

The Catfish Caves of Acatlán, Oaxaca

Reviving cave surveys from long ago

William R. Elliott

This document is the version submitted to AMCS with Literature Cited included. See AMCS Activities Newsletter, Number 42, Dec. 2019 [May 2020], pp. 22-30. Author's address: 914 Bannister Drive, Jefferson City, Missouri 65109. speodesmus@gmail.com.

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 m, 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 km 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 km northwest of Acatlán, but no catfish have been reported there yet.

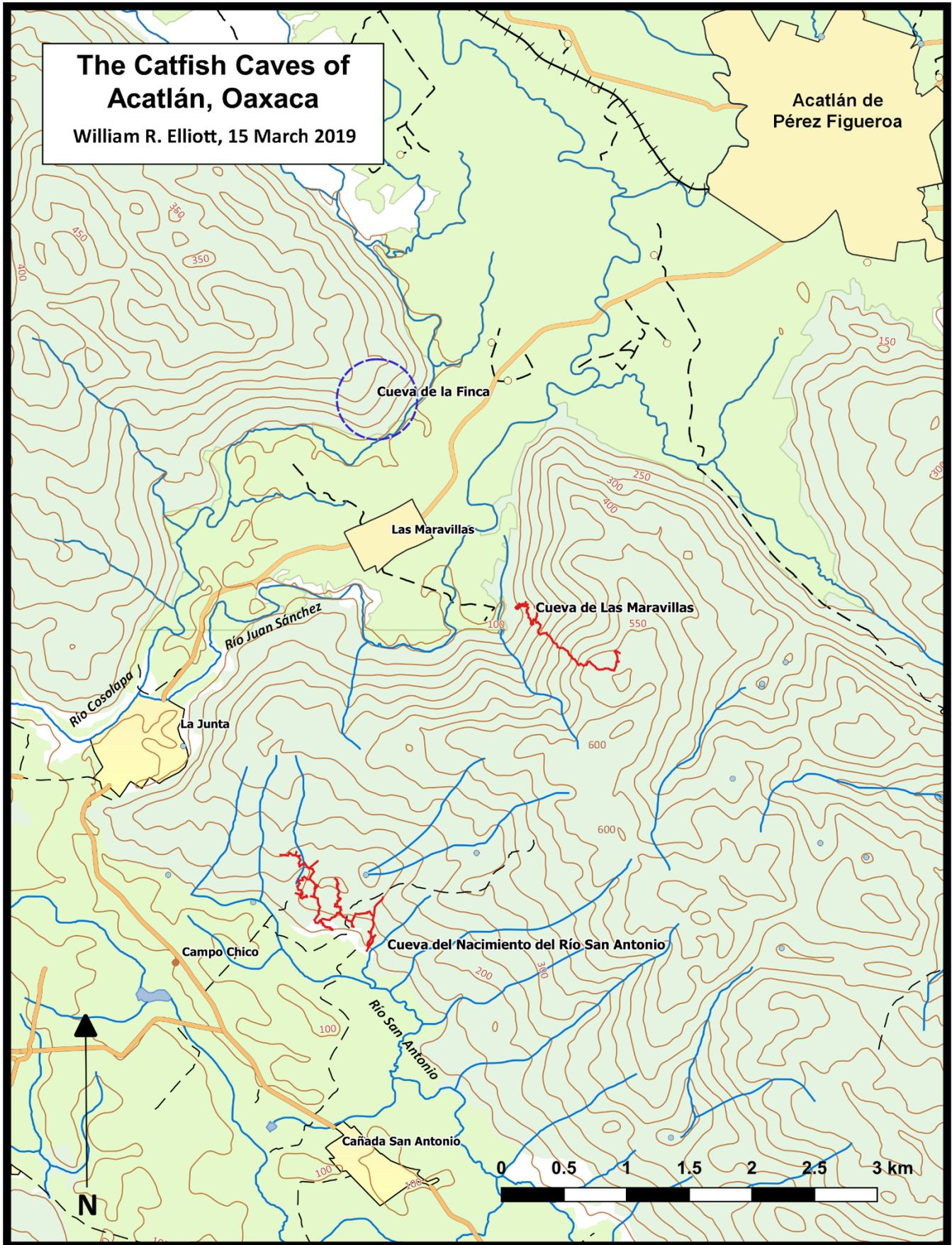
Included here are two cave maps and two area maps from my GIS project to help readers understand the area's hydrogeology. The northern part of the area is covered by the INEGI 1:50000 topographic shapefile, Vicente Camalote E14B68, and on the south by Tierra Blanca E14B78. I used WallsMap and QGIS programs 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 his untimely death in 2017. Logan and Bill Mixon scanned the pencil draft on a large scanner. I was able to



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



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.

