SÓTANO DE YERBANIZ

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This report is a follow-up to last year’s article on *Astyanax* cavefishes in this newsletter and a preview of what will come in an AMCS bulletin on the *Astyanax* caves of Mexico. In 2015 I hope to publish that bulletin on about thirty cavefish sites in the Sierra de El Abra and Sierra de Guatemala, San Luis Potosí and Tamaulipas, and one cave in Guerrero that contains an interesting population of evolving cavefishes.

After forty-five years I am sharing my map of Sótano de Yerbaniz with cavers and biologists. What a long journey! But it was worth the effort to redraw the July 1969 survey by Don Broussard, Jim McIntire, and me. I originally drew the pencil draft and then inked the map on two large sheets in 1969–1970, but unfortunately it was never published. Fortunately, I archived my survey notes and the two map sheets with the Association for Mexican Cave Studies and the Texas Speleological Survey in Austin. I recently traced the maps from scans of the notes and old maps, but over a new line plot. Yerbaniz is the most complicated cave map I have ever drawn. It took six days to map and months to draw. The original data processing was with pencil, paper, slide rule, and drafting machine. This new, more accurate version used the Walls program and Adobe Illustrator 12.

The cave was discovered from pilot Richard Albert’s airplane on 25 January 1969 by Robert Mitchell, Francis Rose, Richard Albert, and Tom Albert. It was an accidental discovery as they searched at dusk for the landing strip at nearby Ponciano Arriaga after scouting for cavefish caves. Little did they know they had found one of the most complex and biologically rich caves of Mexico.\(^1\)

Tony Mollhagen and Francis Rose, of Mitchell’s research team from Texas Tech University, descended the 63-meter entrance pit on 28 January 1969. The next day Mitchell, Rose, Richard, and his son Tom Albert entered the cave with more Goldline rope, explored parts of the first and second levels, and collected eyed, surface *Astyanax* in pools on the upper level. They used two Jumars in the Texas prusik system to ascend. On 31 January 1969 the cave was explored to Level 3 by Jerry Broadus, David Honea, Ann Lucas, Russell Harmon, Tony Mollhagen, and Joe Cepeda, who collected several cavefishes in Lake 1 on the lowest level, about 96 or 97 meters below the entrance. On 2 February 1969, a sizable collection of cavefishes was made from the same lake by Bob Mitchell and Bill Russell.

Sótano de Yerbaniz is in the Arroyo Yerbaniz, about 22 kilometers north of Ciudad Valles, San Luis Potosí. Also discovered from the air and downstream are Sótano de Matapalma, 1.4 kilometers away in a straight line, and Sótano de Japonés, 2 kilometers away. This trio form what I call the Yerbaniz Cluster, with older caves in succession from north to south. Yerbaniz is the youngest and probably the most hydrologically active of the three fish caves.

The Arroyo Yerbaniz drains the largest area of any of the arroyos captured by fish caves, about 16 square kilometers. Surface fishes inhabit the arroyo, but the arroyo does not support a permanently flowing stream. In its course the fish populations are maintained in pools, some of which may be unseen deep in the bed of the arroyo.

The name, *yerbaniz*, refers to an herb, like St. John’s Wort, the flowers of which are used in religious ceremonies on the Día de Los Muertos, according to Juan Gloria, friend to cavers in Cd. Valles, but now deceased. It is also spelled *yerbanís* or *hierba anís*.

Yerbaniz has fifteen pits, including the entrance, connecting three levels, and three lakes on Level 3, which is in two parts. The aggregate horizontal length is 2,075 meters. This is a challenge to represent on one plane. I rendered the new map in three translucent colors to depict the overlapping levels, and I labeled the pits in three series. Pits from Level 1 to Level 2 are numbered as pit 1.1 through pit 1.7. Level 2 pits are pit 2.1 through 2.4. Pits on Level 3 are pit 3.1 through 3.3.

Yerbaniz has massive floods and food input, and there is a large *Astyanax* cavefish population in the scummy Lake 1. Eyed, surface *Astyanax* are sometimes found on Levels 1 and 2 in shallow pools, but they usually are starving and are often swept away by floods. They become food for the cavefishes. The cavefish are survivors, and they can put on massive fat deposits during good times to make it through the lean times.

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The entrance of the cave is an elliptical slot about 10 meters long by 1 to 4 meters wide. It lies in the northern edge of the Arroyo Yerbaniz at an elevation of about 260 meters, according to Google Earth and the Las Palmas 1:50,000 topographic map, not 241.5 meters as given in Mitchell et al. in 1977; survey benchmark elevations have been revised upward since then. The location in that paper is also erroneous. Although a relatively young opening, the entrance is of sufficient size to capture all of the water flowing down Arroyo Yerbaniz except at high flood stage. Water can move past the entrance at such times, as demonstrated in September 1969, when Bill Russell visited the cave entrance immediately after a very heavy rain. So much water was being carried in the arroyo that the entrance could not take all of it. Water about 1 meter deep was flowing by the entrance, where a large whirlpool took water down; at another point mist shot up about 12 meters where air was exhausted from the cave. The results of such violent flooding are seen within the cave, with cobble piles, large palm trunks wedged into corners, and log jams scattered in the floodwater mazes of Levels 1 and 2.

