



# PARKS WATCH

Strengthening Parks to Safeguard Biodiversity

## Park Profile – Venezuela Alfredo Jahn Cave Natural Monument



*The main entrance to the Alfredo Jahn Cave is called Boca 6*

**Date of last field evaluation:** October 2005

**Date of publication:** March 2006

**Location:** Miranda State

**Year of creation:** 1978

**Area:** 58 ha

**Ecoregion:** Montane forest of the coastal range

**Habitats:** Premontane dry forest (seasonal, semi-deciduous, sub-montane ombrophilous forest)



*Text and Photos by Rodolfo Castillo*



*The Galería del Río (River Passage) is the principal route for visitors of the cave*

## **Summary**

The Alfredo Jahn Cave Natural Monument (Monumento Natural Cueva Alfredo Jahn) is located four kilometers to the west of the town of Birongo, Miranda State, in the eastern sector of the Serranía Littoral (coastal mountains) of the Cordillera de la Costa (coastal range). With a network of passages measuring 4.29 kilometers (2.67 miles), it is the largest cave in the central region of Venezuela, as well as one of the most visited in the country. The humid cave, which is still active, has been formed by the action of Cambural Creek. Its calcite walls are covered with spectacular stalagmites, stalactites, and columns that are best developed in the Salón del Chaguaramo (Palm Chamber) or the Salón de la Lluvia (Rain Chamber).

## **Biodiversity**

A seasonal, semi-deciduous, premontane forest surrounds the cave, which contains three strata of dense thickets. Among the most common tree species are the araguaney (*Tabebuia chrysantha*) and the gumbo-limbo (*Bursera simaruba*). Frequent flooding of the creek has limited the establishment of troglobyte fauna (animals living exclusively in the cave); however, an abundant fauna of insects and arachnids exists, as well as populations of four important species of bats, including large numbers of vampire bats (*Desmodus rotundus rotundus*).

## **Threats**

There are two small villages established within the natural monument, but the agricultural areas located in the Cambural Creek watershed are the main threat. Because this watershed feeds the hydrologic system of the cave, these agricultural areas pose a problem to the integrity of the geologic processes at work there. For this reason, this protected area is classified as threatened.