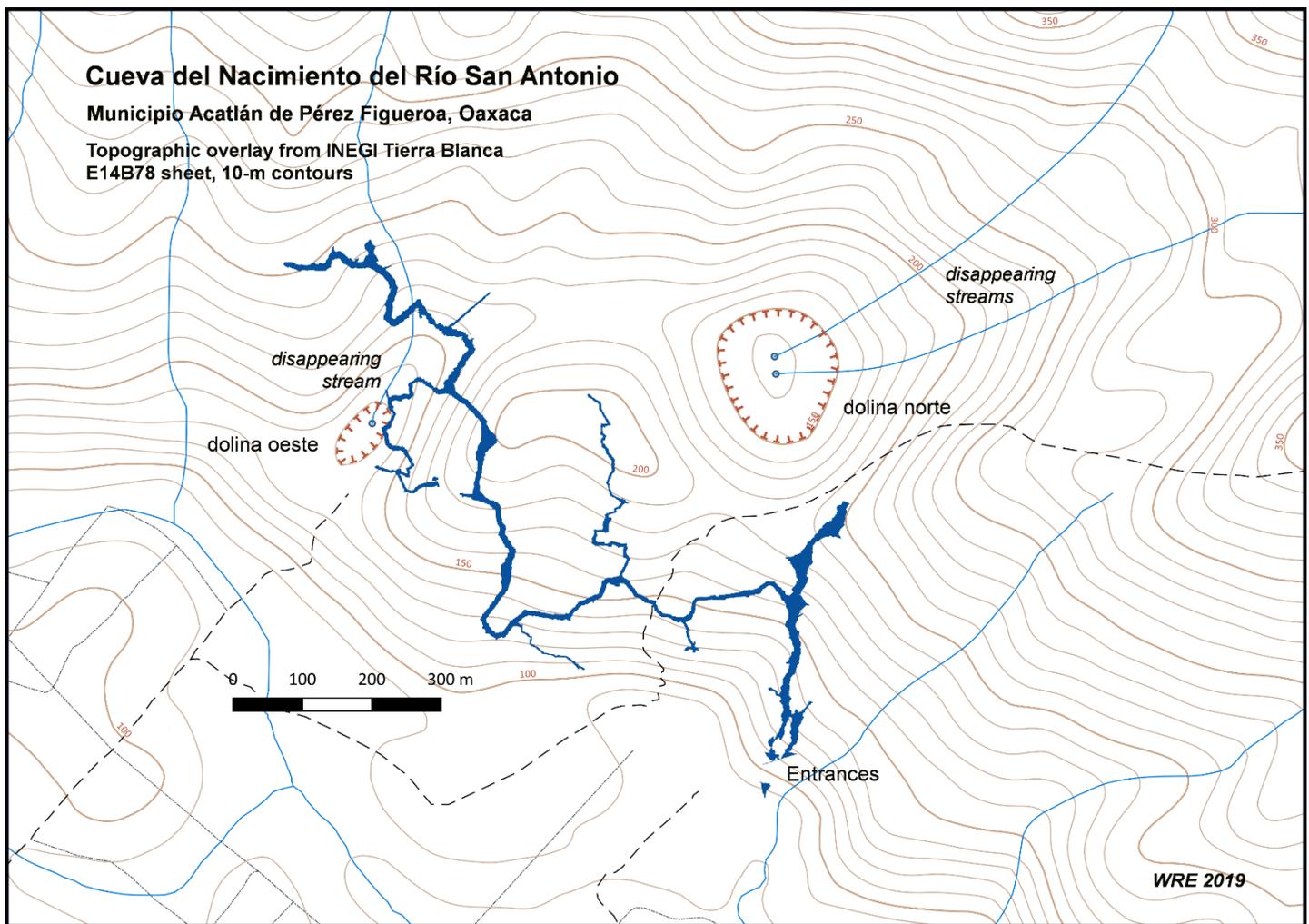
The team of David McKenzie, Stuart Murphy, James Reddell, Mary Butterwick, and Martha Helen McKenzie (David's sister) explored the cave and collected catfishes and other fauna in late 1972. Survey 1 began on 4 January 1973; Suunto and tape were used to map about half of the cave. The team was guided 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 31 December 1973–1 January 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).

