.

Onward to Huautla: Logistics and Departure

On March 31, 2018, we had a well-attended expedition send-off party at my daughter Audrey's home in south Austin. When I got everyone's attention, I spoke from the top of the stairs of the backyard deck and asked Bill Mixon to stand and be recognized for his contributions to U.S. speleological literature and for editing AMCS publications for so many years. Then I held up three flags - from the NSS, Mexico, and The Explorer's Club - to celebrate their participation (particularly the Mexican cavers who received a round of applause) and the PESH banner with the PESH logo. Early morning, Easter Sunday, April 1, we packed, trying to get gear for over a month into the PESH 1995 Chevy van and Blake Harrison's Dodge Ram truck with large camper. To facilitate our border crossing the next day, we drove to Laredo and got rooms at a Motel 6. Early in the morning, we crossed the border and spent two days driving to Tehuacan, Puebla, with its excellent restaurants and excellent vehicle mechanics. As we were packing our bags for the final three-hour drive to Huautla, Blake mentioned to me that his clutch didn't feel right. Since we were about to ascend into the steep Sierra Mazateca and be there for five weeks, it was easy to decide to get it fixed. Blake stayed and I drove on to Huautla. He showed up the next day. The mechanics stuck with the job until 10:30 p.m., and then THEY bought the beer!

A first order of business was to visit a curandero for a blessing. Huautla resident and PESH leader Alma Rodriguez wrote about it:

PESH 2018 was about to start. With this in mind, and knowing there are many curanderos in the area, we were in search of one of them. We were looking not for a famous or prestigious one, but for someone very respectful of traditions and spiritual

beliefs without looking for fame. The first day of the expedition, we went with the few people that had arrived to Huautla to a small place in the nearby area where we would find one of my mother's uncles. He used mushrooms to heal people and performed ceremonies to clean their spirits. However, my mother's uncle had a very selective way to choose his patients. In addition, he did not want to be named. He explained to my mom that that we were about to start a very formal ceremony, and that we needed to be very respectful about it….After we had explained why we were there he affirmed that the caves are very special places and that we as Mazatecs are sometimes afraid of them, while they (the gringos) know what they are doing and are not afraid. He wanted them to be careful and aware of the importance of caves for the environment.

When we told him that there were many people involved in this project, my uncle said he would mention the leader Guillermo Acero *(literal translation of William Steele) as representing all of the members of the expedition. During the ritual he repeated this name many times. He also spoke to Christ and the Virgin on our behalf. He repeated many times that we were there seeking protection and the blessing of the gods to remain safe and to accomplish what we came for.*

He used copal incense and gave a small piece to the attendees to be placed in the copalero and burned. Otherwise we remained very quiet and not overly involved. He chanted many words in Mazateco, and we listened quietly. From time to time he asked again how many people there would be and where they were from, and my mother explained again in our language. He was usually very selective because some outsiders don't behave well when ceremonies are being performed. He hesitated about giving us a small piece of paper or envelope with San Pedro inside--supposedly it protects you from evil. At the end, he did not give it to us. He said it is important and strong when carried, but that the attendees would somehow not be good carriers.

At the end he said that Mazatecs have special diets when they really want a ceremony to be successful. When he said diet, he meant not drinking alcohol for the following four or five days. He also gave us further instructions: if someone were to visit us in the expedition fieldhouse during this time who was not part of the expedition we were not allowed to give him any coffee, bread, or even a glass of water. The last direction was not to have sex in the following days. I think he meant for us to be "completely clean". It was then that I realized this was not a cleansing ceremony but a request to the gods for success, protection, and permission being asked through the curandero´s voice.

For the next three days were busy getting our permission letter from the presidente of Huautla's office, permission from the agente of San Andres, paid 3,000 pesos to the owner of the entrance of La Grieta for access, paid 1,500 pesos to the agencia of Plan Carlota, rented six buildings in Plan Carlota, set up the kitchen, rented two refrigerators to add to the one that came with the cookhouse, got full propane bottles, and bought groceries. We were ready for the arrival of 25 cavers from Huautla by taxi.

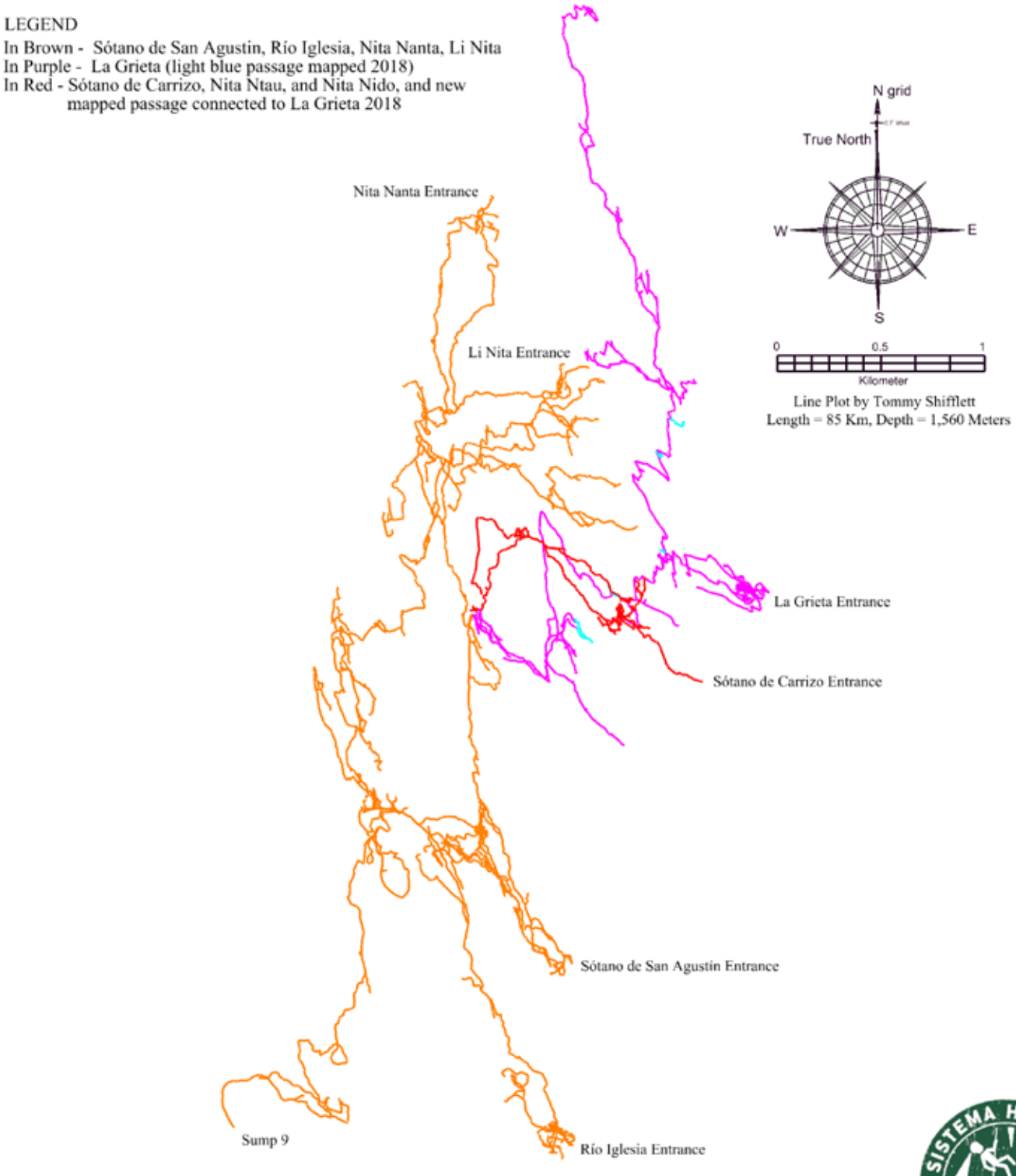
A week after we left Austin, all cavers who'd signed up for the first two weeks or the whole four weeks were present. They were sleeping in six different buildings, including a small room upstairs above the cookhouse/kitchen and many community rooms. Alma Rodriguez, in Huautla, who joined PESH through Facebook, saying: "I live here with my mother now, I have a college degree in English and have taught university-level English. I've opened an English language school in Huautla. I think what PESH is doing is the most interesting thing happening here, and I want to help in any way I can." She's been an immense help ever since.

And We're Off

On April 8, we gathered for a group meeting and to discuss the game plan to get the expedition started. We needed to prioritize.

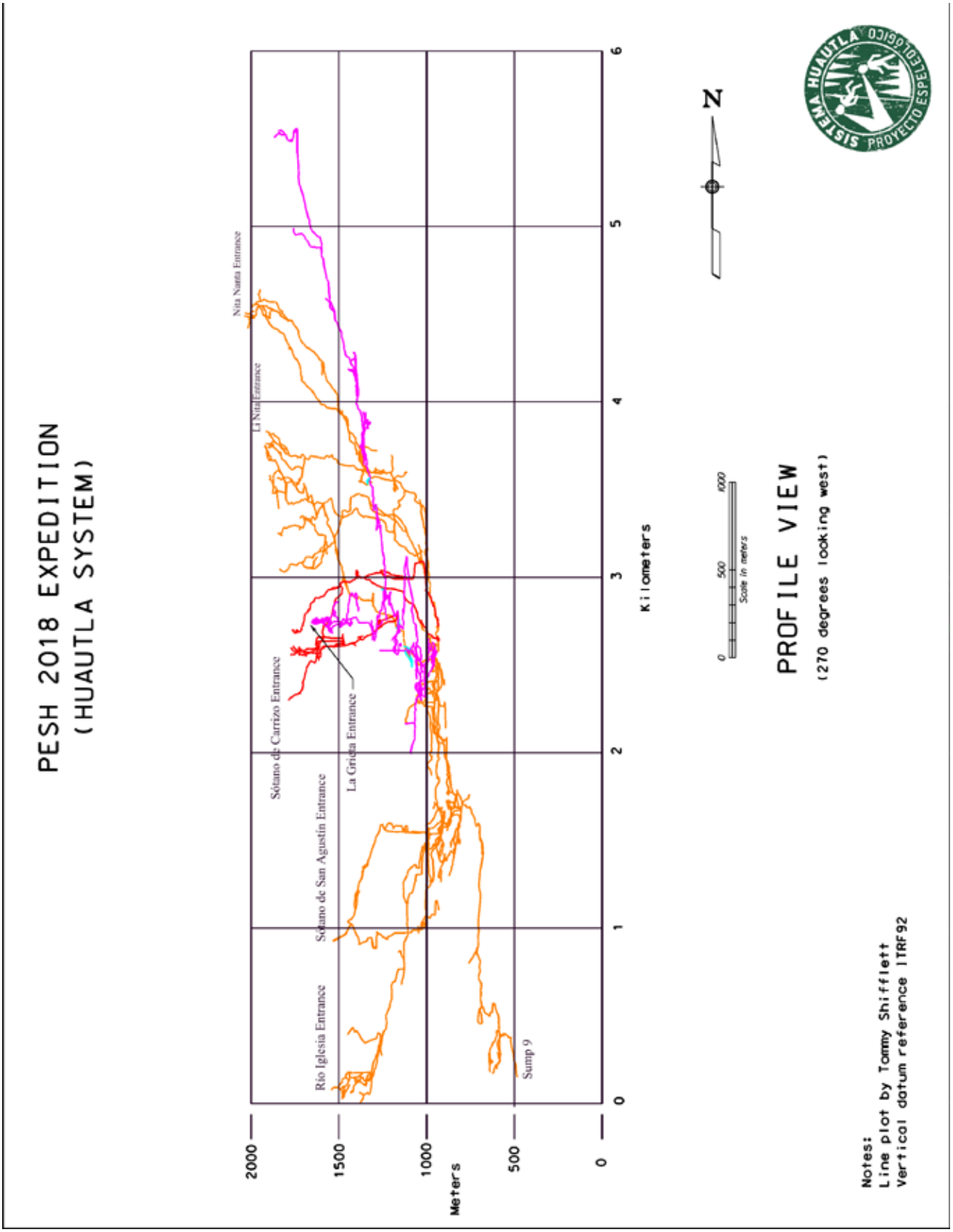
Some plans were carryovers from prior expeditions. We wanted to push Big Wind Cave (Nita Ntjao in Mazateco), found in 2017 high on the same ridge as the highest entrances of Sistema Huautla. Connecting the two would add as much as 20 meters to Sistema Huautla's depth. A focus for all five expeditions has been La Grieta;

PESH 2018 EXPEDITION
(HUAUTLA SYSTEM)



PLAN VIEW

where Camp 3 and Camp 4 would be used again to explore leads and



map. However, this route into Sistema Huautla needed to be rerigged and

reprovisioned before this work could start.

Then there was Sótano de Agua de Carrizo, an 840-meter-deep cave explored in 1977-78 and never revisited. In 2017, we had looked for its two entrances, but the fields from the 1970s had been replaced by fifty-foot-tall trees. Confirming the entrances of Carrizo and rigging them became a priority, since we hoped to connect Carrizo to Sistema Huautla. Checking out the windy crack at the bottom of the impressive TAG Shaft in Nita N'Tau, revisited in 2017, also made our top list. See what goes and what doesn't.

Phase 1: Surface Progress

To me a great thing about cave exploration is that "you don't know until you go." I don't think anything else is quite like it. With a major caving expedition like this one, you get it started and see what "goes." The greatest thing about the Huautla caves is that more often than not, they "go." Late on that first night or early the next day, we'd see what "goes" then plan accordingly.

Caving started happening almost immediately, but I was plugging away at surface duties, in my constant campaign to get access to more caves. Alma told me that she found a taxi driver, Mauricio, who was bilingual in Spanish and Mazateco. He and his taxi were to be hired to drive us to Agua de Cerro to meet with the former agente (one of three at a time), the elected head of the local government (an agencia), to see some caves on his land, near the perched ridgetop town of Agua de Cerro -- and near over half of the 20 known entrances to Sistema Huautla. We waited, but the former agente didn't show. It started raining hard, and we found a little tienda and bought snacks before heading back south. On the way, we wanted to check out a sótano entrance for which GPS coordinates were provided by Bill Stone. It was still pouring, but we stopped at a house along the road, seeing people huddled under the eaves. They offered us hot coffee and were friendly. A man said yes, there is a big sótano not far away, just out of sight behind a hill, down a visible trail. But, he continued, it was not a good day to go to it because the rocks that stair-step down to its edge are wet and slippery. He said you'd have to be a spider to get down to it today, -- come back in two days, and he'd take us there himself. As we prepared to leave, our no-show from Agua de Cerro showed, apologizing for running late. He also was rescheduled for two days later.

Mauricio, our taxi driver-guide met us as planned, and we all ended up going on a tough hike. At first the hike went steeply up to our guide's childhood home, now shut and overgrown, and then steeply downhill into dense growth with tall karst pinnacles. We went a long way and all saw some pits, but nothing of note.

The man who said he'd take us to Stone's lead wasn't home, but his wife said he was working nearby. We found him, and he said to go on, it's right over there. We tried, but we got run off. The rocky path went up to a house on a hill, presumably from which the sótano can be seen, but before we got that far, a woman appeared by the house waving a long stick and shouting in Mazateco to not come any closer and that we could not pass. Alma and Scott Trescott, a US caver who lives in Costa Rica, tried to talk to her, but she was adamant that we could not pass by her house. A dead end.

Phase 1: Underground

Caving was happening as the surface arrangements were being rained out. The two entrances of Carrizo were found in the woods. In continuing discussions, some cavers wanted to start rigging at 840 meters deep. I hesitated for two reasons: 1) Such an effort would eat up a lot of human, rope and gear resources, and 2) Tommy Shifflett, PESH Co-Leader, cartographer, and PESH cave lead advisor, was urging us to look in the upper reaches of Carrizo for something that might connect to Sistema Huautla without going 840 meters deep.

Those arguments won. A team of Stephen Gladieux, Chase Varner, Kaite Graham, Elliot Guerra-Blackmer, and Tiffany Nardico went to Camp 4, located 600 meters deep in La Grieta, to climb Hoo Hah Dome, found the year before. Fernando Hernandez and Matt Tomlinson went to Camp 3 in La Grieta to install a flow recorder and check on the mountain of gear that had been stacking up in Camp 3 (500 meters deep) over the three years it had been used.

In Sótano de Agua de Carrizo, rigging was accomplished in both entrances. That feat required me to remember trips from 40 years earlier, because the maps were unclear. I knew that the single drop Son of a Pitch and the 100-meter deep multi-drop Wet Series came together. I also recalled that there was an up-trending lead where they came together-- in Huautla, not infrequently a sign of an underground water divide and a descending passage.

Also, on this first day of caving, Nita N'Tau was rigged to the top of the awesome TAG Shaft. Found during the 1985 Huautla Project expedition by Richard Schreiber, Frank Bogle, and Jim Youmans, this 136-meter (446 feet) pit was revisited in 2017 by Chris Higgins for the first time since then. Chris specializes in photographing big pits. While there, his team discovered a crack at the bottom of the pit with a howling gale of air entering it. This was one of our major 2018 leads.

The next day, the big event was rigging the 100-meter Son of a Pitch with rebelays and 9-milimeter PMI rope. In 1978, it had been rigged in one shot all the way down with an 11-milimeter rope. I remember waiting a long time at the bottom for my turn to climb. Now, several people could ascend or descend at once, one at a time below a rebelay.

Tennessee caver Kyle Lassiter writes about these days of rigging and lead checking:

I joined the first large rigging team

The TAG shaft. *Chris Higgins.*

going into Carrizo on April 10. There was a bit of confusion concerning which of the two entrances 30 meters apart was the preferred dry route, since no one had visited the cave since 1978. Thus, we split into two teams and rigged each entrance pit to figure it out. I went to what turned out to be the main entrance and helped Josh Hydeman take photos of Chris Lloyd rigging the beautiful sloping 40-meter entrance pitch. Placing many rebelays and dealing with poor rock quality slowed the rigging work, but we all reached the bottom of the entrance pit late in the day and found the top of the next pit, the 95-meter-deep "Son of a Pitch" dry bypass route. The other entrance crew derigged after we confirmed our dry route was the way to go, bypassing the historic route of six consecutive very wet pits, especially during wet weather like we were experiencing.

That night at base camp I started studying the available leads indicated in the Carrizo survey data. I came across one indicated at the bottom of the wet entrance pit series, which had this note:

"BOTTOM OF 6TH DROP, WET SERIES. ZEMAN'S BIVOUAC PASSAGE EXPLORED UPSTREAM 500M+ BY SCHREIBER, MAY 1978 ---- MAJOR LEAD"

"Zeman's Bivouac" *is the location where Steve Zeman was forced to wait out a flood pulse while trying to exit the cave in 1978. It is the beginning of an upstream tributary passage that joins the main stream in Carrizo at the bottom of the 6th drop in the wet entrance pit series. Richard Schreiber was a legendary TAG caver who was involved in many significant caving projects in the 1970s and 1980s, including Ellison's Cave in Georgia and Sistema Huautla. Seeing this survey note intrigued me, since 500 meters is a lot of cave to be mapped, and it was located conveniently close to the main entrance and at the relatively shallow depth of about 150 meters. I did not expect it to lead to any significant finds necessarily, just to add passage to the map.*

The next day we [Chris Lloyd, Bob Anderson, Lee White, and Jesse Houser] returned to rig the Son of a Pitch, and I brought a survey crew along to map Zeman's Bivouac passage. Rigging the pitch ended up taking all day as we dealt with rotten tock and sloping walls, but my survey team did go to check out the beginning of the lead. It started as a tall rift immediately adjacent to the last wet pit and was issuing a small stream from beneath some breakdown. The breakdown filled up much of the passage there, but it looked like there was a crawlway through to the other side; surely the route Schreiber took. Not exactly an inviting passage at that point, but the note about there being 500 meters of cave was convincing.

We [David Rose from the UK, David Tirado from Mexico, Bob Alderson of West Virginia, and I] returned the next day and began the survey early in the afternoon. Miraculously, we found an original survey station to tie-in to from 1978! We pushed through the breakdown

quickly and found a drippy area where the small stream entered via a crack high on the left wall, but the passage continued ahead as a dry paleo canyon well decorated and with lots of popcorn. After a few dozen meters, the floor dropped out of the canyon, forcing us to descend four meters down into a lower level of well decorated crawlways. This passage continued descending and soon dropped into another narrow canyon with the sound of a stream nearby. We had apparently crossed a drainage divide and encountered a different stream within Carrizo, as this was not the same stream seen in the entrance of the cave or in the infeeder earlier!

We soon found a well decorated walking stream passage going upstream, with "RS 6615" written in carbide on a rock near the base of a 30-foot waterfall which we could not climb. At this point, we had surveyed about 500 feet (not meters, contrary to the old survey notes) and found Schreiber's initials, and still needed to explore downstream into the unknown! We explored and surveyed downstream through beautifully decorated canyon passage for about 40 meters to the top of an eight-meter free drop into what looked like a large sandy room. We could not determine if Schreiber had explored to this point, but apparently, he didn't report or drop the pit, if he had been here. We had to leave this lead for another day since we had not brought rope to explore this "upstream infeeder," which of course now was fast becoming a significant downstream lead. Plotting the survey data that night showed that the downstream passage had trended east off the map, opposite the rest of the cave, which trends northwest. Our little side lead survey project had suddenly become the main objective in Carrizo. In honor of the original explorer of this passage, we named this beautifully decorated canyon above the virgin pit "Spirit of Schreiber."

David Rose, Bob Alderson, and I returned with rope and hardware on April 14 to continue exploration downstream in the Spirit of Schreiber passage. Bob rigged the pit nice and dry on the far side of a natural bridge. We found a nice 12-by-8-meter sand-floored room at the bottom, with a 7-meter-wide by 4-meter-high walking passage taking off downstream. The passage abruptly turned north here and then pinched down to a narrow canyon for 75 meters. Bob found and rigged the next eight-meter pit. While David and I were surveying up to him, Bob reported back that just beyond that next pit was another huge shaft with a five second rockfall! I could hardly believe my ears until I saw it with my own eyes. Sure enough, we had just dropped into a 12-meter-high by 6-meter-wide canyon, with the water pouring down a deep pit, 10 meters by 5 meters across. We were only about 100 meters from where we first found the Schreiber Stream at this point. With more rope from the gear stash, we were able to get a Disto shot of 38 meters through the mist, but we couldn't tell if we were seeing the bottom or not. David found a plastic tea strainer that had washed in and decided to name the preceding 8-meter pit "Kettle Falls," and the room above the next big pit the "Tea Room." He must be a Brit! Bob was only able to set a few bolts before we needed to leave for the night. Plotting the survey data showed that the Spirit of Schreiber had veered directly towards the TAG Shaft area in Nita N'Tau. Connecting the two caves or finding a parallel but separate route near the TAG Shaft would both be significant news for the expedition. Morale amongst the team was high!

The next day, Alderson, Houser, and I worked on rigging the pit, with great obstacles. The Disto wouldn't work with all the mist from the nearby waterfall, but a rock drop took three seconds. We would later determine during the survey that it was 47 meters. I descended and soon saw that one wall peeled back into blackness, into what certainly must be the TAG Shaft. I landed on a large balcony on one side of the room, still 60 meters or more off the floor, and soon saw survey stations left from 2017 during an aid climb in the TAG Shaft by Stephen Gladieux and Lee White. Connection confirmed! Agua de Carrizo and Nita N'Tau were now one cave system. The pit was named the "British Invasion" to TAG Shaft, in recognition of the significant contributions by David Rose on this project. We left the cave and celebrated our discovery in the middle of the night back at base camp.

Two days later we returned and surveyed the pit to a depth of 83 meters, and then tied it into the existing survey in Nita N'Tau. It was determined that this new Spirit of Schreiber route to the bottom of the TAG Shaft was an easier route than the original route via Nita N'Tau, so that route was derigged. This connection added about 20 meters of depth to Agua de Carrizo, due to a higher entrance in Nita N'Tau, as well as about 1300 meters in length. I had to leave the expedition at this point, but over the course of the next week the focus turned to enlarging and pushing the windy crack at the bottom of the TAG Shaft, with the hope of connecting it to La Grieta. They added at least seven kilometers in length to Sistema Huautla and made the 136-meter (446 feet) deep TAG Shaft the deepest pit in the entire system. Two major cave connections in one expedition, and I was fortunate enough to be a part of the first one.

Doing it the Hard Way: Trapped!!!

While the other teams were busy, Fernando Hernandez and Matt Tomlinson had gone into La Grieta to take some food to the cavers camping 700 meters deep at Camp 4 and accompany Canadian caver Katie Graham out of the cave, so she could catch a plane to go home. They reported a section of cave about 600 meters deep was flooded to the ceiling. Five cavers - Stephen Gladieux, Katie Graham, Chase Varner, Elliot Guerra-Blackmer, and Tiffany Nardico - were trapped. This possibility had been discussed, given that the ground was noticeably saturated. PESH expeditions take place in April because it should be the driest month of the year, but this was a wet April.

Katie Graham and Steve Gladieux detailed their trip:

We were high and dry during the day, but on the way back to camp we had a rappel series that landed in waist deep water. It was possible to get off rope early and traverse over the water on thin ledges,

but it risked a fall and total submersion, so only some folks elected that route. Tiffany decided to brave the wading this time, and we realized that we could not see the submerged rocks we normally stepped on to stay shallower. The water was turbid. In the subway-like passage the water was definitely around 15 centimeters higher than it had previously been. Given that it is a six-meter wide stream, there was a large difference in flow.

Back at camp the waterfall was raging, with a meter-high rooster tail where a rock had previously stood above the gentle flow. It was impressive! We were enjoying witnessing the cave reacting to rain from a safe and dry camp. We had known coming in that the passage past Pato Mojado might flood shut with the light rain expected on days two and three but were confident that the cave could discharge that water load before our planned exit.

Katie and Chase had a different experience. Their trip downward had been productive. They started to make sense of the myriad of parallel passages, all without recoverable survey stations, including several partial resurveys. They had rigged a few short ropes at waterfalls and free climbed others. To witness the deepest part of this incredible system is very powerful, the character of the passage becomes similar to Cheve, with the carved marbleized canyons. Then, the imagination is frustrated when the water unceremoniously disappears down narrow cracks.

On their way back, the fun slab climb had water streaming over it, making it too slippery and too forceful to climb down. They followed the muddy sides, confused about the change in character. Then they saw the stream way. What had previously been babbling, ankle-deep water had become a roaring, waist-deep expression of violence. Katie tried to follow the river, firmly planting each footstep upstream of a rock and leaning against the flow. Then she came to a drop with no way around it. She figured jumping in and swimming offensively to the side bank was her best bet. But once committed she was swept by the force, desperately and ineffectively reaching for the side banks. Chase watched her ripped down the passage and out of sight with the sort of dumb shock later expressed as "I'm in trouble…"

Katie reached the bank, and relief came and went as she persevered the force of the water making a sail out of the backpack, pulling her downstream. Raising a foot meant the other foot had to hold against the force of the sail. She called to Chase, but he was too far away, she needed to get out now. Deep breaths. Full acknowledgement of the situation. She reached up with arms and legs in a fast fluid motion and was out. She stood shell shocked anxiously waiting to see Chase's light. He appeared, and they both arrived to camp soaked, with mixed, shaking smiles. Katie said, "Yeah, there was a lot of water," and no other objection.

Along with Tiffany Nardico and Stephen Gladieux, they were trapped at La Grieta's Camp 4 by flood water. They kept busy and discovered perhaps the most impressive dome yet found in Sistema Huautla. Stephen Gladieux reports on a scouting trip where Tiffany took lead up a breakdown slope and into a large dome room echoing with the sound of water:

The dome had a sort of antechamber with a proper roof and dry breakdown; hence we probed ahead to see how best to characterize the dome.

Immediately, Chase noticed the fresh air, the smell of the surface! We started doing calculations and wondering – we were still at least 550 meters below the La Grieta entrance, and the overburden here was probably much greater than that! The surface smell was unmistakable to our noses now sequestered down here for four days. At the bottom of the dome we found small fields of plastic pieces, about the size of apricots. Overburden or not, this dome clearly had congress with the surface. It was an unexpected pleasure.

The dome was not exactly huge, though very wide; but the impressive aspect was its height – it soaked up over 2000 lumens of light, and then stretched the darkness above our beams further upward into imagination. We figured it was 150 meters tall or taller.

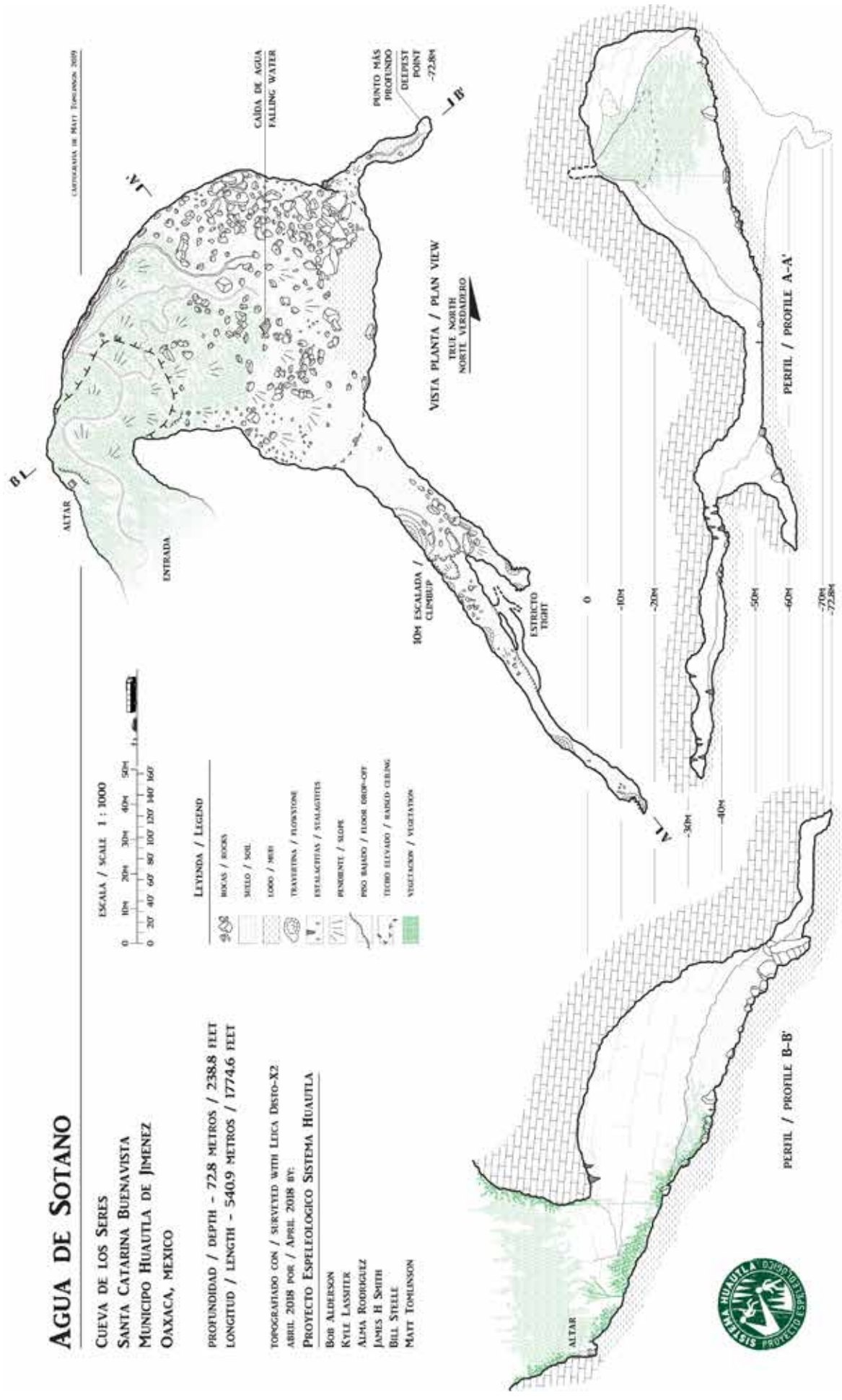
They were trapped there for three days, with only bars to eat, noted Amy Morton in another report. The water eventually receded, and the mission of the deep camps continued.

April 17 was a big day of caving. A group (Elliot Guerra-Blackmer, Chris Lloyd, Gerry Morrill, Matt Tomlinson, and Scott Trescott) journeyed to Camp 3 in La Grieta to camp, explore, and map. Also, a group went into Carrizo to pass through Spirit of Schreiber, down British Invasion to the bottom of the TAG Shaft, to begin enlarging the windy crack to get through it - which happened two days later. Bob Alderson became the "hero of the crack" due to his determined crack-widening skills. He sketched the survey through the crack and christened it "Virgin Queen's Crack" (he's from Virginia). Lee White was the first one to squeeze through the 15-meter-long, body-tight crack to the other side and reach the top of a drop. The La Grieta Camp 3 team emerged after a two-day stay with the report that they had mopped up a bunch of survey in remaining leads and hauled a lot of stuff out of the cave.

Another, smaller achievement was aimed at the Huautla community: Agua de Sótano was mapped. The cave is situated in the Huautla de Jimenez jurisdiction, on the east side of San Miguel Huautepec and below the main road at a settlement named Cueva de Seres. Agua de Sótano has a huge walk-in entrance without much behind it, so it is a good cave for the tourist office in Huautla to send people who ask about caves. Matt Tomlinson, an architect by profession, agreed to draft a map, which will be provided to the tourist office in 2019. We started mapping it on April 16 and finished on April 20. The highlight was Martin Hoff climbing high at the end of the right-hand branch and coming to a dead end of an upper level with a big ceramic pot there.

Meanwhile, Back on the Surface

During PESH expeditions I do our public relations. I speak to school students and community groups. In


AGUA DE SOTANO
CUEVA DE LOS SERES
SANTA CATARINA BUENAVISTA
MUNICIPO HUAUTLA DE JIMENEZ
OAXACA, MEXICO
PROFUNDIDAD / DEPTH - 72.8 METROS / 238.8 FEET
LONGITUD / LENGTH - 540.9 METROS / 1774.6 FEET
TOPOGRAFIADO CON / SURVEYED WITH LEICA DISTO-X2
ABRIL 2018 POR / APRIL 2018 BY:
PROYECTO ESPELEOLOGICO SISTEMA HUAUTLA
BOB ALDERSON
KYLE LASSITER
ALMA RODRIGUEZ
JAMES H. SMITH
BILL STEELE
MATT TOMLINSON
CARTOGRAFIA DE MATT TOMLINSON 2019
ESCALA / SCALE 1 : 1000
LEYENDA / LEGEND
ROCAS / ROCKS
SUELO / SOIL
LODO / MUD
TRAVERTINA / FLOWSTONE
ESTALACTITAS / STALAGTITES
PENDIENTE / SLOPE
PISO BAJADO / FLOOR DROP-OFF
TECHO ELEVADO / RAISED CEILING
VEGETACION / VEGETATION
ENTRADA
ALTAR
CAÍDA DE AGUA
FALLING WATER
PUNTO MÁS PROFUNDO
DEEPEST POINT
-72.8M
10M ESCALADA / CLIMBUP
ESTRICTO
TIGHT
VISTA PLANTA / PLAN VIEW
TRUE NORTH
NORTE VERDADERO
PERFIL / PROFILE A-A'
PERFIL / PROFILE B-B'
0
-10M
-20M
-30M
-40M
-50M
-60M
-70M
-72.8M
SISTEMA HUAUTLA
PROYECTO ESPELEOLOGICO

1981, Bill Stone had given a public slide show in the Huautla movie theatre (now closed), standing room only. This year called for a repeat. We rented the large, covered inner courtyard of the Posada San Antonio for $1,200 pesos ($60 USD), printed handbill invitations, and paid a student of Alma's to put them up around Huautla, I gave a slide show about our project with Alma translating, followed by a speech by Mexican caver Gerardo Morrill. We didn't fill every seat, but, more importantly, the city's movers and shakers were there. Even a Summers Linguistics Institute linguist showed up: he lives in Mazatlan about two hours from Huautla, transforming their spoken Mazateco into a written language.

The next day, while other cavers went back into Carrizo to work on widening Virgin Queen's Crack, we scheduled a visit by a group of public-school teachers. They had asked about being taken to a cave, so we asked them to get written permission from the Catholic Church in Huautla for us to be able to go into Cueva de Agua de Carlota. The entrance is at a retreat the church owns at the edge of the village of La Providencia, on the main road past San Agustin Zaragoza. At Plan Carlota, with Gerry Morrill speaking for us in eloquent Spanish, we showed them the camp, topographic maps, the sleeping rooms, and how our kitchen was set up.

With the expedition humming along in La Grieta, Carrizo, and Nita N'Tau, it was time for me to venture off to attempt to get a new area open to us for cave exploration. We decided to try "bread loaf diplomacy." Alma and I bought ten loaves of bread from a bakery in Huautla and took them with us to give to people we talk to. In Poza Rica it was quiet; no one was visible outside. Alma climbed some steep steps up to a house, found a woman to talk to and found out where Bernardo the representante lives. We went to his house, and I waited outside while Alma was inside with him. He said it was ok with him if we gave a presentation to the school students, but it has to be approved by a committee of parents. Unfortunately, the committee chairwoman was not in favor of what we might tell students about the caves.

Phase 2: Changing of the Guard

April 21 was the midpoint of the expedition, the turnover weekend. Two of the planned four weeks of caving were behind us, with those with us for the first two weeks leaving and those coming for the last two weeks arriving - time for a group photo to include as many of the 2018 team as possible.

On April 23, a lot of preparation was underway in the Plan Carlota fieldhouse for two underground camps: La Grieta Camp 3 and Camp Hulsey. The latter camp, at the base of the TAG Shaft, was named for an Explorers Club member from St. Louis, Ben Hulsey, a major donor to the expedition. As always, legwork continued for more surface work toward future exploration. Preparation for underground camping meant preparing underground camping food. We use three recipes formulated by Sean Lewis for the Sistema Cheve project. There are two breakfast mixes: egg-based and oatmeal-based, and one dinner mix. These were then fortified with jerky, dried fruit, and nuts.

Alma Rodriguez, Jim Smith, and I drove to San Antonio Eloxochitlan the next day to see if we could go to Cueva de San Antonio, a cave known since 1970 when Canadian cavers explored and mapped some of it, publishing their map in the Canadian Caver. The Canadians said that there were prehispanic ceramics in it and oral tradition says that horses had been hidden in it during the Mexican Revolution. People on the street in Huautla had mentioned this cave to me several times, as well.

At the municipio government building in San Antonio Eloxochitlan, we asked for permission to go to the cave and asked where we could hire a guide. To our surprise, the presidente's office assigned a policeman to go with us. He was agile, tireless, and friendly. He also knew where the cave is, which would not have been easy to describe how to find.

We drove along a canyon of the Rio Petlapa which carries the river that the Puente de Fierro crosses before the last climb up to Huautla on the main road. At times, we were driving on a road that had been carved out of a cliff face, as much as 400 feet directly above a sheer cliff to the river below. The policeman knew where to park along the road to take a narrow path that switched back and forth around 300 feet in elevation, sometimes with as much as a 50-foot drop to the path below.

The cave's entrance was big, about 50 meters wide and 30 meters high. There was evidence of a lot of human visitation, but no ceramics in the

Camp Husley.

passages we saw. Some two-inch diameter polypropylene rope was rigged at a steep diagonal angle down a drop where we turned around. It seemed that there is a lot of passage here that the Canadian cavers did not get to or map almost 50 years before. I've even heard that there's another entrance. Thoroughly exploring and mapping Cueva de San Antonio became a goal for 2019.

On April 25, Vico Jones, Jim Smith, and I returned to Poza Rica with a GPS location, looking for a sink. A year earlier, a team from La Grieta Camp 3 included Fernando Hernandez, now a geology graduate student at Western Kentucky University. He was planning a master's thesis on the hydrology of Sistema Huautla. He had gone the furthest of the team members, reaching a point he felt was close to the surface: he found spider webs, a green leaf, and the distinct surface smell. We hoped to tie into his lead from a surface sink. The in-cave survey showed that the sink Fernando had reached from the inside lay to the west of the road to Agua de Cerro (not a good approach), and to the east of Plan de Escoba, an area unknown to us north of Poza Rica, where we were not welcome. So we were following the GPS to find a road that would take us close to the cluster of houses and small farms called Plan de Escoba.

When we got to within sight of Poza Rica, there was a fork and a road to the right. I thought we might had gone out this road at one time: it went around a curve behind the hill and ended -- but I was wrong, it didn't end. We continued on about a kilometer and a half to the end of the road at a little store. We thought it would be good to buy something there, but there was no one minding the store, and so we stood in front of it for a few minutes. Finally, we saw a woman looking down at us from a house above the road, who came down.

We bought some drinks and cookies and gave her PESH brochures in Spanish and Mazateco. When we asked about the representante of the area, the elected representative to the agencia council, she motioned down a path and said his home was about a kilometer away. She advised us to stop at the school we would see and ask for directions again. A very friendly teacher came out of his classroom to talk; he said he knew about us and our work, and then had a boy take us to the representante's house.

The representante's house was actually a cluster of three houses. Two women came out. One was talkative and spoke good Spanish with Vico. The other woman was looking intently at me, as if she recognized me, but I'd never been here or even very close to this place before. Then she smiled and said, "Guillermo Acero". Looking even more closely at her, I thankfully recognized her. "Bertha," I said, and she grinned. I hadn't seen her in 35 years, since she was 16 (now 51). The

The Carrizo connection team.

two women invited us into their home for coffee and sweet bread. They told us that a group of Mexican cavers had been nearby 14 months before, but that they had not gotten all permissions necessary. A landowner had become angry and cut their caving rope. The women said to come back in two days when "the husband" will be there. We took it to mean that they were both his wives.

After these encounters, the surface and underground work of the expedition converged. As we were tracing the surface lead, the Camp Hulsey team of riggers and surveyors back in Plan Carlota had gone into Carrizo to the campsite at the bottom of the TAG Shaft, with the intent of staying for three days: Jesse Houser, Adrian Miguel-Nieto, Ellie Watson, Lee White, and Rich Zarria. Elliot Guerra-Blackmer and Adam McLeod went in for the day to help carry some gear, returning to Plan Carlota the next morning, having climbed out from Camp Hulsey at the bottom of the TAG Shaft. They said they had explored and rigged an impressive shaft series on the other side of the Virgin Queen (now named Howery Stairs, after Ken Howery, a generous PESH supporter). They had run out of rope at the bottom of a drop with a breakdown floor. They weren't sure if it would continue beyond there, but the mapping team of Adrian Miguel-Nieto, Ellie Watson, and Rich Zarria, still in the cave, would push it hard.

They suggested that we drive up near the entrance in a while and give them a ride. Blake, Vico, and I drove towards the turn-around closest to Carrizo, but when we got to the curve by the entrances of La Grieta, we saw Adrian, Ellie, and Rich walking toward us. They smiled: a ride rather than walking the last mile! But then we found out the real reason they were smiling: they had connected to La Grieta! Forty years since we first explored Sótano de Agua de Carrizo, it had become part of Sistema Huautla! They said they came out from beneath breakdown not far upstream from Mazateca Shores, which is around 500 meters deep in La Grieta. The team had added over nine kilometers and five entrances to Sistema Huautla. I didn't hesitate: "This is the biggest success of the expedition! Congratulations!"

The next day, April 27, we continued our outreach efforts. Alma and I went to Huautla to see the female chief of police. We showed her an 8" X 10" color print of Chris Higgins' photograph of the city of Huautla taken with his drone camera and told her about Stone's sótano lead near Agua de Cerro. We were seeking permission to fly the drone over it from the road to take its photo. She said that there was a staff member from the presidente's office at the town of Agua de Cerro this very same day. She would radio and ask her to make the pitch for us at a community

leadership meeting she would attend, and that we should go there and give her the photo of the city of Huautla. We did this and waited outside the room. The door to the meeting was open, and I could see the staff member explaining things and holding up the photo. Then she came out shaking her head no. She said they said they had voted before: no foreigners may go in any caves in their jurisdiction. Since 1981, same answer.

End Games and New Beginnings: The Last Week

Saturday, April 28, with one final week ahead of us on the expedition. Jessie, Ellie, Matt, Rich, and Chris went in to the TAG Shaft to camp at Camp Hulsey and to explore some side passages in the Howery Stairs shaft series. Alma, Blake Harrison, Vico Jones, Jim Smith, and I returned to Plan de Escoba to meet with the representante. We were invited into the house and sat at a table with a plastic floral-patterned cover. Soon we had steaming hot coffee and sweet bread in front of us.

The representante started out by telling us that he knows why we come there, and he's fine with it. He motioned toward Bertha and said that he'd heard her stories for 22 years about the gringo cave explorers. He said he knows that we don't take things out of the caves and that we want to explore them out of curiosity about why they're there and what is in them. He had even come to the 50th anniversary of exploration event in Huautla held on Easter Sunday, 2017. He asked if we would like to rent a house from him when we return next year. We walked outside and into another house next door. It had a lot of things stored in it, which he said he would move out before April 2019. I asked how much rent he will charge us and he said, "However much you think is fair." We left there saying we'd just gotten a lucky break in the planning for 2019.

The 2018 expedition wound down over the next few days. A crossover trip took place with Amy Morton, Gerry Morrill, and Elliot Guerra-Blackmer going in the Sótano de Agua de Carrizo entrance, down Son of a Pitch, through Spirit of Schreiber, down the British Invasion to the bottom of the TAG Shaft, through the Virgin Queen's Crack, down Howery Stairs, and into the La Grieta section of Sistema Huautla. Then they went deeper, past the area where the earlier trip had been flooded in, to Camp 4, where they spent the night. The next day, they hauled out two drills and other remaining equipment, exiting by way of the La Grieta entrance.

Amy wrote this about the through-trip, which she had undertaken after a strenuous six-day underground camp and survey trip in La Grieta:

[Gerry Morrill, Elliot Guerra-Blackmer, and I] suited up to go caving early one morning to go into Carrizo and out La Grieta – the first Sistema Huautla through trip in 31 years according to Bill Steele.

In the next hours we navigated the gritty, cold, windy Carrizo and then through the fragrant, sulfur-smelling dig lead. Next into several hundred meters of vertical paleo passage that's been cut off to the elements for unfathomable amounts of time. It was breaky, crumbly, and sketchy. My virgin caving Muzquiz experience really came into play in this passage. Then some crawling and down the breakdown and then boom, there it was -- La Grieta. The signature smooth scalloped rock, the crystal water pouring through it. It was unmistakably the same cave, although I had never been in this exact section, a little upstream of the famous Camp 2, Mazateca Shores, which is flooded out now. This and Camp 1 are the only camps I didn't sleep in -- even with hammocks, this camp would not be comfortable. We made our way to Camp 4, maybe three more hours after we entered La Grieta. This section of cave has been written about many times, the Scimitar Passage, the Pato Mojado, all the swimming . . . finally you climb breakdown like you never have before. The strangest part was probably the laminated picture of Bill Steele and Jeff Horwitz from 1978 in that exact location someone has stashed at the Pato. The not strange part was my shoulders burning from all the stemming. But I kept up with two of the strongest cavers on the expedition. We ate and enjoyed ourselves, and Gerry told amazing stories at Camp 4 that night. It was one of those memorable nights that changes you. Elliot thanked me for being who I was right before we fell asleep. You don't get that kind of love every day.

The next day we begrudgingly redressed into our wet clothes and began our 12-hour adventure back out La Grieta. Elliot explained where Katie Graham tried to get out (it was at least a three-hour trip to get back to camp! How frustrating!), and we went through the passage from Camp 2 to the Junction Room (the section I hadn't been in before, there's a Tyrolean -- oooh). We changed shirts and took an hour to eat in the Junction Room, which was refreshing. Then we stemmed for way too long, and, just when I didn't think I could take it anymore, there was a rope. The most beautiful sight. Huautla, where the ropes are the time for rest. Despite a long trip and his work to stage de-rig as we went, the indefatigable Gerry was still waiting for us at the bottom of each drop. I saw an actual frog on rope! We smelled the sweet entrance air, came out of the cave, and walked home like badasses. It was a great experience.

We made it back to base camp at about 2:00 a.m., went upstairs to where Bill was sleeping, and gave him his drills.

This crossover marks only the fourth time in Huautla caving history over the past 38 years that an entrance to entrance trip has been done. The first one was in 1981, when Bill Stone, Tommy Shifflett, and Belgian caver Etienne DeGrave descended 1,200 meters deep in Li Nita, which had been connected to Sótano de San Agustin the prior year, constituting a cave system and giving rise to the christening of the name of Sistema Huautla. They came out the Sótano de San Agustin entrance. Then, in 1987, when the Fool's Day Extension route to lower Sótano de San Agustin was found and rigged, Andy Grubbs and Sarah Gayle descended down with us 700 meters

deep, toured the immense Anthodite Hall, and then exited the cave by way of the original route explored in the '60s.

In December 1983, Australian caver Julia James and US caver Lisa Wilk went in the one of the Nita Nanta highest entrances of Sistema Huautla, accompanied by Gerald Moni, to a depth of 400 meters. Julia and Lisa rappelled a 60-meter shaft there, Gerald untied and dropped the rope to them, and then the women executed pulldowns as they derigged eight drops to the Football Stadium where Camp 2 was occupied by cavers. Gerald solo derigged the seven drops to the Grim Pit as he climbed. Julia and Lisa stayed at Camp 2 for a sleep cycle because it had rained on the surface for 24 hours, and they decided to let the flood pulse abate. The next day they lugged their piles of ropes up the 65-meter Maelstrom Shaft, the 86-meter Flakey Shaft, and out to the surface.

That was it for entrance to entrance crossovers until 2018. Other epic entrance to entrance crossovers in Sistema Huautla remain undone.

Other last achievements for this expedition included cleanup of various sorts. The stay at Camp Hulsey at the bottom of the TAG Shaft picked up some additional survey meterage off of the Howery Stairs - the team discovered a better route to Mazateca Shores than the original tight squeeze through breakdown. The name initially given to the connection point from Carrizo/N'Tau to La Grieta was the "Colibrí Connection" (Hummingbird Connection), the second one the "Falcon Connection." Later, with the agreement of the original discoverers and mappers, a final name change honored a major PESH supporter, the Scott Petty Family Connection.

On May 1, Blake, Vico, and Victoria, a visiting friend of Audrey Steele, parked near Poza Rica behind a hill and, without asking permission, boldly hiked to the sink that Fernando had reached underground as the farthest north point reached in Sistema Huautla. Within sight of it, they saw a man working in his cornfield at the bottom of the sink, so they turned around and didn't talk to him. On the way back to Blake's truck, they were challenged by a man who asked if they had permission to be there. Jim Smith simply said in Spanish, "It's really beautiful here," and the man agreed with him.