Level 1, consisting of several large rooms, small intersecting passages, and one long northeast-trending passage, lies at 54–56 meters beneath the entrance datum.

Level 2, at about –68 to –88 meters, has two large rooms (depending on your perspective), many small intersecting passages, one long northwest-trending passage to a part of Level 3 with Lake 3, and a shorter south-trending passage, the Blind Scorpion Passage. Joint sets are about 0°, 45°, and 75°, with pillars trending along those joints.

The rest of Level 3, consisting of the Lake 1 Room the size of a football field and two long overflow pas sageways, lies about 91–97 meters beneath the entrance. Joint sets are about 45°, 75° and 330°. The deepest points in the cave, the surfaces of three lakes in Level 3, lie 96–97 meters beneath the entrance, or at an elevation of 163 meters, not 146.5 as stated in Mitchell et al. These three lakes probably are at local base level, connected via submerged passages. The water is warm, about 29° C in July 1969.

I entered Yerbaniz fourteen times over three years. On 31 July 1969, the last day of the survey, I was fortunate to discover a delicate blind scorpion on Level 2, hence the Blind Scorpion Passage on the map. Or rather the tiny, translucent scorpion found me, on my right thigh. I had been brushing off little amphibious Brackenridgia isopods as we surveyed the tubular passage, crouching against the wet walls. I was about to brush another one off when I looked down and saw what was to become the holotype specimen of a new species to science. I swore out loud and jumped up and down three times, then I collected it. Dr. Mitchell later described it as Typhlochactas elliotti. He found that it was similar to two other blind cave scorpions in Mexico that he had published. Return trips found only two more specimens. Years later it is still considered the world’s most troglomorphic (cave-adapted) scorpion, and it is now by itself in the genus Sotanochactas. This was an exciting find, especially since we did not know that blind scorpions could occur in the lowland tropics—the others were from montane areas. This helped form our idea that cave-animal evolution is possible, even common, in the tropics.

Some of us also found a new...
Brunton compass & tape surveys by William R. Elliott, sketch; Don Broussard, Brunton compass; & Jim McIntire, tape; July 9, 12, 16, 23, 29, 31, 1969. Entrance elevation 260 m, depth 97 m, horizontal length 2075 m, extent 2238 m. Cave has 15 pits & 3 levels. Redrawn by Elliott, 2014.
Sótano de Yerbaniz
Municipio de Ciudad Valles, San Luis Potosí, México

Profile facing 230°

Profile facing 320°

Brunton compass & tape surveys by William R. Elliott, sketch; Don Broussard, Brunton compass; Jim McIntire, tape; July 9, 12, 16, 23, 29, 31, 1969. Entrance elevation 260 m, depth 97 m, horizontal length 2075 m, extent 2238 m. Cave has 15 pits & 3 levels. Redrawn by Elliott, 2014.

Francis Rose with flood debris in Sótano de Yerbaniz. Robert W. Mitchell
I made cavefish population estimates in Yerbaniz and Cueva del Pachón, which is near the northern El Abra pass. Using a two-census, mark-recapture method (Lincoln Index), I statistically estimated the Lake 1 population in Yerbaniz at roughly 8,700. Pachón also had a large population, about 9,800. Because of the limited number of marked fish recaptured, the uncertainties in these numbers are large, but all in all, I think that there could be astronomically large numbers of cavefishes in the El Abra region at base level, not in upper pools. The bottom of Sótano de Soyate also has a large population of cavefishes, not yet estimated. This is interesting to cavefish biologists because it could mean large amounts of genetic variation available for evolution in different isolated or semi-isolated populations.

"We had a cave rescue at Yerbaniz in 1972 during a graduate arachnology class trip from Texas Tech, led by Mitchell. Some of us took John A. L. Cooke, British arachnologist, into the cave to photograph scorpions and schizomids. Mitchell always assumed that everyone could keep up with his maniacal pace, but Dr. Cooke had never been on rope, he was big, and he had a cold too. He tired out when we returned to Level 1, so we let him bivouac on a comfortable spot while we went to our hotel in Cd. Valles. The next morning we had our usual breakfast at the Café Condesa, and then we took John a bistec milanesa and a beer. I rappelled in with his breakfast, and I think he downed the beer before he touched the food. Then the class of about ten guys hoisted him out of the pit. All were happy, and we went on to the next maniacal thing."