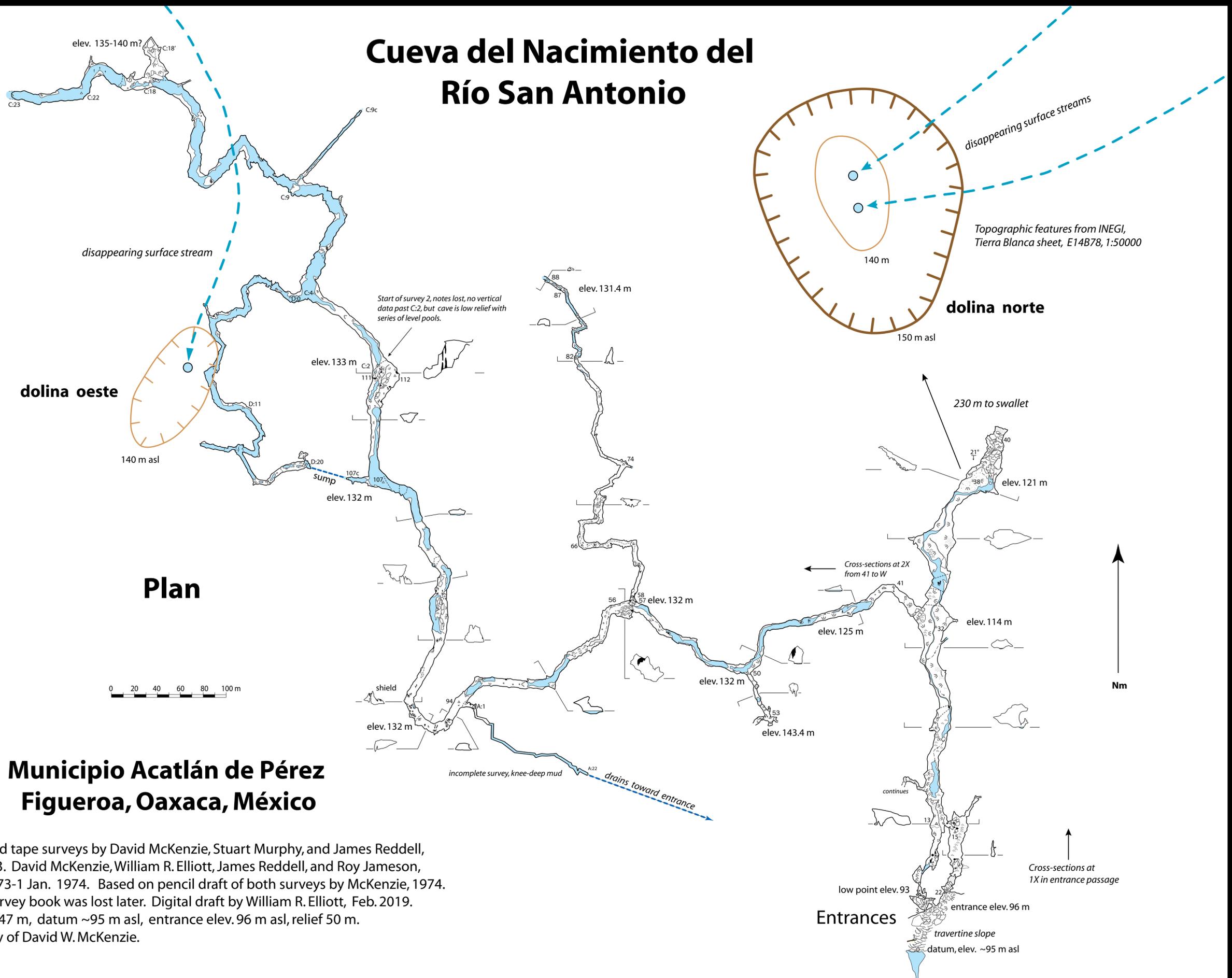
The cave begins at two dry entrances a few meters up a travertine slope from a pool, which is considered the nacimiento. The survey datum is at the north edge of the pool at about 95 m asl (above sea level). The left entrance elevation (station 3) is at 96 m asl, and total relief within the cave is about 50 m. The right entrance is close by, but higher at about 124 m 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 m to a deep lake containing many blind catfishes and crayfishes.