## Description



*The Galería de la Quebrada is another route used by visitors of the cave*

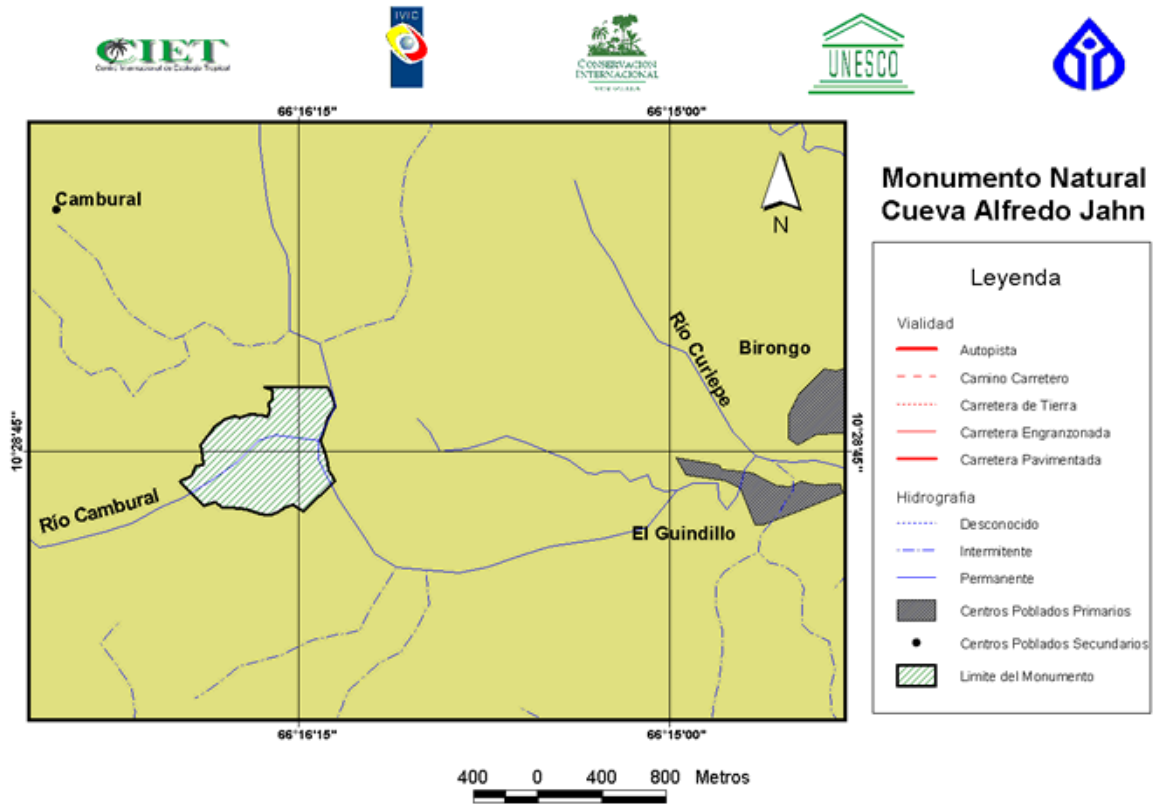
### **Geography**

The Alfredo Jahn Cave is located four kilometers to the west of the town of Birongo, Miranda State, in the eastern sector of the Serranía Littoral (coastal mountains) of the Cordillera de la Costa (coastal range). This natural monument is found at an elevation ranging from 60 to 300 m above sea level (ASL). The semi-steep topography is formed by calcareous hills. The climate is hot and rainy with an average annual precipitation of 1,970 mm. The interior temperature of the cave oscillates between 22°C and 26°C (71-79°F) (MARNR 1992).

The Alfredo Jahn Cave is the largest cave in the central region of Venezuela, and the sixth largest in the country, with a network of horizontal passages measuring 4,292 meters, a depth of 67 meters, and 15 entrances known as “bocas” or mouths. The cave can be divided into six sectors (rough translations are given in parentheses): Galería de la Quebrada (Creek Passage), the Arrastradero (the Crawl Way), Galería del Río (River Passage), Galería Codazzi (Codazzi Passage), Salón del Chaguaramo (Palm Chamber) or Salón de la Lluvia (Rain Chamber), Galería del Sifón del Diablo (Devil’s Siphon Passage), and Galería Henri Pittier (Henri Pittier Passage) (SVE 1973).

This geologic formation consists of calcite and calcite-dolomite marbles (Uzcátegui 1996). The perennial Cambural Creek passes through the interior of the cave, draining a sub-basin whose mineralogy consists of schists from the La Mercedes and Las Brisas formations (Urbani 1974). The cave has formed through the erosive and corrosive actions of water on the calcite and dolomite rock. In the dry season, the creek infiltrates the cave at the level of the Salón del Chaguaramo (or Salón de la Lluvia), along a 200 meter length of calcite block, forming a channel in the cave’s interior until it emerges 600

meters farther down, at Boca 1 of the cave. The waterway then continues above ground until it meets Casupal Creek. In the rainy season, infiltration through the sediments of the channel's bed is not sufficient to capture all of the water flow. The excess flows through a channel above the cave, entering through Boca 8, and then continuing through the cave until it emerges at Boca 1 (Forti et al. 1999).



Source: Tapiquén et al. 2004

The Alfredo Jahn Cave is a relatively young cave, thus the processes of erosion and corrosion are more important in shaping the interior of the cave than the deposition of carbonates (in formations known as dripstones). The thickness of rock above the cave passages is about 30 meters. Due to the high hydrologic activity, many calcite formations, especially stalactites, decorate the cave (Forti et al. 1999). These formations exhibit their best development in the Salón de la Lluvia, where a striking column known as “El Chaguaramo” is found. This column formed through the union of a stalactite and a stalagmite and bears a striking resemblance to the palm tree of the same name.