On the last two days of the expedition, all ropes on the surface were measured, labelled, coiled, and stored properly. Dirty ropes were transported back to Texas for washing. Inventories had been taken of things in various underground camps. Audrey Steele spent the last week on the expedition supervising a thorough inventory of everything stored in a secure place on the surface.

The PESH 2018 Expedition ended with two closing dinners. One was held at the trout farm in San Antonio Eloxochitlan, a third visit which will probably be our last there because it's not what it used to be and is about an hour drive from Plan Carlota. On the final night of the expedition, we had an end-of-expedition dinner at Rosita's in Huautla, including traditional Mazatec dishes, like large tamales baked in banana leaves. Alma Rodriguez surprised us with a cake to celebrate the fifth PESH expedition, with a small Roman candle-like firework in the middle.

The next morning, we began the drive home, with some taking buses to either Mexico City or Oaxaca.

A Scientific Postscript

Aside from exploration, PESH's stated cave science goals were amply fulfilled by this expedition, which did indeed cover all of the "-ologies" of speleology:

Geology – Jim Smith wrote a 400-page master's thesis at Western Kentucky University (WKU) on the hydrogeology of Sistema Huautla (search "James Smith Huautla" online). Fernando Hernandez is now a geology graduate student at WKU and will write his master's thesis about Sistema Huautla.

Howery Stairs. *Chris Higgins.*

Biology – Since, 1980, collections have been made and specimens delivered to taxonomists. To date, 48 new species have been described, with 11 of them fully cave-adapted. As a thank you to Bill Steele for encouraging Mexican biology graduate students to join PESH expeditions, a tarantula collected in a Huautla cave was named Hemirrhagus billsteelei in 2018.

Archaeology – Janet Fitzsimmons wrote her master's thesis at the University of Texas at San Antonio about a significant archeological site in a Huautla cave.

Paleontology – A significant paleontological site was discovered in 2014 in a Huautla cave and will be studied in-depth by professional Mexican paleontologists in 2019. A preliminary report was published in AMCS Activities Newsletter No. 39, June 2016. Paleoclimatology – This study has begun with a stalagmite sample obtained in 2018 and sent to a laboratory specializing in this type of analysis at the University of Nevada

at Las Vegas (under Prof. Matthew S. Lachniet). Dr. Victor Polyak at the University of New Mexico summarized the findings: the upper part of the stalagmite dated to around 55,000 years ago (representing a few hundred years of growth and a large hiatus of no deposition), and the lower part, to between 112,000 and 111,000 years ago (about 1000 years of growth). He concludes: "The good news is that dating systematics are really fantastic (high uranium, low detrital thorium), meaning that Huautla might be a really suitable location for speleothem paleoclimate work, if material can be recovered that is continuous."

PESH 2018 Final Team Roster

1.	Bob Alderson	USA/VA
2.	Don Broussard	USA/TX
3.	Matt Bumbalough	USA/TN
4.	Steve Gladieux	USA/ID
5.	Elliott Blackmer-Guerra	USA
6.	Katie Graham	Canada
7.	Blake Harrison	USA/NM
8.	Jacqueline Hawk	USA/CO
9.	Fernando Hernandez	Mexico/USA
10.	Chris Higgins	USA/TN
11.	Martin Hoff	Wales
12.	Jesse Houser	USA/TN
13.	Josh Hydeman	USA/OR
14.	Vico Jones	Mexico/USA
15.	Kyle Lassiter	USA/TN
16.	Victoria Lindner	USA/TX
17.	Chris Lloyd	Canada/Mexico
18.	Adam McLeod	USA/TN
19.	Jake McLeod	USA/CO
20.	Sonia Meyer	USA/VA
21.	Adrian Miguel-Nieto	Mexico
22.	Gerry Morrill	Mexico
23.	Amy Morton	USA/TX
24.	Tiffany Nardico	USA/CA
25.	Alma Rodriguez	Mexico
26.	David Rose	England
27.	Ron Rutherford	USA/TX
28.	Jim Smith	USA/GA
29.	Elliot Stahl	USA/TN
30.	Bill Steele	USA/TX
31.	Cuate Sanchez	Mexico
32.	David Tirado	Mexico
33.	Matt Tomlinson	USA/TX
34.	Scott Trescott	Costa Rica
35.	Chase Varner	USA/MI
36.	Ellie Watson	USA/TX
37.	Lee White	USA/AL
38.	Audrey Steele	USA/TX
39.	Richard Zarria	USA/TX

Nationalities: Canada, Costa Rica. England. Mexico, USA, Wales

Después de bastante planeación, el viaje largo de los Estados, y tiempo organizando el campamento base, empezó el Proyecto Espeleológico Sistema Huautla de 2018 con metas grandes. Por este repaso, miembros del equipo describen una variedad amplia de experiencias, desde bendiciones mazatecas e aventuras armando varias cuevas hasta investigaciones geológicas y un tiempo atrapados.

CUEVA EL TULE

Jessica Gordon, Peter Sprouse, and James Williams

We had been planning a diving trip to Ranch el Tule in Nuevo León all year, but our first date in September 2018 had to be postponed due to heavy rains on the ranch. A new date for two months later was set. Cueva de El Tule had been mapped in 1998 to a sump, and a short dive into the sump made (AMCS Activities Newsletter 24). A few years later, Tom Iliffe and others made another dive in Tule to look for groundwater fauna, exploring the sump for 130 meters to a depth of 16 meters. Now we were headed back with divers to map and push the sump.

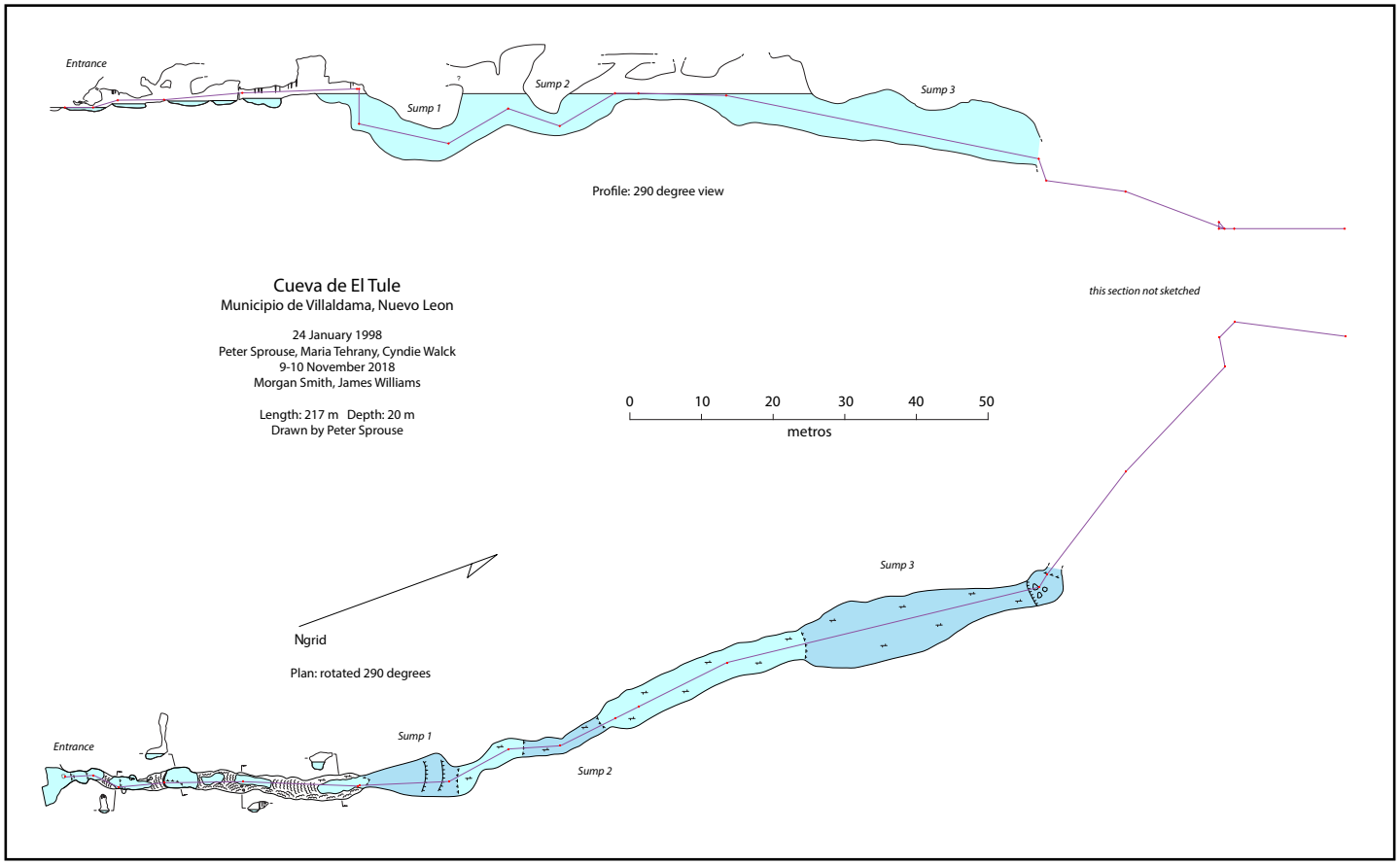
The advance team of Jessica Gordon, Cait McCann, and Peter Sprouse left Austin for Nuevo León on the morning of 8 November 2018, but divers Morgan Smith and James Williams were delayed after they realized they had insufficient documents to bring their car into Mexico, necessitating visits to government offices and ultimately a change in vehicle. The advance team met up with the rancher at the property gate and went over gate key arrangements. Then they made their way up the disused road toward the cave, which required some scouting, lots of vegetation trimming, and some rearranging of rocks in parts of the road that had been washed out. They made it to the old campsite before dark, and settled in to wait for the dive team, who arrived very late.

The next day the weather turned wet and cold as the team carried one set of dive gear up the canyon to Cueva de El Tule. The canyon was steep and slick in places, and required wading through cold pools of water occupied by leeches and flesh-sucking giant water bugs. Once at the cave they found that the increased water level had completely sumped the entrance. At first glance, it looked more like a spring than a resurgence cave. The water temperature was 23°C. Morgan dove first, and once through the short entrance sump had to haul the two 60-cubic-foot composite tanks through 40 meters of dry passage to the second sump. Morgan found the old dive line, but it was loose in places and he spent his short dive replacing it. Then James went in using the same set of gear and started to survey the line that Morgan laid until he hit turn pressure in his scuba tanks. That night back at camp, it was late when the rest of the crew arrived from Monterrey. There were 10 of them: Isabel Grajales, Edgar García, Angel García, Gemma Magalon, Samantha Guzmán, Fernando Valdez, Noel Vázquez, Juan Jaime Gutiérrez, Adriana Montemayor, and Alex Dukes.

Cueva El Tule expedition team. *Jessica Gordon.*

Saturday was the big dive day, with plenty of help to get two full sets of dive gear up the canyon. The wrench needed for one of the dive tanks hadn't made it up the canyon, but fortunately several of the engineers from Monterrey were able to improvise a wrench-like device with a rope and a stick that did the trick. Thanks to excavation work that Peter and others had worked on at the entrance of the cave on the previous day, the water level lowered enough to enable some of the non-divers to navigate through the low-air space to enter the cave. Cait, Edgar, Gemma, Jessica, and Samantha hauled the tanks into the cave for the divers.

Once in the cave, Jessica gave James a brief introduction to cave sketching.

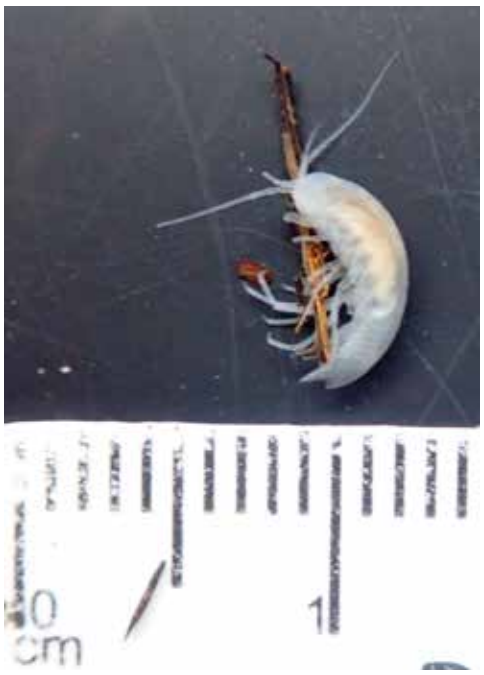


Edgar and Cait move tanks through the dry portion of Cueva El Tule. *Jessica Gordon.*

James and Morgan in Cueva El Tule with an empty expedition reel. *Jessica Gordon.*

The purpose of the second dive was to sketch the sumped passages that were surveyed the day before, push the exploration line, and survey any new exploration. James began sketching the surveyed passage, while Morgan monitored. Soon, the divers were at the end of the surveyed passage, which ended at the beginning of a pit in the third sump. Up until this point, the cave followed a fracture, which can even be seen outside of the cave. The characteristics of the cave were generally narrow and tall with several air bells adorned with many stalactites, soda straws, and flowstone decorations. James put away the sketching tools and pulled out his survey gear. The divers dropped down into the pit to a depth of 20 meters and began surveying the passage. The cave changed very quickly from the fissure cave to a stream conduit that was more rounded with smooth scalloped walls, indicating periods of high flow. The floor was mostly bedrock, with areas containing a thin layer of silt and clay. The water also went from very percolated, with limited visibility, to gin-clear water. Soon they reached the end of the line that Morgan had laid the previous day. James handed the survey slate to Morgan and picked up the reel to begin laying line. The fissure passage of the cave trended north-northwest. After dropping

Morgan at the cave's entrance. *Jessica Gordon.*



Stygobitic cirolanid isopod collected on a dive into Cueva El Tule. *Jessica Gordon.*

down into the stream conduit the cave trended northwest for approximately 50 meters, then made a sharp right in a north-northeast direction. At this point in the cave, the divers noted a possible lead to the right, but they continued down the main passage for approximately another 20 meters before emptying the reel. James tied the line to a small protrusion in the floor while Morgan finished up the survey. Once Morgan was at the end of the line, he handed James a second exploration reel, but ultimately James decided to turn the dive because of nearing the turn pressure necessary to exit the cave safely. The main stream passage appeared to be ascending back above 20 meters depth, with no end to the passage for as far as the divers could see with their lights. Exhaust bubbles could be seen traveling up the passage along the ceiling, causing the passage to percolate and resulting in decreased visibility. Upon returning to the entrance portion of the cave, the divers were greeted by Jessica, who was busy documenting cave biology. She was thrilled that the divers returned with an empty exploration reel, two leads, and some stygobitic cirolanid isopods, likely a new species.

While the dive was happening, many of the dry cavers had set off to chop a trail up onto the ridge to look for caves north of Minas Viejas. Just getting up the ridge took the rest of the day, so it was time to turn around upon reaching the top. Searching for caves there will have to wait for another trip.

Our departure from the ranch on Sunday was complicated by some unexpectedly locked gates. Once back at the highway, the divers headed north to Texas and two folks headed back to Monterrey, while the rest drove to Los Carricitos hot springs in Candela, Coahuila. After tracking down the man with the key, who turned out to be a friend of Noel's uncle, many spring outlets were visited and sampled for groundwater fauna. Some folks soaked in the hot springs. Then Cait, Jessica, and Peter said farewell to the departing Monterrey cavers, and went on to the Río Sabinas canyon to look for the Ojo de Agua de Matias. The gate to this site was locked, so landowner research will be needed. They stayed in Bustamante that night, where the folks at the Hotel Ancira inquired about Orion Knox and showed them mementos of the famous Grutas de Bustamante. The next morning was spent at the Ojo de Agua de Sabinas Hidalgo, looking for groundwater fauna in some of the many spring outlets before starting the drive back to Austin.

Un grupo mesclado de Monterrey, Nuevo León y Austin, Texas pasaron un frio fin de semana largo apoyando a un par de espeleobuzos en su exploracion de un manantial por el canon El Tule en Coahuila, al norte de Minas Viejas. Atraves de topografiar el principe del riochuelo subterraneo, los buzo regresaron con unas isópodos cirolanidos, quizás una especie nueva.

RÍO ULUAPAN EXPEDITION

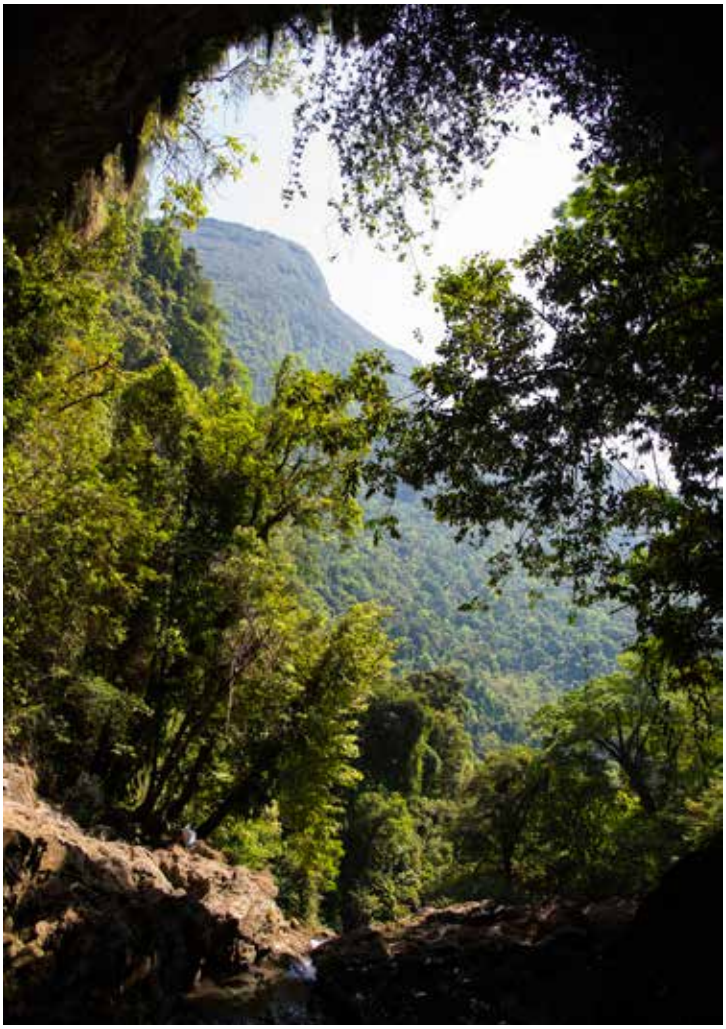
Jon Lillestolen and Adam Haydock

Dive lights fade in and out of the resurgence entrance pool as team members shuttle gear to and from the portaledge. *Adam Haydock*

The goal of the April 2019 Beyond the Sump Team expedition was to explore the Sistema Nacimiento del Río Uluapan (called Ndatsé in the local Mazatec language). The cave is an impressive resurgence with a 20-meter by 30-meter dry entrance above a 20-meter-tall cascading waterfall. It was first described by geologists in the 1970s, and later explored by Swiss cavers in the 1980s as part of their Cerro Rabón expeditions. The Swiss team explored the cave to a higher entrance on the cliffside, documenting the highest known point in the cave and describing the resurgence as discharging "more water than the Huautla and Cheve cave systems combined." The resurgence sump pool was explored by Mexican and American divers in the 1980s and 1990s, with the farthest exploration surfacing in a 14-meter-tall room with a large waterfall. In the intervening years, rising tensions in the local towns halted exploration as cavers could not obtain permission to access the area.

The 2019 expedition consisted of Gilly Elor, Teddy Garlock, Adam Haydock, Joe Heinrichs, Andreas Klocker, Steve Lambert, Jon Lillestolen, Zeb Lilly, Susana Alejandra Mendoza, Charlie Roberson, Tony Akers, Mike Frazier, Fernando Hernández, and Hugo Rodríguez. Just inside the entrance of the Nacimiento Rio Uruapan, a portaledge was set up high near the ceiling to protect the equipment and create a filter so only the team had access to the bags. Divers utilized Valkyrie and silent submersion scooters to conduct survey, photography, videography, in-between sump rigging, and provide dive support. After each day of diving a rope was climbed to haul rebreathers, diving kits, and gear back up to the portaledge.

The large waterfall, named Victoria



A view from the entrance. *Adam Haydock*

Jon transports dive scooters, tanks, and dive kits through the trolley system to Sump 2 in the Rio Uluapan. *Adam Haydock*

Falls, was climbed and after about 100 meters of passage a second sump was discovered. Some of the Sump 2 dives lasted hours due to the dynamic profile of the passage ascending and descending, as well as long decompression procedures. Divers laid spools of line using scooters to propel themselves though the continuing massive passage of Sump 2, and concluded the diving operations with 1200 meters of submerged passage, with the deepest point being 100 meters deep.

The amount of gear needed for the effort in Sump 2 was substantial. In order to minimize residual decompression illness in between surface intervals and to ease the transport of heavy dive gear, a multi-tiered Tyrolean traverse line and trolley system was set up to simplify the transfer of dive gear from the end of Sump 1 to the beginning of Sump 2.

The passage continues with no end in sight. The cave is incredible, the passage is huge and very beautiful. The cave length is 2.5 kilometers with a total system depth of 170 meters.

Un equipo de espeleobuzos se armó una expedición al Sistema Nacimiento del Río Uluapan. Cumplieron una escalada impresionante de las Cascadas Victoria y encontraron otro sifón. El pasaje acuático sigue, con una longitud topografiada de 2.5 kilómetros y una profundidad de 170 metros.

SÓTANO DE LA REDENCIÓN

Ken Demarest

Over the course of two trips in March and July of 2018, a new cave measuring 171 meters in depth was discovered and mapped on the Enriquez family ranch in Músquiz in the state of Coahuila.

The first trip was well attended. Five vehicles and sixteen cavers, led by Amy Morton, made the eleven hour trip into the heart of Músquiz. The objective was to explore the Enriquez ranch for new caves. We had high hopes because the dramatic, 100 meter deep Sótano de los Enriquez existed just an hour's hike from our chosen camp. Perhaps we could find pits of similar depth! In fact, we would find something even deeper.

Everyone wanted to drop this interesting and known pit, so on the first day Philip Rykwalder and Annette Enriquez lead a team that hacked brush for seven hours, finally reaching the pit around sundown. This sótano has nearly the footprint of a football field, almost entirely open to the sky. The bottom lives in that special twilight created by indirect sunlight even in the heat of the day.

Our attempts to discover new pits consisted, day after day, of small teams hacking their way through the spiny and unfriendly scrub that guards the slopes of narrow-topped ridges. Other than a bear den, Team Tall, Team Awesome and Team Testosterone weren't finding much. Pits were typically just a few meters deep, shallow enough to be filled by the blood seeping from the arms and legs of our intrepid explorers. We needed a big pit to redeem the trip!

Ken Demarest became convinced that the narrow-topped ridges would never yield, so on the final day we aimed for the nearest broad, flat-topped mesa. This would have been impractical without the pre-existing trail cut on the first day.

By 11:00 in the morning Ryan Obenhaus had discovered a pit. Upon first inspection it looked like it ended at eight meters, but a bit more Texan style searching found a squeeze and the descent was on. With Amy sketching, Ken rigging, and supported by Dylan Beeler and Ryan, the team pushed downward until they exhausted their rope.

Ryan and Nathan Clark made the two hour round-trip to get rope, returning with Mike Davlantes. As evening fell a new team, composed of Amy, Mike, Ken and Ryan, descended to continue the push.

The Devil Fills You is a keyhole belly crawl that opens directly onto a 60-meter pit. Just outside that crawl is a small hump of rock which, if you are feeling generous, you can call a ledge. With Ken using a munter belay, Mike emerged into the pit shaft and placed the first bolts.

Once they were tight, Mike tossed the wrench over his shoulder, and, since it was untethered, it clinked its way to the bottom of the pit. Fortunately the rope was long, and the rock was not

Ron and Amy look up from the entrance squeeze. *Cait McCann.*

Ken smiles back from the far side of the Devil Fills You crawl. *Cait McCann.*

overly sharp. By 3:00 in the morning, at 120 meters, the team had again run out of rope, in a space with rounded quartz nodules the size of footballs, and a tight but going lead. By 4:00 a.m. we met our "rescuers" coming down to see if we were alright. They had whiskey waiting up top.

The team emerged at 5 in the morning, after 13 hours in cave, hiked back to camp, packed up four hours later, and departed for the US. The new find had redeemed the trip, and our faith that the area would have significant caves, so we named it Sótano de la Redención.

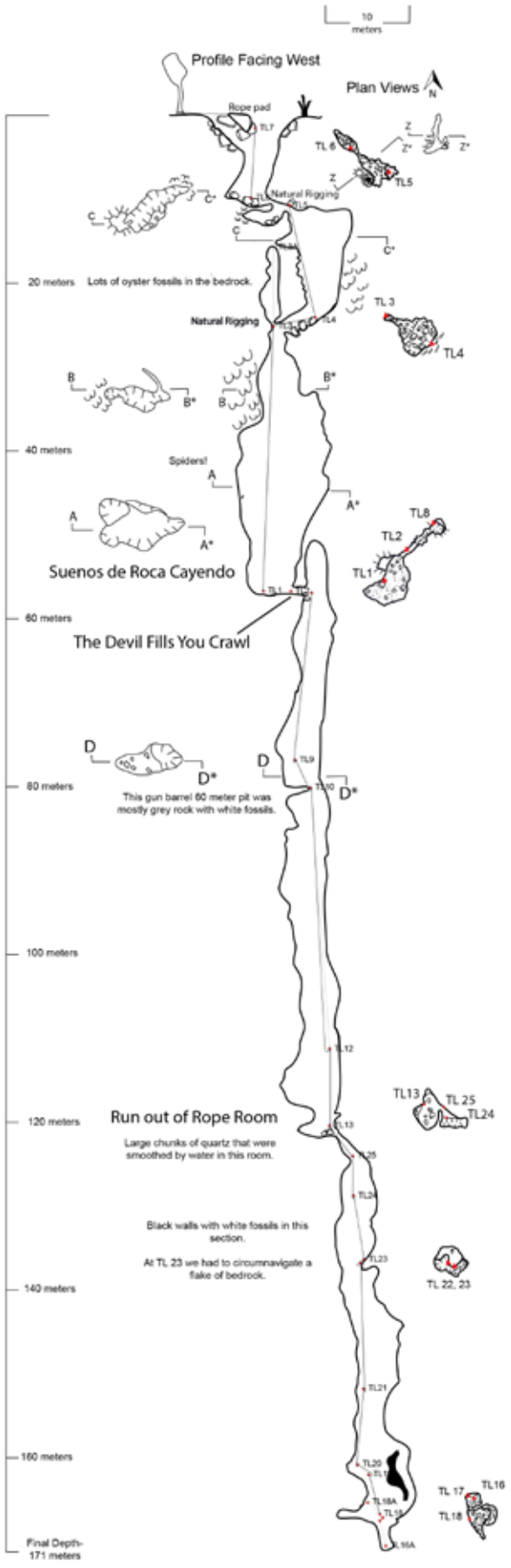
The return trip, four months later, was a small "strike force" of Amy, Ken, Ron Rutherford and Cait McCann. July in Músquiz is hot, so the plan was to use the cave as a cool sleeping environment.

It turns out that hiking an hour to the mesa top, hauling gear and water in 103° F heat and then descending with it to The Devil Fills You wasn't so great. The nights outdoors weren't that hot. Next time, we'd skip the cave camp.

On the way we encountered something interesting. The scattered bones and pungent hide of a baby bear lay in a hollow where the trail wound among some boulders. After some speculation about whether the bear's den might be trail-adjacent we moved on.

In one marathon day the pitches were re-rigged and the lead pushed. At depth, the profiles of black oyster fossils decorate the gray stone walls like prehistoric paisley. After four new pitches, the team found a chamber with a few small splinters of calcite littering the floor.

Cait pushed a narrow, muddy final pit which bottomed out at 171 meters.



Map Drafted by Amy Morton

Ron smiles in between hauling gear.
Cait McCann.

Ken lights up a tumbled piece of calcite at the bottom of a drop.
Cait McCann

Special thanks to our ranch hosts, especially Rick Enriquez, who helped us with a broken fuel line hours from any main road. This was minutes after Ken expressed concern about running over small shrubs in the overgrown road and Ron remarked, "Nah. It would take a stick jumping up from the road and breaking a fuel line or something." What an accurate, but terrible premonition.

A través de dos viajes, en marzo y julio de 2018, una nueva cueva midiendo 171 metros fue descubierto y tipografiado por un grupo de Texas en el Rancho Enríquez por Múzquiz, Coahuila.

PROYECTO SIERRA MIXTA

Marion Akers and Aida Ferreira

Este artículo aparece en inglés primero, y después traducido al español. This article appears first in English and then translated into Spanish.

Introduction

Sierra Mazateca, a cloud forest karst region, is a mountain range located in the northeastern part of the state of Oaxaca in the country of Mexico. It is the largest part of the Sierra Madre Oriental and is located about 300 km southeast of Mexico City and 150 km north of Oaxaca. Although the lower elevations are populated by the Mazatecs and are easily cultivated, the upper regions contain one of the few sections of cloud forest ecosystems remaining in Mexico, and it is said to be one of the richest in MesoAmerica. To the east of the city of Huautla de Jimenez, a limestone plateau rises to more than 2000 meters above the lowlands, with steep gorges and many deep valleys.

In this limestone karstic region much of the rainfall and surface runoff immediately sinks into the subsoil. This karst region extends eastward for about 25-30 kilometers and ends at a massive escarpment called Cerro Rabón and the artificial lake, "Presa Miguel Aleman". This region covers approximately 28,400 hectares of pristine, temperate cloud forest and tropical rainforest. The forest contains a number of endangered species, as well as trees and shrubs including numerous varieties of orchids, bromeliads and other flowering plants. The tremendous ecological variety of this mountain forest makes it an important and unique habitat, with a rich and diverse flora and fauna.

The ecosystem and wildlife are threatened by population growth, pollution, agricultural pressures, deforestation and other socio-economic pressures. One of the negative results is a lack of water in different areas of the region. The caves are an important conduit of this vital liquid. With our continuous documentation and the promotion of this incredible karst ecosystem, we hope to help local communities find more water resources from the underground. In this way, we hope to help preserve this natural Mexican treasure for future generations.

It is worth mentioning that in this particular area, some of the deepest vertical caves in the world have been found, such as the Cheve System and the Huautla System, which has attracted the attention of Mexican and foreign speleologists from around the world. It's a paradise for those who enjoy cave exploration and (or) scientific research, and helps some local communities with a significant economic impact during exploration season.

Education within local elementary schools is another goal of our Project. We make slide presentations for local schools that promote the conservation of their environment and water resources and the preservation of their indigenous language and customs. We have received donations from various sources to help provide additional school supplies, from a set of basic supplies such as notebooks, pens, colors, etc. even a digital projector. We believe children are the future and will make important decisions within their communities. This objective is continuous and requires a long-term commitment.

With the generous help and support of speleologists, friends, subsidies, our own energy and love, we are able to continue working to achieve our general objectives. The money granted allows us to obtain equipment and supplies necessary for exploration, including school supplies for the children of the Sierra Mazateca.

The goals of our project are partially sponsored by the National Speleological Society (NSS-National Speleological

Society, based in Huntsville, Alabama, USA), Central Indiana Grotto and, lastly, active members of the Sierra Mazateca Project. It is registered in the state of Indiana as a non-profit organization, as of September 4, 2012, and is called "Proyecto Sierra Mazateca" or PSM. The grants and donations do not pay for any personal caving equipment or the travel and transportation costs of any participant.

Each year brings adventures, challenges, parties, and enriching life experiences for all of us, so the extra money spent is worth it. All the participants who stay at Cafetal Carlota during the trip are donors. Each participant also brings their energy and love to the Sierra, and we work as a team to document and explore this incredible part of Mexico!

2018 Sierra Mixteca Project

Our 2018 expedition began in a relatively new area within the Sierra Mazateca, in the municipality of San Juan Coatzospam. It is located in the upper area of the Sierra and its inhabitants belong to the Mixteca community. Its president, Arturo Carrera, and his cabinet welcomed us. The local speleological group from Indiana and other contributors supported us by providing us with a grant that made it possible to acquire teaching materials and a financial donation for improvements to a local school. This allowed us to generate an amicable agreement to carry out the expedition and camp at 2,000 meters, accessing the municipality of San Juan Coatzospam. With the help of several local guides, we were able to carry all the equipment and food necessary for 14 days.

There were ten people (Mexicans and foreigners) who took part in this expedition. At times, the local guides accompanied us, and some even stayed overnight in the camp. This was obviously difficult without proper camping and sleeping gear, and left us with much admiration for Mixtec resilience. This included Itzel, the President's sister, and the first Mazatec woman to spend the night in the mountains. She impressed us with her big smile and a warrior attitude.

The base camp, at the altitude of 2144 meters, was wonderful and was located a few meters away from the Sótano Cerro Agua de Jarana, surveyed the previous year at a depth of 90 meters. With the help of the local guides, we were able to clean and organize an area for the kitchen (complete with a very large table), all covered by a very large tarp that protected us from the constant rain. We used the far end of the tarp to collect water. The fire, fed on pieces of dead Ocote pine trees, would not have been possible without the help of Peter (professional climber and speleologist), Mariana, Josué and Felipe. The four of them, in the early morning hours, realized that the rain would drown the flames of our valuable fire; so they installed another tarp next to it, thus keeping us warm and dry during and after each day of exploration. Those of the team that had rested or returned earlier, always had boiling water ready for our dehydrated meals. Sometimes dehydrated food was rejected by the Mixtecs which is quite understandable as it so different from their own unique foods. During the beginning of the expedition, we also had warm Mixteco tamales of chicken or peppers with cheese. We also had fresh eggs that survived the ascent and an excellent recipe of dried pork prepared by our neighbor Juana. Without planning it fully, we had the best Mixtec dinners in the middle of the cloud forest.

We tried to make the most of the fourteen days of our expedition making trails with our machetes, with the help of GPS devices and printed maps with the topography of the specific area.

Each pit was documented with a GPS and its exploration was planned for the following days. Preparing for exploration involves gathering materials (ropes, vertical and rigging equipment for such as drill and batteries, food, water, etc. ...), organizing equipment in different pits and logistics in calculating arrival and departure times. It is important to mention that some pits were located several hours from the base camp. We had to walk on steep, sloping and muddy terrains, carrying a lot of weight on our backs, and we had to save some energy for our return hike to base camp! Once at the entrance of the pit, the first one to descend is the one in charge of installing and assembling the ropes. This is an important role, so the other members can safely descend while they survey the pit. We always have an official record of each cave explored – its location, survey data, and photography. If we are lucky, at the bottom of the cave we may find water, which is vital for the survival of the communities and the protection of the nature that surrounds them.

The mapping time required to survey a pit is dependent on its ease of access and depth. Usually if it is small, one day

Group picture with our mixtec friends. / Foto del grupo con nuestros amigos mixtecos.

is sufficient but some caves may take several days. The goal is to find deep systems that could potentially take several years to explore.

Meanwhile in the cloud forest, one of our members is enthusiastically documenting the flora and fauna of the region. We had the pleasure of being accompanied by Thomas Hawkins, speleologist and botanist. This year when climbing above the clouds at higher elevations, he found an insectivorous plant that is rarely seen in the wild, the wonderful and exotic plant called Pinguicula. To our surprise, we found them in a variety of areas, and even found one in bloom, allowing Thomas to identify the exact species.

Exhausted, after each day trip, we hike back to camp. But our spirits are never lacking and the love of exploration and adventure fills us with energy to wake up renewed for the next day's exploration. Because of the karstic character of the limestone, the walks become difficult and dangerous. Injuries can always occur when falling on the sharply carved stone. There are small and hidden holes everywhere. Most will only distract us from the ultimate mission of finding a deep system, but one never knows which one will open its doors to the underworld; so we keep exploring all of the holes we find and hope for that open door.

Introducción

La Sierra Mazateca, un karst de bosque nuboso, es una cordillera ubicada en la parte noreste del estado de Oaxaca en el país de México. Es la parte más grande de la Sierra Madre Oriental y se encuentra a unos 300 km al sureste de la ciudad de México y 150 kilómetros al norte de Oaxaca. Aunque las elevaciones más bajas están pobladas por los mazatecos y se cultivan fácilmente, las regiones superiores contienen una de las pocas secciones de ecosistemas nubosos que quedan en México, y se dice que es una de las más ricas de América del Norte. Al este de la ciudad de Huautla de Jimenez, una meseta de piedra caliza se eleva a más de 2000 metros sobre las tierras bajas del golfo, y tiene desfiladeros escarpados y muchos valles profundos.

Se identifica como una región kárstica porque gran parte de la escorrentía superficial y el agua de lluvia pasa inmediatamente al subsuelo. Esta región kárstica se extiende hacia el este durante unos 25-30 kilómetros y termina en una escarpa masiva llamada Cerro Rabón y el lago artificial, "Presa Miguel Alemán". Esta región cubre aproximadamente 28,400 hectáreas de bosque nuboso prístino, templado y selva tropical. El bosque contiene una serie de especies en peligro de extinción, así como árboles, incluida una especie rara de cedro o la recientemente encontrada población de plantas carnívoras denominadas como Pinguíncula, la cual es muy raramente vista en su ambiente original. La tremenda variedad ecológica de este bosque de montaña lo convierte en un hábitat muy importante y único, con una flora y fauna rica y diversa que es gustosamente visitada.

El ecosistema y la vida silvestre están amenazados por el crecimiento de la población, la contaminación, las presiones agrícolas, la deforestación y otras presiones socioeconómicas que dan, como uno de los resultados negativos, la falta de agua en diferentes zonas de la región. Las cuevas son un conducto importante de éste vital líquido y de ésta manera podemos ayudarles a localizarla y protegerla para su uso. Con nuestra documentación continua y la promoción de este hermoso lugar y su increíble ecosistema kárstico, esperamos ayudar a la preservación de este tesoro natural mexicano en los siglos venideros.

Cabe mencionar que en ésta zona particular, se han encontrado algunas de las cuevas verticales más profundas del mundo, como el Sistema Cheve y el Sistema Huautla, lo cual ha llamado la atención a espeleólogos mexicanos y extranjeros de todo el mundo, convirtiendo la sierra en un paraíso para aquellos que disfrutan del deporte y la investigación, dejando una derrama económica significativa para comunidades locales en temporada de exploración.

Trabajamos hacia nuestra meta para la educación en una variedad de formas. Hacemos presentaciones de diapositivas para las escuelas locales que promueven la conservación de su medio ambiente y sus recursos hídricos y la preservación de su lengua y costumbres indígenas. Hemosrecibido donaciones de diversas fuentes para ayudar a proporcionar suministros escolares adicionales, desde un conjunto de suministros básicos como cuadernos, bolígrafos, colores, etc. hasta un proyector digital. Los niños son el futuro de la región y tomarán decisiones importantes que darán forma a las regiones y su tierra. Este objetivo es continuo y requiere un compromiso a largo plazo.

The kids are happy to get new school suplies. / Los niños son felices recibiendo nuevos útiles escolares.

Con la generosa ayuda y el apoyo de espeleólogos, amigos, los subsidios, nuestra propia energía y amor, somos capaces de continuar trabajando para lograr nuestros objetivos generales. Cada año trae consigo aventuras, retos, partes, y modificar la vida de experiencias para todos nosotros.

El dinero otorgado nos permite conseguir equipo y suministros necesarios para la exploración, incluyendo el material escolar para los niños de la Sierra Mazateca. Estos fondos no pagan ningún equipo de espeleología personal o los costos de viaje y transporte de ningún participante para llegar al sur de México y a las montañas.

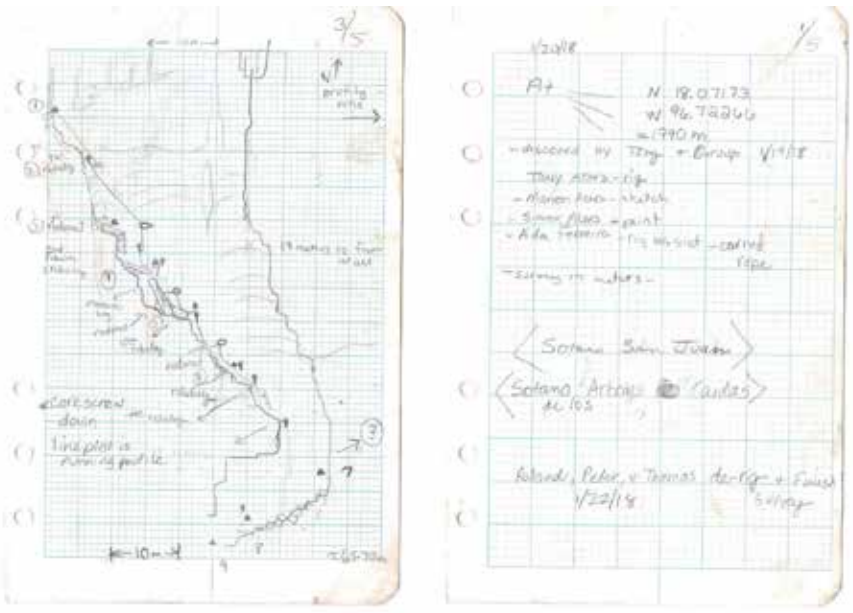
La formación del Proyecto Sierra Mazateca está parcialmente patrocinada por la Sociedad Nacional de Espeleología (NSS- National Speleological Society, con base en Huntsville, Alabama, USA), Club Espeleológico Central de Indiana y por último, miembros activos del Proyecto Sierra Mazateca. Está registrado en el estado de Indiana como una organización sin fines de lucro, a partir de 4 de septiembre, 2012.

Todos los participantes que se quedan en Cafetal Carlota durante el viaje son donantes. Cada participante trae su energía y amor a la Sierra, ¡y trabajamos en equipo para documentar y explorar esta increíble naturaleza!

Los propósitos del Proyecto Sierra Mazateca son en principio asentar un área para acampar en el bosque nuboso y buscar cuevas en el área, a continuación se miden creando así un registro con la intención de protegerlas y educar a las poblaciones marginadas sobre los ecosistemas kársticos subterráneos para promover la conservación del agua y ayudar a su preservación.

Proyecto Sierra Mixteca 2018

Nuestra expedición comenzó en un área relativamente nueva dentro de la Sierra Mazateca, en la Municipalidad de San Juan Coatzospam. Se encuentra en la zona alta de la Sierra y sus habitantes pertenecen a la comunidad Mixteca. Su presidente Arturo Carrera nos dio la bienvenida junto con su gabinete. El grupo espeleológico local de Indiana y otros contribuyentes nos apoyaron proporcionándonos una beca que hizo posible adquirir material didáctico y una donación económica para mejoras a una escuela local. Esto nos permitió generar un acuerdo amistoso para llevar a cabo la expedición y campamento a 2000 metros, accediendo por el municipio de San Juan Coatzospam y con la ayuda remunerada de varios locales para subir todo el equipo y víveres necesarios para 14 días.



Sótano Árboles Caídos

Hubo diez personas (mexicanos y extranjeros) que formaron parte en ésta expedición junto con la grata sorpresa que algunos locales nos quisieron acompañar algunos días, incluso se quedaron a dormir, lo cual con las condiciones climáticas nada acogedoras y la falta de preparación, nos causó mucha admiración de la resiliencia mixteca (incluyendo a Itzel, la primer mujer mazateca en pasar la noche en la montaña siempre con una gran sonrisa y actitud de guerrera).

El campamento base fue maravilloso, nos ubicamos a unos metros del Sótano Cerro Agua de Jarana, registrado el año anterior de 90 metros de profundidad a la altura de 2144 metros y con la ayuda local pudimos organizar y adaptar un área para las casas de campaña y la cocina (con una mesa muy grande echa de pedacera de la tala de años pasados), todo cubierto por una lona muy extensa que nos protegió de las constantes lluvias de la zona (adaptamos una parte de la extensa lona para recolectar agua para nuestro consumo). La fogata, alimentada de pedazos de árboles de ocote viejo y enterrado no sería posible sin la ayuda de Pedro Zabrok (escalador y espeleólogo profesional), Josué y Felipe. Los tres, en la madrugada helada, se dieron cuenta que la lluvia ahogaba las llamas e instalaron con mucha dificultad y desvelo otra lona sobre éste, así nos mantuvo calientes y secos durante y después de cada día de exploración. Aquellos del equipo que les tocaba descanso o regresaban antes, nos recibían con agua hervida para poder preparar la cena caliente. Algunas veces comida deshidratada y rechazada por los mixtecos (comprensible ya que viene empaquetada y seca con recetas y sabores completamente distintos a su tan rico sazón) y en el mejor de los casos tamales calientitos mixtecos de pollo o rajas con queso, huevitos que sobrevivieron el ascenso acompañados de carne seca de puerco preparada por nuestra vecina Juana. Sin planearlo tuvimos las mejores cenas y sazón mixteco en medio del bosque nuboso.

Fueron catorce días en total de la


Sótano Tierra de Maravillas.t


Rolland ready to rig el Mero Hoyo.
Rolland listo para armar el Mero Hoyo.


Itzel Carrera, the mixtec warrior.
Itzel Carrera, la guerrera mixteca.

expedición, de los cuales se trató de aprovechar al máximo, chapeando los caminos con machetes, con la ayuda de aparatos GPS (que nos permite recibir las coordenadas específicas) y mapas impresos con la topografía del área específica (que nos ayuda a leer elevaciones y características de la sierra).

Cada sótano encontrado se registró con el GPS y se planeó su exploración en los días siguientes. La exploración consiste en preparar la logística y los materiales (cuerdas, equipo vertical, equipo para instalación de las cuerdas como taladro y baterías, comida, agua, etc...), organizar equipos en diferentes sótanos, calcular tiempos de llegada y salida (es importante mencionar que algunos sótanos se encuentran a varias horas del campamento base y hay que caminar por terrenos escarpados, inclinados y lodosos, todo esto llevando mucho peso sobre nuestros hombros, y todavía falta el regreso…!). Una vez en la boca o entrada del sótano el primero en bajar es el encargado de instalar y armar las cuerdas para que los demás miembros puedan bajar con seguridad mientras toman medidas y crean un perfil topográfico que luego se entregará a la municipalidad. Esto con el fin de que tengan un registro oficial de cada cueva explorada y su topografía (mapa interno). Si corremos con mucha suerte, al fondo de las cuevas se puede encontrar agua, lo cual es de vital importancia para la supervivencia de las comunidades y la naturaleza que los rodea (esto permite que se pueda planear la extracción del valioso líquido junto con la colecta de agua de lluvia). Dependiendo de la profundidad y acceso del sótano es el tiempo de mapeo que se requiere, generalmente si es pequeño, un día es suficiente pero algunas cuevas pueden tomar varios días, aunque la intención es encontrar sistemas muy profundos que toman a veces varios años en explorar.

Mientras tanto en la superficie, tenemos el gusto de ser acompañados por Thomas Hawkins, espeleólogo pero también botánico experto y muy entusiasta, el cual hace un registro de la flora que encuentra a su paso. Este año su alegría escaló por sobre las nubes al registrar una planta carnívora que es extremadamente difícil de encontrar en cualquier otra parte del mundo, y para nuestra sorpresa, el área no escatimó en números de esta maravillosa y exótica planta llamada Pinguicula.

Agotados, nos espera el regreso, pero el ánimo nunca falta y el amor a la exploración y aventura nos llena de energía para regresar al siguiente día y continuar con el registro. Por la característica kástica (suelo de piedra caliza que es altamente permeable y disoluble por el paso del agua y ácido carbónico que se encuentra en la lluvia y la materia orgánica de la selva) las caminatas se tornan difíciles y peligrosas. Tobillos se pueden romper, cabezas se pueden descalabrar al caer sobre la filosa piedra labrada. Hay hoyos en todas partes, algunos profundos y muchos sólo nos distraen de la misión de encontrar profundos sistemas, pero uno nunca sabe cuál nos abrirá sus puertas al inframundo, así que bajamos a todos los hoyos que encontramos.

Totales por exploración 1994 – 2018
Longitud – 6.803 m (22,321 ft)
Profundidad - 4,946 m (16,228 ft)

TONALIXCO

Speleological Exploration in the Tonalixco, Vercruz Area

José Benjamín Guerrero Alegría, Ángeles Verde Ramírez, Ramsés Miranda Gamboa

This article appears first in original Spanish and then translated into English. Este artículo aparece en español primero, y después traducido al inglés.

Desde principios del año 2003 los alrededores de la comunidad de Tonalixco han sido reconocidos como una zona con un desarrollo kárstico notable. Esta región se ubica en el sector sur de la Sierra Madre Oriental, al suroeste de la ciudad de Orizaba, en las inmediaciones de los municipios de Rafael Delgado, Tlilapan e Ixtaczoquitlán del estado de Veracruz. Las cavernas y sótanos de Tonalixco se desarrollaron en las calizas de la Formación Orizaba (~113-93 Ma), mientras que sedimentos procedentes de la Formación Necoxtla-Atoyac (~86.3-72.1 Ma) suelen rellenar los pasajes de las mismas. Estudios espeleogenéticos recientes han revelado que la formación de las cavernas tiene una fuerte influencia estructural, por lo que la orientación de sus pasajes suele estar asociado a las fallas geológicas mayores de la región. El presente trabajo tiene como objetivo dar a conocer los resultados de las exploraciones que se han realizado en los últimos años y presentar las topografías espeleológicas (planta y alzado) de las cavernas mayores de la región y el registro fotográfico de las mismas. Los datos fueron colectados con ayuda de un DistoX2 modificado a partir de un distanciómetro X310 de Leica y el software para dispositivos portátiles Android Topodroid; para ser posteriormente procesados por los softwares Compass y Adobe Illustrator. Actualmente se conocen 18 cavernas y sótanos, encontrados en su mayoría por los pobladores de la región, de los cuales destacan por su verticalidad el Sótano de la Virgen con un tiro de entrada de 105 metros y el Sótano de Sacacuapa con un tiro de entrada de 80 metros, que presenta un desarrollo mayor a los 400 metros y una profundidad de -250 metros. El trabajo de registro espeleológico continua actualmente, toda vez que se ha detectado la reciente remoción de sedimentos por crecidas en algunas zonas, lo cual permitirá explorar y documentar nuevos pasajes en cavernas que se pensaban visitadas en su totalidad.

The entrance to Sótano de Sacacuapa.