Cueva del Nacimiento del Río San Antonio



Municipio Acatlán de Pérez Figueroa, Oaxaca, México

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.

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

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.

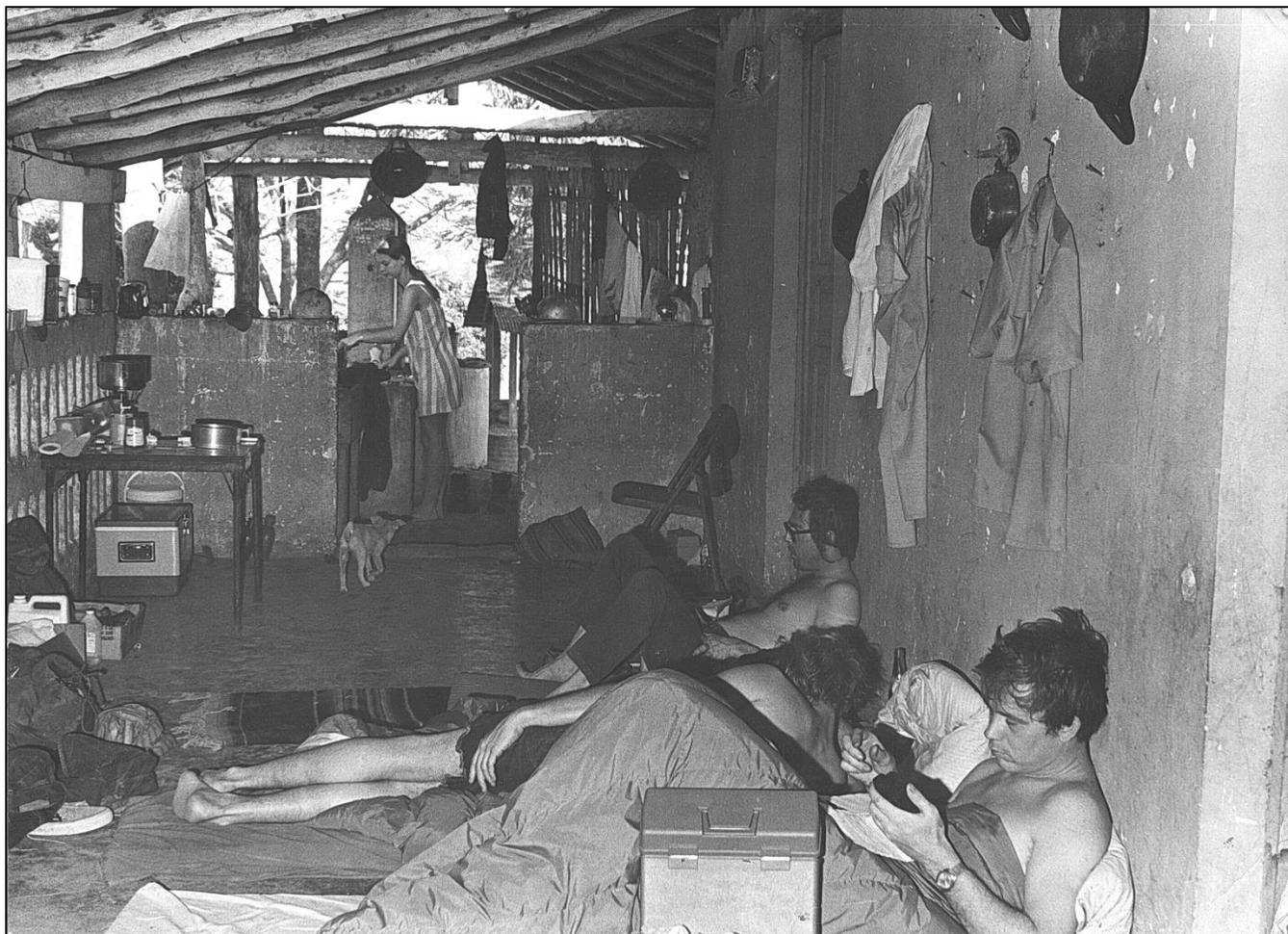
CNRSA is close to the surface. The dry, left-hand passage leading to station 53, must come close to the surface at a calculated 143.4 elevation. I had calculated the entrance location from Mejia-Ortiz’s 2005 study on cave crayfishes. This indicates that we may have the entrance located too far south, as this portion of the cave would otherwise project out of the overlying contour line at 130 m! So, the entrance may be at least 30 m 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 occurs 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 km 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 m 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 27 and 29 December 1976. McKenzie, Grubbs, and Reddell returned for the second survey on 1 January 1977. I completed the digital draft after