With regard to the geology of the cave, the Las Mercedes formation, dating back to the Mesozoic Era (Jurassic-Cretaceous Periods), emerges in the monument. It is a metamorphic formation principally composed of calcite schists, with zones of graphite and locally micaceous areas (PDV 1997). Calcite marbles predominate in the Birongo region (Urbani 1996). In fact, calcite is the most common mineral in caves, taking on spectacular shapes as stalactites, stalagmites, and columns.

Besides calcite, a variety of other minerals also exist in the cave. Halite, for example forms a thin layer covering the bottom walls of the Salón del Chaguaramo. Amorphous oxide-hydroxides of iron and manganese form thin, red to black layers covering the rock on the bottom of the creek that traverses this chamber. Ammonium-jarosite is also present as clear blue points, while koktaite mixed with hydroxyl-apatite and halite appears as grey points on the marble walls. Mangano-berzelite is seen as a thin layer of pink to brownish-pink covering the limestone beds of the active creeks (Urbani 1996). Ammonium-jarosite, koktaite, and mangano-berzelite have not been reported in any other cave in the world (Forti et al. 1999).

### ***Biodiversity***

The vegetation in the 58 hectares surrounding the cave is typical of a seasonal, semi-deciduous premontane forest. The forest contains three dense strata. Among the most common tree species are the araguaney (*Tabebuia chrysanta*), the naked indian or gumbo limbo tree (*Bursera simaruba*), the white ramoon (*Trophis racemosa*), the tuque (*Ocotea glandulosa*), and the palo de vaca (*Poulsenia armata*) (MARNR 1992).

Generally, estimates indicate that the many invertebrates found in the caves of Venezuela are from 250 taxa (147 of which have been determined at the species level), while there are approximately 90 vertebrate species. Bat and fish species are the most numerous vertebrates. Approximately 10% of the cave-dwelling fauna are troglobytes, that is, they complete their entire life cycle inside the caves and have evolutionary characteristics specific to these environments, including a loss of pigmentation and atrophy of the eyes (Galán 1995).

In Alfredo Jahn Cave, the frequent flooding of the Cambural Creek, which can completely inundate the cave, has limited the establishment of a troglobyte fauna. As a result, the species of fauna in the cave are principally troglaphiles (completing only part of their life cycle in the cave) or troglaxene (occasional visitors to the cave environment). Guano-producing animals are particularly abundant (Bordón 1973).

There are at least four species of bats documented in the cave, all of which are common in Venezuela: two small insectivorous species (the common mustached bat, *Pteronotus parnelli* and the funnel-eared bat, *Natalus stramineus*), a large omnivorous species (the spear-nosed bat, *Phyllostomus hastatus*), and the common vampire bat (*Desmodus rotundus rotundus*). The latter species is found throughout the country, and there are numerous myths surrounding it, due to the fact that it feeds exclusively on the blood of mammals. One of the most important factors in the expanded distribution of this species in Venezuela has been the introduction of cattle and horses, which the bat attacks during the night (Linares 1998). The most numerous populations of vampire bats in the cave are in the dry sections close to Bocas 2, 3, and 4. Large amounts of guano cover the soil in the areas where these colonies are located.





*The forest near the Alfredo Jahn Cave*

Six orders of insects have been reported: hymenoptera (ants), coleoptera (beetles), dipterous (flies), neuropteran (lacewings), hemiptera (leaf bugs) and blattaria (cockroaches). There are at least five orders of arachnids, including three species of araneida (*Priscula paeta*, *Wendilgarda miranda*, and *Achacaranea inopinata*). Also, at least two species of shrimp are found in the waters of the Cambural Creek (Bordón 1973).

### ***Management***



*Signs located near the main entrance to the cave*

The Alfredo Jahn Cave was declared a Natural Monument on December 12, 1978 for the purpose of protecting this valuable scenic resource. It is one of the largest caves in the country, and its unique characteristics include multiple entrances and caverns, extensive passages, and notable crystallizations and natural formations (República de Venezuela 1979). The Institute for National Parks (INPARQUES), the government body charged with the administration of the

national park system of Venezuela, is responsible for the administration and management of the cave. Presently, the authorities of El Ávila National Park manage the monument.