Agradecemos a los habitantes de la comunidad de Tonalixco, Veracruz, por recibirnos siempre con calidez y amabilidad durante nuestras visitas de trabajo. Un reconocimiento especial a la familia de Don Victorio Sánchez, quienes siempre están al pendiente de nosotros. Queremos expresar un agradecimiento a Rodolfo Hernández, quien nos mostró la zona. Asimismo, agradecemos el apoyo de las autoridades municipales y de protección civil del poblado de Rafael Delgado, Veracruz.

Agradecemos a los amigos espeleólogos de Orizaba, Ver., espeleólogos de la AMUNAM y a los miembros del proyecto Karstológico Nacional por apoyar en las campañas de topografía.

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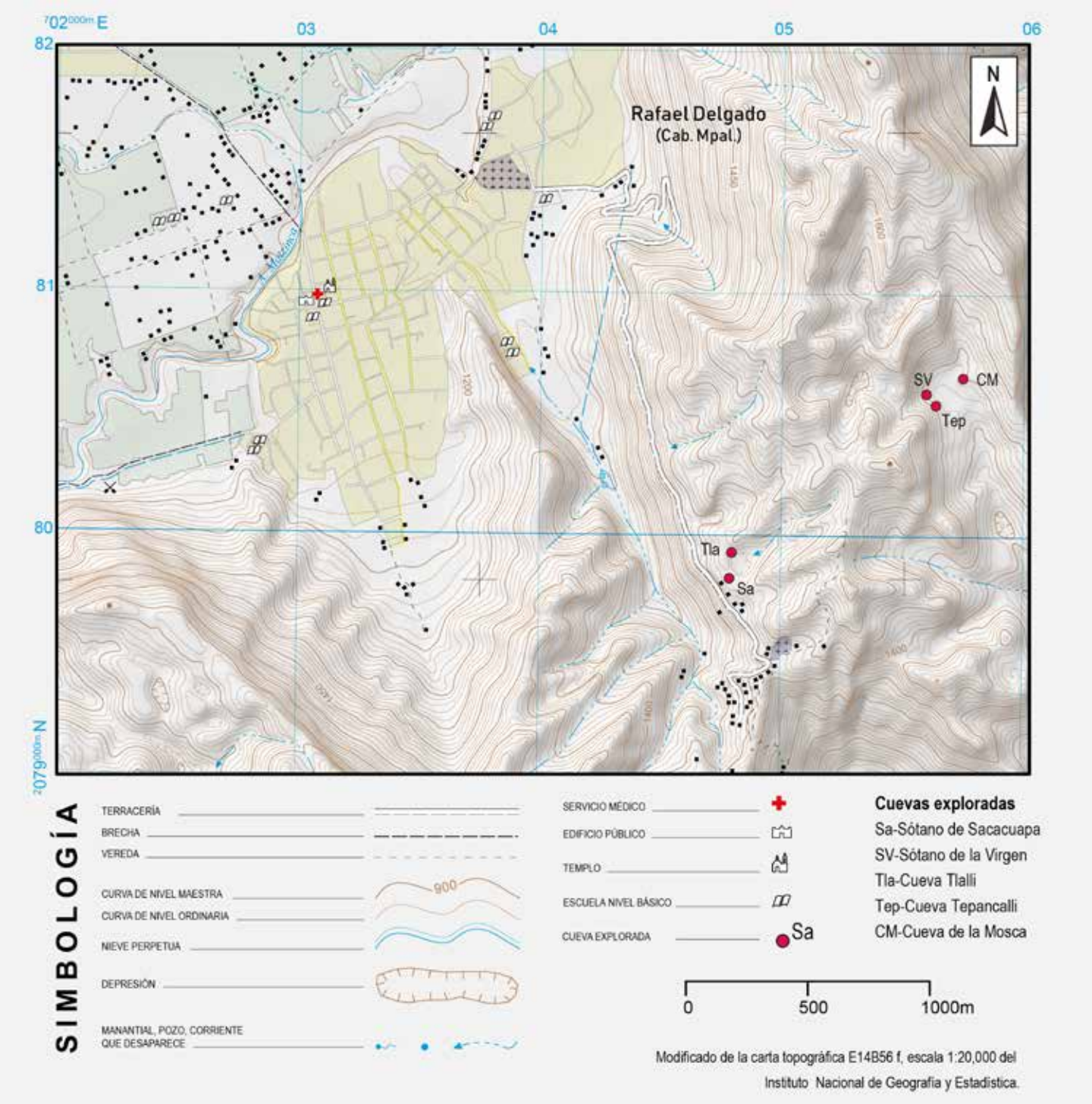
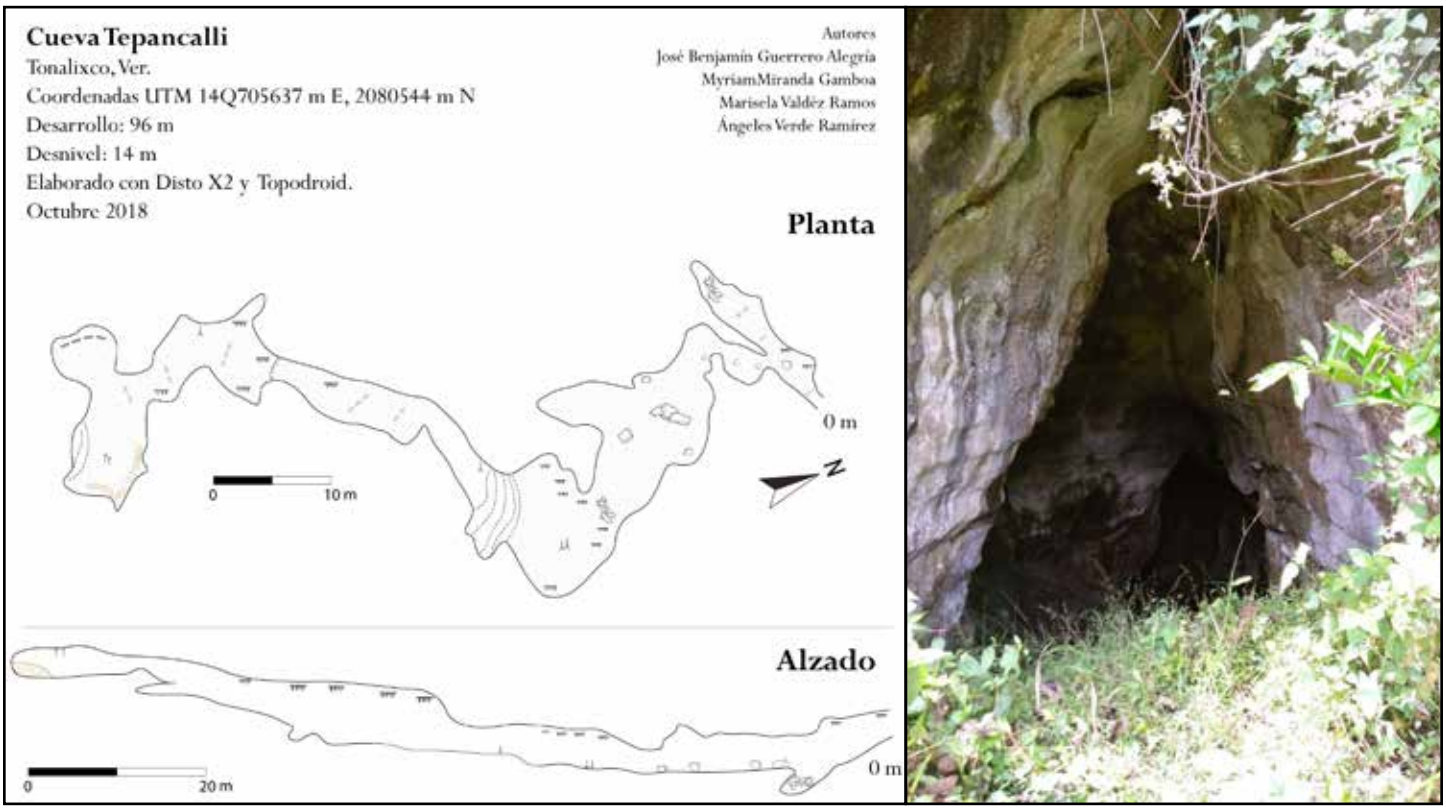
The area around Tonalixco has been known to be a significant karst area since 2003. This area is located in the southern Sierra Madre Oriental, southeast of the city of Orizaba, in the municipalities of Rafael Delgado, Tlilapan, and Ixtaczoquitlán. The caves and pits of Tonalixco are developed in the limestones of the Orizaba Formation (~113-93 Ma), with sediment infilling from Necoxtla-Atoyac Formation (~86.3-72.1 Ma). Recent speleogenetic studies have revealed a strong structural influence on cave development, with passages oriented along major faults. The goal of this study is to present explorations, cave map (plan and profile), and photographs from the last few years. Survey data were collected using the DistoX2 and Topodroid, and maps were later produced with Compass and Adobe Illustrator. There are eighteen caves and pits, mostly found by the local people. These include Sótano de la Virgen

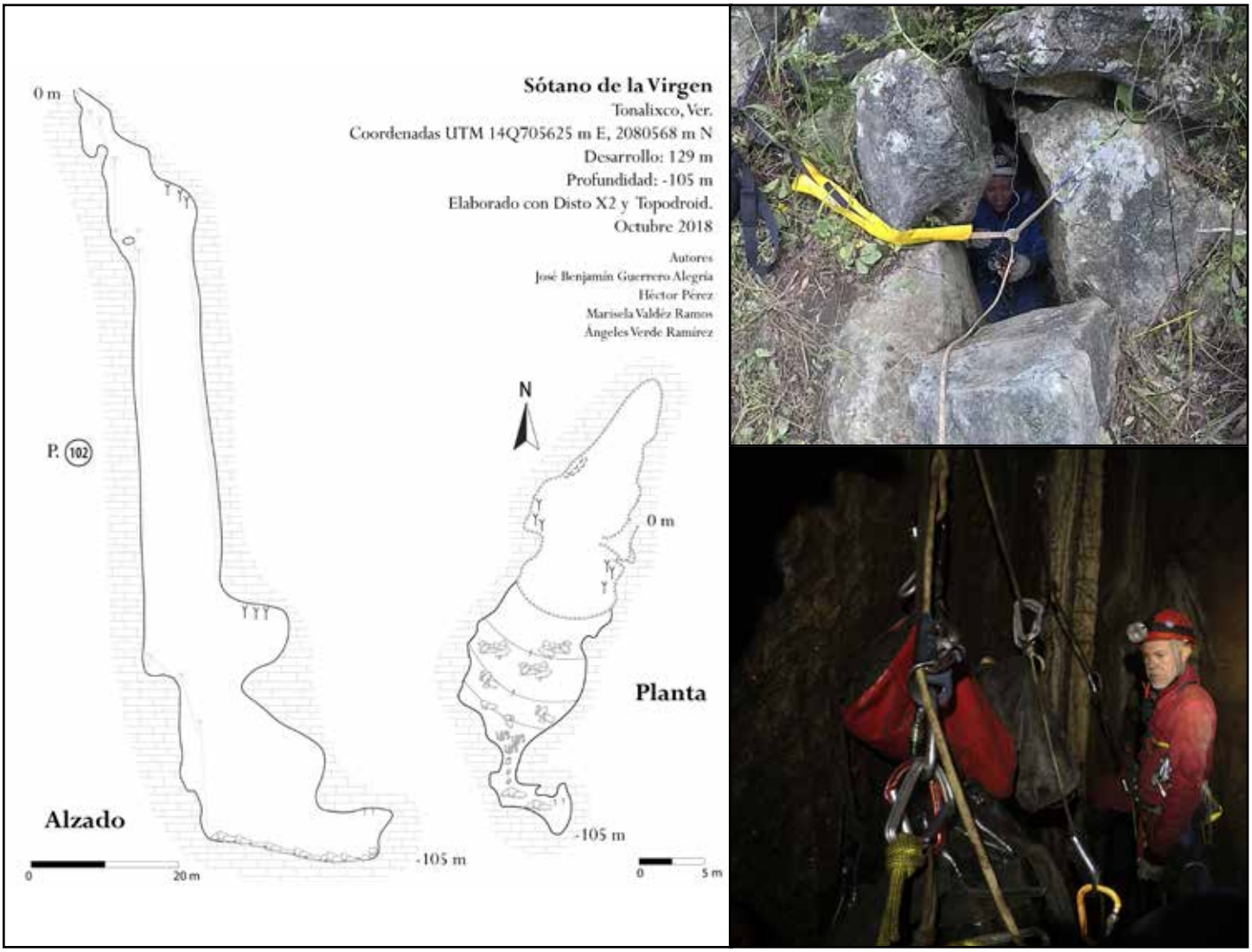
with an entrance drop of 105 meters, Sótano de Sacacuapa with an entrance drop of 80 meters, overall depth of 250 meters, and a length of 400 meters. With recent flooding having removed sediment infill, caves previously thought to end are now being rechecked to document new passages.

We would like to thank the members of the Tonalixco community, who have always welcomed us with warmth and kindness during our field visits. We would especially like to recognize the family of Don Victorio Sánchez, who are always looking afer us. We extend our thanks to Rodolfo Hernández, who showed the area to us. Likewise we appreciate the assistance of the municipal authorities and Protección Civil in Rafael Delgado, Veracruz. Our Orizaba caver friends and the cavers from the Asociación de Montañismo de la UNAM and the Proyecto Karstológico Nacional assisted with cave mapping.



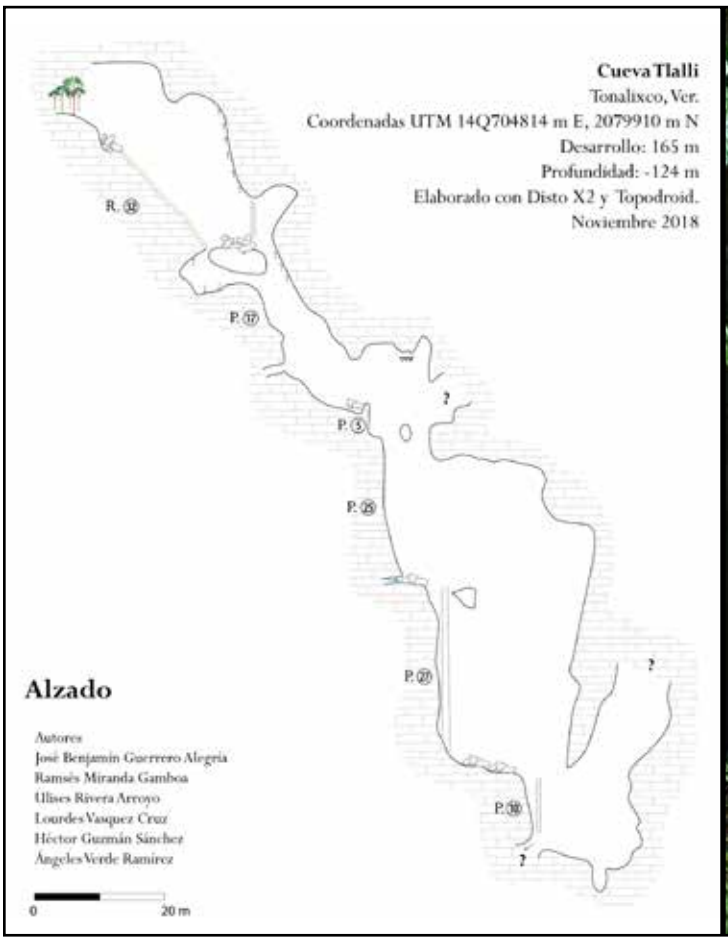


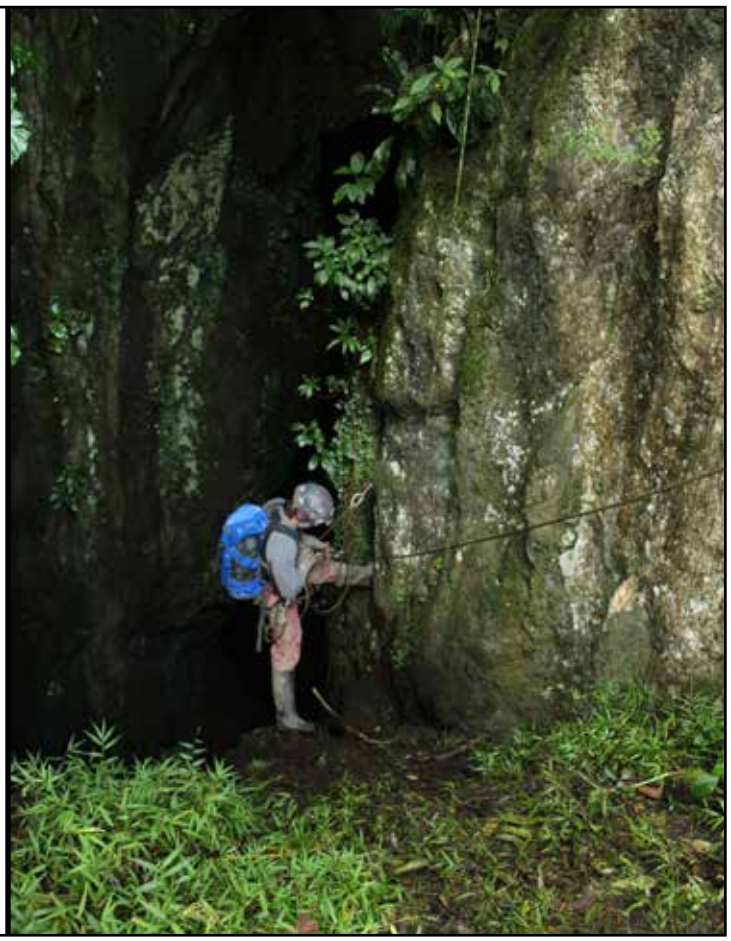
Entrada de la Cueva Tepancalli.



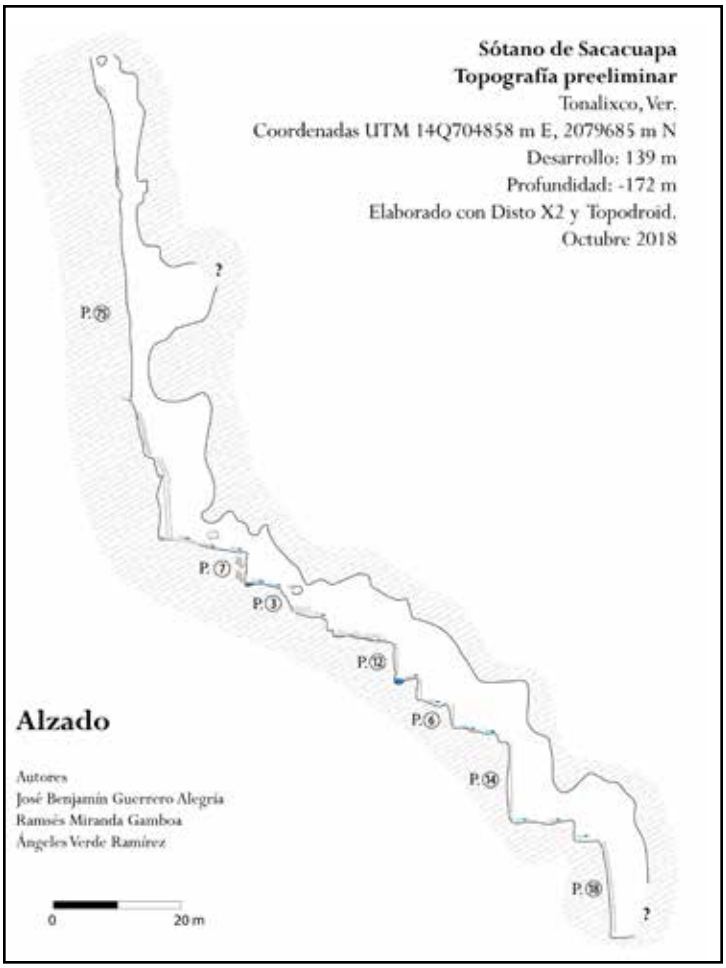
Entrada estrecha del Sótano de la Virgen. (105 meters)

Pasamanos en un repisa del Sótano de la Virgen. El tiro continua 80 meters.





Rampa de entrada de la Cueva Tlalli.



Preparando el material en superficie en la casa de la Familia Sánchez.

Lavando del material en las inmediaciones del campamento.

THANKSGIVING IN MÚZQUIZ

Notes from the Borracho Mesa Camp

Ken Demarest and Barbara Luke
with contributions from Shane Fryer, Cait McCann, Peter Sprouse, and Cyndie Walck

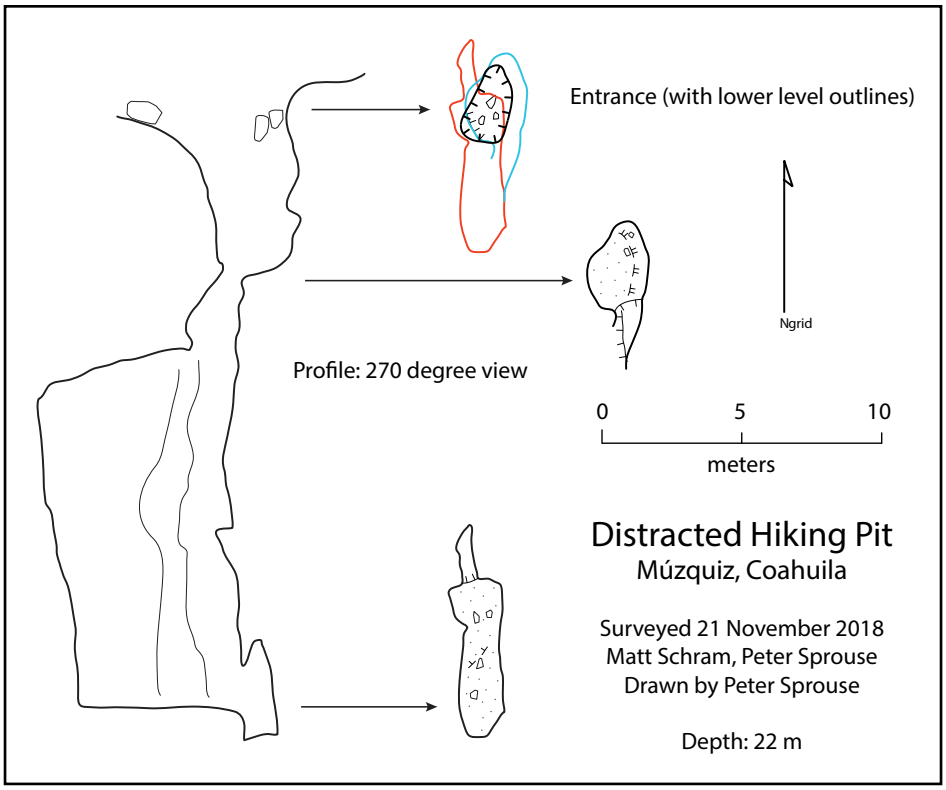
For many years, Thanksgiving week has been a favorite time for cavers to go explore caves in the Sierra Santa Rosa near Múzquiz, Coahuila. November 2018 saw a group of 30 cavers return to the welcoming and spacious Rancho los Ojos, northwest of Múzquiz. Since we had such a large group, we decided to split into two camps on separate parts of the ranch in order to explore two different mesas. The north group set up camp on Mesa Borracho, where the deepest known cave on the ranch, Cueva Gigante Borracho, had previously been discovered. This magnificent cave was 162 meters deep, and there was hope to find an even deeper one. Meanwhile, the south group was about ten kilometers away settling in on the Fiesta Mesa. Satellite texting proved to be very valuable, as it was the only means of communication between the two camps. The trip report of the exploration by the south group appears in the April 2019 Texas Caver.

Borracho Camp was set up under a giant tarp in the same small pasture used in past trips. A large kitchen was assembled where, by weeks' end, a delicious Thanksgiving dinner was prepared (thanks to Peter and Terri for the prep work!). There was music and laughter around the nightly campfire, and marshmallows, of course. Even Bill Mixon was there in spirit, as his pink chair was along. Bear poop was everywhere, but no bears were seen.

Folks went out daily to map previously located caves that had not been surveyed, to check possible leads detected on aerial photos, and to scout for new ones. Several folks utilized the phone app Locus Map Pro, which seemed to be well worth its $10 cost. It collects tracks which makes it much easier to find the cow trail "highways" and also to see what hasn't yet been ridgewalked. Wildlife was plentiful, including deer, fox, birds, rock squirrels, and butterflies.

Caves in Múzquiz tend to be almost

The teams from both Fiesta Mesa and Borracho Mesa reunited. *Bryce Smith.*



strictly vertical, which provides great practice with vertical techniques. Exploring vertical caves also exposes cavers to the dangers of rocks being jarred loose and in these vertical caves it is difficult to get out of the fall zone. Several pits that we explored in the area already had bolts, but we had not been able to discover any evidence of them having been mapped or even the location entered in the database. That is a shame as cavers for years have been trying to maintain and do constantly update a database of all known (reported) caves in Mexico. It is important to update the record to save someone else from repeating tasks.

For several days we were socked in by clouds, which made for wet hiking. Having a second pair of boots was nice so you'd have dry footwear in camp. Snake gaiters were helpful for protection against the lechuguilla. Some of us found hiking poles to be very helpful on the rough karst. Long pants, long sleeves, and gloves also helped to reduce perforations.

Barbara outside of Pozo Violinista. *Peter Sprouse.*

Matt above the second drop in Distracted Hiking Pit. *Peter Sprouse.*

Peter and Matt went to map a lead on central North Borracho Mesa known as 14 Seconds of Clatter. Along the way they stopped at a pit that had been discovered the previous day by Ben and Carrie Hutchins that was described as 7 meters deep. Matt walked right by it while he was absorbed looking at the navigation app on his phone. So we named it Distracted Hiking Pit. At the bottom of the entrance pitch there was an offset drop continuing down that required some clearing of loose rocks. That allowed entry into a squeeze, where a deviation got them a free-hang to the bottom. The floor was about 2 meters by 5 meters, with a tight 2 meter drop off one end that didn't go. The cave was 22 meters deep.

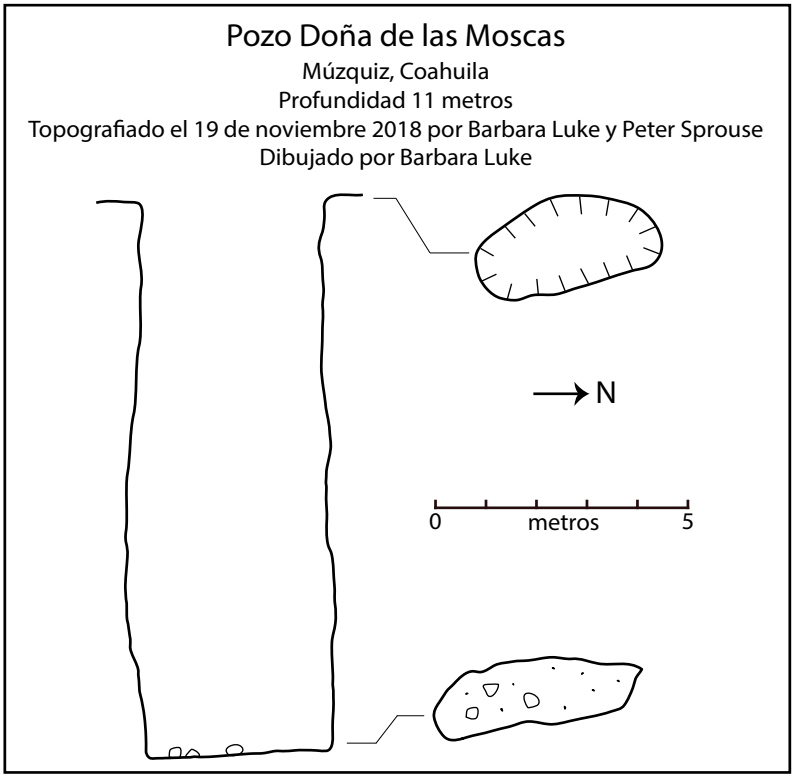
The 14 Seconds of Clatter lead did sound good, so Matt set a bolt at the 1-meter diameter entrance and rappelled in. He set a second bolt 17 meters down, at which point they were out of time for the day. The next day they continued in surveying, but as Matt went deeper, the air turned bad. They bailed without reaching bottom, and headed to another pit lead. It's likely 14 Seconds of Clatter had been bottomed previously since old bolts were seen in it. We need to return to finish mapping it.

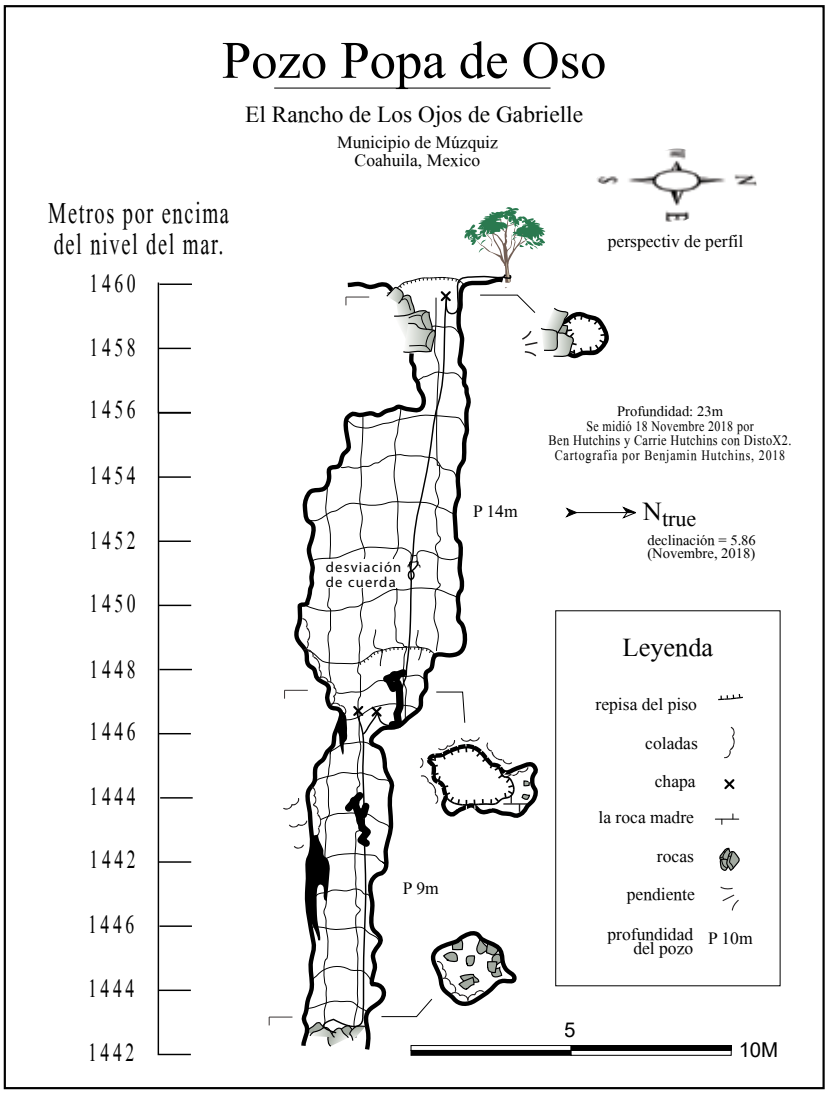
Next up was a pit noted as having a nice open entrance and estimated at 35 meters deep. The view across the mesas was spectacular from this entrance, so we named it Pozo Con Vista. A bolt was set at the entrance, leading to a nice clean drop that required almost no gardening, but alas the pit was only 18 meters deep with no lead at the bottom.

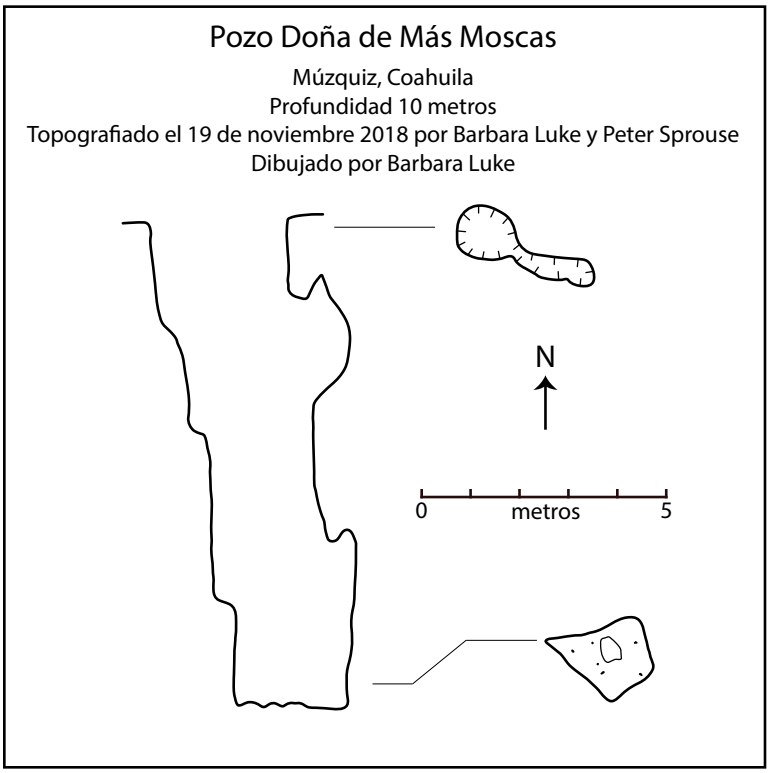
Ron and Kurtis spent quite a few days checking leads on South Borracho Mesa, which was east of our camp. Jeff and Peter hiked out with them one day, and they decided to map a pit that Ron found on the hike. A little bit of gardening and it was ready to go. Pozo Terciopelo Rojo was 11 meters deep and blind. It contained a few red velvet mites.

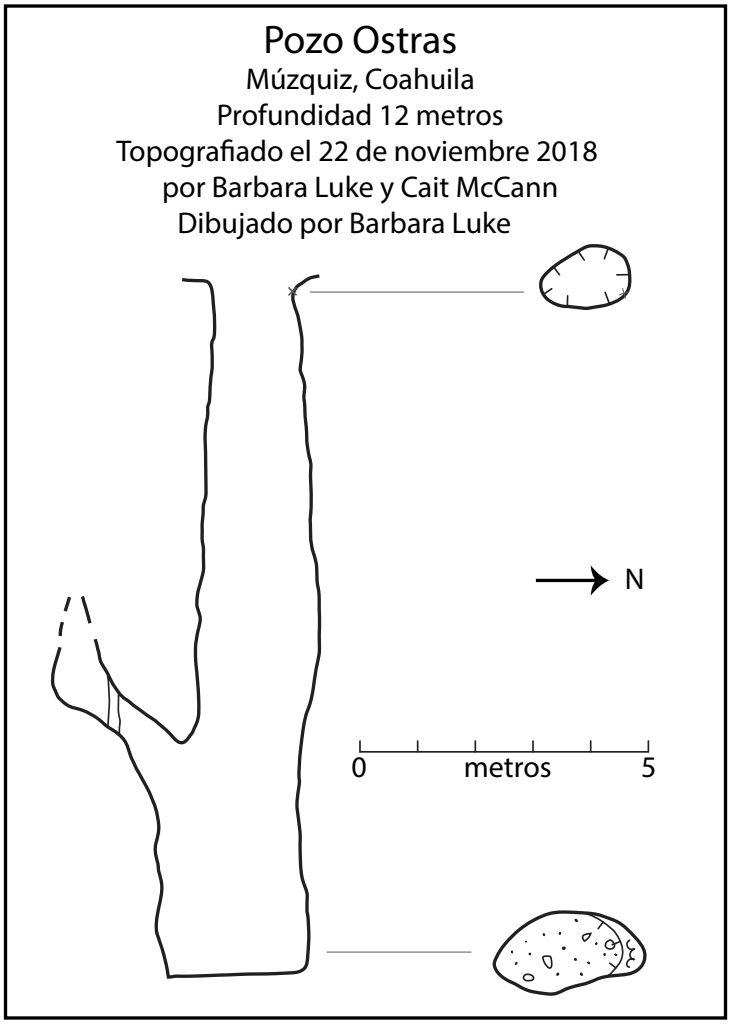
Three groups walked what would come to be named Barren Mesa on Sunday. They found only three pits worthy of mention. Cyndie and Shane returned Monday and mapped Pozo Oso and a 25-meter pit. Ben and Carrie mapped another that they had estimated to have a 2-second rock fall. Barbara spent the day searching for caves nearby with Paul, who had found three pits right next to camp before breakfast that day. They did not find anything deeper than 3 meters. If Paul didn't find anything then the area truly must be barren.

Cait and Barbara spent a long time rigging and mapping a pit on North Borracho. Since neither of them would be considered expert riggers, they pondered carefully before acting. Example: Should we knock this semi-wedged block out of the way before using that spot for a rebelay? Well maybe not - it might be the keystone in the arch across the top of the pit! All worked out well, not too many bolts had to be placed, and the rope carried was just about the right length. After that pit, they knocked out a quick survey of a small pit at the bottom of a sink, easy to rig because a large tree had fallen across the sink right above the entrance. This pit was linear and had lots of big conical snail fossils – gorgeous. They named it Pozo Caracol Calcita.









Peter and Barbara explored and mapped three blind pits on North Borracho on Monday. Pozo Violinista was the most interesting. The other two, Pozo Doña de las Moscas and Pozo Doña de más Moscas, were single-shot pits quite close together.

Several pits were mapped in an area of limestone on North Borracho including Pozo Cedro, which already had a bolt in it. This pit was approximately 40 meters deep. It had a large cedar tree in the entrance and trended along a north-south fracture. Along the same fracture, Cyndie and Shane mapped Berry Pit, which was about 10 meters deep. In that same vicinity, Barbara and Jeff mapped Pozo No Refugio. Cyndie and Shane mapped Clatter-Clatter Boom, another one that had a bolt, but was not on the inventory. They set 3 rebelays to reach a damp drain at the bottom at about 40 meters depth.

Barbara and Jeff mapped three more blind pits on Thursday. The first one was right next to a cattle track. A tight opening gave way to a nice, shallow pit where we found a beautiful purple frog and a menacing-looking spider, collected for taxonomists. The second pit was very nice, so they named it Pozo Bonito. The entrance had a body-length horizontal passage which then gave way to yet another pit. The third pit was quite near Cyndie and Shane's Cedar cave, in the limestone mesa. It had a nice wide opening, with a bit of a shelf across half of it, partway down. Since they could pretty much see everything there was to see from the surface, they named it No Secrets Pit. As they were setting up a clever rig using natural anchors, they spotted a bolt near the surface. Yet another pit that had been previously visited but not reported.

On major objective for the Borracho Mesa crew was to survey and re-rig Gigante Borracho, a 185-meter deep pit discovered on an earlier expedition. The work proceeded in two trips. First, a trip by Ken, Cait, and Matt included re-bolting and sketching. Ken was the bottle neck, doing both tasks,

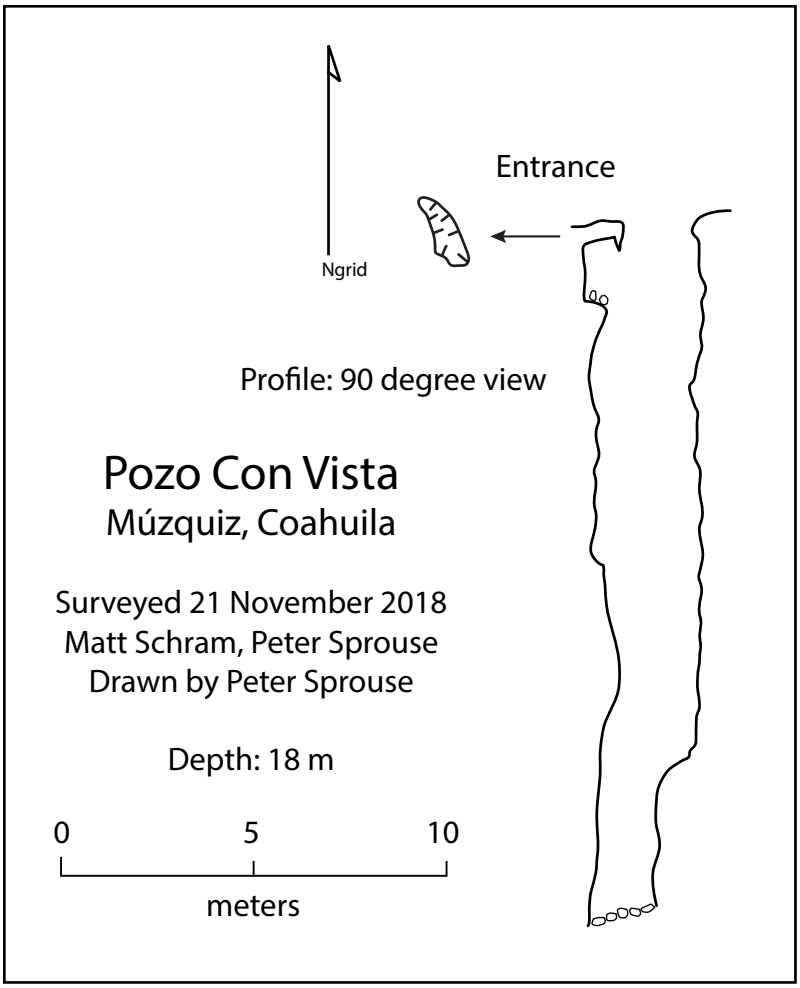
Making new friends while waiting by the side CAPTION

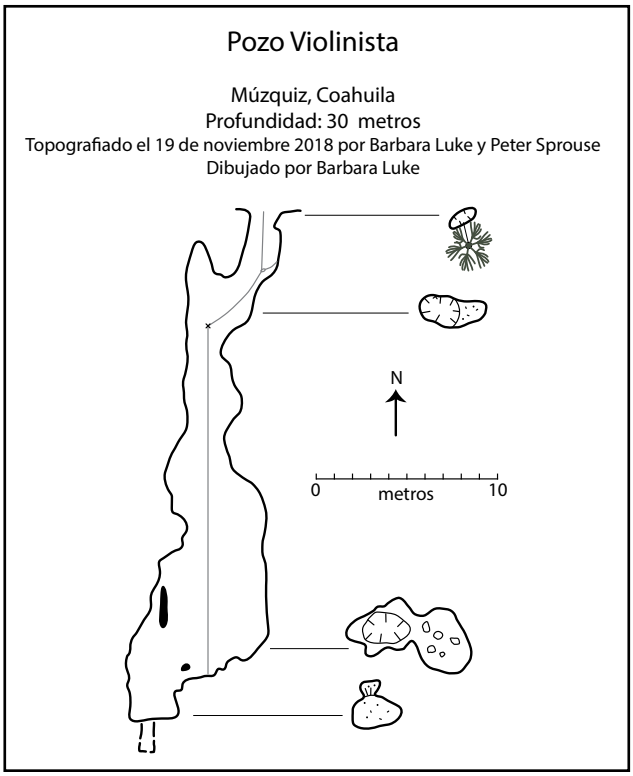
so progress was a bit slow. The team reached about fifty meters and station 8 just above the 90-meter main shaft. Arriving at that station, the team found a polished slope that wanted to pull your dangling pack down into the pit, but by moving carefully one can reach a sitting area at the cusp of the top of the slope. The trip took 14 hours total. On the hike back, dew on the agave plants sparkled in the moonlight as if they were glowing.

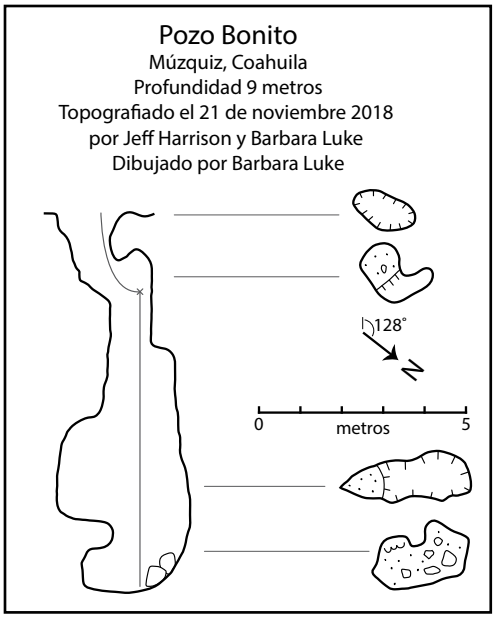
The second trip included Ken, Cait, and Paul. They quickly made it to station 8 and Paul rigged beyond while Ken sketched. The bottom of the main pit is a complex area branching into three passages and includes a complex "raised stage" with a stone wall around it, and a 7-meter tall, 2-meter diameter broken obelisk canted precariously onto a wall. A notable feature is that three drainage areas all converge here; that is, there are two domes of about 50-meter height in addition to the main pit, which might explain the complex triple branching passages, the raised stage, and perhaps also the existence of the obelisk.

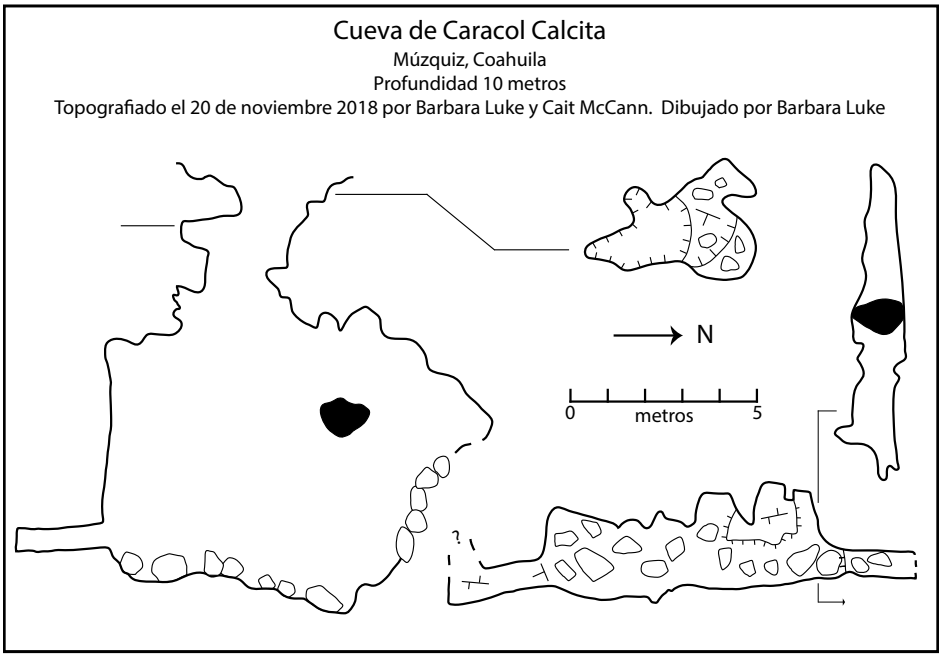
Ken advanced to the top of station RA23 and dropped a rope down. He saw some lost vice grips Ron had mentioned below, however, as he attempted to descend a man-sized rock began to roll. Bracing it with his hip, Ken pulled up the rope and then let the boulder fall, directly onto the vice grips. Oh well.

The team them moved to RA18 and considered adjusting the passage. At this time the potential fall path of the obelisk, which Ken named "Cait's Concern," was between the area of activity and egress, so the team was careful about where to stand and fully



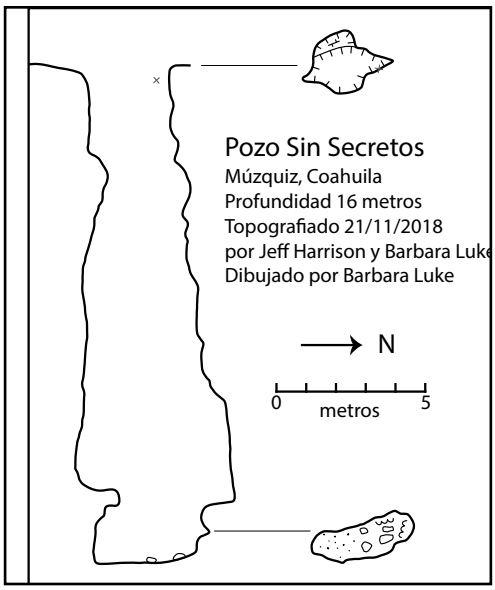


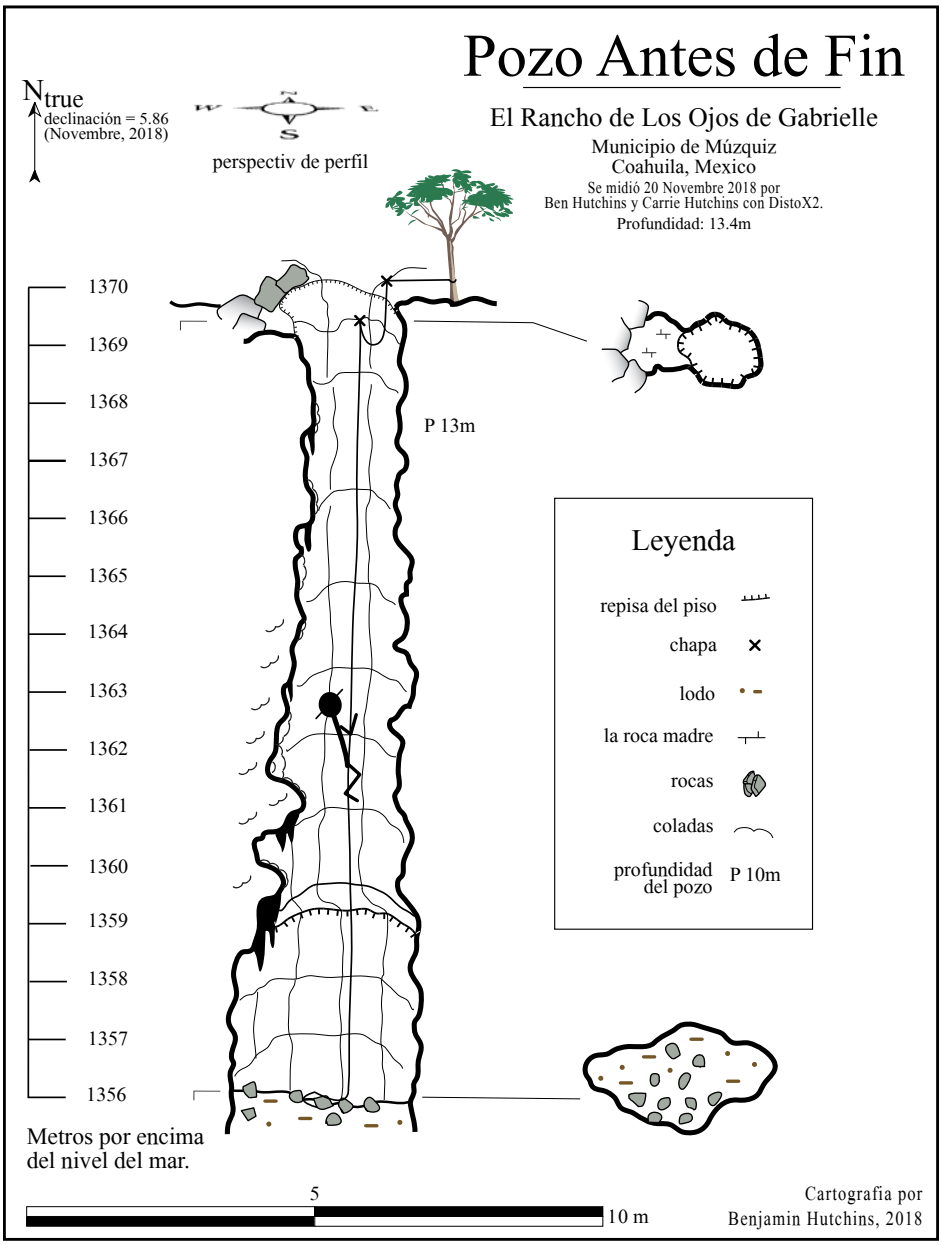




prepared with a path upwards before taking action. After modification, the team found a 9-meter domed room with a dismal drain at the bottom. This second trip took 18 hours. Over breakfast in the morning an incredulous Ron thought back on reports from the discovery of this cave and assured them that, "It still goes!" It's a beautiful cave – maybe it's worth just one more look on the next trip to Borracho Mesa.