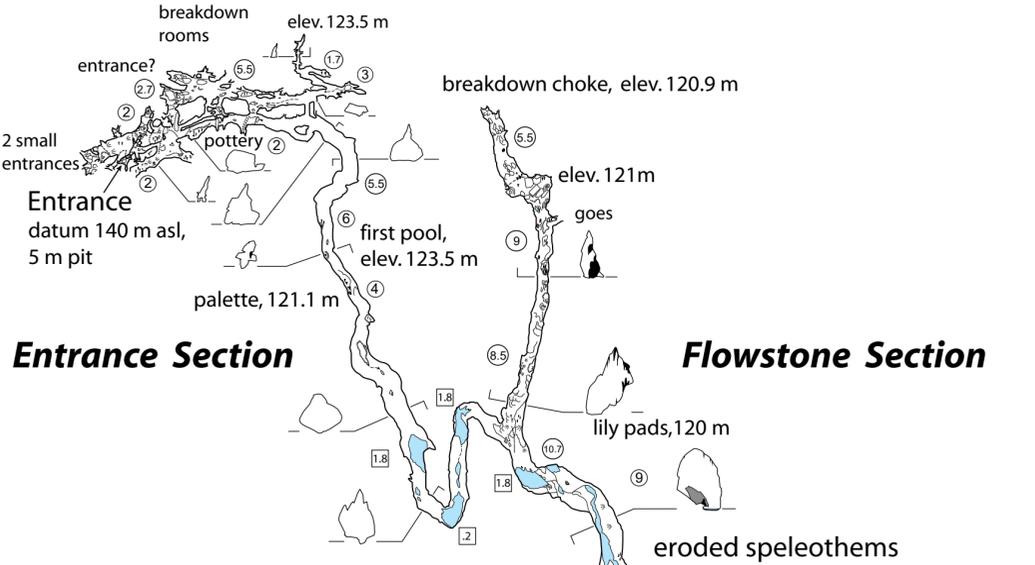


Cavers camping at Campo Chico, 26 December 1972. Left to right: Mary Butterwick in kitchen, James Reddell, Stuart Murphy, and David McKenzie with his Hewlett Packard hand computer. *Marty McKenzie.*

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.



Stream Section

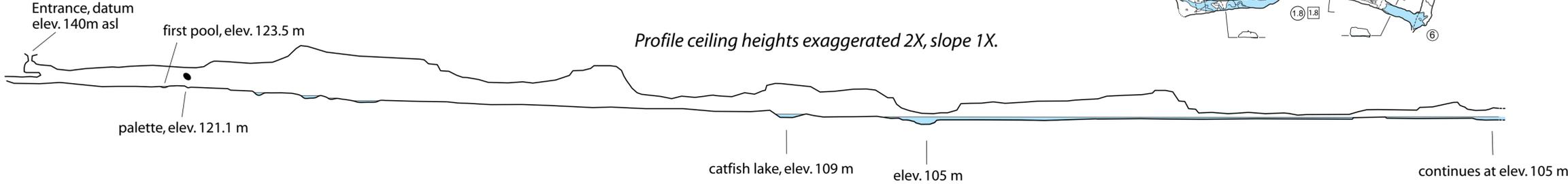


Plan

Cross-sections are enlarged 2x.