Those park rangers assigned to the eastern sector of El Ávila are responsible for monitoring and enforcement in the natural monument, although there is currently no guard post there. The monument's boundaries are not designated in a formal manner on the ground. Although a small stretch of the Casupal Creek serves as a natural border, the remaining boundaries are only defined by elevation levels. Recently some volunteer organizations have posted signs along the way to the cave entrance, which supplement the two previously existing signs describing the characteristics of its geologic formation.

The natural monument has many regulations regarding permitted activities. Prohibited activities include sport or commercial hunting, breeding of domestic animals, large sporting or recreation events, transport of weapons, and removal of plants or animals. Activities such as excursions and scientific research are permitted. The monument does not have its own management plan. The regulations mentioned above are found in the Regulations Regarding the Administration and Management of National Parks and Natural Monuments (República de Venezuela 1989).

### ***Human Influence***

The town of Birongo is found near the cave. It consists of several villages, Marasmita de Birongo being the one located closest to the access route to the cave. Birongo was a "cumbe," a town formed by slaves who escaped from cacao plantations and hid in the mountains, leaving only occasionally (Ríos et al. 1991). The town is located in the Brión municipality, which had a population of approximately 45,000 inhabitants in 2001, and annual growth rate of 2.9%, which is higher than the annual growth rate of 2.2% for the country overall (INE 2005).

A significant tourism industry is developing on the beaches of Brión municipality. As a result, its capital Higuerote has developed an adequate infrastructure of hotels, buildings, and restaurants to support it. Farther from the coast, the main economic activity is agriculture, as in the case of Birongo and the neighboring town of Curiepe, where small-scale cultivation of cacao is especially important. Other crops grown in the area include ocumo, ñame, yucca, mapuey, plantains, and bananas. The villages of Casupal and La Oficina are found within the boundaries of the monument. Some agricultural activity occurs inside the monument, although the majority of villagers cultivate land outside its boundaries. It is also important to note that the creeks of the protected area provide water for the different villages of the region.



*A home in the village of Casupal*

### ***Tourism***

From a cultural point of view, the town of Birongo is particularly interesting as one of the most important centers for the culture of African roots on the coast of Venezuela. The town began as a refuge for African slaves who escaped from the cacao plantations of the region and remained isolated for a long period of time. For many years, its inhabitants did not enter the interior of the cave or realize its potential for tourism and recreation. Today, Alfredo Jahn is considered the most visited cave in the country, with an estimated 2,000 to 5,000 visitors each year.

Access to the cave is by a partially-paved dirt road on the left bank of the Casupal Creek. Where this road crosses the creek, there is a small warehouse that serves local inhabitants as a storage and distribution center for supplies. The road continues, crossing the Cambural Creek, and then, about 200 meters (219 yards) farther, reaches the majority of the entrances to the cave. The best entrance is Boca 6, which permits easy access for visitors.

The most impressive galleries are the Salón del Chaguaramo (or Salón de la Lluvia) and the Galería Codazzi. The Salón del Chaguaramo is nearly 30 meters (33 yards) in length. The name is derived from the enormous six-meter high (20 feet) column whose apex mimics the leaves of a palm. The adjacent Salón de la Lluvia, which is also large, is named for the droplets of water that fall continuously from the roof of the cavern, creating many beautiful formations. Another interesting passage is the Arrastradero, so named because one must crawl in order to pass through it. It connects the Galería de la Quebrada with the Galería del Río and is about 25 meters long (27 yards). The Paso del Tremedal (Quagmire Pass) in the Galería del Río is also notable. It is difficult to pass,



and occasionally filled chest-deep with water, much like the Paso del Mono (Monkey Pass), which one is able to avoid by climbing along the limestone walls.