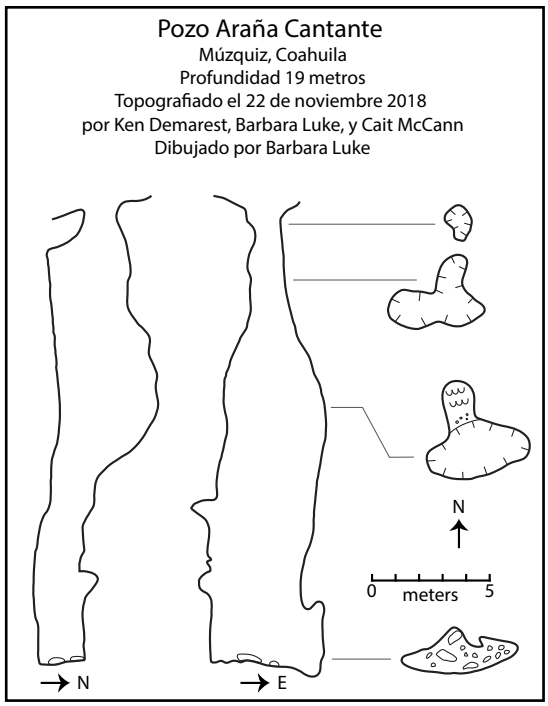
Barbara and Cait stayed close to camp on Friday, the final day of the trip. They explored and mapped two pits about 300 meters southwest of the camp that had been found earlier by Peter and Ken. First they worked Ken's find, Pozo Ostras, named for the near-ubiquitous oyster fossils. Ken





joined them for the second of the two pits, at which time much discussion about rigging ensued. That pit had an interesting "T" shape and some fluted flowstone on the walls, leading down to a small drain hole. At the end of the day, as they headed back to camp, the clouds were slinking up the valleys below them.

The Borracho Mesa crew met up with the cavers who spent the week at Fiesta Mesa back at the ranch house. Everyone headed into town to enjoy a Saturday Thanksgiving meal at Annette Enriquez' house on the edge of town, swapping stories of pits found among the crisscrossing cow paths, caving calendars and campground shenanigans, and new karst invertebrate collections with one another and friends of the Enriquez family.



Amigos viejos y nuevos pasaron sus vacaciones de noviembre topografiando cuevas en Músquiz, Coahuila. Este es el reporte de la mitad del grupo, acampado en por una mesa en el Rancho Ojos de Gabriela. Encontraron bastantes pozos y disfrutaron su tiempo empujando el límite de la exploración de la Cueva el Gigante.

SISTEMA COCOHUASTLI

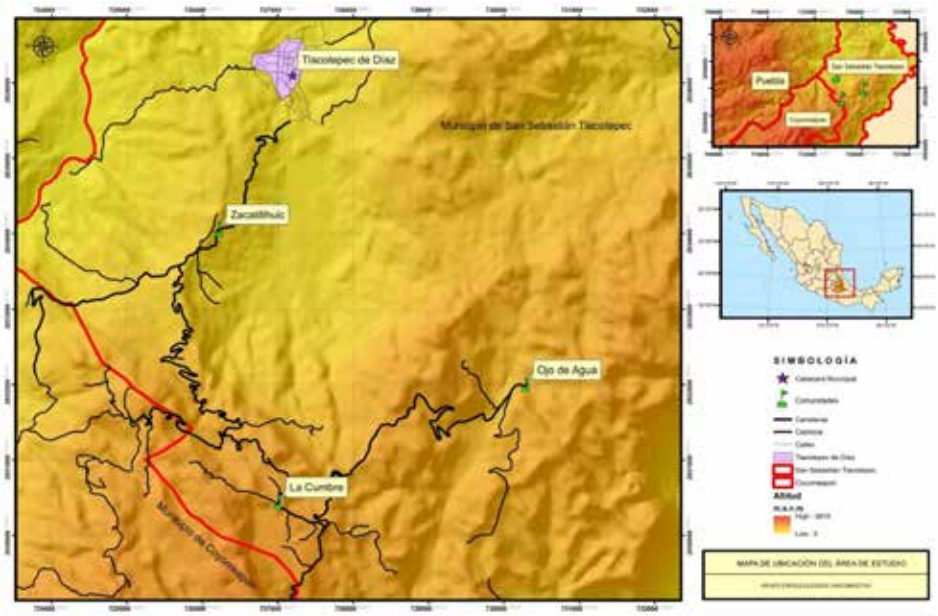
Presented by the Grupo Espeleólogico Chicomóztoc, 2018

This article appears first in original Spanish and then abbreviated and translated into English. Este artículo aparece en español primero, y después acortado y traducido al inglés.

Introducción

La zona de "La Cumbre" ubicada en el municipio de San Sebastián Tlacotepec de Díaz presenta características geológicas que propician el potencial kárstico para la exploración de cuevas de más de 1000 metros de desarrollo vertical. La tarea del Grupo Espeleológico Chicomóztoc desde hace 12 años ha sido buscar en la zona cuevas de gran desarrollo vertical y horizontal; entre las cuevas más profundas se encuentran "La Virgen", "Tlalocan", "Ojo de Agua" y "Cuatlicue", las cuales han dado profundidades entre los -500 y -600 metros. Cerca de la zona de exploración, se encuentra "Sistema Tepepa", una cueva que sobrepasa los 900 metros de profundidad explorada por canadienses en los años 90s. Esta cueva ha sido de gran utilidad para seguir explorando la zona y lograr el -1000 del grupo Chicomóztoc, tomándose en cuenta que los grandes descubrimientos espeleológicos en México han sido por parte de expediciones extranjeras. Hoy en día con toda la nueva tecnología disponible de uso civil, junto con el desarrollo científico, la exploración espeleológica ha dado grandes pasos de progreso, por ese motivo, el grupo espeleológico chicomóztoc está intentando poner en práctica la geología como herramienta fundamental de apoyo a la prospección de otras cuevas con gran potencial de desarrollo vertical.

El M. C. Rogelio Hernández, es de los pocos, si no el único geólogo mexicano en trabajar con espeleogénesis de sistemas kársticos, por ejemplo, el resumidero la Joya en el estado de Guerrero y la cueva ALT en la sierra de Zongolica como caso de estudio en su tesis de maestría.



Mapa de Localización

Justificación y Objetivo General

El presente reporte atiende a la necesidad de mostrar a los simpatizantes de la exploración espeleológica en México y en el extranjero, los avances de exploración del Grupo Espeleológico Chicomóztoc en la zona kárstica de la comunidad de La Cumbre, Sierra Negra, Puebla; así como la implementación de la geología como herramienta de exploración de nuevas zonas prospectivas con alto potencial de desarrollo vertical. Realizar la exploración y topografía completa del Sistema Cocohuastli y encontrar posibles conexiones a otras cuevas aledañas.

Antecedentes

En marzo de 2008 Grupo Espeleológico Chicomóztoc localizó una cueva en los linderos de La Comunidad de Cumbre con La Guacamaya, la nombramos Cocohuastli (Planta que rasga) en esa ocasión se exploró el ramal principal hasta su resurgencia en La Gran Depresión de La Cumbre, quedando varios pasajes y tiros verticales por explorar; el potencial de la cueva es claro.

En el mes de Abril del año 2011, un grupo conformado por José L. Godoy, Marcos y Miguel Barragán, regresan a la cueva Cocohuastli para continuar su exploración, desafortunadamente y debido a un mal entendido, nuestros compañeros casi son linchados por gente de la zona, la exploración en esa cueva es cancelada.

No fue hasta el año 2018 donde se volvió a retomar la exploración del sistema para seguir buscando profundidad.

Localización

La comunidad de La Cumbre se encuentra en extremo sureste del estado de Puebla, dentro de la provincia fisiográfica Sierra Madre del sur. Cuenta con alrededor de 500 habitantes. Las vías de acceso más directas desde la Ciudad de México es tomar la autopista federal México-Puebla de cuota, una vez saliendo de Puebla continuar por la autopista federal Puebla-Córdoba de cuota. Antes de llegar a la

ciudad de Orizaba tomar la desviación hacia la Tinaja y tomar rumbo hacia Tlacotepec de Díaz. Una vez llegando a la cabecera municipal (Tlacotepec de Díaz) se toma la carretera municipal hacia la comunidad de "La Cumbre".

Exploración Noviembre 2018

A diez años de la primera incursión, regresaron seis miembros de Grupo Chicomóztoc a continuar la exploración, la cual tuvo una duración de 11 días en la zona. Dos son los objetivos, exploración del Cocohuastli y realizar una interpretación geológica estructural de la zona recabando puntos GPS, y así poder visualizar la ubicación geográfica de los sistemas kársticos. El campamento base fue montado en La Cumbre, en casa de nuestro amigo Lorenzo Martínez, a pesar de tener ya varios años de estar explorando la zona, el permiso por parte de sus dueños no fue tan sencillo siempre existen algunas trabas.

Martes 20

La cueva inicia por un pasaje estrecho y tortuoso que finaliza en el primer tiro (6 metros), continua por una rampa con 50° de inclinación (Figura 2), continua por tiros cortos hasta llegar a un quinto tiro con una vertical de 9 metros (Figura 3) En la mayoría de los tiros utilizamos los anclajes que se colocaron hace 10 años, la cueva se rearmó y topografió hasta la resurgencia en el Gran Colector de La Cumbre, dando como resultado una profundidad de -74 metros.

Jueves 22

Iniciamos la exploración de nuevos pasajes, siendo el objetivo un tiro que presenta una importante corriente de aire. El armado de la cueva lo realiza Pacheco, mientras Isaí y Omar se encargan de la topografía, el tiro resulto tener 34 metros, y lo nombramos El Pozo Ciego, ya que no tiene continuación, solo el agua se filtra por grietas, al inspeccionar el tiro nos percatamos que del lado opuesto de la base del mismo, se aprecia una continuación por una serie de grietas, se toma la decisión de realizar una travesía horizontal.

Después de varias horas de armado se logra llegar al otro extremo del tiro, iniciamos pasando por un derrumbe el cual se tuvo que desobstruir para llegar a un nivel más abajo, que da acceso a una serie de cuatro tiros alineados, se decide continuar la exploración hacia el fondo de la grieta de donde proviene la corriente de aire. Pasamos por una serie de tres tiros dentro de un estrecho pasaje hasta que llegamos a una galería con un pozo que tenía que ser protegido para continuar, solo que ya no teníamos cuerda, pero estábamos seguros de que a algunos metros había otra salida.

Viernes 23

Regresamos al último tramo explorado, Pacheco continúo equipando la cueva mientras Isaí y Omar realizaban topografía. Una vez librado el pozo el cual presentaba un par de grandes bloques inestables, continuamos por un pasaje hasta llegar a otro pozo que cubría el pasaje en su totalidad, superado este paso estábamos en una nueva salida del sistema, solo que a unos pocos metros iniciaba una gran vertical, en ese momento se dedujo que habíamos salido nuevamente a La Gran Depresión de La Cumbre.

Sábado 24

Bajamos a Tlacotepec, dos amigos dejaban la expedición y se anexaba Jorge Chora.

Domingo 25

Regresa Pacheco, Jorge e Isaí a explorar y topografíar los tiros pendientes antes de la segunda resurgencia, por importancia deciden explorar dos tiros de los siete que existen sobre esa grieta. Tiro 4, vertical de 18.4 metros, continua por una grieta donde solo existe paso para el agua. Tiro 5, de La Muerte, 18.0 metros. Zona de alto riesgo por rocas de fácil desprendimiento de las paredes, donde la vida de Ricardo Pacheco e Isaí Hernández corrieron riesgo. La base falsa del tiro se encuentra sobre unos bloques acuñados entre las dos paredes, continua por 10 metros de arrastradera y se cierra permitiendo solo el paso del agua.

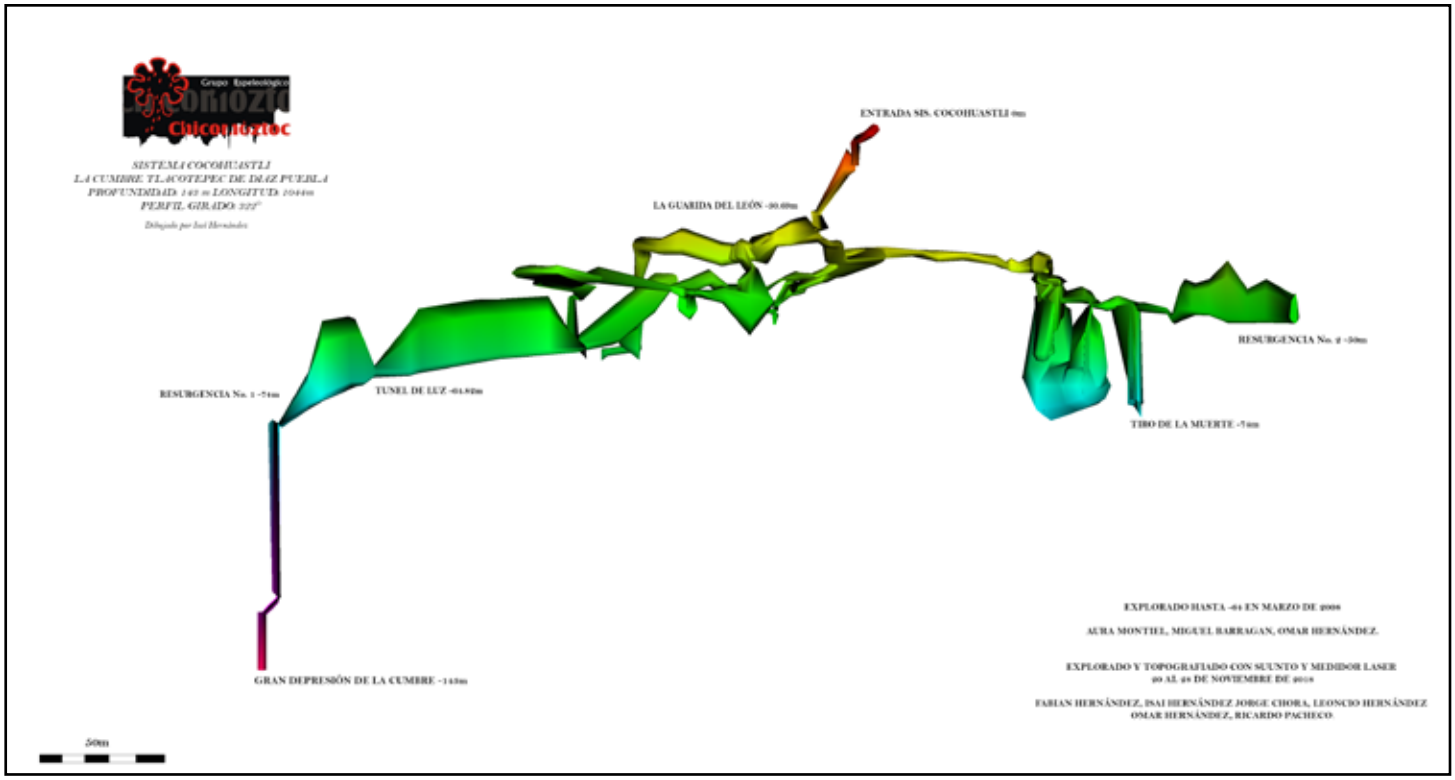
Martes 27

Regresamos a terminar los pasajes pendientes por explorar dentro del Cocohuastli, nos dividimos en dos grupos, Isaí y Pacheco irían al pasaje 1K, y Omar y Jorge al 11CH.

El pasaje 11CH inicia por una galería ascendente que finaliza en una grieta con una inclinación de 50° y poco más de 30 metros, al terminar está pendiente continua horizontal hasta llegar a un paso estrecho por donde el agua continua, con franca corriente de aire, solo que no hay paso humano. Por la noche al regresar al campamento se vaciaron los datos obtenidos dando como resultado que el pasaje 8A pasa por arriba del túnel de La Luz (Resurgencia 1) y todo indica que la corriente de aire se debe a que es otra salida hacia La Gran Depresión de La Cumbre.

El pasaje 1K continua por una pequeña rampa en forma de "V" donde al final se encuentra un tiro de 3 metros, y casi de inmediato continúa un tiro muy angosto de 3 metros para acuñarse más adelante.

Inicio de la Rampa



Mapa de Sistema Cocohuastliz

Miércoles 28

Ultima entrada de la campaña. Regresamos al pasaje principal hasta una galería fósil, donde realizamos sesión fotográfica, finalizado este objetivo, continuamos hasta la resurgencia 1 para medir el ultimo tiro que baja a La Depresión de La Cumbre. Se retira el equipo de la cueva y damos por finalizada la exploración por este año en Sistema Cocohuastli. Una vez en el campamento se descargan los datos al programa; Sistema Cocohuastli por esta campaña queda así: Profundidad: 143 metros, desarrollo horizontal: 1044 metros.

La Gran Depresión de La Cumbre

En 2008 se localizaron dos cuevas en su interior, no se realizó topografía, su exploración sigue pendiente. La Depresión presenta paredes verticales de más de 100 metros, y en su periferia se localizan tres cuevas a más de 60 metros de altura, su exploración está pendiente hasta que localicemos entradas en la superficie. Durante el trabajo de gabinete, se ingresaron a un "Sistema de Información Geográfica (SIG)" las coordenadas de entrada y resurgencias del Cocohuastli, y se comprobó que la salida No. 2 no resurge en La Gran Depresión, fue una conclusión errónea durante la campaña, ahora tenemos pendiente un sótano de gran magnitud por explorar.

Análisis estructural de la zona de exploración mediante un SIG

Geológicamente, el desarrollo vertical y horizontal de los sistemas kársticos está controlado por una configuración estructural existente en el subsuelo y la composición litológica de la formación geológica que este cortando. Para futuras expediciones en la zona se realizó un análisis estructural en un SIG para estudiar los patrones morfológicos del relieve que puedan indicar estructuras locales y regionales que estén relacionadas con la profundidad de las cuevas exploradas por el Grupo Espeleológico Chicomóztoc.

Análisis Local

Durante el desarrollo de la topografía, junto con toda la observación que se realizó en interior de cueva, se identificó que los conductos y tiros principales del sistema presentaban una dirección preferencial entre ellos, se descubrió que el Sistema Cocohuastli está dentro de una configuración de fallas y fracturas bastante diverso.

En la topografía se observan direcciones preferenciales NW-SE, NE-SW y N-S de los conductos del sistema, esto indica que existen tres familias de fallas o fracturas locales que están controlando directamente su desarrollo, por lo tanto con la existencia de dicho sistema, da evidencia de la presencia de una estructura mucho mayor. Se tomaron las coordenadas GPS de la entrada y las dos salidas del Cocohuastli para poder proyectarlas en un SIG y observar su posición geográfica en el relieve.

Una vez proyectados los puntos sobre el modelo de elevación digital (DEM), los resultados fueron positivos. La entrada y las dos salidas del Sistema Cocohuastli muestran una orientación preferencial NE-SW, donde la resurgencia No.1 sale a La Gran Depresión de la Cumbre (salida ya identificada) y la resurgencia No. 2 sale a un nuevo sótano sin explorar.

Sobre el mapa base de elevación se trazó una línea que tocara los tres puntos, indicando la presencia de una estructura mucho mayor que controla directamente a la cueva. Para verificar lo anterior se generó la red de drenaje, los ríos erosionan el relieve siempre siguiendo patrones estructurales en el subsuelo, por lo tanto, uno de los ríos que se generó sobre el modelo, empalma casi paralelamente a la falla inferida anteriormente, esto apoya a la idea de que existe una estructura mucho mayor en la zona de exploración.

Miembros de la exploración en la segunda semana. De izquierda a derecha; Omar Hernández, Ricardo Pacheco, Jorge Chora, Isaí Hernández.

Análisis Regional

Se trabajó en una escala 1:10000 para tratar identificar si la "falla" que controla al Sistema Cocohuastli tiene una mayor extensión sobre el terreno y que relación estructural guarda con otras cuevas de la zona exploradas por el grupo. Una vez proyectada la cueva de estudio, se observó que esta cae sobre una estructura mucho mayor de lo que se pensaba, respetando la orientación NE-SW y con una longitud visible mayor a 4 kilómetros se nombró como la Gran Falla de la Cumbre. Aplicando esta metodología a la exploración, se proyectaron 10 cuevas más, Tlalocan, Coatlicue, Ixtololo Atl, La cortada, La raya, Sótano del Alhuastle, GA-03, GA-04, GA-05 y GA-06 para ver su relación con la gran estructura. Una vez realizada la proyección, los resultados mostraron que las cuevas caen dentro de la gran falla, lo cual indica que las cuevas que se han explorado están estructuralmente relacionadas entre ellas y donde es altamente probable que a lo largo de toda la falla podamos encontrar nuevas cuevas y conexiones.

Posteriormente se marcaron sobre el mapa más lineamientos para tratar de localizar nuevas zonas prospectivas con alto potencial de desarrollo vertical. La zona quedo dividida en cuatro zonas importantes, Zona de la Cumbre, Zona del Gran Caña, Zona de los Tachos y Zona de la Guacamaya.

Complicaciones Geológicas

Los factores geológicos en la zona de exploración son muy importantes, ya que como se mencionó antes, la formación y desarrollo de cuevas está gobernado por la configuración estructural en el subsuelo y la composición de la propia roca. Ortuño Arzate (2003) en su artículo "Late Cretaceous Carbonate Reservoirs in the Platform and Veracruz Basin, Eastern Mexico" presenta un mapa geológico regional de la plataforma de Veracruz y sus áreas aledañas; dentro del mapa esta cartografiada la zona de exploración, donde Arzate coloca una gran cabalgadura que afecta a las rocas de la Formación Orizaba del Cretácico. Buscando correlación, la Gran Falla de la Cumbre podría representar parte del plano de falla de dicha cabalgadura y que esté afectando directamente a las cuevas de la zona como una barrera natural, la cual permitió que dichas cuevas no continuarán ganando profundidad a más de 600 metros.

Conclusiones

Sistema Cocohuastli es solo una parte de las futuras conexiones, en base a la nueva metodología, en las siguientes campañas se tienen que buscar entradas en las comunidades aledañas. La implementación de los análisis geológico-estructurales en la exploración aún requieren mucho trabajo y ardua investigación para obtener resultados mucho más efectivos.

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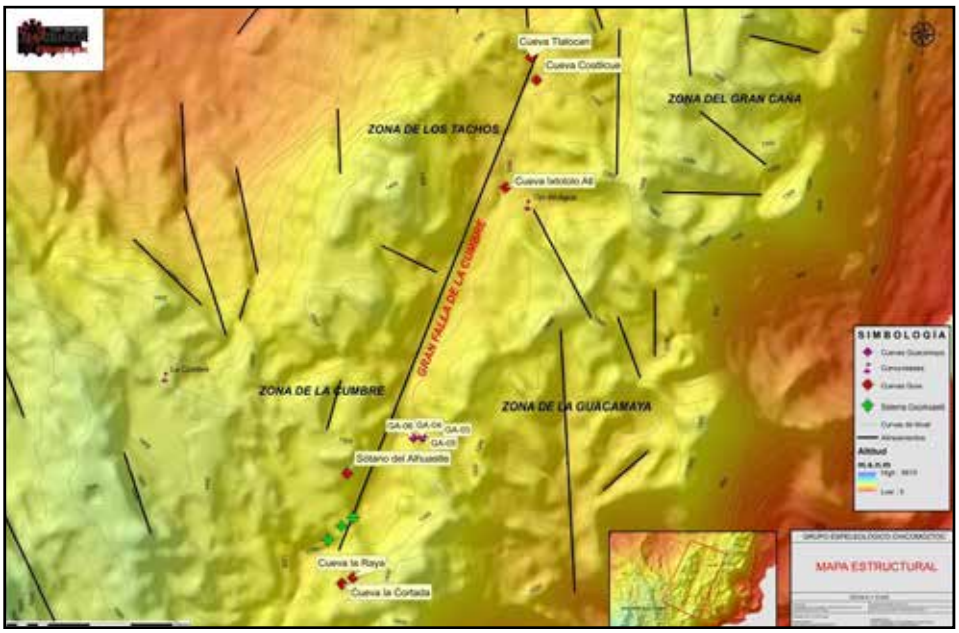
The area around La Cumbre, Puebla in the municipality of San Sebastián Tlacotepec De Díaz has the potential for caves over 1,000 meters deep. The goal of the Grupo Espeleológico Chicomóztoc over the last 12 years has been to find caves of significant vertical and horizontal development. The deep caves found so far include La Virgin, Tlalocan, Ojo de Agua and Cuatlicue, with depths between 500 and 600 meters. Our exploration zone is near Sistema Tepepa, which is over 900 meters deep and was explored by Canadian

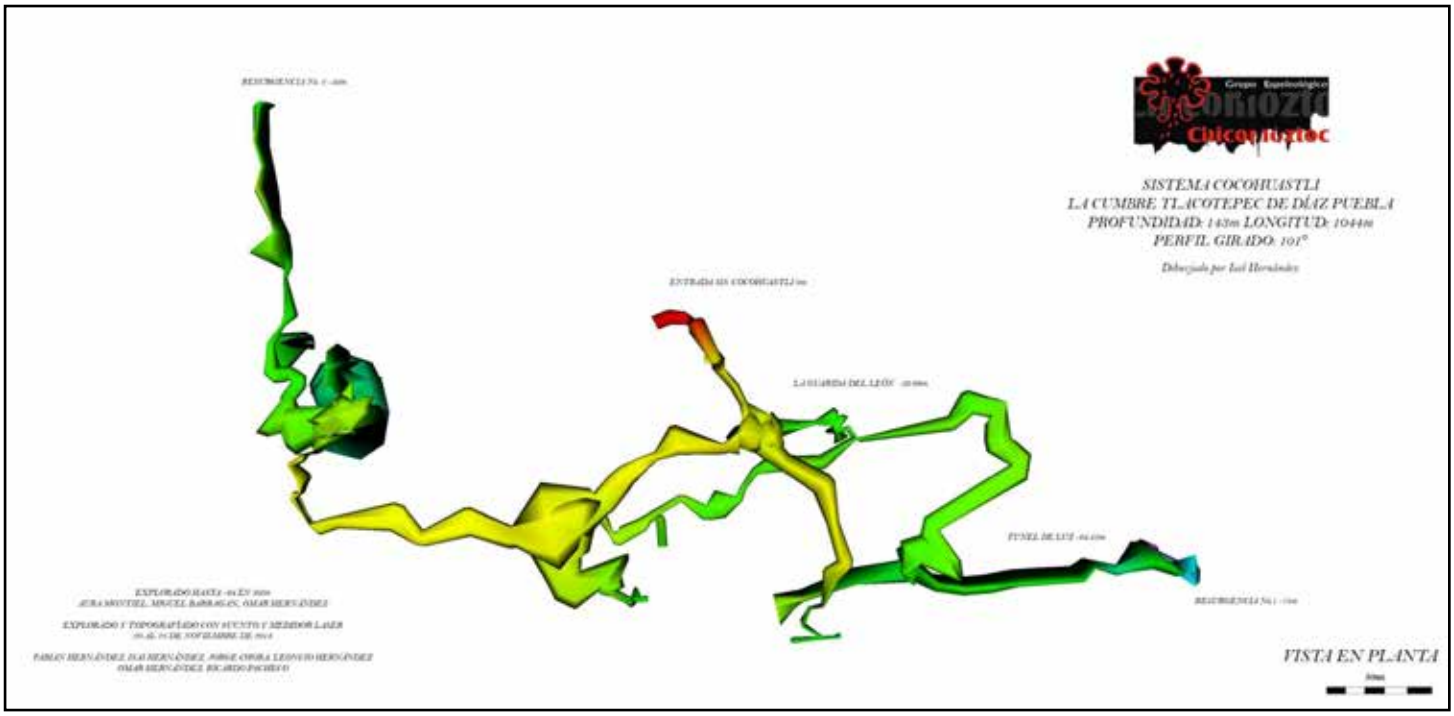


Interpretación estructural de la zona de estudio 20

cavers in the 1990s. The existence of this deep cave encouraged the Chicomóztoc team and prompted them to search for a 1,000-meter deep system on their own, since previous discoveries were by foreign groups. With the use of modern technology and scientific methods, our group has been using geologic methods to assist in the search for deep caves. The primary objective is exploration and mapping of Sistema Cocohuastli as well as attempting to connect to other nearby caves.

In November 2018, ten years after the first exploration in Cocohuastli, the Chicomóztoc spent eleven days continuing exploration in the area. Base camp was in the village of La Cumbre. The first efforts were directed at re-rigging and mapping the initial parts of the cave to a depth of 74 meters. Then, a new passage with strong airflow was rigged and mapped down a 34-meter shaft named El Pozo Ciego. Initially we could not find a good route, but a traverse to some cracks on the opposite wall led to another series of drops, where we ran out of rope. Upon returning, the next obstacle involved finding a route through some large and unstable breakdown. This led to a pit with an exit into the large surface collapse known as the Gran Depresión de La Cumbre. This depression has vertical walls, with entrances visible part of the way up the 100-meter rockface.

In another part of the cave, leading to the Second Resurgence entrance, two 18-meter pits were explored. One of these, Tiro de la Muerte, had a lot of rockfall issues, and underneath a false floor of blocks it could only be followed for 10 meters to where it got too tight. In yet another part of the cave, the "11CH Passage" was explored upwards to where water and airflow continued, but it was also too tight. Returning to the main passage of the cave, a pit beyond a fossil gallery was mapped to the First Resurgence entrance. Then the cave was derigged the final data were processed back at base camp. Sistema Cocohuastli is now 1,044 meters long and 143 meters deep.



Mapa del Sistema Cocohuastli

PROYECTO ESPELEOLÓGICO KOÍNYIS´AYAA NITJAN

2016-2019: Exploraciones del Grupo Espeleológico Universitario (GEU) en Plan de Escoba, Huautla de Jiménez

Ramsés Alejandro Miranda Gamboa, Ángeles Verde Ramírez, Benno Wolfhang Fiehring

En las décadas 80 y 90, un grupo de espeleólogos australianos, liderados por Alan Warild, realizaron expediciones en las cercanías del poblado de Zongolica, municipio de Santa María Chilchotla, al norte de Huautla de Jiménez, que está ubicado al noroeste de la sierra mazateca. Durante estas expediciones lograron explorar más de 37 sótanos, de los cuales nueve tienen entre 486 y 1014 metros de profundidad, siendo Sonconga el más profundo y uno de los nueve menos miles de México (Warild, 1987; 1991; 1992; 1997). Durante esas expediciones se percataron de que en Zongolica, a pesar de contar con un potencial de profundidad teórico de 1900 metros, existe un nivel de base a 650 metros sobre el nivel del mar, lo que significa que esa zona reduce su potencial a 1250 metros (Warild, 1991). Fue debido a esto que los australianos decidieron prospectar al sur de Zongolica, donde la sierra es más alta. Así, encontraron Yuá Nita (-704 metros) y R´ja Man Kijao (-613 metros), los dos sótanos con las entradas más altas y los más alejados a Zongolica en dirección sur, justo en el límite entre los municipios de Huautla y Chilchotla.

Nosotros pertenecemos al Grupo Espeleológico Universitario (GEU) de la Asociación de Montañismo de la UNAM, y en 2016 comenzamos a tener comunicación vía correo electrónico con Alan Warild. Fue en uno de estos correos, hablando acerca de las cuevas verticales que existen en Zongolica, que él nos sugirió visitar Yuá Nita y sus alrededores. La razón que nos expuso fue que en las galerías finales de Yuá Nita había un par de incógnitas que valía la pena revisar, y que además existían en la zona cercana a este sótano algunas cavidades inexploradas. Con esta información y aprovechando la comunicación con Alan, iniciamos ese mismo año el proyecto de exploración en la sierra mazateca con el fin de darle continuidad a las expediciones de los australianos. Desde un inicio buscamos tener comunicación con la comunidad de Plan de Escoba (la más cercana a Yuá Nita), la cual se afianzó en los años 2017 y 2018, lo que nos permitió extender el proyecto de exploración no solo a otras cuevas de la zona, sino también a las ubicadas en los poblados de Zongolica (Chilchotla), Plan de Ocote y Plan de Joya.

Objetivo general

Continuar el trabajo de exploración y prospección espeleológica que los australianos, dirigidos por Alan Warild, realizaron en las décadas 80 y 90 entre los límites de los municipios de Santa María Chilchotla y Huautla de Jiménez.

Objetivos específicos

Descender el sótano Yuá Nita hasta la cota de -704 metros y revisar las incógnitas que dejó el proyecto "Chilchotla 1987."

Explorar la zona kárstica de Plan de Escoba y las comunidades aledañas para encontrar nuevas cavidades y documentarlas.

Introducción

A finales de 2016 hicimos nuestra primera visita a Zongolica, con el objetivo de ubicar el sótano Yuá Nita y empezar a equiparlo. Como no estábamos seguros a quién pertenecía esta cueva, solicitamos permiso a los municipios de Huautla y Chilchotla por igual. Nos tomó tres días encontrar la entrada de Yuá Nita, ya que aunque Alan nos dio todas las referencias, esta se había visitado 30 años atrás. Durante esta primera campaña, logramos equipar la cueva a una profundidad de 600 metros, sin embargo, tuvimos que terminar prematuramente nuestro proyecto por un cambio de autoridades en Zongolica. Pese a ello, tuvimos muchos logros, pues además del trabajo en Yuá Nita, ubicamos nuevas entradas de cuevas y sótanos y, llegamos a la comunidad de Plan de Escoba, la cual descubrimos era la más cercana a Yuá Nita (llegar desde Zongolica nos tomaba dos horas y 400 metros de desnivel). Con estos resultados, decidimos que realizaríamos una nueva expedición cuyo campamento base estaría en Plan de Escoba.

Durante 2017 y 2018 hicimos varias visitas cortas a Plan de Escoba, con la finalidad de conocer a los pobladores, presentar nuestro proyecto y solicitar los permisos correspondientes a las autoridades municipales, al representante y a los miembros de la comunidad. Nos tomó este tiempo generar una buena relación con los pobladores y comunidades aledañas. En este periodo encontramos y exploramos varias entradas de sótanos y cuevas en los alrededores de Plan de Escoba. También descubrimos que Yuá Nita, pertenece al municipio de Huautla y no al municipio de Chilchotla como pensaron los compañeros australianos.

Finalmente, en diciembre de 2018 y abril de 2019 realizamos otras dos jornadas de exploración de tres y dos semanas de duración, respectivamente.

En los alrededores de Plan de Escoba hay una alta densidad de cuevas, estas se caracterizan por ser muy verticales, la mayoría son sótanos y sus galerías se han originado sobre fallas geológicas. La morfología de estas cuevas es muy parecida a las de Zongolica, pues carecen de conexiones subterráneas y abundan las estrecheces. Otro rasgo importante es que la gran mayoría de estas cavidades son fósiles, colectan poca agua y presentan muchos derrumbes que imposibilitan la progresión. Con toda esta información, sabíamos que las cuevas que encontráramos con altitud de 1,900 metros sobre el nivel del mar (altitud media de Plan de Escoba), no serían muy grandes a menos de que su área de captación de agua fuera muy extensa.

Resultados

En este artículo se presentan los resultados más sobresalientes de las expediciones que el GEU ha realizado en los alrededores de Plan de Escoba desde el 2016. Cabe mencionar que en este documento solo se muestran las 5 cuevas más importantes encontradas hasta ahora, sin embargo, hay un gran número de mapas de cuevas más pequeñas que se presentarán en publicaciones posteriores. Las topografías se realizaron con dispositivos Disto X2 y el software de topografía Topodroid, los datos fueron procesados con el software de topografía Cave Compass y Adobe Illustrator CC 2018.

De 2016 a la fecha se han encontrado 100 entradas de cuevas o sótanos, muchos de estos son poco profundos. La tabla 1 presenta las profundidades y longitudes de las 51 cuevas en los alrededores de Plan de Escoba que se han mapeado desde 2016. La longitud y profundidad del total de estas cuevas son 7.83 kilómetros y 4.24 kilómetros respectivamente.

Yuá Nita (Sótano que chupa)

Como ya se mencionó, Yuá Nita fue la cueva que originó nuestro proyecto. Yuá Nita significa sótano que chupa aire y como su nombre lo indica, presenta un flujo considerable de aire en prácticamente todas sus galerías. Esta cueva se exploró por el grupo de australianos del proyecto Chilchotla hace 30 años, y lo interesante es que existía una buena posibilidad de que la cueva continuara por un par de escaladas inexploradas en la galería final a -704 metros por donde posiblemente se va todo el aire.

Yuá Nita es una cueva muy vertical, es llamativo que casi toda se desarrolla sobre un sistema de fallas que la hace "zigzaguear" en dirección este-oeste (Warild, 1991), con prácticamente no desarrollo en dirección norte-sur. Inicia con un amplio tiro de 90 metros que claramente está asociado a una falla. Esta cueva consiste en una serie de tiros interconectados por pasajes cortos y varios y desgastantes "squeezes." A -600 metros la cueva cambia drásticamente su morfología a galerías horizontales con tiros cortos y derrumbes que convergen a una gran cámara (-704 metros) sin aparente continuación. El flujo de aire a esta profundidad es fuerte y no se había encontrado por donde continuaba. Hasta esta cota la cueva había sido explorada por los compañeros australianos. La siguiente descripción corresponde a la expedición de abril de 2019. Después de cuatro intensas jornadas de armado se logró llegar al salón final de Yuá Nita a -704 metros. Cuando llegamos a la sala "El Chingón," antigua sima, nos separamos para buscar un pasaje por el cual pudiera continuar la cueva. Con ayuda del humo de un cigarro, Cédric se dio cuenta que había aire entrando por un pasaje ubicado al costado derecho de la sala, sobre un techo colapsado, al cual bautizamos como "The smoking man pass." Era una desescalada estrecha seguida por un espacio horizontal de 1.5 metros de alto que se había formado entre dos gigantes bloques colapsados. Avanzando sobre ese espacio, encontramos un orificio de unos 10 centímetros de diámetro que permitía ver una sala grande hacia abajo; rompiendo y quitando rocas, logramos hacer un agujero de 2 metros de ancho; colocamos la cuerda y bajamos a una sala de 5 metros de alto. Buscando entre los bloques del suelo, Cédric y su infalible cigarro encontraron un pequeño agujero por donde entraba aire; era tan pequeño que en un principio pensamos que no podríamos continuar más, sin embargo, al golpear la roca alrededor notamos que se deshacía, eso nos animó a seguir intentado abrir un espacio más grande. Después de 40 minutos, rompiendo y acarreando rocas, logramos desobstruir un espacio por dónde pudimos pasar con dificultad. Dentro había un meandro que bajamos desescalando. Seguimos por un tiro corto y llegamos a otro salón amplio, sin embargo, la mayor sorpresa la encontramos más adelante, cuando llegamos a la entrada de una sala más grande de 60 metros de diámetro y 40 metros de alto. En ese punto se sentía claramente una corriente de aire que hacía honor al nombre de la cueva. Dentro de la sala pudimos ubicar un pequeño ramal que llevaba a otro tiro, al bajarlo encontramos otro meandro, lo recorrimos muy emocionados, pensando que la cueva seguiría por ahí, pero un arenal no nos dejó continuar. Regresamos a la última sala grande para buscar la continuación del aire, sin embargo, no logramos encontrarlo entre el gran derrumbe que la conforma. Unos días después exploramos un sótano cercano a Yuá Nita el cual se conectó a -100 metros. Así, la profundidad final de Yuá Nita quedó en 789 metros y se encontró una nueva entrada.

Nitjan Kjua' Choya' (Sótano de la Esperanza)

El Sótano de la Esperanza fue encontrado en la campaña del 2019, tiene su acceso por un tiro de 30 metros de amplias dimensiones. Continúa con un corredor fósil y una larga arrastradera con espeleotemas o una galería horizontal más accesible.

Después de 50 metros la cueva parece terminar, sin embargo, realizando una pequeña escalada se llega a un pasaje de 100 metros que culmina en la cabecera de un tiro de 100 metros denominado como el Tiro del Hombre Impotente. El pozo tiene varias repisas y bastante roca suelta, por lo que el armado debe ser limpio y fraccionado. En este punto la cavidad se angosta y sólo es posible seguir por un estrecho que hay entre bloques. Para poder continuar fue necesario cavar y desobstruir un pequeño hueco algo complicado no mayor a 0.8 metros (Paso del Hombre Potente), que da a una arrastradera.

En este sitio la presencia de agua es mínima y en forma de goteras, le siguen algunas verticales de entre 10 y 30 metros que finalmente dan a un pozo cerrado por derrumbe. En la cabecera del tiro anterior se logró ubicar una ventana que conduce a otra larga galería fósil llena de espeleotemas, al final de la cual se encuentra otra ventana cubierta de lodo que permite acceder a una galería con un pozo de 120 metros (Tiro de la Silenciosa Águila Imperial). Esta vertical conduce a una sala grande con rocas de derrumbe que tiene 65 metros de diámetro y 50 metros de alto (Sala Finolis de Diego Pérez). En la parte alta de esta sala se halla un aporte de agua que más adelante se pierde en una de las rocas mayores a mitad de la galería. Esta sala se cierra entre derrumbes y arenales con pasos bastante confinados, pero a una altura de 25 metros desde el fondo, existe una ventana que permite continuar por la caverna. La siguiente sección es muy diferente a todo lo anterior y más técnico, es un conducto freático fósil que en promedio tiene una inclinación de -40°. Es un conducto largo de dimensiones reducidas que consiste en una serie de tiros pequeños y confinados alternados con pasos estrechos y desescaladas que dificultan la progresión y demanda mucha cuerda (El Juramento del Español). La cueva al final tuvo un desarrollo de 1100 metros y una profundidad de 417 metros.

Nitjan Lao Vati (Sótano donde ruedan las piedras)

Esta cueva fue explorada en el 2018. La entrada de este sótano es una impresionante rampa de 80 metros de largo y 25 metros de ancho que va en dirección suroeste. Después de arrojar unas piedras a su gran rampa, pudimos escuchar cómo rebotaban por un buen rato, lo que nos alentó y emocionó tanto por la posibilidad de estar ante una cueva profunda como por apreciar su grandeza. Después de la rampa, la cueva cambia de dirección hacia el norte y mantiene esta dirección preferencial. Al terminar la rampa comienza la parte de la cueva con techo con un gran salón con 50 metros de alto. Esta cueva consiste en galerías de grandes dimensiones con una inclinación promedio de -70o, como si fuera una rampa gigante. Cuando alguien por error tiraba una piedra, se podía escuchar la piedra cayendo muchos segundos golpeado estrepitosamente las paredes, debido a esto las personas que entraban a esta cueva debían ir muy cerca unos de otros para evitar cualquier accidente, de este hecho surge su nombre. El armado de esta cueva se realizó pegados todo el tiempo a una de las paredes para evitar posicionar la cuerda en la trayectoria de las rocas que caían. Todas las rocas que rodaban desde la entrada son detenidas por una gran pared a -200 metros con la que colisionan. Es impresionante ver las marcas de múltiples golpes en esta pared, ocasionados por el rodamiento de rocas a través de casi toda la cueva (Paredón del fusilamiento). A -282 metros hay una grieta estrecha llena de sedimentos donde desafortunadamente no es posible continuar, la cueva se termina similar a otras cuevas de la región. Fue una lástima que esta cueva se terminó después de haber visto galerías tan grandes. Cabe señalar que no hay aporte alguno de agua en el interior, es totalmente fósil.

Nitjan Cha´nja jtsí (Sótano de las Golondrinas)

Es un sótano muy reconocido por la gente local debido a su gran tamaño y por las historias que se cuentan acerca de él. Dicen que se escucha música al fondo y que ahí vive un guardián, es un lugar sagrado. La gente local nos sugirió dejar una ofrenda de alimentos si lográbamos llegar al fondo y no dejamos de hacerlo pues cuando estas admirando a Nitjan Cha´nja jtsí te sientes pequeño. Su nombre significa Sótano de las Golondrinas en mazateco pues estas aves anidan ahí. Se encuentra al oeste de Plan de Escoba, cerca de los poblados de Plan de Ocote y Plan de Joya. Cuando llegamos a Nitjan Cha´nja jtsí lo primero que hicieron nuestros amigos mazatecos fue arrojar una roca para demostrarnos lo profundo que es este sótano, quedamos impactados cuando la roca tardo más de 5 segundos en llegar al fondo, estábamos muy entusiasmados por saber que había algo profundo. Changa es un hermoso sótano con -172 metros de profundidad. Comienza con una gran dolina que en la parte más alta tiene 70 metros de diámetro. Después de bajar la parte inclinada de la dolina nos encontramos con un tiro libre con forma cilíndrica perfecta de 150 metros de largo y 50 metros de diámetro, afortunadamente pudimos fraccionarlo después de unos péndulos, para facilitar la topografía y la salida. En el fondo del tiro libre hay una grieta con un tiro adicional de 22 metros de largo y después de este no hay por donde continuar. Es una lástima que este sótano no continúe, cuando lo encontramos pensamos que era la cueva mayor de la zona, pero ocurre lo mismo que en la mayoría de las otras cuevas, la poca agua que colecta se filtra por un montón de bloques impenetrables.

Nitjan Malitzin (Sótano de Malitzin)

La Malintzin fue un golpe de suerte. Durante la campaña de 2019, el primer día que salimos a conocer los caminos mazatecos nos tropezamos con un

hombre que pastoreaba unos chivos y sin pedírselo tuvo a bien mostrarnos varios sótanos que conocía. De todos los que bajamos ese día, fue el último, el que menos parecía, el que nos haría volver al campamento con buenas noticias. Sólo había que descender 5 metros. El pequeño agujero estaba tapado de raíces, hojas y tierra, pero una fuerte corriente de aire nos puso las orejas tiesas. Al forzar el paso cayó todo abajo. Todavía no sabíamos que estábamos en la cabecera de un gran pozo de 110 metros que se desarrolla sobre una falla vertical (Tiro de los Conquistadores). El medio metro del que distaban sus paredes no te hacía darte cuenta de la magnitud, sólo el ruido de las piedras al caer nos hizo sonreír. La Malintzin fue explorada hasta los 283 metros de profundidad. A cada entrada quiso desmoralizarnos, haciéndonos creer que se cerraba. Sólo su respiración la delataba y nos proporcionaba el aliento necesario para volver a intentarlo. Es una cueva muy vertical que consiste de una serie de tiros que conforman una vertical de 200 metros y que requirió una instalación técnica evitando roces y caída de piedras. El primer final (El Final Ancestral) quedó en un meandro muy estrecho con fuerte corriente de aire que logramos superar por un pozo ubicado más arriba. Con el segundo final no pudimos. Aquí alcanzamos la cota más profunda, pero el aire se perdía entre dos paredes de roca impenetrables. Desinstalando tocó revisión de incógnitas y así llegamos hasta una gran sala que dejó abierta la exploración. Sin tiempo, por llegar el fin de la campaña de abril, nos quedamos con el buen sabor de boca de que "Malitzin" sigue viva, esperando para guiarnos a un nuevo mundo, dentro de este universo subterráneo.

Interacción con la comunidad

Un aspecto fundamental para el desarrollo de estas expediciones es la asertiva interacción con la comunidad. Tenemos presente que cuando vamos a explorar, somos visitantes, por lo que debemos ser muy respetosos de las costumbres y terrenos de la gente local. Es por esto que desde 2016 hemos dedicado tiempo y esfuerzo para formar un lazo importante con los habitantes, buscando concientizarlos de que el principal propósito para descender a las cuevas es deportivo. Como mexicanos, valoramos (fomentamos) el acercamiento con las comunidades originarias, por lo que hemos realizado diferentes actividades sociales para beneficiar a la comunidad en la medida de nuestras posibilidades. Una forma de retribuir la confianza que los pobladores nos otorgan, es socializando los resultados obtenidos de las exploraciones, tales como mapas topográficos y fotografías.

Conclusiones

Se armó la cueva Yuá Nita hasta la cota de -704 metros, a esa profundidad se encontró un pasaje que permitió acceder a un gran salón. De esta manera, la profundidad final de Yuá Nita es de 789 metros. Además, se encontró una entrada adicional a este sistema.

Desde 2016 se han localizado 100 entradas de cuevas y sótanos en la región de Plan de Escoba de las cuales fueron mapeadas 51. Entre las cuevas destacan el Nitjan Kjua' Choya' (-417 metros), Nitjan Malitzin (-283 metros) y Nitjan Lao Vati (-286 metros) por ser las más profundas hasta el momento.

El desarrollo preferencial de las cuevas mapeadas en este proyecto es hacia el norte y hacia el oeste, además de que morfológicamente son similares a las cuevas de Zongolica, por lo que determinamos que la zona de exploración pertenece a un sistema hidrológico independiente de otros.