Profile looking north



water passage continues elev. 105 m

months of work using Walls and Adobe Illustrator. The extent (total length) of the cave is 1885 m, depth 35.4 m, at the final station 87 (see on map), about 105 m asl.

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 Río 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 m, close to the measured length of 1885 m. And there may be another 240 m of cave to map!

Maravillas begins at a 5–m pit entrance on the hillside at about 140 m elevation, into a joint-controlled, fractured, series of breakdown rooms, 2–5 m 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 m high and 10–15 m wide. Cross-sections are enlarged to 2X on the map for legibility. This "Entrance Section," as I designated it, comes to the first pool at 150 m from the entrance, at 123.5 m elevation. Soon after that is a palette or shield formation. In another 80 m the "Stream Section" begins with a series of pools 0.2 to 1.8 m deep. A sharp dogleg leads to an intersection with the northbound "Flowstone Section," which goes 120 m to a breakdown choke. The passage here is 5–10 m wide and 9 m 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 m from the entrance "catfish lake" was noted, with an elevation of about 109 m, depth 1.2 m. 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 m.

About 400 m from catfish lake the passage turns north–northeast for 200 m, then it turns southeast for 36 m to the final station, number 87. The water passage continues 0.8 m deep for about 240 m 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 km southeast of Las Maravillas. After comparing this location map with Mejía–Ortiz's 2005 area map, the depth of the cave, and the local hydrology, I tentatively placed the cave entrance at an elevation of 140 m asl, not far above the base of the hill, but the location could be within a radius of 200 m from there (see area map). Doyle Mosier has no precise location either. All of these trips were before GPS existed, and we had few topo maps back then.

There may be a sumidero at the south edge of the valley and 450 m 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 m. 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 4WD 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 km 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 m southwest of Almolonga. It does not resurge into the Río Juan Sánchez, which actually flows out of the southeast side of Almolonga only 1 km away.

Tom Byrd et al. mapped it as “Cueva de Juan Sánchez” (Byrd 1976), a 2–km–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. Epigeal 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 epigeal 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 mm long, with no visible eyes but small flecks of pigment in the skin. My photo of the species in this article was a 69–mm 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 Río 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 Mejía–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.

Literature Cited

- Byrd, Tom. 1976. Christmas in Acatlán [with map of Cueva de Juan Sánchez]. AMCS Activities Newsletter, 4:23–24. Map also at <http://www.mexicancaves.org/maps/0092.pdf> accessed April 2019.
- Elliott, William R. 2018. The *Astyanax* Caves of Mexico. Cavefishes of Tamaulipas, San Luis Potosí, and Guerrero. Association for Mexican Cave Studies, Bulletin 26. Austin, Texas. 326 pp.
- Mejía–Ortíz, Luis M. 2005. Adaptations to Cave Life in Decapods from Oaxaca. AMCS Bulletin, 15:169.
- Miller, Robert R. 1984. *Rhamdia reddelli*, new species, the first blind pimelodid catfish from Middle America, with a key to Mexican species. Transactions of the San Diego Society of Natural History. 20(8):135–144.
- Mosier, Doyle. 1984. Cave dwelling populations of *Rhamdia* (Pimelodidae) in Mexico. AMCS Activities Newsletter, 14:40–44.
- Reddell, James, and William R. Elliott. 1974. Trip report [partially to Acatlán, Oaxaca]. AMCS Newsletter 5(1):7–13, published in 1977.
- Russell, Bill. January 1977. Schoolbus scoops Zoquitlán Area. [Cueva de la Finca]. AMCS Activities Newsletter, 5:20.
- The Black Holes Expedition, ca. 1990. Maps of Cueva Juan Sánchez 1 and 2. p. 21. Map also at <http://www.mexicancaves.org/maps/3098.pdf> accessed April 2019.

Resumen

El autor usa dibujos y apuntes reconstruidos recientemente para documentar cuevas en el estado de Oaxaca exploradas en los años 70s como parte del estudio del habitat 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 sugieren que hayan muchas más por le región para alentar a la siguiente generación de biólogos y espeleólogos.