Con estas actividades se reactivan las exploraciones iniciadas por el proyecto "Chilchotla", por lo cual se continuarán las expediciones en la región. El objetivo de futuras visitas será terminar los mapas topográficos de las cuevas encontradas y continuar con la exploración de la región en busca de cavidades que drenen hacia el noroeste.

Los miembros de esta expedición agradecemos a las autoridades del Municipio de Huautla de Jiménez por brindar el permiso para realizar esta visita y a los pobladores de Plan de Escoba por su caluroso recibimiento. Gracias al Consejo Técnico de la AMUNAM por apoyar este proyecto y confiar en nosotros, así como a nuestros amigos que prestan equipo o nos apoyan con la compra de playeras. Gracias a David Cilia, Gustavo Vela, Marta Candel por las fotografías.

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En memoria de Julio Kaji Kiyono, María Magdalena Felipa Alegría, y María Gloria Reyna Castillo. Queridos papá y mamás de espeleólogos participantes de este proyecto.

En memoria de Diego Pérez Quintero. Hijo, hermano y amigo; querido por todo aquél que lo conocía.

Resumen

En continuación con las expediciones espeleológicas realizadas por australianos en el límite de los municipios de Huautla de Jiménez y Santa María Chilchotla, miembros del GEU reactivan la exploración de la zona registrando hasta el momento 100 nuevas entradas de cuevas, de las cuales 51 ya han sido topografiadas. Se reexploró la cueva Yuá Nita que se conocía hasta -704 metros y se encontraron nuevas galerías llegando a la cota de -789 metros. Entre las cuevas exploradas destacan el Nitjan Kjua' Choya' (-417 metros), Nitjan Malitzin (-283 metros) y Nitjan Lao Vati (-286 metros) por ser las más profundas hasta el momento.

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Continuing previous expeditions undertaken at the edge of the Huautla de Jiménez and Santa María Chilchotla municipalities, members of the GEU reinitiated exploration of the area, registering 100 new cave entrances so far, of which 51 have been mapped. They re-explored Yuá Nita Cave, known to a depth of 704 meters, and found new rooms making the total depth -789 meters. So far, the deepest caves explored include Nitjan Kjua' Choya' (-417 meters), Nitjan Malitzin (-283 meters) y Nitjan Lao Vati (-286 meters).

EXPEDICIÓN SISTEMA CHEVE 2018

Bill Stone

Sonia Dudziak descends a travertine-floored canyon in the new section of the LOKCM tunnel discovered in 2018.
Sonia Dudziak desciende por un cañón con piso de travertino en la nueva sección del túnel LOKCM descubierta en 2018. *Kasia Biernacka.*

Este artículo aparece en inglés primero, y después traducido al español. This article appears first in English and then translated into Spanish.

Prologue

At the end of the 2017 Cheve expedition an extraordinary discovery was made two kilometers east of the main entrance to Cueva Cheve. The new cave was initially named "CL6" by the recon team. Further discussions with residents in the municipality revealed that the place had a proper geographical name, so the new cave became "Cueva de la Peña Negra" – Cave of the Black Cliff. The initial explorations encountered extremely narrow, constricted passages, with hundred meter-long fissures less than 20 centimeters wide and body-tight crawlways. But the final exploration push in 2017 had been stopped due to lack of rope at a 25 meter drop in a stupendous tunnel measuring 40 meters wide by 40 meters tall. It carried a strong wind – even in that large tunnel – so the portent was that there was much more cave to be discovered beyond that drop. When we left in early May of 2017 Cueva de la Peña Negra had 3.4 kilometers of surveyed passage and reached a depth of 426 meters. It's location on the topographic map placed it in a zone where no previous exploration had been conducted in the Sierra Juarez and it's numerous branches suggested that it might completely bypass Cueva Cheve and head deeper into the mountain. Interest in knowing where it went was high among the team members. So the only question at that point was how quickly we could organize a return.

Not quite ten months later the advance team left Austin on February 25, 2018. Ultimately, forty people from six countries participated. The final derig crew returned to Austin on April 30, 2018. In between that ten week gap a lot happened. While the Peña Negra demanded our primary attention, a significant mystery also remained near the bottom of Cueva Cheve. A labyrinthine maze leading east from the stream canyon just below Camp 3 was discovered in April of 2017. It

carried and incredibly strong wind and held the promise of perhaps leading to a bypass of the underwater tunnels at the present end of the cave. As a result, two major cave systems were explored in 2018.

As with the 2017 expedition we had a lot of people on the mountain working multiple simultaneous objectives. In fact, 2018 proved to be significantly more complex as we had up to 6 underground camps stocked during the expedition (with sleeping kits, cookware, fuel, and telephones). Often three or four of these were in use at the same time. Each camp that was occupied had at least one exploration/survey team and sometimes two with each team comprising 2 to 4 people.

To make sense of this we had to con-struct a chart at basecamp on a white board showing where all team members were located on any given day. I have reproduced that chart here (see the Camp Location figure). The immediate sense one gets in looking at this chart is that team members were bouncing about inside the mountain for substantial periods of time (for a grand total of 512 logged person-days at underground camps in 2018). For most people this represented somewhere between 40 to 50% of their time on the expedition; for some it was much more (the high being 83%). The upshot, however, was that people were moving about frequently underground, changing cave systems, and checking into camps as if they were hotels.

Reservations were needed – otherwise they might show up only to discover that all sleeping bags were in use … a very awkward and uncomfortable situation for everyone involved, especially if two different teams converged at the same time following a long day of transit. And so basecamp, via the phone system, acted as the Expedia.com for Cheve travel. One consequence of this subterranean migratory behavior is that it is difficult to tell a simple story about what happened on the expedition. It was the antithesis of the linear, siege-driven time line that would, for example, follow a single person to the summit of Everest or K2. What follows below can be considered a sort of Canterbury Tales … a collected series of vignettes that interweave in time and space with overlapping characters to highlight key incidents and follow the various exploration fronts – all of which were generally directed towards finding new tunnels that would bypass the northern end of Cueva Cheve. This summary also provides an overview context for the other articles being written by various team members.

Derek Bristol hiking in the Infinite Borehole, Cueva de la Peña Negra. Note the person in the distance near the center of the image to indicate the size. / Derek Bristol caminando en el Gran Tunel Infinito, Cueva de la Peña Negra. Observe a la persona en la distancia cerca del centro de la imagen para indicar el tamaño. *Kasia Biernacka.*

Calories

I started my 2018 expedition log in a snow storm sitting in a small regional airport in Toledo, Ohio on February 23, wondering if any planes would leave that day and whether I would manage to connect up with the trucks that would be leaving Austin in two days for Cheve. The previous night I had given a lecture to some 400 students and professional engineers at the university there. The banquet had been impressive and I felt no need for breakfast that morning. This made me think of the frenzied work that had gone on over the previous six weeks relating to expedition food, specifically specialized underground camp food. I had been fortunate in that numerous Austin cavers had come out to the ranch the past three weekends (and some weekday nights) to help compress and pack food and equipment. Most of this food had been bulk–purchased by Vickie Siegel, Sean Lewis, and me in one marathon Saturday on January 24 in the conference room with a projector showing the calculated quantities we needed and web sources for those ingredients while one of us placed orders for up to 100 kilograms or more per item. Sean had done extensive nutritional studies over the previous months. He had then single–handedly taken on the task of revising the custom underground camp dried food mix constituents and proportions that we had been tinkering with for years. The idea was to boost fat calories, protein, and nutrients to give everyone superior long-term athletic performance while not losing substantial weight during the expedition still a pervasive issue even in 2018.

We purchased an extraordinary amount of dried and freeze-dried bulk food in that one day (sufficient for more than 600 person days underground),

	February				March																	
DAY OF THE MONTH>>	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
DAYS FROM START OF EXPEDITION>>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Last Name																						
Stone	R	D	D	D	CA	CA				PN	PN		PN	PN	PN		CA	CA	CH		K	K
Siegel	R	D	D	D	CA	CA							PN				CA	CA	CH		K	K
Vieira																		PN	K		CH	
Frazier					CA	CA						PN	PN	K	K							
Frazier					CA	CA																
Lewis	R	R	D	D	D	CA				PN		PN		PN		K	K	K	K	K	K	K
Shade	R	R	D	D	D	CA				PN		PN		PN	PN	K	K	K	K	K	K	
Stahl												PN	PN					PN				
Lillestolen	R	R	D	D	D	CA				PN		PN		K	K	K	K	K	K			
Morrill					CA	CA					PN		PN	K	K	K	K	K	K		CH	
Gala												PN		CA						K	K	K
White	R	R	D	D	CA	CA				PN	PN	PN	PN	K	K	K						
Diaz Aceves					CA	CA																
Smith																		CA	CH	C1	C1	
Kandl														CA								
Hicks	R	R	D	D	D	CA				PN			PN		PN	K	K	K	K			
Anderson												PN		PN			PN	S	CH	C1	C1	
Miguel-Nieto																		K	CH	C1	C1	
Roser												PN	PN	PN	PN	PN			CH	K	K	K
Biernacka														CA	PN	K	K	K	K			
Fiedorowicz														CA	PN	K	K	K	K	K	K	
Minton																						
Droms																						
Bristol																PN	PN	K	K	K	K	K
Borengasser																						
Hackley																		CA		K	K	K
Byrd																		CA	CH	C1	C1	
Miranda																						
Verde																						
Dudziak																						
Hoffmann																						
Covington																						
Schwartz																						
Toles																						
Berrones																						
Satterfield																						
Sikorska																						
Machorro																						
Stone																						
Barragan																						
Team Count:	7	7	7	7	11	11	10	10	13	13	13	16	16	19	19	20	22	25	25	25	24	24
In Undgr Camp:	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	8	7	9	9	11	13	7
Total In Cave:	0	0	0	0	0	0	0	0	0	6	3	9	8	9	10	10	9	11	14	11	15	7

	March													April								
DAY OF THE MONTH>>	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9
DAYS FROM START OF EXPEDITION>>	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Last Name																						
Stone	K	K	K	K				CB	C2	C2	C3	C2	K	K	K	K	ST	ST	ST	ST	CA	CA
Siegel	K	K	K	K	PN								K	K	K	K	ST	ST	ST	ST	CA	CA
Vieira	K	CT	CT	CT	CT	CT	CT	CT	CT	CT	CT					C2	C3	C3	CT	CT	CT	CT
Frazier				K	K	K	K														CA	CA
Frazier																					CA	CA
Lewis	K	K		K		K	K	K	CT	CT	CT	CT				CT	CT	CT	CT			C2
Shade																		ST	ST	K	K	K
Stahl	C1	C1	C1	C1	CA		CA		C2	C2	CT	CT						LG	LG	LG	LG	
Lillestolen	K	CT	CT	CT	CT	CT	CA				PN							LG	LG	LG	LG	LG
Morrill	K	CT				CT	CT	CT	K							C2	C3	C3	CT	C2	C3	C3
Gala	K	CA			PN	PN																C2
White		K	K	CT	CT	CT	CA	C1	C2	C2	C3	C2	C3	C3	C3	C3	C2	C2				
Diaz Aceves														K	K	K						
Smith	K	CT	CT																			
Kandl							CA															
Hicks																						
Anderson	C1	C1	C1	C1																		
Miguel-Nieto	K	CT	CT	CT	CT	CT	CA											LG	LG	LG	LG	LG
Roser	K	K	K	K							C2	C2	C3	C3	C3	C3	C2	C2			K	K
Biernacka		CA				CT	CT	CT	K							CT	CT	CT	ST	K		
Fiedorowicz		CA		CT	CT	CT	CT	CT	CT	CT	CT											
Minton						PN																
Droms						PN	CA															
Bristol	K	CT	CT		CA	CA	CA	CB	C2	C2	C3	C2										
Borengasser																					K	
Hackley	K	CT	CT	CT	CA		CA		C2	C2	CT	CT	CT	CT	CT	CT	CT	CT		C2	CT	CT
Byrd	C1	C1	C1	C1	CA		CA	CB	C2	C2	CT	CT	CT	CT	CT	CT	CT	CT				C2
Miranda											PN	K	PN	PN								
Verde											PN		PN	PN								
Dudziak			K	K	K	CT	CT	CT	CT	CT	CT					CT	CT	CT	CT	CT	CT	CT
Hoffmann			K	K	K	CT	CT	CT	CT	CT	CT					CT	CT	CT	CT	CT	CT	CT
Covington				K	K	K	K	K	CT	CT	CT	CT										
Schwartz											C2	C2	C3	C3	C3	C3	C2	C2		C2	C3	C3
Toles														K	K	K		ST	ST	K	K	K
Berrones																					K	
Satterfield																						C2
Sikorska																						
Machorro																						
Stone																						
Barragan																		ST	ST	K		
Team Count:	26	27	28	28	24	23	23	23	23	26	26	26	26	27	27	22	23	22	22	23	25	25
In Undgr Camp:	15	15	15	17	9	12	9	12	14	12	14	10	7	9	9	15	13	16	11	12	11	13
Total In Cave:	15	15	15	17	11	15	9	12	14	12	17	10	9	11	9	15	13	16	11	12	11	13

	April																				
DAY OF THE MONTH>>	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
DAYS FROM START OF EXPEDITION>>	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
Last Name																					
Stone					C2	C3	C3	C3	C3	C3	C3	C3	C3	C2	C2	CH			D	D	D
Siegel			CA	CA	K	K	K	K	K	ST			ST	ST	ST	ST			D	D	D
Vieira																					
Frazier																CH					
Frazier																CH					
Lewis	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3	C2	C2						D	D	D
Shade	K	K	CA	CA	K	K	K	K	K	ST		PN	ST	ST	ST	ST			D	D	D
Stahl															CH						
Lillestolen	LG		CA		C2	C3	C3	C3	C3	C3	C3	C3	C3	C2	C2				D	D	D
Morrill	C3	C3	C2	C2																	
Gala	C3	CT	CT	CT																	
White																					
Diaz Aceves					K	K	K	K	K	ST											
Smith																					
Kandl																					
Hicks																					
Anderson																					
Miguel-Nieto	LG				ST	ST	ST	ST			PN	PN	PN								
Roser	K	K																			
Biernacka																					
Fiedorowicz																					
Minton																					
Droms																					
Bristol																					
Borengasser			CA	CA	ST	ST	ST	ST				PN				CH			D	D	D
Hackley	CT	CT	CA																		
Byrd	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3	C2	C2						
Miranda											PN	PN	PN		CH						
Verde													ST	ST	ST	ST					
Dudziak	CT	CT	CA			PN			CT	CT	CT	C3	C3	C2	C2						
Hoffmann	CT	CT	CT	CT					CT	CT	CT	C3	C3	C2	C2						
Covington																					
Schwartz	C3	C3	C2	C2																	
Toles	K	K	CA																		
Berrones	ST				C2	C3	C3	C3	C3	C3	C3	C2	C2			CH			D	D	D
Satterfield	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3	C3	C2	C2			PN					
Sikorska				CA		PN			CT	CT	CT	C2	C2			PN					
Machorro	ST		CA		ST	ST	ST	ST			PN		PN		CH	PN					
Stone					CA	PN			CT	CT	CT	C2	C2	C2	C2						
Barragan	ST		CA		ST	ST	ST	ST													
Team Count:	23	23	23	22	23	21	20	20	20	20	21	20	21	23	20	20	20	16	7	7	7
In Undgr Camp:	15	12	7	7	13	13	13	13	13	13	10	10	12	9	9	3	0	0	0	0	0
Total In Cave:	15	12	7	7	13	15	13	13	13	13	13	12	15	9	11	11	0	0	0	0	0

A table that shows the underground camps in the Cheve System along with the names of each team member. Peña Negra Camps: K = camp "Kyle"; CT = camp "Cartman"; ST = camp "Stan"; Cheve Camps: C1 = camp 1; C2 = camp 2; C3 = camp 3. / Una tabla que muestra los campamentos subterráneos en Sistema Cheve junto con los nombres de cada miembro del equipo. Campos de Peña Negra: K = campamento "Kyle"; CT = campamento "Cartman"; ST = campamento "Stan"; Campamentos de Cheve: C1 = campamento 1; C2 = campamento 2; C3 = campamento 3.

Basecamp 2018, en Llano Peña Negra. / Campamento Base 2018, en Llano Peña Negra. *Kasia Biernacka.*

leaving only a few odd items like durable hard cheese and jerky which were difficult to locate in Mexico on our final list. The boxes began arriving over the next three weeks. The garage was by then also full with some 40 haul sacks, carefully packed with rope, telephone wire, sleeping bags (compressed into 6 liter Darren drums), Thermarest pads, cook kits, tables , chairs, generators, extension cords, and the mission control shelter. There was still a mountain of things to pack. But, as always, it somehow compressed and fit into four trucks being driven by Bev Shade, Vickie Siegel, Jon Lillestolen, Sean Lewis, Lee White and me. Three days later we met Mike and Donna Frazier, Gerardo Morrill, and Wicho Diaz in Cuicatlán, Oaxaca or "Cuica" as the locals like to shorten it. Wicho, Gerardo, and I had a brief meeting with the Comisariado of Concepción Pápalo, Pedro Vigil Neri, and we were then cleared to begin setting up basecamp.

In 2017 we had camped in Llano Cheve, but it was clear that the majority of the work in 2018 would take place at the Peña Negra so we decided to set basecamp just outside the entrance in a recent growth forest of 10 meters tall Ocote pines. This would have worked out simply except for the 120 meter vertical drop from the nearest 4x4 vehicle access a kilometer away. March 2nd and 3rd found us marching up and down this hill interminably like a procession of ants backpacking all the equipment down to camp. And then, just when everyone was well spent from hauling, the fog moved in from the east. It was then we discovered that Llano Peña Negra weather was quite different from Llano Cheve: orographic lift allowed the coastal cloud banks to slide up the adjacent valleys and into basecamp with no obstacles in the way; Llano Cheve was at the bottom of a 300 meter deep sinkhole guarded by a high eastern rim that stopped the lapping clouds, for the most part. That evening heavy cold drizzle began to fall before we had a chance to set up most personal tents and the main kitchen and mission control centers. It would remain like this, with about 50% rainy days, for the next two months. We delivered a lecture in Concepcion Papalo the evening of March 4th to a crowd of around 300.

This year Vickie, and Marcin Gala who had just arrived, set up a rope treadmill to demonstrate vertical skills and allowed the local villagers to try their hand at ascending with a

FROG rig. It was popular after the first contestant – a surprisingly confident 7 year old girl – showed everyone how it was done.

The First Push: Peña Negra 2018

For the next four days the entire team, with 16 now on site, rigged Cueva de la Peña Negra to the Lost in Space chamber (-300 meters level), transported supplies for an initial underground camp at the present limit of the Infinite Borehole at the deepest point in the cave, and ran a phone line to that camp. Perhaps the most significant incident during this time was the initial trip by Marcin Gala and Jon Lillestolen through the "Juniper Tube" restriction. They had discovered that the 40 meter long oval–shaped bedrock crawlway, known from late April of 2017, was now, earlier in the year, half full of water. They had managed to get through it with only one eye above water. On the other side, soaked, cold, and depressed at the thought of this being the route through which everyone and everything going into the cave would have to pass, they began searching the "Lunch Room" chamber, just beyond the crawlway, for possible alternative routes. Six meters up the south wall of the chamber Marcin spotted a narrow fissure. They free climbed into this and discovered a small, but dry tunnel leading south. To their joyous amazement it connected 60 meters later with a 10 meter diameter chamber at the base of the previous rope drop, and above the start of the Juniper Tube.

On March 9th Lillestolen, Frazier, Morril, and White established Camp Kyle at the -437 meter level. There was something of a joke involved here. With both Cheve and Peña Negra being rigged in 2018 we knew there was going to be a problem identifying which underground camp a person was talking from on the phone system. Cheve already had three underground camps: C1 (-400 meters), C2 (-805 meters), and C3 (-1,100 meters). Mike Frazier had thought about this and had acquired a number of small plastic cartoon action figures from the animated television series "South Park". Thus, the first camp in Peña Negra became "Camp Kyle" (-437 meters). Two other camps in Peña Negra would eventually be established: "Camp Cartman" (-647 meters) to continue deeper explorations; and "Camp Stan" (-311 meters) to investigate several extensive tunnels branching off from the Lost in Space chamber (see the Plan map for locations).

All six of these camps were eventually linked by single wire earth-conducting Michie phones. Standard procedure was for each of these camps to call to basecamp at 9am each day to coordinate activities, share new data, and to make equipment, food, and personnel changeout requests. Two days later (March 11) Shade, Lewis, Kasia Biernacka, Tomek Fiodorowicz, and Mary Hicks joined the others at Kyle and it was then, with two teams working in open, continuing, unexplored cave, that the new survey data began to arrive – continued for the next month on average – at a rate of half a kilometer per day in passage frequently measuring 40x40 meters in cross section. No one had seen anything like this on a deep caving expedition in recent history.

Not long after this a call was received at basecamp from Lillestolen regarding their progress in the deep continuation of the Infinite Borehole. As he related it to Marcin Gala – who was serving as basecamp coordinator – they had run into "highly technical" passage. We eventually came to understand that they had used 65 rock bolt sets in a single day along with several hundred meters of rope to rig the route. What had been gigantic walking passage turned into gigantic passage with house–sized rectangular blocks wedged between vertical canyon walls.

In many cases there was no floor to walk on: the holes between those blocks dropped 30 or more meters to the sound of a stream rumbling below. In place of easy walking was now a web of traverses, rappels, and climbs. Often the passage would terminate against a giant stack of these boulders and one could see, 30 or more meters up, large passage at the ceiling of the enormous tunnel. Gerardo Morril had performed some spectacular climbs to surmount these obstacles and there were now a series of free–hanging 30 meter plus pitches that led up to the roof, only to cross a giant boulder to be faced with an equal rappel down the other side. This cycle repeated itself numerous times, devouring rope and rigging hardware. Within two weeks of our arrival on the mountain the survey data indicated that the main (Infinite Borehole) passage was heading resolutely northwest, towards what appeared to be an imminent connection with Cueva Cheve somewhere between Saknussemm's Well and Camp 2 at the 800 meter level of Cheve.

A Change of Course

Marcin Gala, Corey Hackley, and Nathan Roser arrived at Camp Kyle on March 15 and replaced Lillestolen's team. The following day they descended

Yasmin Barragan writing in her log at Camp Kyle, -437 meters deep in Cueve de la Pena Negra in April 2018. / Yasmin Barragán escribió en su registro en Camp Kyle, a -437 metros de profundidad en Cueve de la Peña Negra, en abril de 2018. *Kasia Biernacka.*

76 meters vertically and explored half a kilometer of continuing large tunnel beyond a 60 meter shaft where the previous group had stopped. The pit was the deepest yet discovered in Peña Negra and it had a significant waterfall dropping into it. When there was a downpour on the surface – frequent this year – it turned into a torrential, cold shower for anyone on rope. Gala's team came to within 300 meters of Cheve before the giant tunnel they were in, which had been heading predominantly northwest, abruptly took a 120 degree swing to the east. The following day (March 17) Gala, Lewis, Roser, Bristol, and Hackley discovered another half kilometer of enormous tunnels (at one point reaching measured dimensions of 50m wide and 80 meters tall) heading east, punctuated by a series of huge hollow cones, some more than 70 meters across and 50 meters deep, that appeared to be drawing material down and to the north, towards Cheve. They were like giant antlion funnels. Later calculations showed that the base of the second of these funnels was within 50 meters above known tunnel in Cheve. Before this discovery, however, the cave had appeared to descend into a dead end in a silt floored canyon. Hackley had retreated back up the slope and began investigating a narrow, popcorn encrusted fissure leading up and north. He followed this unlikely tunnel some 60 meters before it suddenly opened into what appeared to be the continuation of the main, huge tunnel, still heading east. However, the side track into the silt–floored canyon had not been without merit. They subsequently reported that this was the only flat spot they had seen in 3–1/2 hours of continuous travel and that it would serve well as an advance camp – soon to be known as "Camp Cartman".

Jordan Toles (left) and Yasmin Barragan making the 9pm telephone call to basecamp from Camp Kyle in Cueva de la Peña Negra. / Jordan Toles (izquierda) y Yasmin Barragan hacen la llamada telefónica de las 9pm al campamento base desde Camp Kyle en Cueva de la Peña Negra. *Kasia Biernacka.*

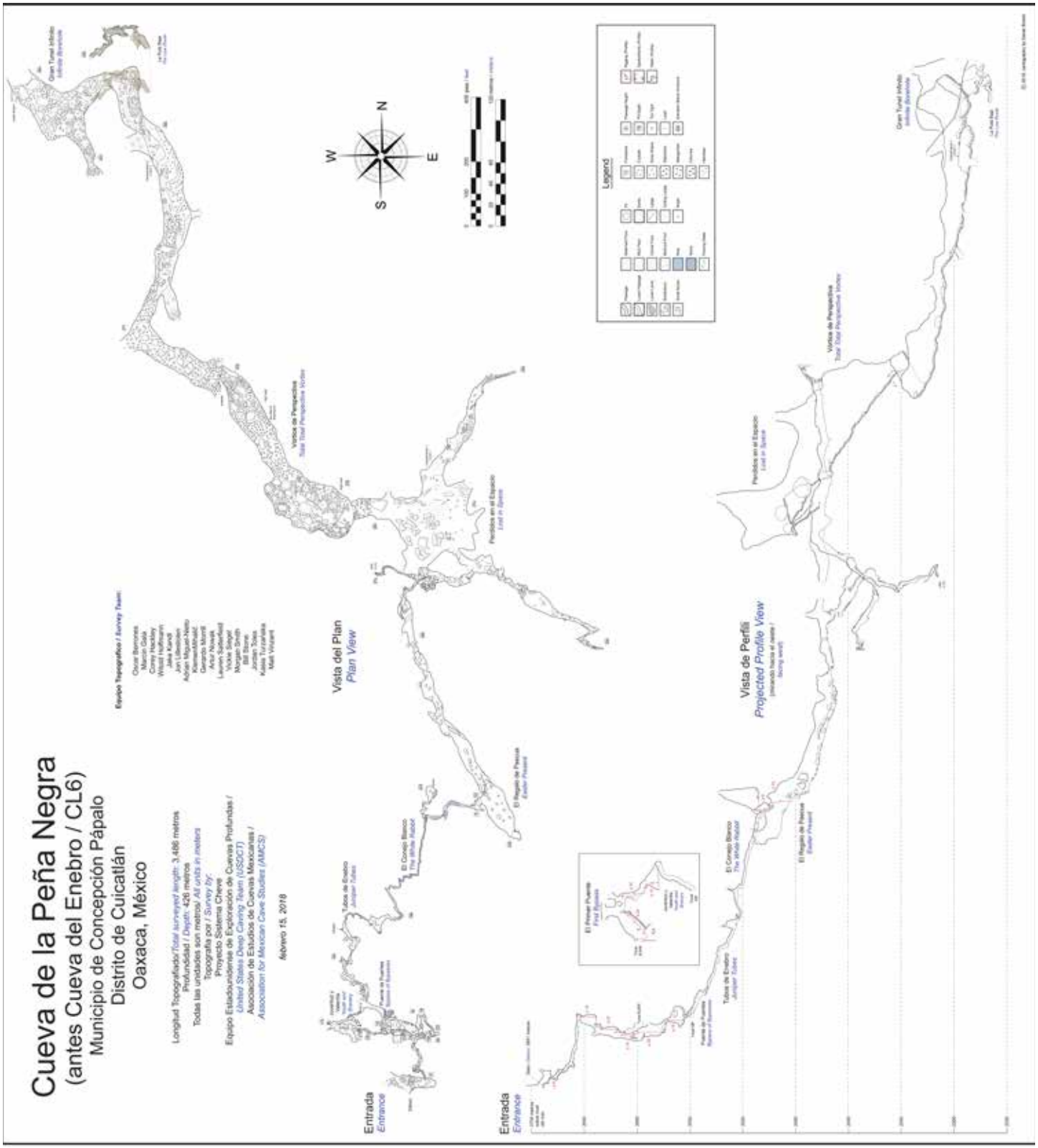
The other end of the phone line: Vickie Siegel answers the call at basecamp. / El otro extremo de la línea telefónica: Vickie Siegel responde la llamada en el campamento base. *Kasia Biernacka.*

Two days later Lillestolen, Adrian Miguel Nieto, Morgan Smith, Nick Vieira, and Gerardo Morrill established Camp Cartman and prepared for a five day push. On March 21 Vieira rigged down into a complex series of tunnels below the second giant antlion funnel with Miguel-Nieto sketching and Morrill and Lillestolen running DISTOX laser instruments for the survey. The supply lines had been stretched thin to Camp Cartman and they were running out of bolts, but the vertical pitches kept coming. Vieira had to use slings and redirects in places where rebelays would normally have been set, but their rope supply held out. It was 9pm that night when the basecamp phone crackled to life with Camp Cartman on the line. Vickie Siegel had been running the phones that night and people were scattered about camp making dinner and hot drinks to combat the cold that had settled in. My log book records what happened next:

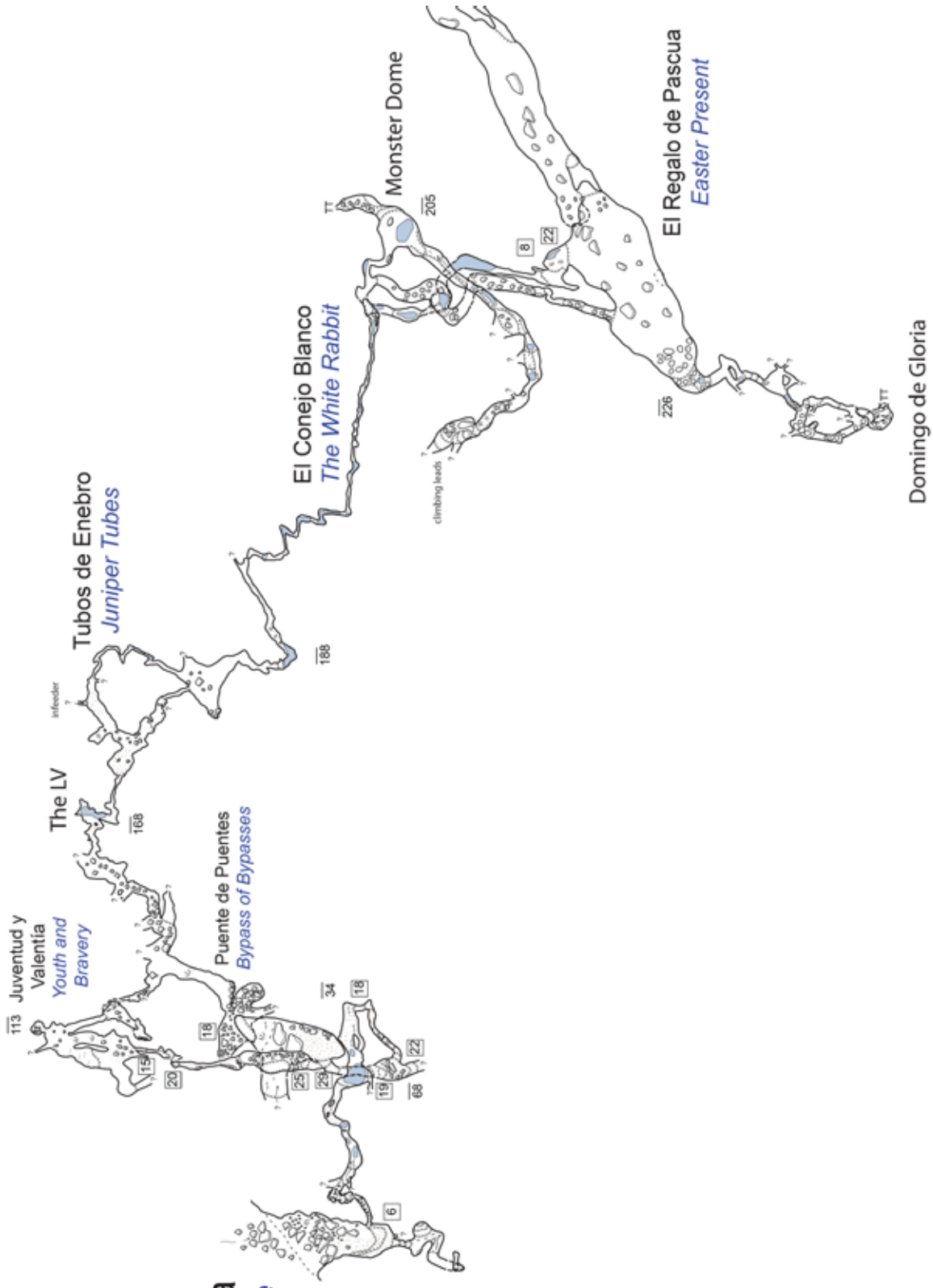
I was busy reheating some cocoa when Vickie called out "Bill, come over – they've connected to Cheve." Jon was on the line reporting that they had connected at several places but the first was at survey station CC13. Jon then said, "Bill knows where this is – it's his station 1." Marcin Gala had predicted this possibility the previous day and indeed that is where they dropped in today. The only person disappointed tonight was Corey Hackley, who insisted that they should have remained in the high borehole he had seen and possibly bypassed Cheve to the east. Despite this, there was an immediate celebration in basecamp that went on well past midnight.

The connection with Cheve was exciting – the discovery of a connection between major cave systems is always a rare event. But underneath the celebration there was some disappointment. A connection meant that a huge new cave had just been absorbed into "Sistema" Cheve. Some wondered aloud whether this was fair, as the Peña Negra, in general, had far larger tunnels than those in Cheve. Why not Sistema Peña Negra? But that would be contrary to long precedent. Worse, however, we had been counting on the Peña Negra to in fact miss Cueva Cheve… to go around it to the east.

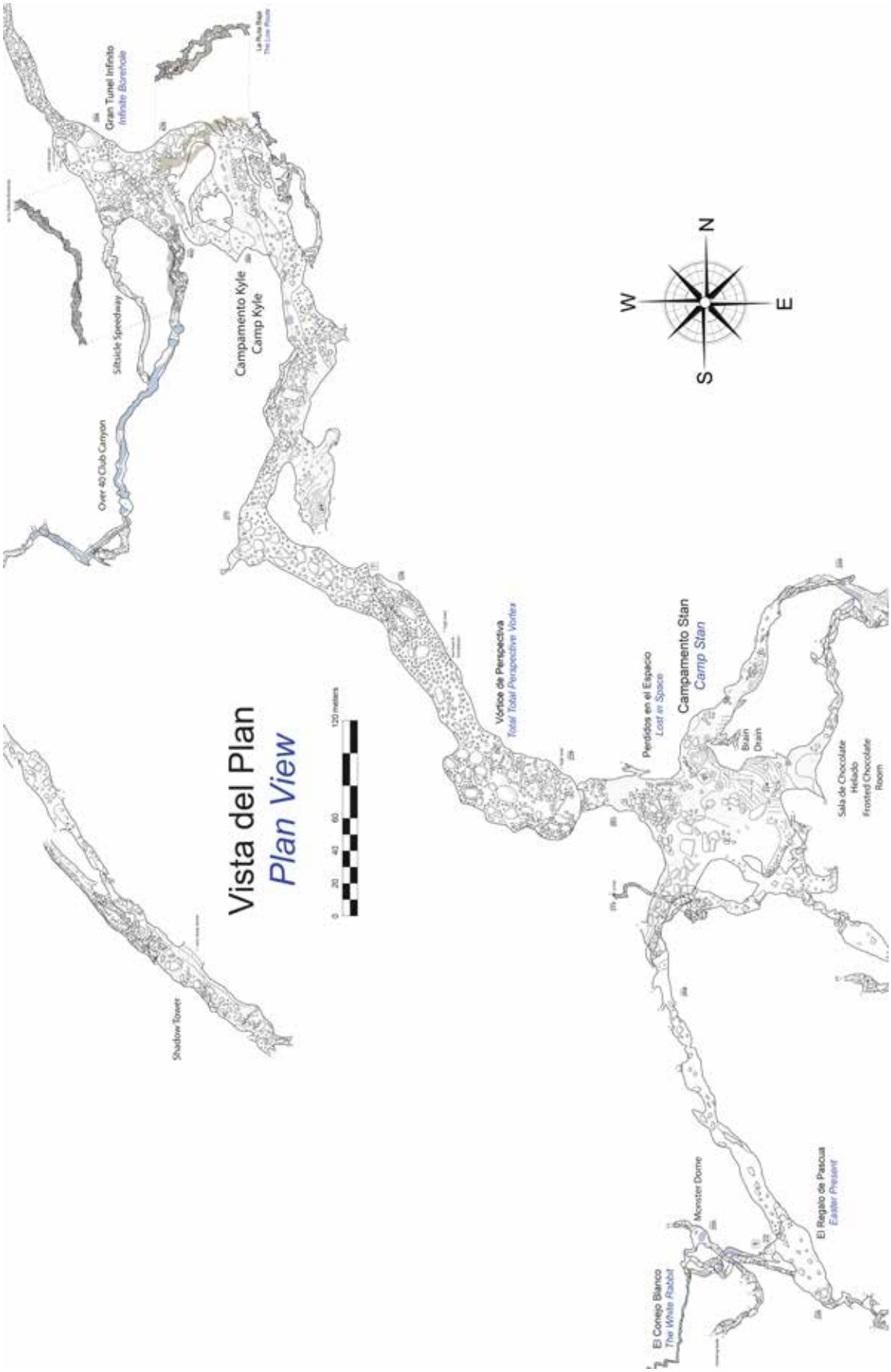
Over the following several days Tomek Fiedorowicz and Lee White joined those at Camp Cartman, as did Witek Hoffman, Kasia Biernacka, and Sonia Dudziak. Together they extended the large borehole above the ant-lion funnels several hundred meters further east before a collapse in the



The map of Cueva de la Peña Negra in May of 2017. / El mapa de Cueva de la Peña Negra en mayo de 2017.



Plan View of the beginning of Cueva de la Pena Negra, showing the constricted tunnels before reaching the Easter Present tunnel. /
Vista del Plan del inicio de la Cueva de la Peña Negra, que muestra los túneles constreñidos antes de llegar al túnel del Regalo de Pascua.



Plan view from the White Rabbit to Camp Kyle in the Peña Negra Cave. /
Vista del Plan del Conejo Blanco al Campamento Kyle, Cueva de la Peña Negra.

tunnel stopped progress. A side passage leading to the south opened into more than a kilometer of ascending galleries – which they named "The Silk Road" – that paralleled the descending Infinite Borehole but displaced 600 meters to the east. But the efforts to find an eastern bypass to Cheve appeared to have stalled.

At the end of March there was a mass exodus from Camp Cartman. But by that time other things had been happening, most notably Cueva Cheve had now been rigged all the way to Camp 2. The rigging of lower Cheve (beyond Camp 2) was still in progress when it was realized at Cartman that a through-trip was now possible. And so on March 28 Vieira, Hoffman, Dudziak, and Fiedorowicz chose to exit via Cheve, thus completing the first through trip from Peña Negra to Cheve, a traverse of more than 6 kilometers underground.

Into the Calles de Papalo

While kilometers of borehole were being discovered in the Peña Negra rigging teams slowly began entering Cueva Cheve. Kristen Anderson, Adrian Miguel Nieto, Adam Byrd, and Morgan Smith reached Camp 1 (-400 meters) on March 15th. Byrd, Anderson, and Elliot Stahl returned for a 2-day push below Camp 1 on March 18th and continued rigging down to the beginning of the Turbines (-700 meters), below Saknussessm's Well. There was then a week-long hiatus before Derek Bristol, Lee White, Adam Byrd and I returned, planning to stay in the cave long enough to complete the rigging to Camp 3 (-1100 meters). Our foursome quickly diminished to 3 when the safety latch for White's descender failed during the descent of Angel Falls (-300 meters). Since there were no ropes beyond there for a while he continued along with us to Saknussemm's Well ("SAK") then returned to Camp 1 where he called in his problem to basecamp and sat it out there alone until a replacement descender could be brought in the next day.

I went down SAK first, inspecting the previous team's rigging. It was all new Cancord 9 milimeter rope. I admit that new rope makes me feel more secure in a place like this. I have never gotten over the visceral feeling of looking down a 155 meter drop in a cave. And SAK was loud (from the waterfall), overhung, misty, and technical. There were 14 rebelays that demanded focus. At the bottom I checked the phone line at our traditional equipment depot and was surprised to find it worked (it had not been used in almost a year and flood waters raged through this section of the cave in summer time). Marcin Gala was running phones in basecamp and his response had the cool business-like tone of an air traffic controller. Rather than saying "Hey, the phone line works to SAK, cool! " he said "I can see by your [slow] progress that you will not make Camp 2 in time for the 9pm call in so please plan to call tomorrow at 9am." With just Adam, Derek and me now we had staggering packs and it felt dangerous doing all the awkward climbs in the Salmon Ladders. The going was slow. At one point on an awkward committing rappel I suddenly realized there was only one old hand driven, rusting bolt holding the rope. The hanger was stainless but it was obvious the bolt beneath it was corroding. I studied it for a minute then told the other two we needed to put in a backup bolt. Out came the TE30 drill. It drilled the hole in under 10 seconds, perhaps 200 times faster than whomever had set that rusting hand driven bolt in 1986. Thus began our work for the day: we had to replace a number of tyrolean traverse lines that had been storm lashed. Several hours went by in the wind driven spray of the waterfalls and I was by then quite cold and had both my suit hood up and balaclava on. The next tension traverse had a core shot rope and the section beyond was held up by nothing more than 50% of the core strands. We were most definitely not reaching Camp 2 today! By then it was past midnight and we were all getting stuporous. Fortunately we had planned ahead and everyone had their own camp kit with them so when 1:30am rolled around on March 26 we found a sand bar beside the river (the first in hours of travel) and bivouacked there for the night.

The following day Corey Hackley, Elliot Stahl, and Lee White caught up with us and the six of us established Camp 2 and called in to basecamp. Marcin was again on the line, but this time relaying information from Camp Cartman: they were out of rope and planning to head back to the Peña Negra entrance. The phone line in the cave was a "party line" – anyone who picked up the phone could hear everyone on the line. Cartman was listening in and when they realized that Cheve was now rigged, and with a connection established, the route out via Cheve was actually now significantly shorter than going out the Peña Negra. They informed basecamp they would be leaving via Cheve to make the first through trip. This would then leave Cartman empty. The following morning Corey and Adam took half the rope at Camp 2 and moved to Camp Cartman while Derek, Lee and I continued rigging in Cheve towards Camp 3.

It was less than a day later, on March 29, that Hackley and Byrd ferreted out a way through the collapse at the east end of Peña Negra. It involved what Hackley described as a "nasty, muddy squeeze" that they had to remove rocks from in order to make it sufficiently large to pass. But it was short and on the other side was the continuation of the giant borehole. The tunnel had simply been blocked by a large collapse. While still 50 meter wide for large sections the new tunnel was also different from the jumbled breakdown floor of the main cave to that point. Large stretches of the entire tunnel floor were covered in smooth flowstone. Initially, from the summit of the collapse pile where they entered, the tunnel sloped downward, then leveled out. By the end of March Hackley and Byrd had extended Peña Negra a half kilometer further east,

putting the end of this new tunnel – named "Calles de Papalo" in honor of the village – more than 300 meters east of the main fault in Cheve. This was "no man's land" and an area we had been hoping to reach for decades. Sinkholes on the surface, and the general spacing of geologic faults in the Sierra Juarez, all indicated that there should be another large cave system about one kilometer east of the main Cheve fault. But the rapid discoveries ceased when the ceiling collapsed again. This time the bypass was not so obvious. Hackley later wrote: "We dug about 6 meters through small breakdown heavily cemented with flowstone. Progress was extremely hard-won… the flowstone caused the material to behave as a single mass. When we started digging, we were following weak wisps of air. By the time we were finished, we were mistaking the sound of air moving through the breakdown for a massive waterfall ahead. This tells me that the dig has probably passed through most of the obstruction. Given its location, the character of the trunk leading up to it, and the air [it is most interesting]."

Although several teams returned to this area in 2018 no further progress was made at the end of the Calles de Papalo. However, a curious discovery was made near the point where the squeeze initially opened up into Calles de Papalo. The crawlway had intersected the giant Papalo tunnel midway down a flowstone covered slope. The main route descended down that slope, but in the opposite direction (west) it ascended for 70 meters before reaching the top of the tunnel. Above this point there was a spectacular 40 meter diameter dome that ascended into blackness. Hackley described their discovery:

"It is a minimum of 100 meters high, and about 40m wide near the base, narrowing toward the top. Adam and I named it the "Big Gaz" dome... we thought it was a brilliant name, but it seemed to fall a little flat when we announced it. Curiously, there was no water falling down the dome at all – not even a drip. It appeared to be almost exclusively phreatic in origin, and is associated with the massive fault that isolates Calles De Papalo from the main Peña Negra trunk. We saw air coming into the Calles de Papalo passage, vigorously, both from the breakthrough point by which we entered and the terminal dig. The dome is too large to discern airflow, but the air that is coming into the area has to either exit into Cheve somehow, or go up into the dome. So far, we have a collection of air inlets but no outlets. It is a very interesting [place]."

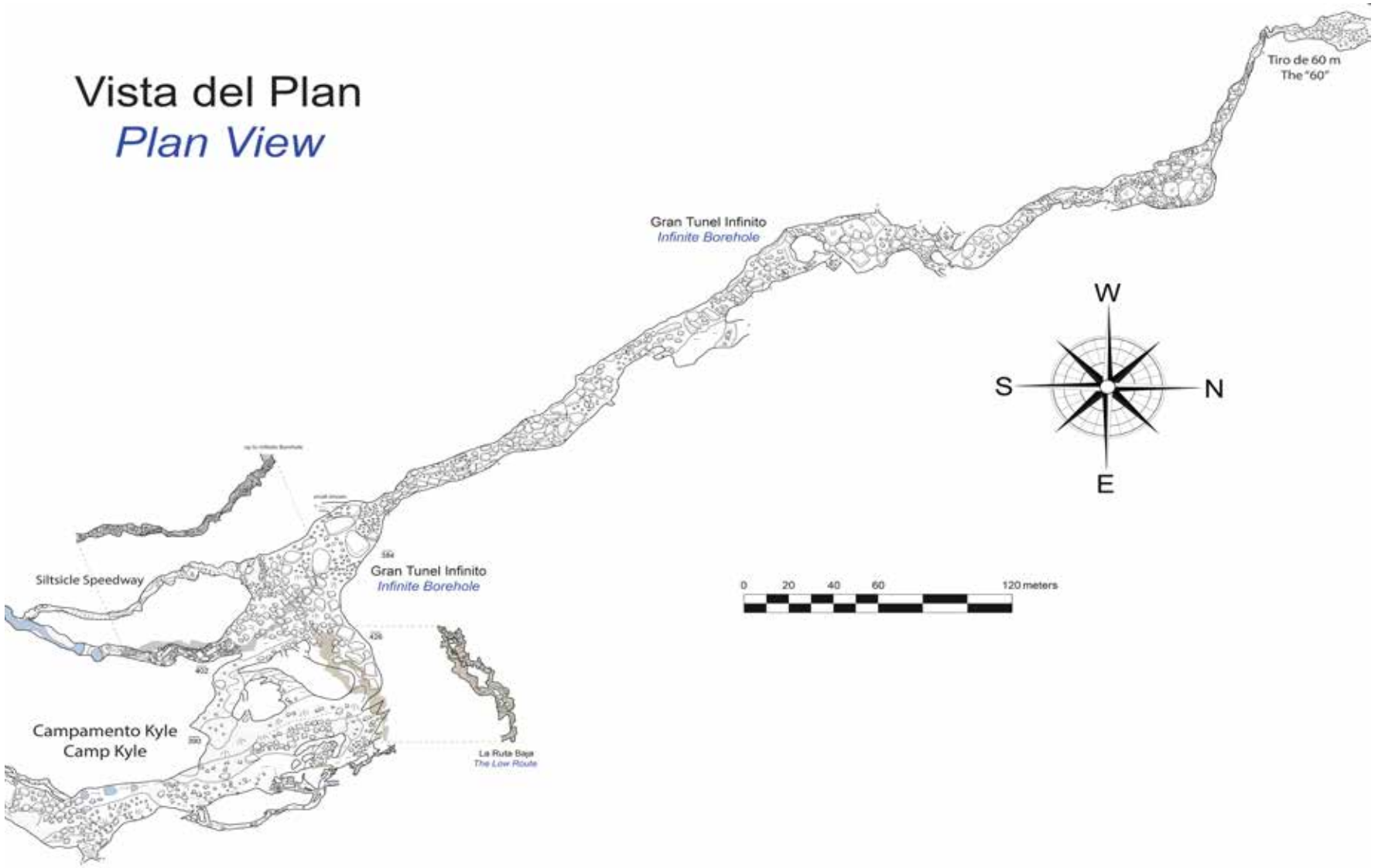
Gerardo Morrill at the top of a 30 meter pitch in the Infinite Borehole that he had scaled from the bottom. / Gerardo Morrill en la parte superior de un tiro de 30 metros en el Gran Tunel Infinito que había escalado desde la parte inferior. *Kasia Biernacka.*

It was not realized until late in the expedition that these enormous tunnels beyond Camp Cartman were all at a level inside the mountain approximately 230 meters above the active stream passage in Cueva Cheve. The implication was that the Peña Negra caves were formed first, in a higher strata of rock than most of Cheve, and that there must therefore exist a much larger amount of passage that we had not seen – paralleling, higher, and to the east of, the main Cheve fault. There was one more surprise in store from this area in 2018.

On April 5th Hoffman, Vieira, and Morrill surveyed another half kilometer of unusual black-colored, smaller fissure tunnel leading west from the first of the huge antlion funnels. To their stunned surprise they walked into a junction with the Cheve Sumplands tunnel (the main route to Camp 2) not 50 meters from the place where our rigging team had bivouacked just 10 days earlier. It was astonishing to believe that everyone had walked by that tunnel for 31 years and had not seen it. The result of this discovery was that there was now a much faster way to Camp Cartman via the Cheve entrance. It had previously taken most team members two days to reach Cartman via the Peña Negra entrance.

To the Upstream Infinite Borehole

Just beyond Camp Kyle in Peña Negra the main tunnel took a hard left turn and hit a junction, measuring 60 meters across. This had been the limit of exploration in 2017. To the right, and north, was the continuation of the Infinite Borehole described above. To the left was a narrower canyon – still 10 meters across – from which a rappel led to a sizable stream. It was surmised, and later confirmed by survey, that this was not the same stream that



The results of the first push on the Infinite Borehole, from Camp Kyle. /
Los resultados del primer avance en el Gran Tunel Infinito, de Camp Kyle.

passed by Camp Kyle. And it led both upstream and downstream. There was further conjecture that the downstream direction would surely connect with the other stream and perhaps might be passable underneath the giant boulders that now made up the floor of the Infinite Borehole. But the upstream tunnel was certainly going somewhere else. On March 11th Bev Shade, Kasia Biernacka, Sean Lewis, and Mary Hicks began exploration and survey of the upstream tunnel. Over the next five weeks they were joined by Lee White, Mike Frazier, Gerardo Morrill, Tomek Fiedorowicz, Matt Covington, Jordan Toles, Yazmin Barragan, and Nathan Roser at various times. More than two kilometers of tunnels, all trending upstream, were discovered, ending in the "Shadow Tower" chamber, an unstable breakdown-floored canyon. The last push in mid-April left with possible continuations on both ends. This final chamber was essentially at the same level as the top of the Total Perspective Vortex (the main route to Camp Kyle) but with the tunnel displaced 220 meters to the southwest. Curiously, the Shadow Tower room is located directly under the Peña Negra headwall but 333 meters below it. This suggests that there is nothing preventing further cave development beneath the Llano Peña Negra, despite the surface of the llano having an impermeable rock layer that channels surface streams into large arroyos that sink into the ground when they meet the limestone head-wall.

The Boomerang Borehole

Early evening of March 16 Vickie Siegel and I arrived at Camp Kyle. There was no one there. The sleeping bag situation was in disarray and some bags had been left sitting on top off space blankets with no covering – soaking up water. I counted 11 bags in camp including two that had been unopened in their original 4 liter Nalgene transport bottles. All of the sleeping spots that had been prepared were taken so we set to work leveling out two more places. There was no lack of sand at Kyle – there was a 40 meter wide hill of it, sitting at the angle of repose, on the west side of camp – and I carried six 25 liter packs of it to the camp site, dumping it and later flattening it to a serviceable site. About this time Bev Shade and Nathan Roser showed up, having spent the day surveying a flowstone-floored canyon leading off of the massive Lost in Space chamber. The team that had discovered it in 2017 had barely time to run around it quickly and note unexplored passages leading off … of which there were many. I had half expected to run into someone during our inbound journey but we hiked through the chamber without seeing or hearing anything.

There was an awkward 30 minutes or so where it seemed that Bev and Nathan were not interested in talking to us. I've seen this before when you show up at a remote place where people have been working hard as a small, tight team for days or weeks. We were the interlopers. But eventually she opened up and discussed what they had done, showing us the maps they had produced over the last week. She had been sketching with a mechanical pencil on 8-1/2 x 11 inch waterproof sheets that Derek Bristol had printed out, rather than going all-digital. Although only one team in 2017 had been using DISTOX laser instruments tied via Bluetooth to a tablet-based survey/drafting program more were now going this technology in 2018. It was a year of technology transition. For a lot of us who grew up with pencil sketching maps in caves it was a big deal to make the change since there were drawbacks to the all-digital approach… such as less precision with a stylus versus a fine point pencil, and losing a memory card or losing a survey due to power loss. Several weeks later Bev and Vickie would spend a long day resurveying a section of the Infinite Borehole where an entire day's digital data had been lost in such a manner. But in time those problems will be solved and people will one day wonder how it was possible to survey with only pencil and paper.

For months prior to the 2018 expedition I had been studying the Peña Negra map data. The Lost in Space chamber contained a number of tunnels leading off. The most intriguing was labeled "LOKCM"… the first initials of the names of the survey party in late April 2017. The important part was that this particular tunnel was leading well away from the main cave in an easterly

Tomek Fiedorowicz at the big bend in the Troubadour Borehole in Cueva de la Peña Negra. / Tomek Fiedorowicz en la curva grande en el Gran Tunel del Trovador en Cueva de la Peña Negra. *Kasia Biernacka.*

direction – out into the blank section of the map where we wanted to go. Derek Bristol had been out this tunnel a few days earlier and had discovered a narrow fissure that seemed to lead out over a deep canyon, as evidenced by the persistent echoes following their yells. They had no rope so the lead remained uninvestigated until Vickie, Nathan and I headed out there on March 17th. We were unable to find Derek's fissure but ended up rigging a rope down an alternate route into the canyon any-ways. The entire place was flowstone covered with a number of small waterfalls in just the right places so that you were sure to get a damp right from the start. The passage immediately opened up into a 10 meter wide formation-decorated corridor that, 100 meters later, spilled over into a deep canyon that seemed to have both upstream and downstream extensions. But by this time we were out of rope.

Two days later we returned with considerable rope and managed to use most of it rigging traverses in the upstream canyon. A series of climbs up flowstone ramps and more rappels followed. The last rappel dropped us into a small travertine covered crawlway. Vickie led onward, finding the route. She soon yelled back that we were out into open territory. Ahead a 15 meter wide, 10 meter tall tunnel led on. There was a stepped oval shaped dome in the roof that was surprisingly multicolored, like the eye of Jupiter. Hence, the new discovery became the "Jupiter Tube." The floor was an undulating surface of 2 centimeter-thick black colored plates that let off brittle squeaks and cracking noises as we marched along. The sharpness of the edges suggested that the collapse that created the floor was recent, but that can be deceiving in caves.

Ultimately, more than a kilometer of new tunnels were discovered beyond the Eye of Jupiter, some reaching crosssections of 15 x 15 meters. Initially the passage headed due south for 400 meters, then suddenly turned east. Wicho Diaz, Jordan Toles, Vickie Siegel and I explored this until we ran out of rope on April 1, 300 meters further east. On April 5th Siegel, Toles, Bev Shade, Yazmin Barragan and I returned and were surprised to find the tunnel taking a sharp turn to the north where, several hundred meters further, we were stopped at a collapse of the tunnel, apparently caused by an incoming waterfall. The multiple changes in direction, heading first south then east, then ultimately back north again, gave rise to the name "Boomerang Borehole." We conjectured that the passage had wrapped around an anticline with the south bound and north bound segments being essentially in the same rock strata but on opposite sides of the fold; the central east-heading segment was jagged and torn, which would support the idea that it was cutting across the anticline bedding and different strata contributed to the rough terrain. Completing the strange picture was the presence of three independent domes near the area of the change of passage direction – each in excess of 60 meters tall, potentially leading to an upper level that may bypass the collapse at the end of the tunnel.

The Mad Hatter

On March 29th Derek Bristol, Lee White and I left Camp 3 in Cheve, having completed the rigging of the cave, and began ascending towards the entrance. No sooner had we reached Camp 2 when Yuri Schwartz and Nathan Roser arrived from the surface. Also there were Corey Hackley and Adam Byrd who had been exploring but staying in Camp 2. Our Camp 3 team had originally been intending to exit via Cueva Cheve the next day but help was needed at Camp Kyle, Camp Cartman had now been vacated, and Yuri needed a third person for their team for safety at Camp 3. The plan that evolved had Lee joining Yuri and Nathan the following morning and returning to Camp 3 to begin work on the windy crawlway that had been discovered at the end of the 2017 expedition; Derek and I headed out Peña Negra via the original connection route along with Hackley and Byrd. The latter two branched off when we reached the second antlion funnel in Peña Negra and went on to discover the Calles de Papalo tunnel, as described earlier. I stayed at Camp Kyle to help with explorations of the Jupiter Tube while Derek completed the first through trip from Cheve to Peña Negra.

At Camp 3 Swartz and crew settled in for three days of work in an attempt to remove rocks wedged in the windy crawlway, which Yuri had now given the name "Gone with the Wind." They progressed 20 meters down an inclined tube before running low on supplies – our rigging team had not taken in any food or fuel during our brief visit so all they had with them were the limited resources that they could carry that far in a backpack. They exited the cave on April 4. However, following just a single day on the surface, Yuri and Gerardo Morrill headed back into the cave on April 6, arriving at Camp 3 late on the 7th, following a night at Camp 2. On April 8th they reached the bottom of the sloping tube and began ascending, making another 5 meters of progress. Meanwhile Sean Lewis, Lauren Satterfield, and Adam Byrd had entered Cheve on April 8th and reached Camp 3 the night of April 9th. They then set in for five intense days of the complete antithesis of exploration in Peña Negra. Instead of 40 meter diameter tunnel they were lucky to see 1 meter diameter. Mostly it was less. Following 5 more meters of body-tight bedrock crawling the cave suddenly changed. It was as if they had entered a vast subterranean void, except that the void was filled with giant marbles. Progress through the gaps in the "marbles" (large breakdown blocks) was slow, steady … and frustrating. Others were mapping kilometers of borehole on this same mountain!

On April 15th reinforcements in the form of Jon Lillestolen, Oscar Berrones, and myself arrived at Camp 3. Yuri and Gerardo had exited the cave on the 12th, so we now had a 6 person

end game team at Camp 3 to play out what options we could before having to begin the derig on April 22nd. Sean Lewis was at camp, solo, when we arrived. After four 10+ hour trips he had burned out and needed a day off. I could sense despair on his face. Adam and Lauren had gone off again to the marble jar … now known as the Mad Hatter Breakdown… and returned late in the evening having made only incremental progress. Thus far a total of 12 pushes had been made to the Mad Hatter area and the survey tally was just over 200 meters, averaging a total of 16m per day. The allusion was that anyone still working on this problem (vice in the big tunnels in the Peña Negra) had to be mad. The following morning I got to personally see what they were up against, and instantly understood Sean's emotions of the previous evening.

The Gone with the Wind section at the beginning was only about 30m long but it was body tight and the initial 20 meters descended on a 30 degree angle to a junction with a small trickle stream way. To be clear this "room" was barely wide enough to turn your body around in. It just seemed bigger compared to the body-tight tube on the way down. There you can turn around and head up another body size tube in bedrock. They had certainly not wasted any more effort than the minimum necessary to just get through. Another 10 meters of squeezing upward through this and there was a bedrock wall on the left and truck size boulders on the right. For the briefest of moments we were in passage 2 meters wide and 5 meters tall. We were past Gone with the Wind. The Mad Hatter lay ahead. Then it was up, up, up through breakdown squeezes until we reached station ZDE63 – the furthest point reached by Lauren and Adam. For the next 8 hours Jon, Oscar, and I laboriously surveyed between boulders while in the not far distance the others could be heard attempting to tease out the route. The place was not stable. No human had ever been here which meant that the matrix above – an apparently limitless expanse of "marbles" in this gi¬ant marble pile – could come loose if the others accidentally removed the wrong boulder in an effort to follow the elusive wind. There were periodic crashes of rocks falling as the others intentionally moved small rocks out of the way. Loose, unstable rocks abounded. Some would kill you if they fell at an inopportune time while you were climbing or squeezing past them. Of all the objective dangers that exist in unexplored cave, this is the one that bothers me most.

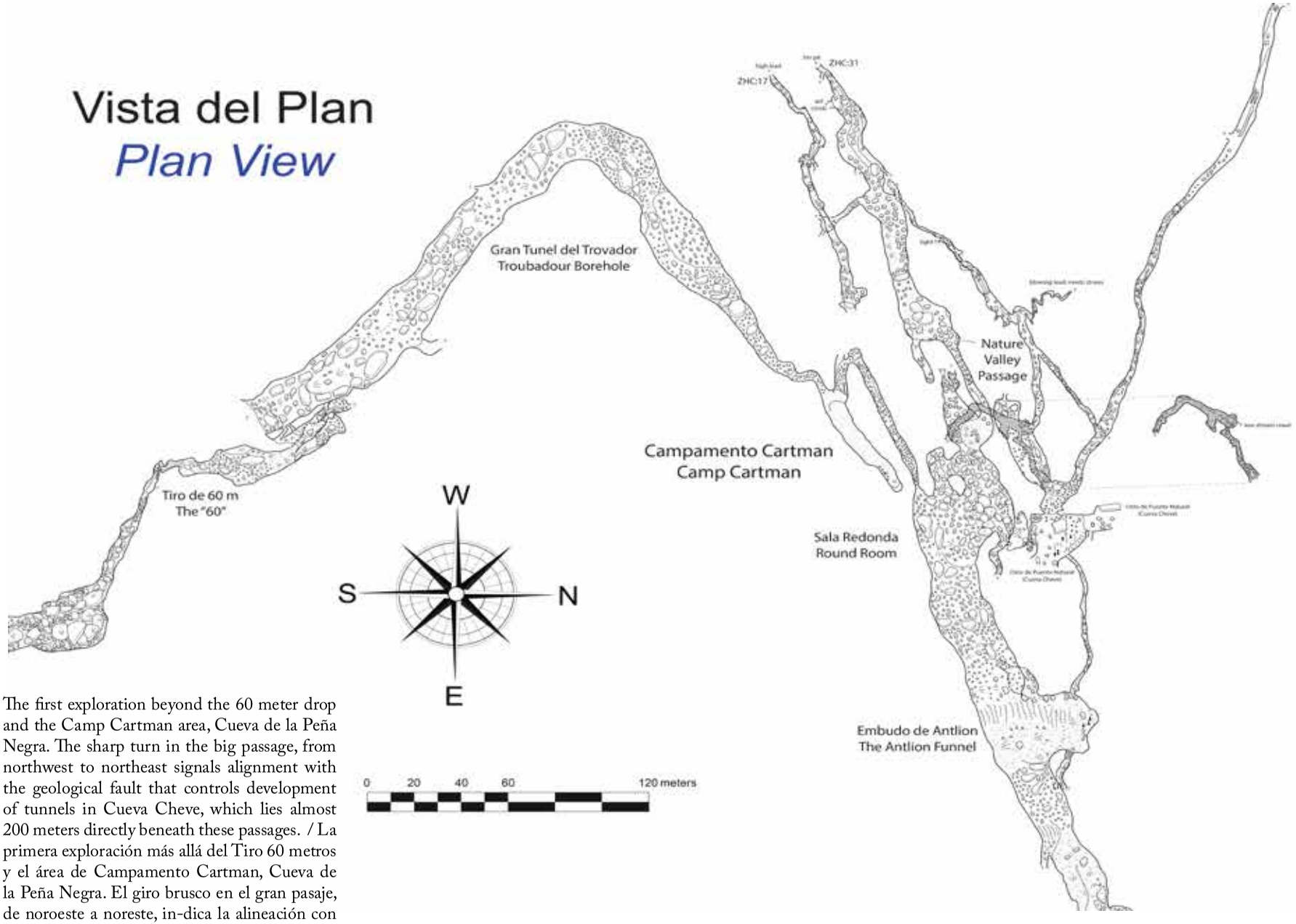
The wind that normally rips through here – making it an unpleasant, hypothermic place, as we had learned in 2017 – was now quiet, perhaps related to the protracted storms on the surface. Paradoxically, we needed the wind to show us the way on. Sean and crew were investigating every void but generally the trend was that we were going upward and slowly eastward. The real question was: how big was this breakdown pile and how could we get out of it? The wind was our only guide. A hundred meters above us lay Harbinger Hall, explored in the 1990s. But it was a dead end chamber with no air flow and no way onward. So where was the wind going? We know we have to go east (Cheve is 5 kilometers west of the resurgence springs) and so far the only way you can go east in this cave is to intersect a shear fracture in the rock strata that goes from northwest to east/southeast. We had seen it elsewhere in Cheve (the sharp turn in the Infinite Borehole before Camp Cartman being a good example) and it was a known geologic feature in Huautla as well. So, it appeared that the main tunnel just beyond Camp 3 had done exactly that – suddenly turned east. But within 100 meters the huge tunnel was stopped at this giant pile of collapsed boulders (topped by Harbinger Hall). That leaves open the question: does the main cave continue east of the big collapse? If so, then the Mad Hatter is just skirting around the north side of the giant collapse cone and we need to go further east. How far up do we need to be to find the fossil borehole? This is what we talked about around the stove each morning and evening.

We made one more desperate 12 hour attempt on the Mad Hatter on April 17th. We did add 100 meters of survey, totaling 305 meters of gain in 14 days of work. Sean discovered what appears to be a descending section of the breakdown pile leading north. But there was no breakthrough, only limited progress and no definitive clues as to which way to go. So the Mad Hatter won this round. Memory of unpleasant experience, fortunately, fades with time. Further study of the 3D computer map will certainly convince someone to return here, for the air is going somewhere and it is still 15 kilometers straight line distance to the resurgence springs. For further formation on this area read the article by Sean Lewis.

Above the ASB:

The Arne Saknussem Borehole (or "ASB"), the final section of cave leading to Camp 3 in Cheve, was discovered in 1989. For the following 29 years teams of explorers, weighed down by heavy backpacks of equipment, food, rope, and occasionally diving gear, had lumbered down this one kilometer stretch of very large canyon passage – averaging 10 to 20 meters wide and up to 55 meters tall. All considered it to be a monolithic rectangular tunnel with no side passages. There is an iconic spot in the tunnel, much photographed, where a huge boulder hangs suspended between the canyon walls. Directly under it, on the west wall, are what clearly appear to be the letters "A" and "S", in white calcite on otherwise dark tan colored rock. The temptation to assign the words "Arne" and "Saknussem" to those letters was obvious. But that was as far as it went – it was a single tunnel.

But the new discoveries in the Peña Negra had changed our thinking. Somewhere, as much as 230 meters above the current active Cheve streamway and to the east, there is an ancient, older cave. And as the Peña Negra connections to Cheve in 2018



The first exploration beyond the 60 meter drop and the Camp Cartman area, Cueva de la Peña Negra. The sharp turn in the big passage, from northwest to northeast signals alignment with the geological fault that controls development of tunnels in Cueva Cheve, which lies almost 200 meters directly beneath these passages. / La primera exploración más allá del Tiro 60 metros y el área de Campamento Cartman, Cueva de la Peña Negra. El giro brusco en el gran pasaje, de noroeste a noreste, in-dica la alineación con la falla geológica que controla el desarrollo de los túneles en Cueva Cheve, que se encuentra casi 200 metros directamente debajo de estos pasajes.

had demonstrated, junction tunnels exist between these two vertically separated caves. The morning of April 16th, six of us were sitting around the stove at Camp 3. It was apparent that enthusiasm was waning for returning to the Mad Hatter and a day off was declared in camp. It was then that Sean Lewis mentioned having seen something at the roof of the tunnel near the "A.S." signature rock. Around 3pm four of us set off to see the lead (Jon, Oscar, Sean, and me) and indeed, with all our brightest lights illuminating the roof, there appeared to be a tunnel up there. In fact there was a blackness on the west side of the canyon also, both at roof level. Oscar brought a DISTOX and we measured 55 meters to the roof. Two days later, still groggy from the final, unsuccessful push on the Mad Hatter, we spent most of the morning assembling aid climbing gear from bits and pieces of other equipment. There were two complete sets of state-of-the-art climbing gear in the Peña Negra, but that was far away from us. So we made quick draws from webbing; pooled our non-locking carabiners; and fashioned adjustable daisies from used 9 millimeter dynamic rope and two Petzl Microtraxion pulleys instead of the Yates adjustable daisies we normally used. With some searching Adam came across three old etriers at Camp 3. Luckily, we also found a 35 meter length of 10.2 milimeter PMI dynamic rope and an ATC for belaying that had been left at Camp 3 following the 2017 expedition. The rest of the equipment – drill, hammer, wrench, bolts – we had from our general rigging equipment and it appeared we had sufficient bolts and drill batteries to do it. Armed with this make shift climbing kit we set off to tackle a 55 meter overhung wall.

We climbed in two person shifts. We still had Sean's TE30 drill, which was not optimal for what we were attempting to do (it was heavy) but, on the other hand, it drilled bolt holes in 10 seconds flat, which is hard to argue with. The rock at the beginning was smooth, solid and the climbing angle was less than 90 degrees vertical which made the going easier. This changed dramatically at the end of the day, however. Oscar led the first pitch of 15 meters with Adam belaying. Those two then took a break and Lauren led the next 15 meter pitch with me belaying from a small ledge where Oscar had stopped. At the conclusion of each pitch we rigged a static 9 milimeter rope. Adam then went up around 10pm with Lauren belaying for the 3rd and 4th pitches. It was then that the rock started becoming broken up and the ceiling overhung. By 1am they were still 15 meters below and 20 meters away from whatever was up there – even from that height we could not see exactly what was there due to the overhang. It was still possible that all this work would lead to nothing but a dead end pocket.

The following afternoon (April 19th) with Lauren belaying while

The Antlion Funnel, beyond Camp Cartman in Cueva de la Peña Negra. /
El Embudo del Hormiga-león, más allá de Campamento Cartman en Cueva de la Peña Negra. *Kasia Biernacka.*

hanging from the anchors and standing on very small ledges, Adam finished the climb. It was a tedious route in overhung bad rock, but by 10pm he was at the top. It had taken us only a day and a quarter to reach it. A similar climb in 1980 (the Mil Metro Dome in Huautla's Li Nita cave) had taken well over two weeks of effort using hand set bolts. The improved technology meant that the idea of climbing 230 meters to reach an older level of cave was not some impossible fantasy.

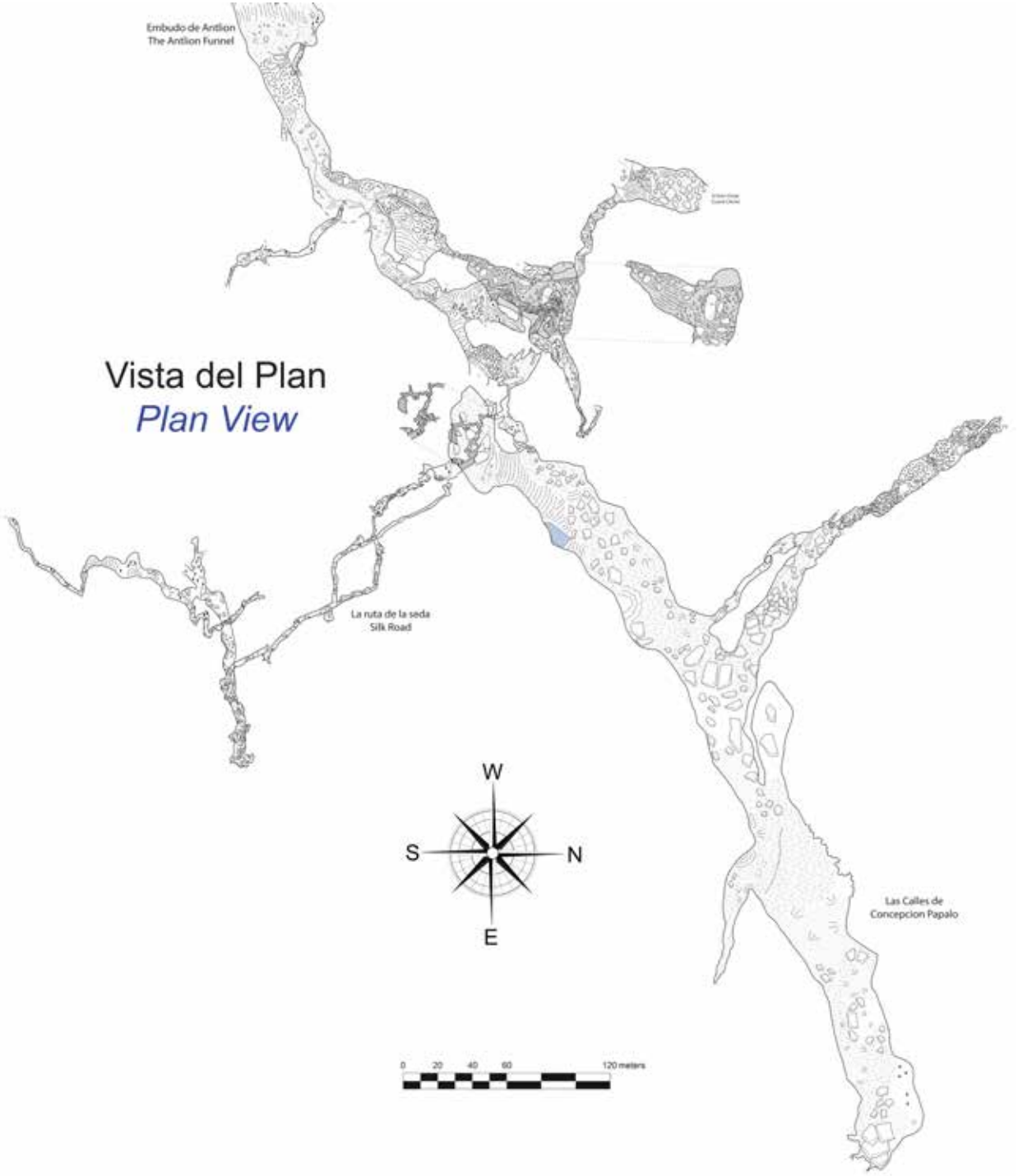
The morning of April 20th found Jon, Adam, and me standing on top with survey gear. It was then obvious that we had a real tunnel – headed due east. It was hard not to be excited. The tunnel jogged north temporarily, then back east, then north, then east again before finally breaking out into a 20 meter wide tunnel some 200 meters east of the ASB. The floor was covered with very small broken rocks that sloped from west to east. A huge, colorful slickenside formed the east wall. There was one restriction some 150 meters further on then it opened again for another 100 meters before it closed down at a collapse. It felt like we had surely missed something so we slowly retreated 500 meters to the ropes, looking along the east wall for something going east. Jon found a narrow fissure going down to a vertical drop that carried wind – blowing out. "I am sure you can fit," Witek Hoffman said confidently in his Polish-accented English. His voice carried up from somewhere in the fissure. I, on the other hand, was fairly certain that I would not "fit." It was April 21st, and it was the last exploration trip of the expedition. The previous afternoon Witek and Sonia Dudziak had made a special trip to Camp 3 bringing food, which we had finally run out of that morning – we had been rationing it for the previous two days. That same day Sean, Lauren, and Oscar had headed out and Adam, who had been working for 14 days straight, decided to stay in camp and begin cleanup of Camp 3. And so Witek, Sonia, Jon and I had

A view of the Arne Saknussemm Borehole from Camp 3, Cueva Cheve. / Vista del Gran Tunel Arne Saknussemm (ASB) desde el Campamento 3, Cueva Cheve. *Kasia Biernacka.*

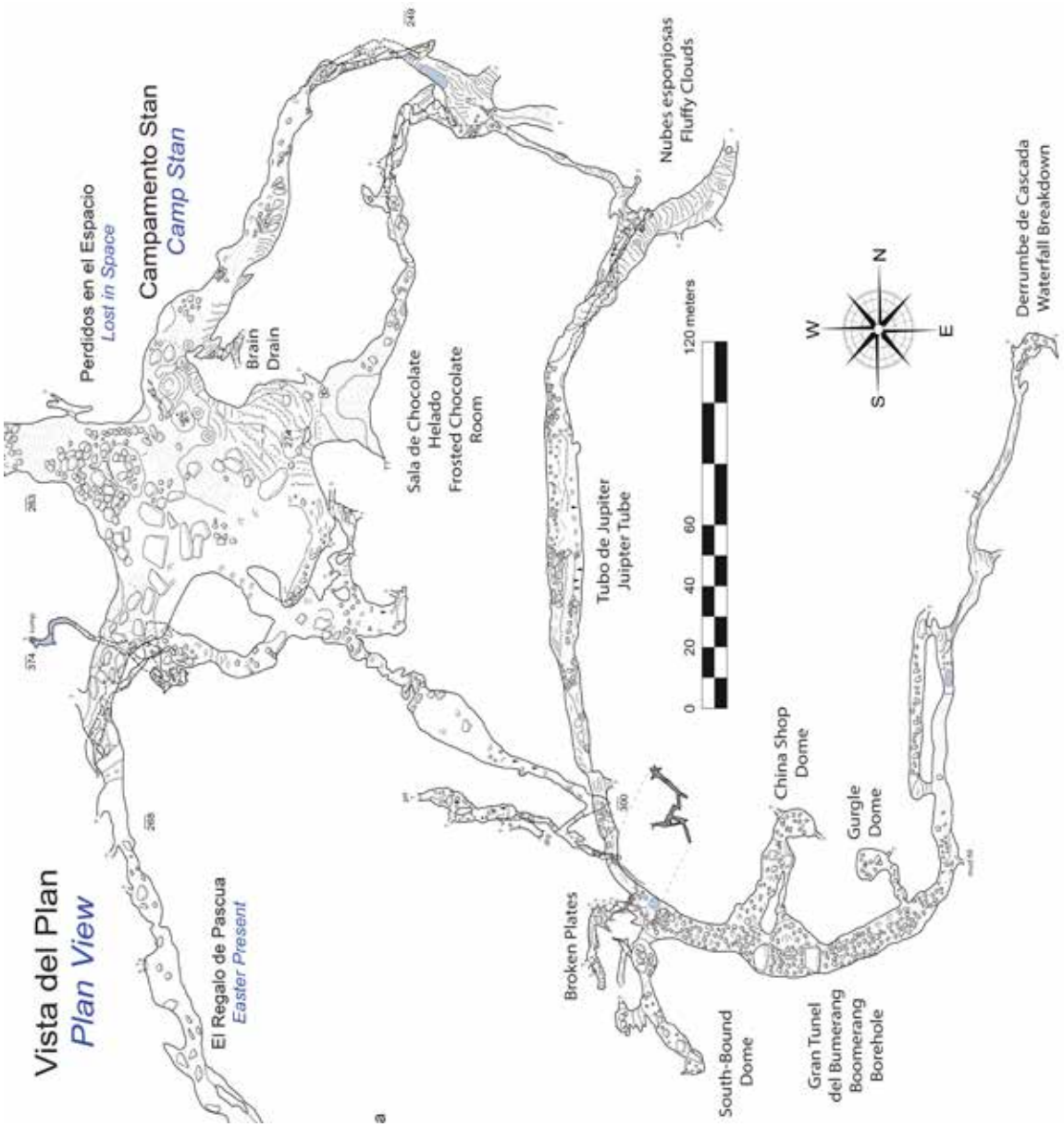
fissure might be too tight for me. I should have taken that advice and given them the survey gear at that point. They were covered in mud and I had not brought my suit (I was just in Capilene fleece and nylon shorts). When the time came to survey the first pit everything went well, but then I saw the fissure traverse and paused. All of those ahead of me were much smaller individuals. Against better judgement [note to future self !] I forced my way into the traverse. There were no footholds and the walls were slick…. nothing but greasy mud on smooth walls with no edges anywhere. The tendency was to slip down into the crack, and get stuck there. So even with the traverse rope it was still a struggle to stay high enough in the fissure to move at all. There was an obvious bulge in the wall just before the vertical rappel rope at the end of the traverse. I pressed through it, even though my harness buckle caught several times. It was a downward sloping fissure and gravity helped. When I got to the rope I snapped an ascender safety onto the line and rigged my descender. Then I looked back up, wondering how the hell I was going to get out. But the tunnel below was larger so I went down to do the survey. We ended up perhaps 40 meters east of the main tunnel before The harness D-ring was the main issue – there was no forcing it through. I climbed back down and discussed this with the others. This was a somewhat desperate situation, but no one was panicking yet. We still had a drill and a hammer. Jon went up and set to work on the rock bulge. Between the drill holes and the hammer he managed to remove some of the lower part of the bulge. Luckily that proved to be just enough for me to get through. We regrouped in the big tunnel, joking about our erstwhile predicament. Actually, it had been my quandary – they all could have left me there. We stayed up chatting till 11:30pm in camp. Next time we come to a tight fissure like that I will let those who fit go do their thing.

Epilog:

I began this story with exploration teams confidently advancing down seemingly endless gigantic corridors, mapping kilometers in the process, and ended with tales of desperation. Expedition caving involves both, perhaps luckily not in equal measures. The difference between the two largely reduces to one word: perseverance. We had been granted the exceedingly good fortune of having been presented with a stunning, open, enormous unexplored



The limits of exploration in 2018 in the Cueva de la Pena Negra. The discovery of the gigantic (note the scale bar carefully in the map) "Calles de Papalo" section of the cave by Corey Hackley and Adam Byrd changed everyone's perception of how Sistema Cheve formed. The huge Calles de Papalo tunnel is more than 200 m above the active river in Cueva Cheve, which lies directly beneath it. More such tunnels should exist to the east. / Los límites de la exploración en 2018 en la Cueva de la Peña Negra. El descubrimiento de la gigantesca sección de la cueva "Calles de Papalo" realizada por Corey Hackley y Adam Byrd (observe cuidadosamente la barra de escala) cambió la percepción de todos sobre cómo se formó el Sistema Cheve. El enorme túnel de Calles de Papalo está a más de 200 m sobre el río activo en Cueva Cheve, que se encuentra directamente debajo de él. Más túneles de este tipo deberían existir hacia el este.



Detailed plan map of the area east of Camp Stan in the Cueva de la Peña Negra. The giant "U" shape of the eastern passages suggests the presence of a geological anticline in the rock strata. / Plano detallado del mapa del área al este de Camp Stan en la Cueva de la Peña Negra. La gigantesca forma de "U" de los pasajes orientales sugiere la presencia de un anticlinal geológico en los estratos rocosos.

At the eastern limit of exploration in the Calles de Papalo (from left to right): Corey Hackley, Adam Byrd, Sean Lewis. This point is located more than 300 meters east of the best-known passage in Cueva Cheve. It also represents the most remote location humans have reached in the Cueva de la Peña Negra. / En el límite oriental de exploración en las Calles de Papalo (de izquierda a derecha): Corey Hackley, Adam Byrd, Sean Lewis. Este punto se encuentra a más de 300 metros al este del túnel más al este conocido en Cueva Cheve. Este es también el lugar más remoto que los humanos han alcanzado en la Cueva de la Peña Negra. *Kasia Biernacka.*

tunnel to begin the expedition in 2018. And in due course we explored and mapped the easy stuff, of which there was plenty. But in the end the discovery of the next breakthrough into new gigantic corridors always stands on the efforts of those willing to dedicate 10 or 20 or 30 pushes into a breakdown maze, a body-tight crawl, or to climb an exceedingly high dome in order to find the elusive pathway into the big stuff. It is the essence of cave exploration.

On April 22nd we began derigging the two caves. Basecamp was packed up and most everyone was back at their work by May 1. It had been an extraordinary expedition. The rigging of two major vertical cave systems had consumed nearly 8,000 meters of rope. A total of six underground camps were set (3 in each cave) in 2018 and it was not uncommon to have only 3 to 5 people in base-camp and the remainder of the team spread across 3 or more underground camps. All of the camps were linked to basecamp with a single wire Michie phone system so that efforts could be coordinated daily. The result of this was that an extraordinary amount of cave was discovered and mapped in 2018. A total of 13.5 kilometers of new cave – the vast majority of which was borehole measuring 40 x 40 meters or larger – was added to the system, most of that in Peña Negra. The depth of Peña Negra reached 798 meters before not one but four widely separated connections were made to Cueva Cheve. The first connection was made near Camp 2 in Cheve just above the East Gorge in a dry flow-stone floored gallery first explored in 1988. With the connections the length of Sistema Cheve increased to 45,949 meters. The profile of the connected cave system now reveals clearly that the upper portion of Cheve, known for over 30 years now, is just a side passage to the Peña Negra. The lower section of Cheve also saw intense exploration effort, with 1.1 kilometers of new cave discovered this year but no new depth. The 55 meter climb in the ASB, however, suggests that a complete re-investigation of the main tunnels in Cheve are in order to reach a continuation of the main trunk tunnel in the Peña Negra. That is where we will direct our efforts in 2019. While Sistema Cheve is currently in 14th po¬sition with regard to the deep caves of the world, the possibility still exists through determined exploration that it could one day be proven to be the world's deepest cave.

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Al final de la expedición de Cheve 2017, se hizo un descubrimiento

extraordinario a dos kilómetros al este de la entrada principal de Cueva Cheve. La cueva nueva fue inicialmente nombrada "CL6" por el equipo de reconocimiento. Más discusiones con los residentes en el municipio de Concepción Pápalo revelaron que el lugar tenía un nombre geográfico adecuado, por lo que la cueva nueva se convirtió en "Cueva de la Peña Negra." Las exploraciones iniciales encontraron pasajes extremadamente estrechos, con fisuras de cien metros de largo y menos de 20 centimetros de ancho. Pero el impulso de exploración final en 2017 se había detenido debido a la falta de cuerda en una caída de 25 metros en un túnel estupendo de 40 metros de ancho por 40 metros de altura. Llevaba un fuerte viento, incluso en ese túnel de gran tamaño, por lo que se pronosticaba que había más cuevas por descubrir más allá de ese tiro. Cuando salimos a principios de mayo de 2017, la Cueva de la Peña Negra tenía 3,4 kilómetros de pasaje topografiádo y alcanzó una profundidad de 426 metros. La ubicación en el mapa topográfico lo colocó en una zona donde no se había realizado una exploración previa en la Sierra Juárez y sus numerosos ramales sugirieron que podría sobrepasar Cueva Cheve y adentrarse más en la montaña. El interés por saber hacia dónde iría, era alto entre los miembros del equipo. Entonces, la única pregunta en ese momento era qué tan rápido podíamos organizar un regreso.

Apenas diez meses después, el equipo de avanzada salió de Austin el 25 de febrero de 2018. En última instancia, participaron cuarenta personas de seis países. El último equipo de desarme regresó a Austin el 30 de abril de 2018. Entre ese espacio de diez semanas sucedieron muchas cosas. Mientras que la Peña Negra demandó nuestra atención primaria, un misterio significativo también permaneció cerca del fondo de Cueva Cheve. En abril de 2017, se descubrió un laberinto que se dirigía hacia el este desde el cañón del arroyo justo debajo del Campamento 3. Llevaba un viento increíblemente fuerte y prometía tal vez sobrepasar los túneles inundados en lo que se conoce hasta ahora como el final actual de la cueva. Como resultado, se exploraron dos sistemas principales de cuevas en 2018. Al igual que con la expedición de 2017, tuvimos muchas personas en la montaña trabajando múltiples objetivos simultáneos. De hecho, el 2018 demostró ser significativamente más complejo, ya que teníamos hasta 6 campamentos subterráneos abastecidos durante la expedición (con conjuntos para dormir, utensilios de cocina, combustible y teléfonos). A menudo tres o cuatro de estos estaban en uso al mismo tiempo. Cada campamento que estuvo ocupado tenía al menos un equipo de exploración/topografía y algunas veces dos, con cada equipo compuesto por 2 a 4 personas.

Para evitar confución, tuvimos que construir una tabla en el campo base en una pizarra que mostraba dónde estaban ubicados todos los miembros del equipo en un día determinado. He reproducido esa tabla aquí (ver la figura de la ubicación del campamento). El sentido inmediato que se tiene al observar esta tabla es que los miembros del equipo se movían dentro de la montaña durante períodos de tiempo sustanciales (para un total de 512 días/personas registradas en campamentos subterráneos en 2018). Para la mayoría de las personas, esto representaba entre el 40 y el 50% de su tiempo en la expedición; para algunos fue mucho más (el máximo fue 83%). Sin embargo, el resultado fue que la gente se movía con frecuencia bajo tierra, cambiaba los sistemas de cuevas y se registraba en los campamentos como si fueran hoteles. Se necesitaba hacer resevación; de lo contrario, podrían llegar solo para descubrir que todos los sacos de dormir estaban en uso ... una situación muy incómoda para todos los involucrados, especialmente si dos equipos diferentes convergían al mismo tiempo después de un largo día de travesía. Y así, el campamento base, a través del sistema telefónico, actuó como una agencia de viajes para los que entraban a Cheve. Una consecuencia de este comportamiento migratorio subterráneo es que es difícil contar una historia simple sobre lo que sucedió en la expedición. Fue la antítesis de la línea de la cronología impulsada por el asedio que, por ejemplo, seguiría a una sola persona hasta la cima del Monte Everest o K2 en el mundo de alpinismo. Lo que sigue a continuación se puede considerar una especie de los cuentos de Canterbury ... una serie recopilada de viñetas que se entrelazan en el tiempo y el espacio con caracteres superpuestos para resaltar incidentes clave y seguir los diversos frentes de exploración, todos los cuales generalmente se dirigieron hacia la búsqueda de nuevos túneles que sobrepasaran el extremo norte final de la Cueva Cheve.

The food we eat underground: clockwise from top: dried fruit; nuts; dried vegetables; dried fruit; dried mangos. / Los alimentos que comemos bajo tierra: en sentido horario desde arriba: frutos secos; nueces; verduras secas; fruta seca; mangos secos.

Calorías

Comencé mi registro de la expedición de 2018 en una tormenta de nieve sentada en un pequeño aeropuerto regional en Toledo, Ohio, el 23 de febrero, preguntándome si algún avión se iría ese día y si lograría conectarme con los camiones que partirían de Austin en dos días para Cueva Cheve. La noche anterior había dado una conferencia a unos 400 estudiantes e ingenieros profesionales en la universidad ahí. El banquete había sido impresionante y no sentía necesidad de desayunar esa mañana. Esto me hizo pensar en el frenético trabajo que se había llevado a cabo durante las seis semanas anteriores en relación con la

comida de la expedición, especialmente la comida de campamento subterráneo especializada. Había tenido la suerte de que numerosos espeleólogos de Austin habían ido a mi rancho los últimos tres fines de semana (y algunas noches de los días laborables) para ayudar a comprimir y empacar alimentos y equipos. La mayor parte de esta comida fue comprada a granel por Vickie Siegel, Sean Lewis y yo en un marathónico sábado 24 de enero en una sala de conferencias, con un proyector que mostraba las cantidades calculadas que necesitábamos y las fuentes web de esos ingredientes mientras uno de nosotros colocaba pedidos de hasta 100 kilogramos o más por artículo. Sean había realizado extensos estudios nutricionales durante los meses anteriores. Luego se encargó personalmente de revisar los componentes y las proporciones de la mezcla de alimentos secos del campamento subterráneo que habíamos estado manipulando durante años. La idea era aumentar las calorías, las proteínas y los nutrientes de las grasas para brindar a todos un rendimiento atlético a largo plazo superior, sin perder un peso sustancial durante la expedición, un problema aún generalizado incluso en 2018.

Compramos una cantidad extraordinaria de alimentos deshidratados en ese día (suficiente para más de 600 personas por día bajo tierra), dejando solo algunos artículos extraños, como el queso duro y la carne seca durables, que fueron difíciles de ubicar en México en nuestra lista final. Las cajas empezaron a llegar en las próximas tres semanas. Para entonces, el garaje también estaba lleno con unas 40 bolsas de transporte, cuidadosamente embaladas con cuerdas, cables telefónicos, sacos de dormir (comprimidos en tambores Darren de 6 litros), colchones de la marca Thermarest, conjuntos de cocina, mesas, sillas, generadores, cables de extensión y un refugio para el control de misión. Todavía había una montaña de cosas para empacar. Pero, como siempre, de alguna manera se comprimió y encajó en cuatro camiones conducidos por Bev Shade, Vickie Siegel, Jon Lillestolen, Sean Lewis, Lee White y yo. Tres días después, nos reunimos con Mike y Donna Frazier, Gerardo Morrill y Wicho Díaz en Cuicatlán, Oaxaca o "Cuica" como a los lugareños les gusta acortarlo. Wicho, Gerardo y yo tuvimos una breve reunión con el Comisariado de Concepción Pápalo, Pedro Vigil Neri, y luego nos autorizaron a comenzar la instalación del campo base. En 2017 habíamos acampado en Llano Cheve, pero estaba claro que la mayor parte del trabajo en 2018 se realizaría en la Peña Negra, por lo que decidimos colocar el campo de base justo afuera de la entrada en un bosque de crecimiento reciente de pinos de Ocote de 10 metros de altura. Esto hubiera funcionado simplemente a excepción de la caída vertical de 120 metros desde el acceso de vehículos 4x4 más cercano era a un kilómetro de distancia. El 2 y el 3 de marzo nos encontramos marchando arriba y abajo de esta colina interminablemente como una procesión de hormigas transportando todo el equipo hasta el campamento. Y luego, justo cuando todos estaban bien agotados en el transporte, la niebla se movía desde el este. Fue entonces cuando descubrimos que el clima de Llano Peña Negra era muy diferente al de Llano Cheve: el levantamiento orográfico permitió que los bancos de nubes costeras se deslizaran por los valles adyacentes hacia el campamento base sin obstáculos en el camino; Llano Cheve estaba en el fondo de un sumidero de 300 metros de profundidad, protegido por un alto borde oriental que detuvo a las nubes traslapadas, en su mayor parte. Esa noche, una fuerte y fría llovizna comenzó a caer antes de que tuviéramos la oportunidad de instalar la mayoría de las tiendas de campaña personales y la cocina principal y los centros de control de la misión. Permanecería así, alrededor del 50% de días de lluvia, durante los próximos dos meses. Dimos una conferencia en Concepción Papalo la noche del 4 de marzo a una multitud de alrededor de 300 personas. Este año, Vickie y Marcin Gala, que acababan de llegar, instalaron una cuerda para demostrar habilidades verticales y permitieron a los aldeanos locales probar suerte ascendiendo con equipo de escalada de expedición. Fue popular después de que el primer participante, una sorprendentemente confiada niña de 7 años, mostró a todos cómo se hizo.

El primer avance: Peña Negra 2018

Durante los siguientes cuatro días, todo el equipo, con 16 en el sitio, instalaron cuerdas en la Cueva de la Peña Negra hasta la cámara Perdidos en el Espacio (nivel -300m), transportó suministros para un campamento subterráneo inicial en el límite actual del Tunel Infinito en el punto más profundo de la cueva, y corrió una línea telefónica a ese campamento. Quizás el incidente más significativo durante este tiempo fue el viaje inicial de Marcin Gala y Jon Lillestolen a

Bill Stone rigging in Cueva Cheve, March 2018. /
Bill Stone armando las cuerdas en la Cueva Cheve, marzo 2018.
Kasia Biernacka.

través de la restricción "Juniper Tube" (tubo de enebro). Habían descubierto que el pequeño túnel de 40 metros de largo, conocido desde fines de abril de 2017, estaba ahora, a principios de año, medio lleno de agua. Habían logrado atravesarlo con un solo ojo por encima del agua. En el otro lado, empapados, fríos y deprimidos al pensar que este era el camino por el que todos y todo lo que entraba en la cueva tendrían que pasar, comenzaron a buscar en la Cámara de Almuerzos, más allá del camino de acceso, para una posible ruta alternativa. A seis metros de la pared sur de la cámara, Marcin vio una fisura estrecha. Escalaron la pared y descubrieron un pequeño túnel seco que llevaba al sur. Para su asombro, se conectó 60 metros más tarde con una cámara de 10 metros de diámetro en la base de la caída de la cuerda anterior, y por encima del inicio del Tubo de Enebro.

El 9 de marzo, Lillestolen, Frazier, Morril y White establecieron Campamento "Kyle" en el nivel de -437 metros adentro Cueva de la Peña Negra. Aquí había algo de broma. Como tanto Cheve como Peña Negra fueron armados en 2018, sabíamos que iba a ser un problema identificar de qué campamento subterráneo estaba hablando una persona en el sistema telefónico. Cheve ya tenía tres campamentos subterráneos: Campamento 1 ("C1", al nivel -400 metros), Campamento 2 ("C2" al nivel -805 metros) y Campamento 3 ("C3" al nivel -1,100 metros). Mike Frazier había pensado en esto y había adquirido una serie de pequeñas figuras de acción de dibujos animados de plástico de la serie animada de televisión "South Park," que ha sido popular durante más de dos décadas. Así, el primer campamento en Peña Negra se convirtió en "Campamento Kyle" (-437 metros). Otros dos campamentos en Peña Negra serían realmente establecidos: "Campamento Cartman" (-647 metros) para continuar exploraciones más profundas; y "Campamento Stan" (-311 metros) para investigar varios túneles extensos que se ramifican desde la cámara Perdidos en el Espacio (consulte el mapa del Plan para las ubicaciones). Los seis de estos campamentos fueron eventualmente vinculados por teléfonos de diseño tipo "Michie" que usa un solo conductor. La señal regresa a través de la conducción de la Tierra. El procedimiento estándar era que cada uno de estos campamentos llamara al campamento base a las 9am cada día para coordinar actividades, compartir nuevos datos y hacer solicitudes de cambio de equipo, alimentos y personal. Dos días después (11 de marzo) Shade, Lewis, Kasia Biernacka, Tomek Fiodorowicz y Mary Hicks se unieron a los otros en Campamento Kyle y fue entonces que, con dos equipos trabajando en una cueva que continuaba, e inexplorada, comenzaron a llegar los nuevos datos de topografía. Y continuó por el siguiente mes, con un promedio de medio kilómetro de topografía nueva por dia y pasajes que median con frecuencia 40 metros x 40 metros en sección transversal. Nadie había visto nada como esto en una expedición de espeleología profunda en la historia reciente.

An exploration team in Camp Cartman (-647m), late March 2018: (left to right): Witek Hoffman; Sonia Dudziak; Nick Vieira; Gerardo Morrill; and Tomek Fiedorowicz. / Un equipo de exploración en Campamento Cartman (-647m), finales de marzo de 2018: (de izquierda a derecha): Witek Hoffman; Sonia Dudziak; Nick Vieira; Gerardo Morrill; y Tomek Fiedorowicz. *Kasia Biernacka.*

No mucho después de esto, se recibió una llamada en el campamento base de Lillestolen sobre su progreso en la continuación profunda del Gran Tunel Infinito ("Infinite Borehole"). Tal como lo relató con Marcin Gala, que se desempeñaba como coordinador del campamento base, se habían encontrado con un pasaje "altamente técnico." Finalmente, llegamos a comprender que habían usado 65 juegos de plaqueta y tornillo para roca en un solo día junto con varios cientos de metros de cuerda para preparar la ruta. Lo que había sido un pasaje gigantesco se convirtió en un pasaje gigantesco con bloques rectangulares del tamaño de una casa atorados entre las paredes verticales del cañón. En muchos casos no había piso para caminar: los hoyos entre esos bloques tenian caidas de hasta 30 o más metros hasta el sonido de una corriente que retumbaba abajo. En lugar de caminar con facilidad, ahora había una red de travesías, rápeles y escaladas. A menudo, el paso terminaría contra una pila gigante de estas rocas y uno podría ver, 30 o más metros más arriba, un gran pasaje en el techo del enorme túnel. Gerardo Morril había realizado algunas escaladas espectaculares para superar estos obstáculos y ahora había una serie de tiros amarrados con cuerda de más de 30 metros libres que conducían al techo, solo para cruzar una roca gigante y enfrentarse con un rappel (decenso vertical) igual por el otro lado. Este ciclo se repitió varias veces, devorando la cuerda y los accesorios de anclaje. A las dos semanas de nuestra llegada a la montaña, los datos de la topografía indicaron que el pasaje principal (Infinite Borehole) se dirigía enteramente hacia el noroeste, por lo que parecía ser una conexión inminente con Cueva Cheve en algún lugar entre el Pozo de Saknussemm y el Campamento 2 al nivel -800 metros en Cueva Cheve.

Un cambio de rumbo

Marcin Gala, Corey Hackley y Nathan Roser llegaron al Campamento Kyle el 15 de marzo y reemplazaron al equipo de Lillestolen. Al día siguiente,

descendieron verticalmente 76 metros y exploraron medio kilómetro de túnel grande que continuo más allá de un tiro de 60 metros donde el grupo anterior se había detenido. El tiro fue el más profundo que se descubrió en Peña Negra y tuvo una caída de agua significativa en él. Cuando hubo un aguacero en la superficie, frecuente este año, se convirtió en una lluvia torrencial y fría para cualquier persona que estaba subiendo la cuerda. El equipo de Gala llegó a un punto 300 metros de conductos conocidos en Cueva Cheve antes del túnel gigante en el que se encontraban, que se dirigía predominantemente al noroeste, realizó un giro brusco de 120 grados hacia el este. Al día siguiente (17 de marzo), Gala, Lewis, Roser, Bristol y Hackley descubrieron otro medio kilómetro de túneles enormes (en un punto que alcanzaron dimensiones medidas de 50 metros de ancho y 80 metros de altura) en dirección este, marcados por una serie de enormes conos huecos, algunos de más de 70 metros de ancho y 50 metros de profundidad, que parecían estar arrastrando material hacia el norte, hacia Cheve. Eran como embudos de hormigas gigantes. Cálculos posteriores mostraron que la base del segundo de estos embudos estaba a 50 metros sobre un túnel conocido en Cheve. Antes de este descubrimiento, sin embargo, la cueva parecía descender hacia un callejón sin salida en un cañón con suelo azolvado. Corey Hackley se había regresado hacia arriba por la pendiente y comenzó a investigar una fisura angosta, con incrustaciones de "palomitas de maíz" (un tipo de formación de cuevas), hacia el norte. Siguió este túnel improbable unos 60 metros antes de abrirse repentinamente hacia lo que parecía ser la continuación del enorme túnel principal, aún en dirección este. Sin embargo, la pista lateral en el cañón de suelo azolvado no había sido sin mérito. Posteriormente informaron que este era el único lugar plano que habían visto en casi 4 horas de viaje continuo y que serviría como un campamento avanzado, que pronto se conocerá como "Campamento Cartman".

Dos días después, Lillestolen, Adrian Miguel Nieto, Morgan Smith, Nick Vieira y Gerardo Morrill establecieron Campamento Cartman y se prepararon para un avance de cinco días. El 21 de marzo, Vieira amarró en una compleja serie de túneles debajo del segundo embudo gigante con Miguel-Nieto dibujando el mapa y Morrill y Lillestolen ejecutando los instrumentos para medir distancia, dirección e inclinación. Las líneas de abastecimiento se empezaban a agotar hacia Campamento Cartman y se estaban quedando sin tornillos, pero los pasos verticales seguían llegando. Vieira tuvo que usar eslingas y redirecciones en lugares donde normalmente se habrían establecido fraccionamientos, pero su suministro de cuerda se mantuvo. Eran las nueve de la noche cuando el teléfono del campamento base cobró vida con el Campamento Cartman en la línea. Vickie Siegel había estado usando los teléfonos esa noche y había gente dispersa por el campamento preparando la cena y bebidas calientes para combatir el frío que había llegado. Mi libro de registro redacta lo que sucedió a continuación:

Estaba ocupado recalentando un poco de chocolate cuando Vickie gritó: "!Bill, ven, se han conectado con Cheve¡" Jon estaba en la línea informando que se habían conectado en varios lugares, pero el primero fue en la estación de reconocimiento CC13. Jon luego dijo: "Bill sabe dónde está, es su estación 1." Marcin Gala había predicho esta posibilidad el día anterior y de hecho es donde bajaron hoy. La única persona decepcionada esta noche fue Corey Hackley, quien insistió en que deberían haber permanecido en lo alto del túnel grande que había visto más allá de los grandes embudos y posiblemente haber evitado a Cheve hacia el este. A pesar de esto, hubo una celebración inmediata en el campamento base que se prolongó hasta pasada la medianoche.

La conexión con Cheve fue emocionante: el descubrimiento de una conexión entre los principales sistemas de cuevas es siempre un evento raro. Pero debajo de la celebración hubo cierta decepción. Una conexión significaba que una "cueva nueva" acababa de ser absorbida por el "Sistema" Cheve. Algunos se preguntaron en voz alta si esto era justo, ya que la Peña Negra, en general, tenía túneles mucho más grandes que los de Cheve. ¿Por qué no Sistema Peña Negra? Pero eso sería contrario a un largo precedente. Peor, sin embargo, habíamos estado contando con la Peña Negra para, de hecho, evitar a Cueva Cheve ... para rodearlo hacia el este. Durante los siguientes días, Tomek Fiedorowicz y Lee White se unieron a los de Campamento Cartman, al igual que Witek Hoffman, Kasia Biernacka y Sonia Dudziak. Juntos, extendieron el gran tunel sobre los grandes embudos, varios cientos de metros más al este, antes de que un colapso en el túnel detuviera el progreso. Un pasaje lateral que conducía al sur se abría a más de un kilómetro de galerías ascendentes, que denominan "La Ruta de la Seda" (no por ningún rasgo geológico en particular, sino más bien porque, al igual que la Ruta de la Seda de la historia antigua, esperaban que llevara más al este), que eran paralelas al Infinite Borehole descendente, pero se desplazaban 600 metros hacia el este. Pero los esfuerzos por encontrar un desvío al este de Cheve parecían haberse estancado.

A finales de marzo hubo un éxodo completo desde Campamento Cartman. Pero para entonces ya habían estado ocurriendo otras cosas, especialmente Cueva Cheve que había sido armado hasta el Campamento 2. El armado de la parte inferior de Cheve (más allá del Campamento 2) aún estaba en progreso cuando se dieron cuenta en Cartman que un viaje de entrada y salida ahora era posible. Y así, el 28 de marzo, Vieira, Hoffman, Dudziak y Fiedorowicz eligieron salir por Cheve, completando así el primer viaje de Peña Negra a Cheve, una travesía de más de 6 kilómetros bajo tierra.

Sean Lewis explores the gigantic "Calles de Papalo" section of Cueve de la Pena Negra. The tunnel at one point reaches dimensions of 50 m wide and 80 m tall. Note the person in the distance for scale. / Sean Lewis explora la gigantesca sección "Calles de Papalo" de la Cueva de la Peña Negra. El túnel en un punto alcanza dimensiones de 50 m de ancho y 80 m de altura. Tenga en cuenta la persona en la distancia para la escala. *Kasia Biernacka.*

En las Calles de Papalo

Mientras se estaban descubriendo kilómetros de túneles en Cueva de la Peña Negra, los equipos de armado, lentamente comenzaron a entrar en Cueva Cheve. Kristen Anderson, Adrian Miguel Nieto, Adam Byrd y Morgan Smith llegaron al Campamento 1 (-400 metros) el 15 de marzo. Byrd, Anderson y Elliot Stahl regresaron para un avance de 2 días debajo del Campamento 1 el 18 de marzo y continuaron armando hasta el comienzo de las Turbinas (-700 metros), debajo del Pozo de Saknussessm. Luego hubo una pausa de una semana antes de que Derek Bristol, Lee White, Adam Byrd y yo volvimos, planeando quedarnos en la cueva el tiempo suficiente para completar el armado hasta al Campamento 3 (-1100 metros). Nuestro cuarteto disminuyó rápidamente a 3 cuando el cerrojo de seguridad para el descensor de White falló durante el descenso de la Cascada de Ángeles (-300 metros). Como no hubo cuerdas más allá de ahí por un tiempo, White continuó con nosotros hasta el Pozo de Saknussemm ("SAK") y luego regresó al Campamento 1, donde reportó su problema al campamento base y se quedó ahí solo hasta que se le pudo traer un descensor de reemplazo el día siguiente.

Fui el Primero en bajar SAK, inspeccionando el armado del equipo anterior. Todo era cuerda nueva de Cancord 9 milimetros. Admito que la cuerda nueva me hace sentir más seguro en un lugar como este. Nunca he superado la sensación visceral de mirar una caída de 155 metros en una cueva. Y SAK era ruidoso (por la cascada), amenazante, brumoso y técnico. Hubo 14 fraccionamientos que demandaron enfoque. En la parte inferior, revisé la línea telefónica en nuestro depósito de equipo tradicional y me sorprendió descubrir que funcionaba (no se había utilizado en casi un año y las aguas de las inundaciones se desbordaban en esta sección de la cueva en verano). Marcin Gala estaba usando teléfonos en el campamento base y su respuesta tenía el tono fresco de un controlador de tráfico aéreo. En lugar de decir "Hey, la línea telefónica funciona para SAK, ¡genial!" Dijo "Puedo ver por tu progreso [lento] que no llegaras al Campamento 2 a tiempo para la llamada de las 9pm, así que planea llamar mañana a las 9am." Con solo Adam, Derek y yo ahora teníamos mochilas enormes y se sentía peligroso hacer todas las subidas difíciles en las Escaleras de Salmón. La marcha fue lenta. En un momento dado, en un incómodo rappel, de repente me di cuenta que había un solo tornillo oxidado colocado a mano que sujetaba la cuerda. La plaqueta era de acero inoxidable, pero era obvio que el tornillo debajo se corroía. Lo estudié por un minuto y luego les dije a los otros dos que necesitábamos colocar un tornillo de seguridad. Sacamos el taladro TE30. Se perforó el agujero en menos de 10 segundos, tal vez 200 veces más rápido que el que lo había hecho en 1986. Así comenzó nuestro trabajo del día: tuvimos que reemplazar varias líneas transversales tirolesas que habían sido azotadas por la tormenta. Pasamos varias horas en la brisa de las cascadas y para entonces yo tenía bastante frío y ya tenía mi capucha y un pasamontañas puestos. La siguiente travesía con tensión tenía una cuerda dañada hasta su núcleo y la sección más adelante se sostenía solamente con el 50% de las hebras del núcleo. ¡Definitivamente no estábamos llegando al Campamento 2 el día de hoy! Para entonces ya era pasada la medianoche y todos nos estábamos quedando dormidos. Afortunadamente, lo habíamos planeado con anticipación y todos teníamos nuestro propio equipo de campamento, así que cuando nos dió la 1:30am del 26 de marzo, encontramos un banco de arena junto al río (el primero en horas de viaje) y nos fuimos a hacer un vivaque por esa noche. Al día siguiente, Corey Hackley, Elliot Stahl y Lee White nos alcanzaron y los seis de nosotros establecimos el Campamento 2 y llamamos al campamento base. Marcin estaba otra vez en la línea, pero esta vez transmitía información desde Campamento Cartman: faltaron cuerdas y planeaban regresar a la entrada de Peña Negra. La línea telefónica en la cueva era una "línea abierta": cualquiera que atendiera el teléfono podía escuchar a todos en la línea.

Cartman estaba escuchando y cuando se dieron cuenta de que ahora Cheve estaba armado, y con una conexión establecida, la ruta a través de Cheve era ahora significativamente más corta que la de Peña Negra. Informaron al campo base que se irían a través de Cheve para realizar el primer viaje. Esto dejaría a Cartman vacío. A la mañana siguiente, Corey y Adam tomaron la mitad de la cuerda en el Campamento 2 y se mudaron al Campamento Cartman, mientras que Derek, Lee y yo seguimos armando Cheve hacia el Campamento 3.

Fue menos de un día después, el 29 de marzo, que Hackley y Byrd se abrieron paso a través del colapso en el extremo este de Peña Negra. Se trataba de lo que Hackley describió como un "desagradable, fangoso y estrujante " del que tenían que quitar las rocas para hacerlo suficientemente grande como para pasar. Pero fue corto y en el otro lado estaba la continuación del tunel gigante. El túnel simplemente había sido bloqueado por un gran colapso. Si bien todavía era de 50 metros de ancho para secciones grandes, el nuevo túnel también era diferente del revuelto piso de la cueva principal hasta ese punto. Grandes tramos de todo el piso del túnel estaban cubiertos de travertino suave. Inicialmente, desde la cima de la pila de colapso donde entraron, el túnel se inclinó hacia abajo y luego se niveló. A fines de marzo, Hackley y Byrd habían extendido Peña Negra medio kilómetro más al este, poniendo el final de este nuevo túnel, llamado "Calles de Papalo" en honor al pueblo, a más de 300 metros al este de la falla principal en Cheve. Esto era "tierra de nadie" y un área que habíamos esperado alcanzar durante décadas. Los sumideros en la superficie, y la separación general de las fallas geológicas en la Sierra Juárez, indicaron que debería haber otro sistema de cuevas grandes, aproximadamente a un kilómetro al este de la falla principal de Cheve. Pero los rápidos descubrimientos cesaron cuando el techo se derrumbó de nuevo. Esta vez el bypass no fue tan obvio. Hackley más tarde escribió: "Cavamos alrededor de 6 metros a través de un pequeño derrumbe fuertemente cementado con travertino. El progreso fue extremadamente difícil de lograr ... el travertino hizo que el material se comportara como una masa única. Cuando comenzamos a cavar, seguíamos una brisa tenue de aire. Cuando terminamos, estábamos confundiendo el sonido del aire que se movía a través del arrastramiento con una enorme cascada por delante. Esto me dice que la excavación probablemente ha pasado por la mayor parte de la obstrucción. Dada su ubicación, el carácter del tronco que conduce a ella y el aire [es lo más interesante]."

Aunque varios equipos regresaron a esta área en 2018, no se hicieron más progresos al final de las Calles de Papalo. Sin embargo, se hizo un curioso descubrimiento cerca del punto en que el derrumbe se abrió inicialmente en Calles de Papalo. La vía de acceso había cruzado el túnel gigante de Calles de Papalo a mitad de camino por una pendiente cubierta de travertino. La ruta principal descendió por esa pendiente, pero en dirección opuesta (oeste) ascendió 70 metros antes de llegar a la parte superior del túnel. Sobre este punto había una espectacular cúpula de 40 metros de diámetro que ascendía a la oscuridad. Hackley describió su descubrimiento:

"Tiene un mínimo de 100 metros de altura y unos 40 m de ancho cerca de la base, estrechándose hacia la parte superior. Adam y yo lo llamamos la cúpula "Big Gaz" ... pensamos que era un nombre brillante, pero pareció no gustarle a la gente cuando lo anunciamos. Curiosamente, no habíaagua cayendo por la cúpula, ni siquiera un goteo. Parecía ser casi exclusivamente de origen freático, y se asocia con la falla masiva que aísla a Calles de Papalo del tronco principal de Peña Negra. Vimos aire entrando en el pasaje de Calles de Papalo, vigorosamente, desde el punto de avance por el que entramos y la excavación terminal. El domo es demasiado grande para discernir el flujo de aire, pero el aire que ingresa al área tiene que salir a Cheve de alguna manera o subir al domo. Hasta ahora, tenemos una colección de entradas de aire pero no salidas. Es un [lugar] muy interesante."

Nos dimos cuenta hasta muy tarde en la expedición que estos enormes túneles más allá del Campamento Cartman estaban todos a un nivel dentro de la montaña, aproximadamente a 230 metros sobre el paso del arroyo activo en Cueva Cheve. La implicación era que las cuevas de Peña Negra se formaron primero, en un estrato de roca más alto que la mayor parte de Cheve, y que, por lo tanto, debe existir una cantidad de pasaje mucho mayor que no habíamos visto: paralelo, más alto, y al este de la falla principal de Cheve. Había una sor¬presa más que nos esperaba en esta área en 2018. El 5 de abril, Hoffman, Vieira y Morrill inspeccionaron otro medio kilómetro de un inusual túnel de fisuras de color negro más pequeño que se dirigía hacia el oeste desde el primero de los enormes embudos. Para su gran sorpresa, entraron en un cruce con el túnel de "Tierra de Sumideros" (Sumplands, la ruta principal al Campamento 2), justo a 50 metros del lugar donde nuestro equipo de anclaje estableció nuestro vivac tansolo 10 días antes. Era sorprendente creer que todos habían caminado por ese túnel durante 31 años y no lo habían visto. El resultado de este descubrimiento fue que ahora había un camino mucho más rápido hacia Campamento Cartman a través de la entrada de Cueva Cheve. Anteriormente, a la mayoría de los miembros del equipo les había llevado dos días llegar a Cartman a través de la entrada de Peña Negra.

Al Gran Tunel Infinito Río arriba

Justo más allá del campamento Kyle en Peña Negra, el túnel principal giró a la izquierda y llegó a un entronque, midiendo 60 metros de ancho. Este había sido el límite de exploración en 2017. A la derecha, y al norte, se encontraba la continuación del Gran

Tunel Infinito descrito anteriormente. A la izquierda había un cañón más estrecho, todavía de 10 metros de ancho, desde el cual un tiro vertical conducía a una corriente considerable. Se supuso, y luego se confirmó mediante la topografía, que esta no era la misma corriente que pasaba por Campamento Kyle. Y condujo tanto hacia arriba como hacia abajo. Hubo otra conjetura de que la dirección corriente abajo seguramente se conectaría con la otra corriente y tal vez podría ser transitable debajo de las rocas gigantes que ahora formaban el piso del Gran Tunel Infinito. Pero el túnel corriente arriba ciertamente iba a otra parte. El 11 de marzo, Bev Shade, Kasia Biernacka, Sean Lewis y Mary Hicks comenzaron la exploración y el estudio del túnel río arriba. Durante las siguientes cinco semanas se les unieron Lee White, Mike Frazier, Gerardo Morrill, Tomek Fiedorowicz, Matt Covington, Jordan Toles, Yazmin Barragan y Nathan Roser en varias ocasiones. Se descubrieron más de dos kilómetros de túneles, todos con tendencia río arriba, que terminaron en la cámara de la "Torre de las Sombras," un inestable cañón con piso de derrumbe. La última prospección a mediados de abril dejó con posibles continuaciones en ambos extremos. Esta cámara final se encontraba esencialmente al mismo nivel que la parte superior del Vórtice de Perspectiva Total (la ruta principal hacia Campamento Kyle) pero con el túnel desplazado 220 metros hacia el suroeste. Curiosamente, la sala de la Torre de la Sombra está ubicada directamente debajo del cabecero de Peña Negra (en la superficie) pero a 333 metros por debajo. Esto sugiere que no hay nada que impida un mayor desarrollo de la cueva debajo del Llano Peña Negra, a pesar de que la superficie del llano tiene una capa de roca impermeable que canaliza los arroyos de la superficie hacia grandes arroyos que se hunden en el suelo cuando se encuentran con la pared de caliza.

Gerardo Morrill (left) and Nick Vieira celebrate after making the 4th connection to Cueva Cheve, at a junction with Sumplands (-740 m Cheve) on the main route to Camp 2. The marker on the rock (written in carbide nearly 30 years earlier) marked the connection point to previously known passage. / Gerardo Morrill (izquierda) y Nick Vieira celebran después de hacer la 4ta conexión a Cueva Cheve, en un entronque con Sumplands (-740 m Cheve) en la ruta principal al Campamento 2. El marcador en la roca (escrito en carburo casi 30 años antes) marcó el punto de conexión a pasaje previamente conocido. *Kasia Biernacka.*

El Gran Túnel Boomerang

La tarde del 16 de marzo, Vickie Siegel y yo llegamos al campamento Kyle. No había nadie ahí. La situación de las bolsas de dormir estaba en desarreglo y algunas bolsas se habían dejado sobre mantas espaciales sin cubrir, absorbiendo agua. Conté 11 bolsas en el campamento, incluidas dos que no habían sido abiertas en sus botellas de transporte Nalgene originales de 4 litros. Se tomaron todos los lugares para dormer que se habían preparado, así que nos pusimos a trabajar para nivelar dos lugares más. En Kyle no faltaba arena (había una colina de 40 metros de ancho, sentada en el ángulo de talud natural, en el lado oeste del campamento), y llevé seis mochilas de 25 litros al lugar del campamento. Con esto aplanamos un sitio útil. Casi al mismo tiempo aparecieron Bev Shade y Nathan Roser, después de pasar el día explorando un cañón con suelo de travertina que salía de la enorme cámara Perdidos en el Espacio. El equipo que lo descubrió en 2017 apenas tuvo tiempo de recorrer rápidamente y observar pasajes inexplorados. Hubo muchos pasajes que continuaron más allá del límite de su visita. Casi había esperado encontrarme con alguien durante nuestro recorrido al entrar, pero llegamos a la cámara sin ver ni escuchar nada. Hubo unos 30 minutos incómodos en los que parecía que Bev y Nathan no estaban interesados en hablar con nosotros. He visto esto antes cuando se llega a un lugar remoto donde la gente ha estado trabajando duro durante días o semanas con un equipo pequeño. Éramos los intrusos. Pero finalmente se sinceró Bev y habló sobre lo que habían hecho, y nos mostró los mapas que habían producido durante la semana pasada. Ella había estado dibujando con un lápiz mecánico en hojas impermeables de 8-1/2 x 11 pulgadas que Derek Bristol había impreso, en lugar de hacerlo totalmente digital. Aunque solo un equipo en 2017 había estado utilizando los instrumentos láser DISTOX vinculados a través de Bluetooth a un programa de levantamiento/dibujo basado en tabletas, ahora esta tecnología estaba funcionando en 2018. Fue un año de transición de tecnológia. Para muchos de nosotros que crecimos dibujando mapas a lápiz en las cuevas, fue un

gran problema hacer el cambio, ya que el enfoque completamente digital tenía inconvenientes ... como menos precisión con un lápiz óptico en lugar de un lápiz de punta fina; y perder una tarjeta de memoria o perder un mapa total debido a la pérdida de energía. Varias semanas más tarde, Bev y Vickie se la pasaron retopografiando un largo dia una sección del Gran Tunel Infinito donde se habían perdido datos digitales de todo un día en esa manera. Pero con el tiempo, esos problemas se resolverán y la gente algún día se preguntará cómo fue posible realizar topografías en cuevas con lápiz y papel. Durante los meses anteriores a la expedición del 2018, había estado estudiando los datos de la topografia de la Cueva de la Peña Negra. La cámara de Perdidos en el Espacio contenía una serie de túneles que continuaron. El más intrigante fue etiquetado como "LOKCM" ... las primeras iniciales de los nombres del equipo de exploración a finales de abril de 2017. La parte importante fue que este túnel en particular estaba alejándose de la cueva principal en dirección este - en la sección en blanco del mapa a donde queríamos ir. Derek Bristol había visitado a este túnel unos días antes y había descubierto una fisura estrecha que parecía salir a lo largo de un profundo cañón, como lo demuestran los ecos persistentes que siguen a sus gritos. No tenían cuerda, por lo que el lugar permaneció sin investigar hasta que Vickie, Nathan y yo regresamos al lugar el 17 de marzo. No pudimos encontrar la fisura de Derek, pero de cualquier forma terminamos instalando una cuerda por una ruta alternativa hacia el cañón. Todo el lugar estaba cubierto de travertino con una serie de pequeñas cascadas justo en los lugares precisos, de tal modo que uno se mojaba desde el inicio. El pasaje se abrió de inmediato a un corredor decorado de formaciones de 10 metrosde ancho que, 100 metros más adelante, se extendió a un cañón profundo que parecía tener extensiones tanto hacia arriba como hacia abajo. Pero a estas alturas ya nos habíamos quedado sin cuerda. Dos días después volvimos con una cantidad de cuerda considerable, la mayor parte de ella, se utilizó para hacer el armado de las travesias rio arriba en el cañon. Una serie de esca ladas y rampas de travertino le siguieron con tiros verticales. El último descenso nos dejó en un pequeño túnel cubierto por travertino. Vickie siguió adelante, encontrando la ruta. Ella pronto nos gritó que estábamos en un territorio abierto. Adelante encontramos un túnel 15 metros de ancho y 10 metros de alto. Había una cúpula con forma ovalada escalonada en el techo que era sorprendentemente multicolor, como el ojo de Júpiter. Por lo tanto, el nuevo descubrimiento se convirtió en el "Tubo de Júpiter." El suelo era una superficie ondulada de placas de color negro de 2 centimetros de espesor que a la medida que avanzabamos dejaban escapar unos fragiles crujidos y rechinidos conforme avanzábamos. La nitidez de los bordes sugiere que el colapso que creó el piso fue reciente, pero eso puede ser engañoso en las cuevas.

En última instancia, más de un kilómetro de túneles nuevos se descubrieron más allá del Ojo de Júpiter, algunos de ellos alcanzando secciones transversales de 15 x 15 metros. Inicialmente, el pasaje se dirigió hacia el sur durante 400 metros; luego de repente giró hacia el este. Wicho Díaz, Jordan Toles, Vickie Siegel y yo exploramos esto hasta que nos quedamos sin cuerda el 1 de abril, 300 metros más al este. El 5 de abril, Siegel, Toles, Bev Shade, Yazmin Barragan y yo regresamos y nos sorprendimos al encontrar el túnel girando bruscamente hacia el norte, donde, varios cientos de metros más lejos, nos detuvimos en un colapso del túnel, aparentemente causado por una cascada entrante. Los múltiples cambios en la dirección, dirigiéndose primero al sur y luego al este, y luego finalmente volviendo al origen al nombre "Gran Tunel del Bumerang." Supusimos que el pasaje se había enrollado alrededor de un anticlinal con los segmentos sur y norte, esencialmente en los mismos estratos rocosos pero en lados opuestos del pliegue; el segmento central, siguiendo al este, estaba irregular y desgarrado, lo que apoyaría la idea de que estaba cortando por medio del anticlinal y diferentes estratos contribuyeron al terreno difícil. Completando la imagen extraña fue la presencia de tres cúpulas independientes cerca del área del cambio de dirección del pasaje, cada una en exceso de 60 metros de altura, lo que potencialmente lleva a un nivel superior que puede evitar el colapso al final del túnel.

El Sombrero Loco

El 29 de marzo, Derek Bristol, Lee White y yo salimos del campamento 3 en Cheve, habiendo completado el armado de la cueva, y comenzamos a ascender hacia la entrada. Apenas llegamos al Campamento 2 cuando Yuri Schwartz y Nathan Roser llegaron de la superficie. También estaban Corey Hackley y Adam Byrd que habían estado explorando en Peña Negra pero permaneciendo en el Campamento 2. Nuestro equipo del Campamento 3 originalmente tenía la intención de salir a través de Cueva Cheve al día siguiente, pero se necesitaba ayuda en el Campamento Kyle. El campamento Cartman ahora se desocupó, y Yuri necesitó una tercera persona por seguridad para su equipo en el Campamento 3. El plan que evolucionó hizo que Lee se uniera a Yuri y Nathan a la mañana siguiente y regresara al Campamento 3 para comenzar a trabajar en el camino ventoso descubierto al final de la expedición 2017; Derek y yo nos propusimos salir de la cueva por la Peña Negra a través de la ruta de conexión original junto con Hackley y Byrd. Los dos últimos se ramificaron cuando llegamos al segundo embudo grande en Peña Negra. Ellos siguieron descubriendo el túnel de Calles de Papalo, como se describió anteriormente. Me quedé en Campamento Kyle para ayudar con las exploraciones del Tubo de Júpiter mientras Derek completaba el primer viaje de Cueva Cheve a la entrada de

Cueva de la Peña Negra.

En el Campamento 3, Swartz y su equipo se instalaron durante tres días de trabajo en un intento por eliminar las rocas encajadas en el pasillo que lleva el viento, que Yuri había dado ahora el nombre de "Lo que el Viento se Llevó." Avanzaron 20 metros por un tubo inclinado antes de agotarse los suministros. Nuestro equipo de armado no había ingerido ningún alimento ni combustible durante nuestra breve visita, por lo que todo lo que teniamos con nosotros eran los recursos limitados que podiamos cargar hasta ahí en una mochila. Salieron de la cueva el 4 de abril. Sin embargo, después de un solo día en la superficie, Yuri y Gerardo Morrill regresaron a la cueva el 6 de abril, llegando al Campamento 3 el 7 por la tarde, luego de una noche en el Campamento 2. El 8 de abril llegaron al fondo del tubo inclinado y comenzaron a ascender, avanzando otros 5 metros. Mientras tanto, Sean Lewis, Lauren Satterfield y Adam Byrd entraron a Cheve el 8 de abril y llegaron al Campo 3 la noche del 9 de abril. Entonces Ellos iniciaron por cinco días intensos la completa antítesis de la exploración en Peña Negra. En lugar de un túnel de 40 metros de diámetro, tuvieron la suerte de ver un pasaje con diámetro de 1 metro. La mayor parte fue menos. Siguiendo 5 metros más en un túnel tan apretado que la roca tocó todas las partes de tu cuerpo la cueva cambió repentinamente. Era como si hubieran entrado en un vasto vacío subterráneo, excepto que el vacío estaba lleno de canicas gigantes. La progresión a través de los espacios en las "canicas" (grandes bloques de derrumbe) fue lento, constante ... y frustrante. ¡Otros topografiaban kilómetros de tuneles grandes en esta misma montaña!

El 15 de abril, los refuerzos en la forma de Jon Lillestolen, Oscar Berrones y yo llegamos al Campamento 3. Yuri y Gerardo habían salido de la cueva el 12. Así que ahora teníamos un equipo de 6 en el Campamento 3 con la idea de investigar todas las opciones que pudieramos antes tener que comenzar el desarme el 22 de abril. Sean Lewis estaba en el campamento, solo, cuando llegamos. Después de cuatro viajes de más de 10 horas, se había cansado y necesitaba un día libre. Podía sentir la desesperación en su rostro. Adam y Lauren se habían ido otra vez al frasco de mármol ... ahora conocido como "El Derrumbe del Sombrerero Loco" ... y regresaron tarde en la noche después de haber hecho solo un progreso incremental. Hasta el momento, se había realizado un total de 12 prospecciones en el área del Sombrerero Loco y el conteo de la topografía fue de poco más de 200 metros, con un promedio de 16 m por día. La alusión fue que cualquier persona que todavía esté trabajando en este problema (como a diferencia en los grandes túneles de la Peña Negra) tenía que estar loco. A la mañana siguiente, pude ver personalmente a qué se enfrentaban, y comprendí al instante las emociones de Sean de la noche anterior. La sección de "Lo que el Viento se Llevó" al principio tenía solo unos 30 metros de largo, pero muy estrecho y los 20 metros iniciales descendieron en un ángulo de 30 grados a un entronque con una pequeña corriente. Para ser claros, esta "habitación" era apenas lo suficientemente ancha como para poder girar el cuerpo hacia adentro. Simplemente parecía más grande en comparación con el tubo ajustado en el camino hacia abajo. Ahí se puede dar la vuelta y dirigirse a otro tubo del tamaño de tu cuerpo en la roca base. Ciertamente, no habían desperdiciado más esfuerzo que el mínimo necesario para pasar. Otros 10 metros de túnel apretado hacia arriba a través de esto y había una pared de la roca base a la izquierda y rocas del tamaño de un camión a la derecha. Por unos momentos muy breves estuvimos en un pasaje de 2 metros de ancho y 5 metros de altura. Estábamos más allá de Lo que el Viento se Llevó. El Sombrerero Loco se adelantó. Luego subió, subió, subió entre las rocas hasta que llegamos a la estación ZDE63, el punto más lejano alcanzado por Lauren y Adam. Durante las siguientes 8 horas, Jon, Oscar y yo topografiamos laboriosamente entre las rocas, mientras que en la

Witek Hoffman, Bill Stone, and Vickie Siegel at Camp Kyle study the maps of the latest discoveries in Cueva de la Peña Negra. These maps were drawn by hand in the cave using a mechanical pencil (0.5mm). New digital technology is gradually replacing this ancient method of cartography. / Witek Hoffman, Bill Stone y Vickie Siegel en Campamento Kyle estudian los mapas de los últimos descubrimientos en Cueva de la Peña Negra. Estos mapas fueron dibujados a mano en la cueva usando un lápiz mecánico (0.5 mm). La nueva tecnología digital está reemplazando gradualmente este antiguo método de cartografía. *Kasia Biernacka.*

distancia no lejana, se podía escuchar a los demás intentando encontrar la ruta. El lugar no era estable. Ningún humano había estado aquí, lo que significaba que la matriz de arriba, una extensión aparentemente ilimitada de "canicas" en este gigantesco derrumbe, podría desprenderse si alguno de nosotros accidentalmente movía la roca equivocada en un esfuerzo por seguir el viento elusivo. Hubo choques periódicos de piedras cayendo mientras los otros intencionalmente movían las pequeñas rocas del camino. Rocas sueltas e inestables abundaron. Algunas te matarían si cayeran en un momento inoportuno mientras estabas escalando o deslizándote junto a ellas. De todos los peligros objetivos que existen en cuevas inexploradas, este es el que más me molesta.

El viento que normalmente atraviesa por aquí, lo que lo convertía en un lugar desagradable e hipotérmico, como lo supimos en 2017, ahora estaba tranquilo, quizás relacionado con las tormentas prolongadas en la superficie. Paradójicamente, necesitábamos el viento para mostrarnos el camino. Sean y su equipo investigaban todos los vacíos, pero en general la tendencia era que íbamos hacia arriba y lentamente hacia el este. La verdadera pregunta era: ¿qué tan grande era este derrumbe y cómo podríamos salir de el? El viento era nuestro único guía. A cien metros sobre nosotros se encuentra la "Sala Precursor" (Harbinger Hall), explorado en la década de los 90s. Pero era una cámara sin salida, sin flujo de aire ni camino a seguir. Entonces, ¿a dónde iba el viento? Sabemos que tenemos que ir al este (Cheve está a 5 kilómetros al oeste de los manantiales del nacimiento, abajo del pueblo de Santa Ana Cuauhtémoc) y hasta ahora la única manera de ir al este en esta cueva es interceptar una fractura por corte en los estratos rocosos que van desde el noroeste al este/sureste. Lo habíamos visto en otras partes de Cheve (el fuerte giro en el Gran Tunel Infinito antes de Campamento Cartman es un buen ejemplo) y también era una característica geológica conocida en Huautla. Por lo tanto, parecía que el túnel principal más allá del Campamento 3 había hecho exactamente eso, de repente giró hacia el este. Pero a menos de 100 metros, el enorme túnel se detuvo en esta gigantesca pila de rocas derrumbadas (rematada por la Sala Precursor). Eso deja abierta la pregunta: ¿continúa la cueva principal al este del gran colapso? Si es así, entonces el Sombrerero Loco está simplemente bordeando el lado norte del cono gigante de colapso y tenemos que ir más al este. ¿Qué tan arriba debemos estar para encontrar el conducto fósil … el pasaje antiguo que pasa por alto el derrumbe? Esto era de lo que hablabamos alrededor de la estufa cada mañana y tarde en el Campamento 3.

Hicimos otro intento desesperado de 12 horas contra el Sombrerero Loco el 17 de abril. Agregamos 100 metros a la topografía, totalizando 305 metros de ganancia en 14 días de trabajo. Sean descubrió lo que parece ser una sección descendente del derrumbe hacia el norte. Pero no hubo avances, solo un progreso limitado y no hay pistas definitivas sobre qué camino tomar. Así que el Sombrerero Loco ganó esta ronda. El recuerdo de la experiencia desagradable, afortunadamente, se desvanece con el tiempo. Un estudio más a fondo del mapa de computadora en 3D sin duda convencerá a alguien para que regrese aquí, ya que el aire va a alguna parte y todavía está a una distancia de 15 kilómetros en línea recta de los manantiales del resurgimiento.

Mary Hicks (left) and Jon Lillestolen in the 140 m diameter Lost in Space chamber in Cueva de la Peña Negra. / Mary Hicks (izquierda) y Jon Lillestolen en la cámara Perdidos en el Espacio de 140 m de diámetro en la Cueva de la Peña Negra. *Kasia Biernacka.*

Por encima de la ASB

El Gran Tunel de Arne Saknussem (o "ASB" en sus siglas en ingles), la sección final de la cueva que conduce al Campamento 3 en Cheve, se descubrió en 1989. Durante los siguientes 29 años, equipos de exploradores, cargando mochilas pesadas con equipo, comida, cuerda y ocasionalmente equipo de buceo, habían avanzado por este tramo de un kilómetro de cañón muy grande, con un promedio de 10 a 20 metros de ancho y hasta 55 metros de altura. Todos lo consideraron como un túnel rectangular monolítico sin pasajes

laterales. Hay un punto icónico en el túnel, muy fotografiado, donde una enorme roca cuelga suspendida entre las paredes del cañón. Directamente debajo de él, en la pared oeste, se ven claramente las letras "A" y "S", en calcita blanca sobre roca de color canela. La tentación de asignar las palabras "Arne" y "Saknussem" a esas letras era obvia Pero eso fue todo, fue solo un túnel.

Pero los nuevos descubrimientos en la Cueva de la Peña Negra habían cambiado nuestra forma de pensar. En algún lugar, hasta 230 metros sobre la corriente actual del arroyo Cheve y hacia el este, hay una cueva muy antigua. Y como las conexiones de Peña Negra con Cheve en 2018 habían demostrado, existen túneles de unión entre estas dos cuevas separadas verticalmente. La mañana del 16 de abril, seis de nosotros estábamos sentados alrededor de la estufa en el Campamento 3 en Cheve. Era evidente que el entusiasmo se desvanecía por regresar al Sombrerero Loco y se declaró un día libre en el campamento. Fue entonces cuando Sean Lewis mencionó haber visto algo en el techo del túnel cerca de la roca de la firma "A.S." Alrededor de las tres de la tarde, cuatro de nosotros (Jon, Oscar, Sean y yo) partimos para ver si realmente había algo ahí. En efecto, con todas nuestras luces más brillantes iluminando el techo, parecía haber un túnel allá arriba. De hecho, también había una negrura en el lado oeste del cañón, ambos a nivel del techo. Oscar trajo un instrumento de topografía DISTOX y medimos 55 metros hasta el techo.

Dos días después, todavía aturdidos por la fallída exploración final del Sombrerero Loco, pasamos la mayor parte de la mañana armando el equipo de escalada con partes y piezas de otros equipos. Había dos juegos completos de equipo de escalada con tecnología de punta en la Peña Negra, pero eso estaba muy lejos de nosotros. Así que hicimos dibujos rápidos de la telaraña; agrupamos nuestros mosquetones; y formamos escaleras ajustables a partir de una cuerda dinámica de 9 milimetros y dos poleas Petzl Microtraxion en lugar de las escaleras ajustables Yates que usamos normalmente. Con un poco de búsqueda, Adam se encontró con tres viejos "etriers" (escaleras fijas hechas de eslingas de nylon) en el Campamento 3. Afortunadamente, también encontramos una cuerda dinámica PMI de 10,2 milimetros de longitud de 35 metros y un ATC para el aseguramiento que se había dejado en el Campamento 3 después de la expedición del 2017. El resto del equipo (taladro, martillo, llave inglesa, tornillos) lo teníamos en nuestro equipo general de anclaje y parecía que teníamos suficientes tornillos y baterias para el taladro para hacerlo. Armados con este kit improvisado de escalada, nos pusimos en camino para abordar un muro en extraplomo de 55 metros. Nos subimos en turnos de dos personas. Todavía teníamos el taladro TE30 de Sean, que no era óptimo para lo que intentábamos hacer (era pesado) pero, por otro lado, perforaba agujeros para tornillos en 10 segundos, lo cual es difícil de discutir. La roca al principio era suave, sólida y el ángulo de ascenso era, inicialmente, menos de 90 grados en vertical, lo que facilitaba el avance. Sin embargo, esto cambió dramáticamente al final del día. Oscar lideró el primer lanzamiento de 15 metros con el aseguramiento de Adam. Estos dos se tomaron un descanso y Lauren dirigió el siguiente lanzamiento de 15 metros. Me aseguró desde una pequeña repisa donde Oscar se había detenido. Al final de cada lanzamiento, montamos una cuerda estática de 9 milimetros. Adam luego subió alrededor de las 10pm con Lauren asegurando el tercer y cuarto lanzamiento. Fue entonces cuando la roca comenzó a romperse y el techo a ponerse en extraplomo.. Para la una de la madrugada, todavía estaban a 15 metros por debajo y a 20 metros de lo que pudiera haber arriba, incluso desde esa altura no podíamos ver exactamente lo que estaba ahí debido al techo en extraplomo. Todavía era posible que todo este trabajo llevara a nada más que a un pasaje sin salida.

La tarde siguiente (19 de abril) con Lauren asegurándo mientras colgaba de los anclajes y de pie en muy pequeñas repisas, Adam terminó la escalada. Era una ruta tediosa en roca saliente, pero a las 10 de la noche ya estaba en la cima. Nos había llevado solo un día y un cuarto en alcanzarla. Un ascenso similar en 1980 (el Domo Mil Metro en la cueva Li Nita en Huautla) se realizó durante más de dos semanas de esfuerzo con los tornillos colocados a mano. La tecnología mejorada significó que la idea de escalar 230 metros para alcanzar un nivel más antiguo de cueva no era una fantasía imposible.

La mañana del 20 de abril nos encontramos a Jon, Adam y yo en la cima con equipo de topografía. Entonces fue obvio que teníamos un verdadero túnel en dirección al este. Era difícil no estar emocionado. El túnel se dirigió hacia el norte temporalmente, luego regresó al este, luego al norte, luego al este otra vez antes de finalmente romperse en un túnel de 20 metros de ancho unos 200 metros al este de la ASB. El suelo estaba cubierto de rocas rotas muy pequeñas que se inclinaban de oeste a este. Un enorme y colorido espejo de falla formó la pared este. Había una restricción unos 150 metros más adelante y luego se abrió de nuevo durante otros 100 metros antes de cerrarse en un colapso. Sentíamos que seguramente habiamos pasado desapercibido algo, así que retrocedimos lentamente 500 metros hacia las cuerdas, viendo a lo largo de la pared este en busca de algo con dirección al este. Jon encontró una fisura estrecha que descendía a una caída vertical que llevaba el viento soplando.

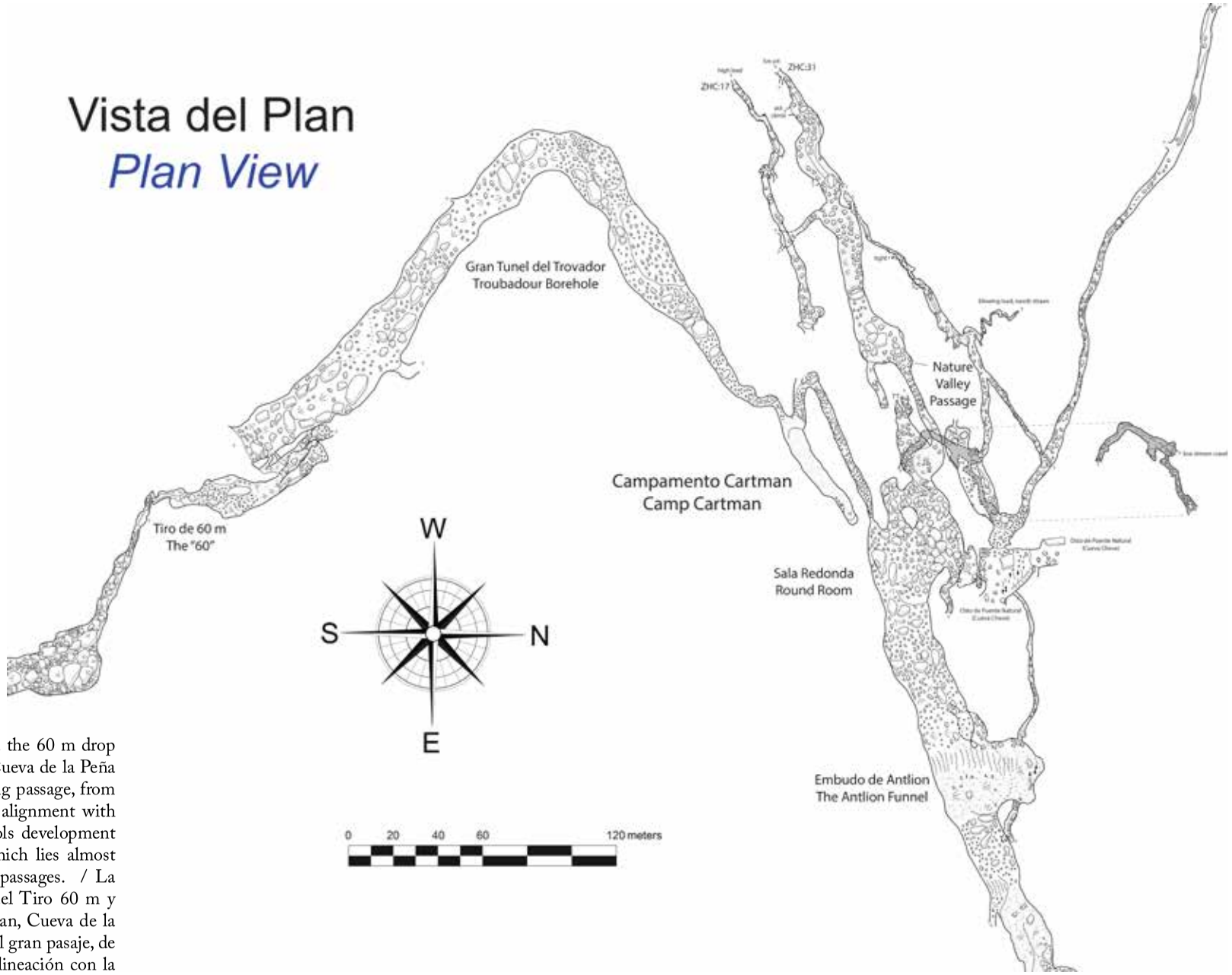
"Estoy seguro de que puedes caber," dijo Witek Hoffman con confianza en su inglés con acento polaco. Su voz llegó desde algún lugar de la fisura. Yo, por otro lado, estaba bastante seguro de que no "cabería." Fue el 21 de abril, y fue el último viaje de exploración de la expedición. La tarde anterior, Witek y Sonia Dudziak hicieron un viaje especial al Campamento 3 trayendo comida, que finalmente nos habíamos terminado esa mañana: habíamos

Adam Byrd near the top of the 55 meter tall ASB, near Camp 3, Cueva Cheve. All of this vertical height was gained from the floor of the tunnel over the course of less than two days using techincal climbing methods. / Adam Byrd cerca de la cima del ASB de 55 metros de altura, cerca del Campamento 3, Cueva Cheve. Toda esta altura vertical se obtuvo desde el piso del túnel en el transcurso de menos de dos días utilizando métodos de escalada técnica. *Jon Lillestolen.*

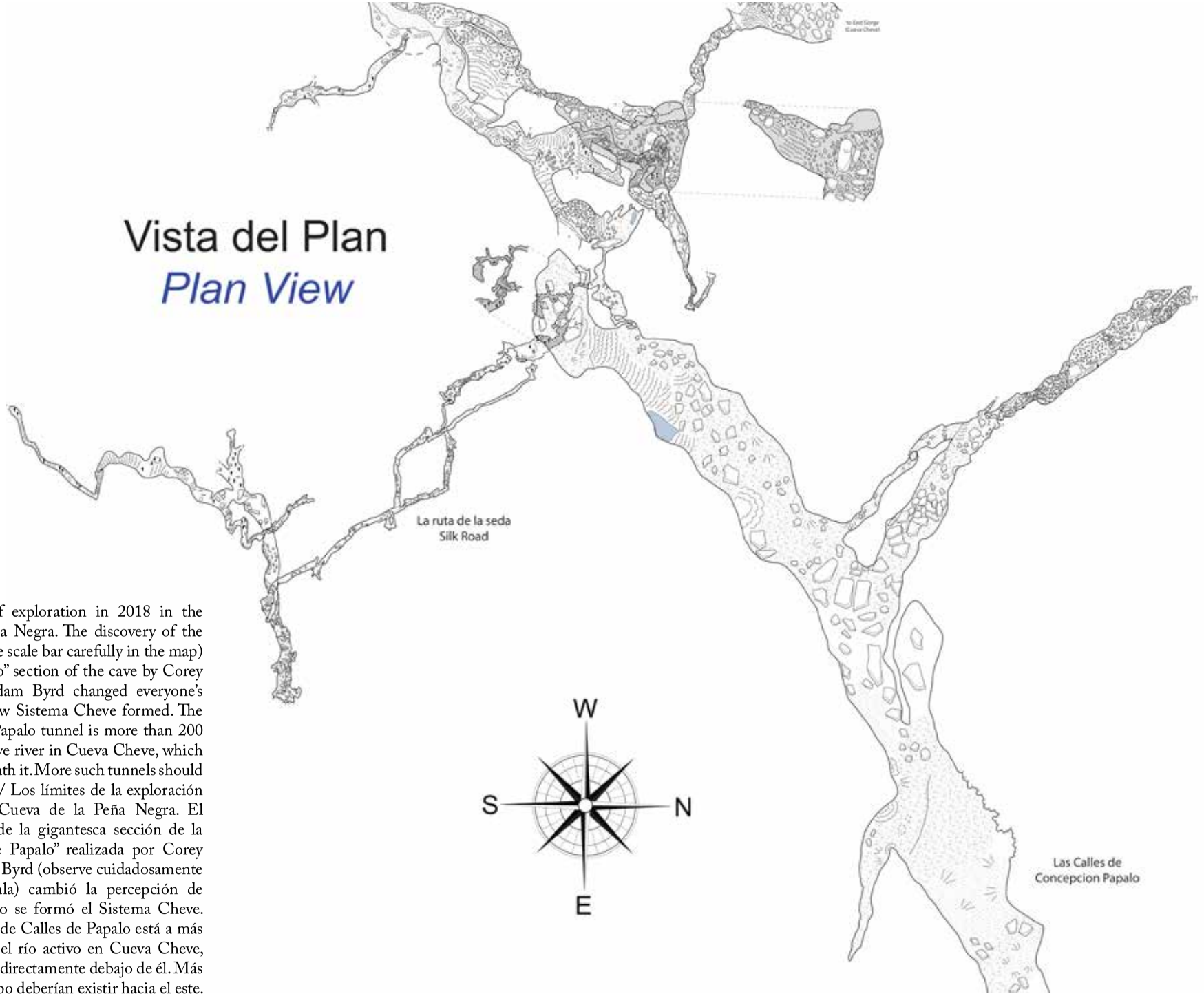
Bill Stone creates a digital map of the tunnel at the top of the ASB canyon. In the distance Adam Byrd make the first exploration of what lies beyond. The fact that this tunnel exists at all - at the ceiling of a major passage in Cueva Cheve and leading perpendicularly away to the east - suggests that the cave is much more complex than previously believed. / Bill Stone crea un mapa digital del túnel en la parte superior del cañón ASB. En la distancia, Adam Byrd realiza la primera exploración de lo que está más allá. El hecho de que este túnel exista en absoluto, en el techo de un pasaje principal en Cueva Cheve y que se aleja perpendicularmente del pasaje principal, sugiere que la cueva es mucho más compleja de lo que se creía anteriormente.

estado racionándola durante los dos días anteriores. Ese mismo día, Sean, Lauren y Oscar salieron y Adam, que había estado trabajando durante 14 días seguidos, decidió quedarse en el campamento y comenzar la limpieza del Campamento 3. Y así, Witek, Sonia, Jon y yo habíamos regresado a esta fisura en el nuevo pasaje en la parte superior de la escalada de 55 metros, que ahora recibió el nombre de "Falla en su Dirección General" (otra obra de teatro en un sketch de Monte Python), por la presencia del espejo de falla que había cambiado la dirección de la cueva de regreso al noroeste: la dirección principal de la brújula que parece controlar la formación de Cueva Cheve. Así que los cuatro estábamos en la fisura de Jon. Witek emergió diciendo que estaba a medio camino del tiro de Jon y que continuaba pero que se necesitaban cuerdas. Luego procedió a amarrar 2 cuerdas y una línea transversal. Mientras Witek seguía confiando, a Jon le preocupaba que la fisura fuera demasiado estrecha para mí. Debí haber tomado ese consejo y les hubiera dado el equipo de topografía en ese momento. Estaban cubiertos de lodo y yo no había traído mi traje (solo estaba en una camisa y pantalones cortos de nylon). Cuando llegó el momento de examinar el primer tiro vertical, todo salió bien, pero luego vi que la fisura atravesaba y se detuvo. Todos los que estaban delante de mí eran individuos mucho más pequeños. Contra un mejor juicio [¡nota para mi futuro yo!] me abrí paso en la travesía. No había puntos de apoyo y las paredes estaban resbaladizas: nada más que lodo rebaloso en paredes lisas sin bordes en ninguna parte. La tendencia era deslizarse hacia abajo en la grieta, y quedar atrapado ahí. Así que incluso con la cuerda transversal todavía era una lucha mantenerse lo suficientemente alto en la fisura para moverse. Había una protuberancia obvia en la pared justo antes de la cuerda vertical de decenso al final de la travesía. Continué, a pesar de que mi hebilla del arnés se atascó varias veces. Era una fisura inclinada hacia abajo y la fuerza de gravedad ayudó. Cuando llegué a la cuerda, coloqué un ascen¬sor de seguridad en la línea y armé mi "marimba" (descensor). Luego miré de nuevo, preguntándome cómo diablos iba a salir.

Pero el túnel debajo era más grande, así que bajé para hacer la topografía. Terminamos tal vez a 40 metros al este del túnel principal antes de que terminara nuestra prometedora exploración. Después de un tercer tiro, giró hacia el noroeste y bajó por una fisura angosta a una habitación llena de lodo, al final de la línea. Así que comenzamos nuestro retiro alrededor de las 8pm, con los datos de la topografía en mano. Habíamos hecho nuestro trabajo. Todo salió bien hasta que llegué a la fisura por encima de la segunda cuerda. Me enviaron primero, tal vez por diversión, pero nuevamente, si me quedaba atrapado ahí, ninguno de ellos saldría tampoco. Lo intenté cuatro veces y me atoré lo suficientemente como para convencerme de que no podía pasar. La fuerza de gravedad no estaba de mi lado esta vez y la protuberancia en la pared presentaba un problema grave. No tenía otra opción con respecto a tener mi equipo vertical puesto que acababa de subir con una cuerda a la fisura. La hebilla del arnés era el problema principal: no podía forzarla. Bajé y discutí esto con los demás. Esta era una situación un tanto desesperante, pero nadie estaba en pánico todavía. Teníamos un taladro y un martillo todavía. Jon subió y se puso a trabajar en la protuberancia en la pared. Entre el taladro y el martillo, logró quitar algo de la parte inferior del bulto. Por suerte eso demostró ser suficiente para que yo lograra salir. Nos reagrupamos en el gran túnel, bromeando acerca de nuestra antigua situación. En realidad, había sido mi dilema, todos podrían haberme dejado



The first exploration beyond the 60 m drop and the Camp Cartman area, Cueva de la Peña Negra. The sharp turn in the big passage, from northwest to northeast signals alignment with the geological fault that controls development of tunnels in Cueva Cheve, which lies almost 200 m directly beneath these passages. / La primera exploración más allá del Tiro 60 m y el área de Campamento Cartman, Cueva de la Peña Negra. El giro brusco en el gran pasaje, de noroeste a noreste, in-dica la alineación con la falla geológica que controla el desarrollo de los túneles en Cueva Cheve, que se encuentra casi 200 m directamente debajo de estos pasajes.



The limits of exploration in 2018 in the Cueva de la Pena Negra. The discovery of the gigantic (note the scale bar carefully in the map) "Calles de Papalo" section of the cave by Corey Hackley and Adam Byrd changed everyone's perception of how Sistema Cheve formed. The huge Calles de Papalo tunnel is more than 200 m above the active river in Cueva Cheve, which lies directly beneath it. More such tunnels should exist to the east. / Los límites de la exploración en 2018 en la Cueva de la Peña Negra. El descubrimiento de la gigantesca sección de la cueva "Calles de Papalo" realizada por Corey Hackley y Adam Byrd (observe cuidadosamente la barra de escala) cambió la percepción de todos sobre cómo se formó el Sistema Cheve. El enorme túnel de Calles de Papalo está a más de 200 m sobre el río activo en Cueva Cheve, que se encuentra directamente debajo de él. Más túneles de este tipo deberían existir hacia el este.

The derigging team at the end of April 2018: (from left to right, behind) David Stone, Bill Stone, Vickie Siegel, Adam Byrd, Mike Frazier, Donna Frazier, Ramses Miranda, Witek Hoffman, Nathan Roser, Sonia Dudziak; (left to right, front): Grace Borengasser; Lauren Satterfield; Oscar Machorro, Jon Lillestolen, Yazmin Barragan, Bev Shade y Jola Sikorska. / El equipo de desarmar a finales de abril de 2018: (de izquierda a derecha, atrás): David Stone, Bill Stone, Vickie Siegel, Adam Byrd, Mike Frazier, Donna Frazier, Ramses Miranda, Witek Hoffman, Nathan Roser, Sonia Dudziak; (izquierda a derecha, frente): Grace Borengasser; Lauren Satterfield; Oscar Machorro, Jon Lillestolen, Yazmin Barragan, Bev Shade y Jola Sikorska.

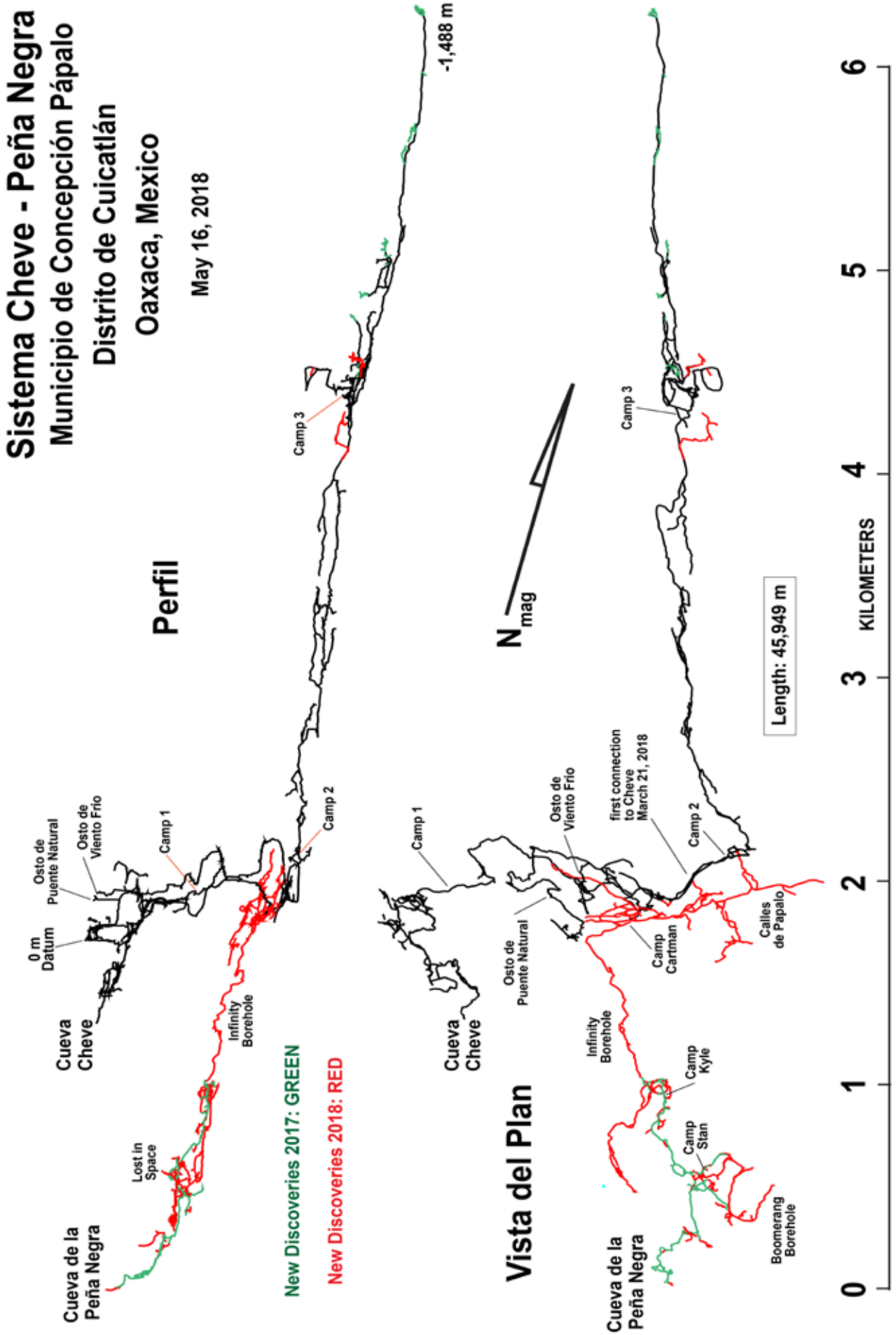
ahí. Nos quedamos charlando hasta las 11:30pm en el Campamento 3. La próxima vez que lleguemos a una fisura apretada como esa, dejaré que aquellos que quepan hagan lo suyo.

Epílogo

Comencé esta historia con equipos de exploración avanzando confiadamente por pasillos gigantes interminables, topografiando kilómetros en el proceso, y terminé con historias de desesperación. La espeleología de expedición involucra a ambos, quizás por suerte no en las mismas medidas. La diferencia entre los dos se reduce en gran medida a una sola palabra: perseverancia. Se nos había otorgado la enorme fortuna de haber sido presentados con un impresionante túnel abierto inexplorado para comenzar la expedición en el 2018. Y, a su debido tiempo, exploramos y mapeamos las cosas fáciles, de las que habían muchas. Pero al final, el descubrimiento del siguiente avance en nuevos corredores gigantescos siempre se basa en las exploraciones de los que están dispuestos a dedicar10 o 20 o 30 salidas a un laberinto de derrumbe, a un arrastradero angosto, o a escalar una cúpula extremadamente alta para encontrar el camino elusivo que conduce a las cosas grandes. Es la esencia de la exploración de cuevas. El 22 de abril comenzamos a desarmar las dos cuevas. Campamento base estaba limpio y casi todos regresaron a su trabajo el 1 de mayo. Había sido una expedición extraordinaria. La conexión de dos sistemas principales de cuevas verticales había consumido casi 8,000 metros de cuerda. Se establecieron seis campamentos subterráneos (3 en cada cueva) en 2018 y no era raro tener solo de 3 a 5 personas en el campamento base y el resto del equipo distribuidos por 3 o más campamentos subterráneos. Todos los campamentos estaban vinculados al campamento base con un sistema telefónico Michie de un solo cable para que las exploraciones pudieran coordinarse diariamente. El resultado de esto fue que se descubrió y topografió una extraordinaria cantidad de cueva en el 2018. Se agregó al sistema un total de 13.5 kilómetros de pasajes nuevos, la gran mayoría de las cuales era en tuneles que miden 40 x 40 metros o más. La profundidad de Cueva de la Peña Negra alcanzó los 798 metros antes de que se realizaran no solo una sino cuatro conexiones muy separadas a Cueva Cheve. La primera conexión se realizó cerca del Campamento 2 en Cheve, justo por encima de la Garganta Este, en una galería con piso de travertina seca que se exploró por 45,949 metros (y la decimocuarta cueva más profunda del mundo; Es la octava cueva más larga y la segunda más profunda de México a partir de 2018). El perfil del sistema de cuevas conectadas ahora revela claramente que la parte superior de Cheve, conocida desde hace más de 30 años, es solo un pasaje lateral a la Peña Negra. La sección inferior de Cheve también vio un intenso esfuerzo de exploración, con 1.1 kilómetros de cuevas nuevas descubiertas este año pero sin nuevas profundidades.

La escalada de 55 metros en la ASB, sin embargo, sugiere que una reinvestigación completa de los túneles principales en Cheve está justificado. Por medio de tales ascensos debería ser posible alcanzar una continuación del túnel del tronco principal en Cueva de la Peña Negra, más allá del colapso en el gran túnel de Calles de Papalo. Ahí es donde dirigiremos nuestros esfuerzos en 2019. Si bien Sistema Cheve se encuentra actualmente en la posición 14 con respecto a las cuevas más profundas del mundo, existe la posibilidad de que, a través de una exploración determinada, se pueda demostrar que algún día será la cueva más profunda del mundo.

The line map shown on the facing page was created by computer processing of the mapping data in Sistema Cheve. Lines in black represent Cueva Cheve as it was known before 2017. Lines in Green represent new discoveries in 2017; lines in Red are new discover¬ies in 2018. From this data, especially in the profile view, it is evident that the upper section of Cueva Cheve is a peripheral segment of the main cave system. / El mapa de líneas que se muestra en la página opuesta se creó mediante el procesamiento por computadora de los datos de topografia en Sistema Cheve. Las líneas en negro representan a Cueva Cheve como se conocía antes de 2017. Las líneas en verde representan nuevos descubrimientos en 2017; Las líneas en rojo son nuevos descubrimientos en 2018. A partir de estos datos, especialmente en la vista del perfil, es evidente que la sección superior de Cueva Cheve es un segmento periférico del sistema de cuevas principal.


Sistema Cheve - Peña Negra
Municipio de Concepción Pápalo
Distrito de Cuicatlán
Oaxaca, Mexico
May 16, 2018
Perfil
-1,488 m
Camp 3
Camp 2
Camp 1
Osto de Viento Frio
Osto de Puente Natural
0 m Datum
Cueva Cheve
Infinity Borehole
Lost in Space
Cueva de la Peña Negra
New Discoveries 2017: GREEN
New Discoveries 2018: RED
Vista del Plan
N mag
Camp 3
Camp 2
Camp 1
Osto de Viento Frio
first connection to Cheve March 21, 2018
Osto de Puente Natural
Camp Cartman
Calles de Papalo
Infinity Borehole
Camp Kyle
Camp Stan
Boomerang Borehole
Cueva de la Peña Negra
Cueva Cheve
Length: 45,949 m
0
1
2
3
4
5
6
KILOMETERS

DON BROUSSARD

The passing of the first generation of AMCS cavers, those who were active in the 1960s, continues with the loss of Don Broussard. Don was very involved in the exploration of the Sierra de el Abra and Aquismon in San Luis Potosí in his early caving years. In the 1980s Don led efforts to explore and survey the Crevice in the deepest part of Sótano de las Golondrinas. Has was also active in explorations in the Huautla area of Oaxaca and the Purificación karst of Tamaulipas. ¡Vaya con Oztotl, Don!

-Peter Sprouse

Don outside of See My Shovel Cave.
Jean Krejca

Don was an active caver from about 1968 on. He went on many hard caving trips from maybe 1967 through the 1990s, and continued to be part of the support crew for major expeditions to Huautla and other destinations. Don was always cheerful and helpful. His trademark was to walk up and say "Good morning!" even if it was late at night. Everyone noticed how unassuming, modest, and quiet he was. His good friend, John Fish, said, "Don was a faithful helper, a faithful friend."

Don and David Honea were friends in Houston schools from 1st through 12th grade. Don went to the University of Arkansas, where he started caving, then to the University of Texas, where he joined the UT Grotto caving club. He, David, and Bill Elliott were caver pals and room mates in 1968-1969. In the summer of 1969 Don worked with Bill Elliott and Jim McIntire in the Sierra de El Abra, mapping and making cavefish collections in many caves for Robert W. Mitchell's cavefish research. After that he worked for John Fish from 1971-1973 in the El Abra as part of John's dissertation work on hydrogeology. Most of Don's work in the El Abra is documented in AMCS Bulletin 26 by Bill Elliott, The Astyanax Caves of Mexico, 2018. Don was declared the "King of the El Abra" because he went in more caves for science and mapping than anyone else. Friends presented him with a free copy of the cavefish bulletin in 2018 and had a lunch in his honor.

John Fish remembers the time when he and Don returned to Ciudad Valles after a crawlway trip in Sótano de la Tinaja. They emerged covered in mud. When they returned to their rented room Don walked straight to the concrete shower stall and proceeded to wash down his muddy clothes before stripping and scrubbing himself down to the skin. That way he got all the mud off in one session.

Bill Elliott is working on an index to Don's name in all of the AMCS newsletters since the beginning, and maps he participated in. His name was on 47 maps in San Luis Potosi and Tamaulipas alone. Don was involved with mapping Sótano del Venadito, Tamps., from 1969 to 1998. He led the re-survey of the cave from 1989-1998, the longest project in the Sierra de El Abra.

Don's family originally was from the Houston area and Louisiana. He is survived by his mother, Madeline Skinner of Brenham, Texas; sister, Linda Broussard, Los Angeles, CA; nephew, Morgan Broussard, Houston area; and cousin, Wendell, Smithville. David Honea has notified the family and will be assisting them in making arrangements.

Contributors: William R. Elliott, John Fish, David Honea, Logan McNatt, Peter Sprouse, Nancy Weaver.

Don Broussard was a frequent caving companion of mine for about 20 years in the 1980s and '90s. For most of those years we were also neighbors in Driftwood, Texas. Don was active, even legendary, in Mexican caving, including long stints in both the Sierra de El Abra and in Huautla, the latter as recently as 2018. Don was one of the principal explorers of the Crevice at the bottom of Sótano de las Golondrinas, which extends the famous pit to over

500 m deep. He was also active in Texas, making many survey trips into Honey Creek and later supporting diving efforts there, among other projects.

One particularly memorable trip with Don in Huautla comes to mind. In 1987, while coming out of Camp IV in Sótano de San Agustín after the historic connection with Nita Nanta, Don injured his back and needed to bivouac near the entrance. Bill Steele stayed with him. The following day Doug Powell and I went in to help carry his gear. While we waited for Don to climb out, the three of us investigated a high ledge just inside the cave. We probed breakdown following the air, and eventually found an obscure way through the collapse into a totally independent deep route, unknown and unsuspected for over 20 years. That passage, the Fool's Day Extension, reconnected about 500 meters lower, but provided a much improved route to the bottom that played a pivotal role in future expeditions. So while Don didn't discover that passage himself, we wouldn't have found it without him.

Don had several close calls while caving and became legendary for those as well. He survived free diving into a pocket of bad air and passing out in the Sierra de El Abra, a plane crash in the Sierra de Guatemala, and getting short-roped in Sótano de San Agustín, causing him to nearly run out of insulin (Don was diabetic), to name a few. We began to talk about the nine lives of Don Broussard because he survived so many potentially fatal scenarios.

Don was a diminutive man who lived a simple life, but made a big impact on caving. He will be missed.

-Mark Minton

I spent quite a bit of time caving with Donald Broussard in Mexico in the summer of 1973, when he and I were both helping John Fish with his PhD hydrology research in the Sierra del Abra, around Ciudad Valles.

On one trip Don was free diving a sump in Cueva de Los Sabinos and evidently lost consciousness when he came up in bad air on the other side of the sump. Fortunately, John Fish had hold of a rope tied to Don, and was able to drag Don back out of the sump and resuscitate him. It was a miracle that Don survived, although for some time after that the whites of his eyes had turned scarlet. We were worried about that when crossing the border a few days later.

On another trip, Don was flying from Ciudad Valles back to Texas with Dr Richard O. Albert, and Dr Albert's soon, Tom Albert. Their plane crashed on a ridgetop in the Sierra de Guatemala northeast of Ciudad Victoria. Again miraculously, they all survived the crash with only minor cuts, although the small plane was totally destroyed. It took them three days (with almost no food or water, or insulin for Don's diabetes) to find their way down the mountain and out of the dense jungle to the remote habitation at Tres Manantiales, where a of couple of poor farmers were barely eking out a living. The farmers shared what little food they had. It still took another couple of days for Don, Tom and Dr Albert to walk out to the highway and manage to ride buses and hitchhike all the way back to Dr Albert's home in Alice, Texas.

I am very sad to hear that Don is no longer with us. My dad, Stanley Bittinger, used to work with Dr Albert's second wife, who gave the book to my dad after Dr Albert died. My dad passed the book on to me and I converted it into this digital format.

In the summer of 1971, John Fish had a small research grant which allowed him to provide room and board for Don in return for Don's help with John's PhD research project – investigating the karst geology and underground water flows in the Sierra del Abra mountains to the north of Ciudad Valles. I had heard about the work they were doing and volunteered to help, paying for my own food, and sleeping (for free) on the floor of the small twin-bed room that John and Don were occupying at the Hotel

Taking notes and water samples.
photo provided by Steve Bittinger

Covadonga. Part of the research was to take a series of water samples from major springs where cave waters emerged from the mountains. On one occasion, Don and I had gone to get yet another water sample from the Nacimiento del Río Huichihuayán. When we arrived at the nearby small town, we discovered that the river was in flood and the little ferryboat was nowhere to be found. Unperturbed, we simply waded into the river and swam across – fully clothed and with our Vietnam jungle boots on. In the caves that we had been exploring and mapping, it was common for us to have to swim like this across pools of water, so we were quite used to swimming fully clothed and with our boots on. I can distinctly recall the conversation that Don and I had that day, wondering what sort of spectacle we made for the local people of that little town. Two gringos drive up in a battered old pickup truck, get out and walk down to the river, walk straight into the river and swim across fully clothed – about 30 yards wide at that point. On the other side of the river there was a little path leading about a mile up to the spring. We collected our water samples and walked back, swam back across the river, got back in the truck soaking wet, and drove back to Ciudad Valles. Of course, this part of Mexico is quite tropical and warm, so

swimming across the river and being soaking wet was not a problem. The Vietnam jungle boots we were wearing had mesh insoles and drainage holes on the side so the water in our boots quickly drained out.

Another part of the research John Fish was doing was to trace the water flows through the cave systems. After heavy rains we would dump millions of specially dyed spores into caves where streams were disappearing underground. A week or two later, we would visit nearby springs to see if any of the spores we had dumped were now emerging in the water coming from the spring. We would suspend special mesh bags in the middle of the springs and leave them there for a few days, hoping they would capture a few representative spores that might be emerging. The spores could then be identified under the microscope due to having been dyed a bright fluorescent color. The Nacimiento Río Choy was the major spring we visited many times, and where we did eventually capture spores that had travelled under the mountain range. The Nacimiento Río Choy is a spectacular place, and I enjoyed going there many times with Don. There were several entrances, but we always climbed up the hill – well above where the water emerged from the mountain. Inside the upper entrance we were at the top of a long slope leading down into a spectacular room. The spring waters emerged from a deep lake which we measured to be more than 70 feet deep in the middle. The cathedral-like ceiling above the lake was more than 100 feet high, with a skylight that let in the sun. Sometimes at noon a narrow shaft of sunlight would shine down onto the lake. A dramatic pillar of rock juts up from the middle of the lake. We would swim out to this pillar, climb up, then jump off into the deep lake waters. It was lots of fun and a spectacular place to go swimming on a hot day.

Don was a fantastic companion and excellent caver. I look back on that summer as one of the best times in my life. Although we were living very frugally (and I was sleeping on the tile floor), we all got along well, enjoyed each other's company, trusted each other's competency in what we were doing, and had a lot of fun together.

-Steve Bittinger

ERNIE GARZA

Ernie (R) in Xilitla alongside Runi Burnett, Ted Peters, andTerry Raines in April of 1966. *P. Winsborough.*

NSS 13484-FE, CM
July 20, 1938 – August 16, 2019

International caver and creative photographer, Ernest Garza, was born in Brownsville, Texas. He grew up in Corpus Christi and southern California. Nicknamed Ernie and Ernesto, he was a skilled caver, photographer, and friend to many. Ernie passed away at his residence in Austin, Texas, age 81, with friend Vivian Loftin by his side. His family and friends are mourning his death, so soon after his close friend and neighbor, Don Broussard, passed away on May 16. Ernie passed away after recent stays in the hospital and nursing home, then spending his final weeks in Austin, living under the watchful eyes of cavers Yazmin Avila and Jim Kennedy.

Logan McNatt and Barbara Vinson interviewed him in June to learn more about his life. Logan and Terry Holsinger went through some of his slides and photo prints to get them ready for friends to organize and scan. There are numerous albums in storage cabinets and elsewhere.

His cousin, Tavita Alvarado, remembers Ernie attending W.B. Ray High School in Corpus Christi, Texas. She recalled Ernie as a diver who would bring sea collections to his family. Rune Burnett said that Ernie worked in undersea welding for a time. He became independent of his parents, Ramon and Esther Salinas Garza, at age 15 or 16. He was in the Los Angeles area for junior high, where he started learning photography. He worked in photography at McGreggor Studios in Corpus Christi in high school.

He served in the Army at Fort Huachuca, Arizona, in 1961-1963, where he learned advanced photography. He was back in Corpus in 1965 and California 1966-1994. He often came to Austin via expeditions to Mexico, and in 1994 he moved to Terry Raines' old house on Parkwood near Mueller Airport. He rented 473 Limestone Lane, Driftwood, and then he bought his country place on 444 Billie Brooks Road.

The first caving photo we have of him was at Xilitla, San Luis Potosí, in 1966. He made trips to the Sierra de El Abra, San Luis Potosí and Cuetzalan, Puebla. He focused on Oaxaca, where he caved in the Huautla Area and the Cerro Rabón. His name is on at least 23 Mexican cave maps, and he explored and photographed many others.

Ernie went on many trips to Mexico and a few Texas caves. He published

cave photos, trip reports, reviews and articles. He received an NSS Fellow award in 1988, and he and Karlin Meyers received a Certificate of Merit Award in 1993 for pioneering the Cerro Rabón in Oaxaca, where there are many deep caves.

In California he lived in Manhattan Beach, Hermosa Beach, Monterey Park and Los Angeles, and he was a member of the Southern California Grotto. He went caving with Frank Binney, Dave Bunnell, Carol Vesely, Bob Richards, Steve Slocomb, John Woods, Blane Colton, Bill Deane and others. Ernie and John Woods went in many California caves: Lilburn Cave (survey trips), Church Cave, Soldier's Cave, Cave of the Winding Stair (survey trips), Crystal '67 (Houghton's Cave). Ernie and John caved in Arizona at Onyx Cave (survey trips), Cave of the Bells, SP Cave, Fort Huachuca Cave and Dante's Descent. They also travelled around Nevada and made brief sorties together into the Grand Canyon and Northern Mexico around Hermosillo. He assisted Dave Bunnell in mapping Painted Cave, California, for years the largest surveyed sea cave in the world. He surprised everyone by pulling out two helium-filled Snoopy balloons that he used to measure the 130-foot ceiling. Ernie also went on a big 1982 expedition to Mount Kaijende, Papua New Guinea. Details of his career with citations are in a long biography compiled by Elliott, available at http://cavelife.info/

John Woods said, "Ernie Garza is the studliest nerd who ever walked the planet and an eccentric among eccentrics. He has done things that macho men fear and yet has always remained self-effacing, gentle and kind. He is one of the most soft-spoken men I have even known. I used to joke that he had no adrenal glands. Both his eccentricity and his humility are legendary among cavers. I can truly say that all who meet him – care for him. I have never met a more affable man."

Ernie hardly reacted when a massive rock fall nearly nailed his caving group in Dante's Descent, Arizona. Ernie emerged from a cloud of dust and said, "That was exciting." Ernie was constantly forgetting his caving helmet. Once he bought a straw hat to replace his forgotten helmet at Millerton Lakes Cave, CA. He taped a carbide lamp to the hat and everything was fine until it caught fire in the cave while it was on his head. Ernie never batted an eye. He put out the fire and kept on caving with a smoldering "helmet." Nothing could fluster him.

Ernie loved to photograph caves, people and nature. He kayaked to sea caves on the West Coast. He built a cool, wooden photo box for cavers to pose in at gatherings. He made annual pilgrimages to Burning Man, the NSS Convention and the Texas Caver Reunion. He was well-known for his excellent photos, which were published in the NSS News, AMCS Activities Newsletter, Texas Caver, and books.

Ernie did some freelance photography and was a still photographer for a number of motion pictures. He also did some publicity stills. Later, he started working as a model maker and lab tech for a motion picture special effects house. He worked on movies like Star Trek The Motion Picture (1979), Bladerunner (1982), Tron (1982), Brainstorm (1983), 2010 (1984), Ghostbusters (1984), and Solar Crisis (1990). There is a photo of Ernie on a ladder next to the giant Enterprise spaceship model. Ernie made his screen appearance in the first Ghostbusters as he was portrayed as a levitated Chinaman holding a rubber chicken in a shot of a newspaper article about the strange happenings in New York City. He worked for Robert Abel and Associates, Boss Productions, Charles Eames Design studio, Neuhart-Donges-Neuhart and Fine Arts Software. Frank Binney said Ernie had an office right below Jane Fonda and Tom Hayden, and they met Jane.

Early Caving Trips

Ernie is mentioned in at least 34 AMCS newsletters and on 23 cave maps from 1965-2015. He explored many others.

In April 1966 Bob Burnett, Ernie Garza, Ted Peters, Terry Raines and Philip Winsborough explored five caves near Xilitla, San Luis Potosí (four were mapped). In 1971 Ernie joined Don Broussard, Robert Hanford, David and Ann Honea, Sandy Robinson, Leslie Clapp, Rich Cooper, Blake Harrison, Dave Jackson, Roy Jameson, Craig Sainsott and Frank Binney to explore and map caves in the Sierra de El Abra near Ciudad Valles, S.L.P. In March 1972 he was involved in exploring El Sótano [del Barro], Querétaro, then the world's deepest pit. His mapping trips are listed below and in the biography.

Ernie helped map at least 23 caves in Mexico. These 15 have his name on them:

1966, San Luis Potosí, Xilitla highlands, Cueva de la Selva, Cueva de Tlamaya, Cueva del Salitre;
1972, San Luis Potosí, Sierra de El Abra, Nacimiento de El Río Coy, Cueva Pinta, Cueva de los Monos and Sótano de los Monos;
1972, Queretaro, Sierra Gorda, El Sótano [del Barro];
1973, San Luis Potosí, Sierra de El Abra, Sótano de la Cuesta;
1977, Oaxaca, Huautla, La Grieta;
1979, Puebla, Cuetzalan, Cueva Tecolo;
1980, Puebla, Cuetzalan, Atepolihuit de Nauzontla, Sumidero San Bernardo;
1989, Oaxaca, Cerro Rabón, Nita Jan;
1993-1997, Oaxaca, Cheve Area, Sistema Cheve;
2001, Oaxaca, San Juan Coatzóspam, Cueva de la Concha de Caracol, Cueva de la Grieta, Cueva con Huesos y Viento;
2003, Oaxaca, Cheve, Sistema Cheve;
2005, Nuevo León, Purificación, Cueva de la Nochebuena;
2005, Tamaulipas, Sierra de Guatemala, Sótano de Jineo;
2009, Oaxaca, Huautla, Cueva Agua Golondrinas 2;
2012, Oaxaca, Huautla, Cueva de las Arañas

A Few Ernie Stories

In the early 1970s Ernie invented "Garzaline" and solved the problem of flashlight corrosion. He packed the interior of the flashlight with Vaseline.

In December 1972 Ernie and others explored Sótano de Vásquez, Tamaulipas, and surveyed over a kilometer of passage, reaching Glow Worm Canyon. Fish Lake was reached on a trip by others in February 1973, who collected blind fish for Robert Mitchell and William Elliott's research.

In 1975 Ernie was detained by two corrupt cops in a Querétero bus station. They took away his new machete, still wrapped in paper in his pack, and his bottle of tequila. They left him for a moment to see their comandante, so Ernie gave them the slip into a waiting cab. He then flagged down a bus on the road.

In 1979 Carol Devine and Ernie used folding kayaks to float the Usumacinta river in Guatemala. Carol and her husband Mike had a guest ranch in the Petén jungle called Finca Ixobel. They arrived just after Mike was led to an amazing discovery in a cave near their property. It was covered with Maya wall paintings and was eventually named Naj Tunich. National Geographic chief archaeologist George Stuart heard that Ernie was in the cave area and arranged to have Ernie map the interior. Then they flew him from the jungles up to the National Geographic headquarters in Washington, DC, where Ernie helped analyze his data to generate a map of the cave for the feature story in the magazine. They then flew Ernie back to the jungle where he finally did his float trip with Carol. Ernie was amazed at the whole experience and spoke of swimming in an underground swimming pool in the NG headquarters building; he felt it was truly surreal.

In 1984 Ernie paddled his Folboat along the rugged coast of Punta Banda, Baja California Norte. Landing on one of the few beaches, he discovered a series of caves that were later named "Sistema Punta Banda." Lacking a flashlight, he couldn't appreciate their full extent, but he returned with glowing reports of large chambers filled with barking sea lions. A huge gray whale surfaced five m from Ernie and Dave Bunnell's boat.

In January-February, 1985, Blane Colton, Ernie, Laszlo Kubinyi, and Karlin Meyers conducted a reconnaissance of the Suchitunaco Plateau, part of the Sierra Mazateca east of Huautla de Jiménez, Oaxaca. They were able to scout the routes up into the area and found a number of caves. They found an enormous sinkhole that cavers had been seeking. They were the first foreigners to visit Cerro Rabón since 1969. This was pure reconnaissance, since their maps, photos, and information regarding trails and terrain were inadequate. There were no roads onto the plateau, so they took a steep, direct route from Jalapa de Díaz to the escarpment, west across the plateau, and through the village of San Martín Caballero before descending to Tenango.

In March 1987 a multinational group of 13 cavers, including Ernie, spent three weeks exploring the extensive Cerro Rabón karst. Local permission, a sensitive issue due to nearby archeological finds in caves, was at first refused, necessitating a trip to Mexico, D.F. A base camp was installed at the edge of a large dolina near the remote village of San Martín Caballero. They discovered Ojo de las Mazatecas, about 150 m in diameter and 250 m deep. The deepest cave that was explored was Kijahe Xontjoa, 1223 m deep in 2000. In a horizontal cave called Nita Tunso-o, a promising lead was followed to a dry stream passage that opened up into a beautifully decorated borehole. Abundant tarantulas were seen in this cave.

In March 1988, Ernie, Beth Meyers, and Karlin Meyers set off from Phoenix to meet Blane Colton, Jeb Steward, and Laszlo Kubinyi. They hiked 13 rugged km to Cerro Rabón. Ernie led a team of cavers southeast and up the mountain from San Martín Caballero to a large surface rift that became known as The Fissure, or Nita Diplodocus. This spectacular cleft has two deep pits in its upper section.

In May 1988, California cavers reconnoitered Isla San Martin, Baja California, near San Quintin on the Pacific coast. Amy Battista, Dave Bunnell, Ernie, Susan Hammersmith, and Bob Richards took two boats to make the five-km voyage to the volcanic island. They hiked the whole 5.5-km circumference of the island, finding no sea caves, but a local fisherman showed them a lava-tube cave up on the lava slopes. On a later trip he found an unusual sea cave, with three levels, on the mainland. Cueva de Tres Pisos has 316 m of mapped passage, probably making it the largest sea cave in Baja California.

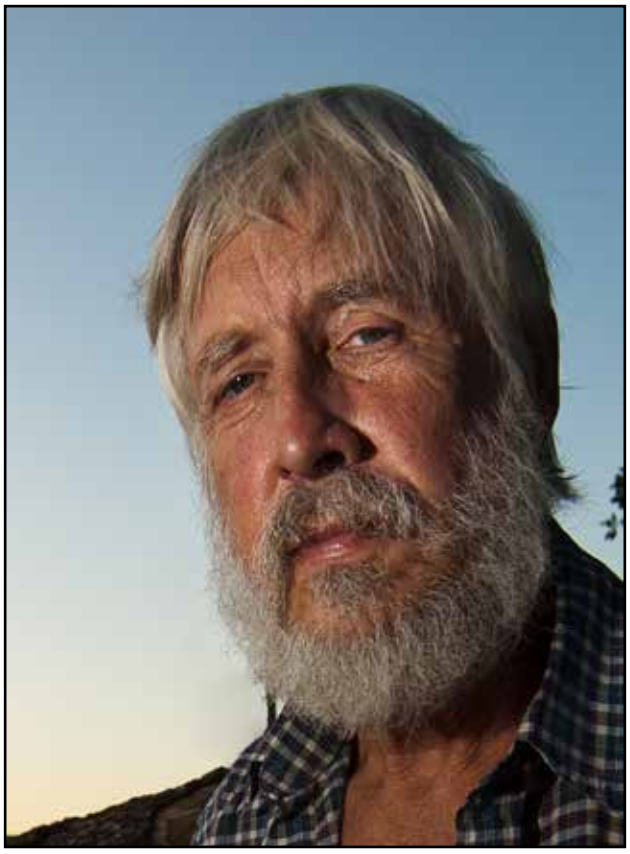
2018. Ernie, Gilly Elor and Andreas Klocker drove the truck from the U.S. to Huautla, and everyone else arrived at varying times via public transport. These trips would not have been possible without support by Ernie, who helped on language barriers, local politics, and great cooking.

A memorial gathering for Ernie may be planned for this fall. There was a New Orleans jazz funeral march in his honor at the Texas Caver Reunion, Paradise Canyon, October 12, 2019.

Contributors: William R. Elliott, Tavita Alvarado, Kira Holt, Vivian Loftin, Steve Slocomb, John Woods, Bruce Rogers, Dave Bunnell, Logan McNatt, Jim Kennedy, Rune Burnett, Susan Souby, Terry Holsinger, Terry Raines, Frank Binney, Katie Arens and Nancy Weaver.

PETER STRICKLAND

Peter Strickland passed away on July 3, 2018, at home with his family by his side, with caver-song writer Barb MacLeod's cave ballads playing. With over 50 years' involvement with caving, he is fondly remembered by those who had the good fortune to know him as a caver, mentor, volunteer, friend and family member, or any combination of the above. Born in San Francisco in 1946, where his father was stationed during WWII, he grew up in up-state New York. As a kid he liked to find cracks between rocks and climb around in them. With no fear of heights, his father once found him, at age 5, thirty feet up in a tree in their yard. His formal introduction to caving came in 1964, when his older brother, John, read about the National Speleological Society in an issue of National Geographic Magazine, and joined to get the NSS News. Thenext year, the brothers attended the NSS convention in Bloomington, Indiana. This event was Pete's introduction to vertical caving, learning about climbing systems and rappel devices, seeing his first Goldline rope and Jumar ascenders. The International Exploration session consisted primarily of descriptions of trips by the University of Texas (UT) Grotto to Mexico's large and deep caves such as Sótano de Tlamaya and Ventana Jabalí (which pushed Surprise Pit in Fern Cave, Alabama, into second place as deepest in the Western Hemisphere). Pete realizedthat Austin, Texas, was the place to be.After serving in the U.S. Army in Europe (1967-1969), where he was able to visit a number of vertical caves, he joined a trip to Mexico with a group from McMaster University (Ontario, Canada) which ignited his interest in Mexican caving. Pete made his way to San Marcos, Texas, with its active Southwest Texas Student Grotto.



Pete at the 2011 Texas Cavers' Reunion. *Geoff Hoese.*

There were close caving ties between the central Texas cavers, and in 1971, he moved into "The" Kirkwood House (1307 ½) in Austin. No rooms being available, he was an unused stairwell to live in. This blossomed into the famous Kirkwood caving community of the 1970's.

Pete helped explore some of Mexico's deepest and longest caves in the 1970's and'80's, where his technical climbing and rigging skills came in handy. This included the first descent of Sótano del Barro in 1972, with the 1,500 foot rope he had acquired in Germany. Crewing with other Texans to chop through the jungle of the El Abra, they explored Cueva de Tanchipa, Sótano de la Cuesta and Hoya de Guaguas. Many trips across Mexico led him to Sótano de las Golondrinas, Huautla, Sótano del Arroyo, the river caves of Zoquitlán and the Cuetzalan area, among many others un-named but unforgotten. Pete knew all the best camping spots and the best rigging points for his favorites. In later years Pete was active in the annual Bustamante Project (1997-2006), created to help the town of Bustamante, Nuevo Leon, Mexico restore Gruta del Palmito to its natural beauty. Pete's projects included installation of steps for improved access, trail work, graffiti removal, and installation of educational, conservation, and directional signs. Pete always felt the future of caving was getting new people involved, and over the years he led many a newbie caver on trips through this, one of his favorite caves.After his passing, over a hundred of Pete's family and friends from all over the country gathered at the pond he had constructed at "Stricklandia". It was an afternoon, night and morning of hot tubbing, swimming, camaraderie and merriment in his honor. Pete would have loved it.

Contributions from John Strickland, Jocie Hooper, Jay Jorden, Sherry Graham, and Logan McNatt

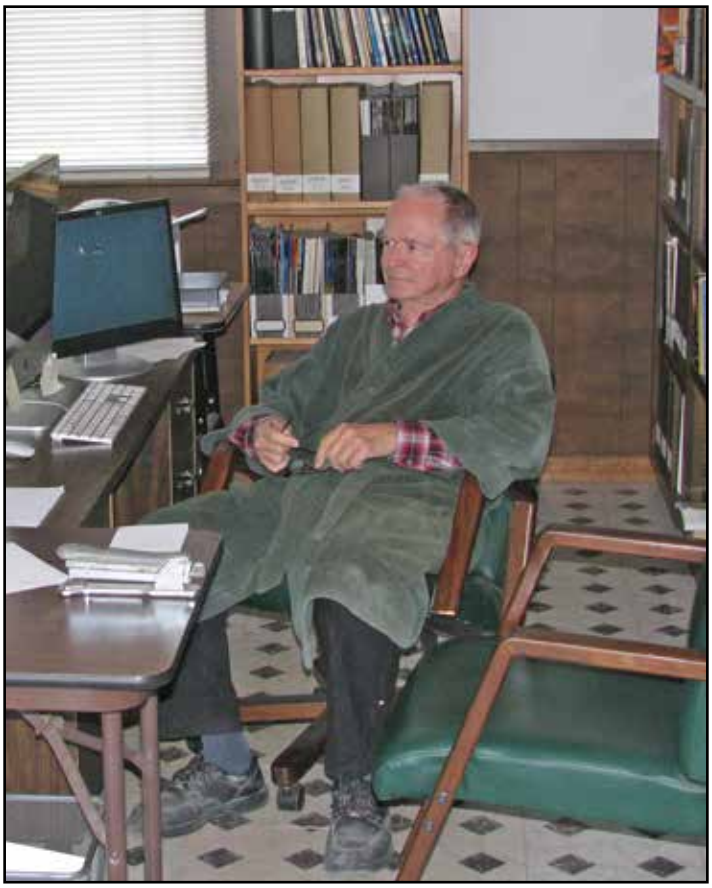
WILLIAM "BILL" MIXON

William Mixon passed away peacefully at age 78, with some of his caving companions by his side. There is a huge amount to say about Bill's contributions to speleology, but here I'll talk about his impact on Mexican caving and the AMCS. Bill was always a keen observer of cave exploration in Mexico, and this led him to leave his position at the University of Chicago in 1981 to move to Austin to become more involved. His focus was always the "arts and letters", and in 1992 he assumed the role of AMCS editor with Activities Newsletter 19. He continued this work uninterrupted through issue number 41 in 2018. He brought many AMCS Bulletins and other publications to print as well. His publication efforts rank him as one of the giants of Mexican speleology, and will be a lasting legacy.

- Peter Sprouse

I've known Bill Mixon since the 1970s. I knew him first as editor of the Windy City Speleonews and may have met him a couple of times at caving events in Indiana or elsewhere in the upper Midwest at that time, but we became fast friends after he moved to Austin in the early 1980s, where I already resided. We shared an intellectual curiosity and interest in all things scientific, often discussing and critiquing the latest announcement of a scientific advance. (Bill worked in physics at the Tokamak fusion reactor at the University of Texas and I worked in the chemistry department doing organic synthesis.) We also shared an appreciation for concise writing and good grammar, often lamenting the poor quality of even official pronouncements and journal articles. We met for lunch almost every work day, even long after UT Grotto lunch gatherings had faded away.

Bill Mixon was intensely interested in the phenomenal caving taking place in Mexico, even though he was no longer personally doing hardcore trips. He moved to Austin to be closer to the action and very quickly moved into a leadership position within the AMCS, becoming the primary editor of its flagship publication, the AMCS Activities Newsletter, which he transformed into a world-class journal. He also oversaw the publication of many AMCS Bulletins covering specific topics in great detail. He was a meticulous grammarian and conscientious editor, keeping countless details in order. Bill also maintained a vast personal caving library as well as the AMCS library with extensive material on Mexico from AMCS exchanges and other foreign publications, all of which was indexed online. He had a great memory and could often point to an obscure publication to answer a question or provide background material.



A 2013 photo of Bill Mixonat at his computer in his home office, a space that now serves as the Texas Speleology Center. *Bill Elliott*

In addition to his work on publications, he also devoted a large amount of time to making the AMCS website an outstanding reference source for Mexican caving. He scanned and posted or archived thousands of cave maps, photographs from major expeditions, videos, out-of-print publications, and other items involving caving in Mexico. He was also often the primary representative of the AMCS at NSS Conventions, where he maintained a small space selling publications.

After he became gravely ill, Bill arranged for his house to become the Texas Speleology Center, which provides offices, meeting space and a permanent home to the libraries and archives of both Texas and Mexican caving. Bill Mixon's legacy will live on for decades to come.

- Mark Minton

WILLIAM HART RUSSELL

Bill Russell, cave scientist and caver extraordinaire, passed away on 21 March 2019 after a brief illness. Born in 1937 in Houston, Texas, to a professional librarian, Leonore Schuppert Russell, and a geologist, William Low Russell, he grew up in Bryan, Texas, with his brother, Philip, where his father taught at Texas A&M University for several decades. Their father took them on fieldwork trips which inspired William's very early engagement with caves and cave science. After serving in the army in Germany, returning to the University of Texas at Austin to complete his degree in Geography, and then working for the IRS, he became a central force in caving, cave exploration, and cave science, particularly in Texas and Mexico -- a role he played for over 60 years.

Bill Russell and friend.

Mexico:

William was one of the founders of the Speleological Survey of Mexico (SSM), whose name was later changed to the Association for Mexican Cave Studies. He participated in the first SSM field trip in November 1962 which visited caves in Tequila, Veracruz, and Xilitla and Ciudad Valles, San Luis Potosí. By 1965 William was able to compile a comprehensive inventory of the caves of the Sierra de El Abra. In that same year, he led the first cave exploration trip to Huautla, Oaxaca. When the three Texans arrived, the locals assumed they were just more gringos looking for magic mushrooms.

In the 1970s and beyond, William mentored new generations of AMCS cavers while continuing his caving in Mexico and Texas. In recent years he was generously supportive in ensuring the long-term success of the AMCS and other caving organizations. Your famous Golden Crowbar will follow you onto your next cave digs, William!

I was fortunate to have William as a mentor when I arrived as a young caver in Austin in 1973. I had moved into the stairwell at 1307 ½ Kirkwood, and at first he was a bit of a mystery to me, being nearly a generation older. I recall answering the phone at Kirkwood early on, and heard "This is Bill Russell" and then nothing else. It took a minute to get the conversation going! But I soon got to know him well, and he became a neighbor in Kirkwood.

His stories of all of the places he had explored in Mexico enthralled me. Over the years I was able to visit many of them and follow up on his work. These included places where he was among the first to explore caves, like Cuatro Cienegas, La Parada, and the Sierra de El Abra. Some areas that he pioneered have never been revisited, and names like Carabanchel still hang like legends in my mind, waiting for someone to follow his footsteps. He was a true explorer.

-Peter Sprouse

Austin and Texas:

In addition to discovering the deepest caves of the Western Hemisphere, William also discovered the deepest caves of Central Texas. He located the deepest caves in Austin through similar applied knowledge and researching local geological and topographic maps. Even though the caves had been filled, their mark upon the geography was obvious to William.

It is almost impossible to fully quantify the valuable contributions and credible service that William spent his life dedicating to the caves of Austin. William was a powerful force in re-opening, mapping and preserving our local caves, which suffered from widespread filling.

William excavated and documented more caves in the Austin area than any other person, bar none. Working as a brother, father, and grandfather figure within the caving community, he mentored and/or inspired possibly every cave scientist and cave digger working in Central Texas. The City of Austin's rich heritage of protecting caves and associated wildlands for the preservation of water quality can be attributed to many people, but to no one more so than William H. Russell.

From 1997 to 2000, he lobbied to have the land donated to the City of Austin as a preserve so that its rich cave treasures could be protected and further explored by local cavers. Since

Bill Russell. *Terri Treacy.*

acquisition by the City, the preserve was named the Blowing Sink Research Management Area. After his death, the City renamed this tract to the William H. Russell Karst Preserve.

William was a true explorer and a driving force in caving in Texas, inspiring generations of cavers and helping preserve cave data, natural resources, and water quality in Austin, Texas.

Nationally:

As a member of the National Speleological Society William was awarded a Certificate of Merit, made a Fellow of the Society, and was awarded Honorary Membership, which confers the society's highest honor.

From the 1970s and beyond, William mentored new generations of cavers while continuing his caving in Mexico and Texas. In recent years he generously supported ensuring the long-term success of the AMCS and other caving organizations.

William is survived by his brother Philip and his life partner Katie Arens.

Contributions from Katie Arens, Peter Sprouse, and community petition to City of Austin for William H. Russell Karst Preserve