One of the best routes for exploration is Boca 6–Galería del Río–Galería Codazzi–El Hongo–Salón del Chaguaramo, which traverses nearly 520 meters (569 yards). Another interesting route, Boca 6–Galería de la Quebrada–Boca 8, is almost 240 meters in length (262 yards). These two routes are connected by the Arrastradero, through which visitors can pass from one route to the other, spending between four and five hours in the interior of the cave (Ríos et al. 1991).



*The column known as “El Chaguaramo”*

*A group of university students in the Salón del Chaguaramo*



In Alfredo Jahn Cave, visitors should take precautions against the risk of histoplasmosis, a disease caused by a fungus (*Histoplasma capsulatum*) that is seen around the world. Associated with dry caves, the disease is contracted through inhalation of the spores, which then transform into yeast in the lungs. Although Alfredo Jahn Cave is generally a humid cave, there are dry sections with large accumulations of guano, which are considered to be higher risk areas for contraction of the disease (Suárez et al. 2002).

Certain equipment is necessary when entering the cave, such as flashlights with replacement batteries and helmets for protection in those galleries with low ceilings. It is also recommended that tourists only enter the cave with guides who know the system of passages and the areas with a higher risk of histoplasmosis.

## **Conservation and Research**

Scientific exploration of the cave began in 1952, when it was visited by the Speleology Section of the Venezuelan Society of Natural Sciences. Juan Antonio Tronchoni, Eugenio De Bellard, Roberto Contreras participated in the first exploration. They were guided by local hunters who knew the cave as Cueva de la Tapa de Cambural (Gate of the Cambural Cave). The researchers named the cave to memorialize the noted Venezuelan engineer and naturalist Alfredo Jahn (1867 – 1940). Jahn, a well-known explorer of the Andean, central, and Amazonian regions of Venezuela, was also the founder of the Venezuelan Society of the Natural Sciences. He was a pioneer of various scientific disciplines in Venezuela, including geography, geology, topography, astronomy, anthropology, linguistics, and botany (Fundación Polar 1997).

The cave was registered in the National Speleological Cadastre by the Venezuelan Speleological Society in 1973 (SVE 1973). Included in the 1973 cadastre is the only available description of the fauna of the cave, which was documented by Carlos Bordón. Since that time, some members, in particular Franco Urbani, have conducted studies on the physical chemistry of the water (Urbani 1995) and the cave's geology and mineralogy (Urbani 1996). More recently, the stalagmites of the cave have been utilized in paleoclimatology studies (Gonzales and Gomez 2002).

There has been an outbreak of histoplasmosis in Alfredo Jahn Cave, reported in March 2000, which affected a group of 34 college students and a professor who were in the cave for 20 minutes. It was one of the largest outbreaks ever reported; 71% of the 28 students who were evaluated developed acute histoplasmosis (Suárez et al. 2002).

The disease, which is contracted by inhaling spores which transform into yeast in the lungs, is generally associated with dry caves. However, the fungus is particularly abundant in areas where accumulated bird and bat excrement is either decomposing or mixed with the soil. It tends to be inhaled with dust when the guano is disturbed. The severity of histoplasmosis depends on the degree of exposure and previous immunity of the patient. Common symptoms include a high fever (up to 42°C, or 107.6°F), chills, an unproductive cough, thoracic pain, nausea, and vomiting, which are often confused with the flu (except in acute cases). The symptoms tend to persist for about two weeks. The majority of symptoms disappear within 10 days, but may last longer in more serious cases. The disease should be treated with an antifungal, especially when acute complications develop (Suárez et al. 2002).

Few biological research projects relate directly to Alfredo Jahn Cave (Carlsen 1999), however, there are various projects that apply to the biology of Venezuelan caves in general (Galán 1995, Galán y Urbani 1987, Linares and Bordón 1987).

## Threats

### *Agriculture and Deforestation*

Within the natural monument there are two small villages, Casupal and La Oficina, which were present before the creation of the protected area. These currently include 24 rustic houses and approximately 125 inhabitants (OCE 1994, INE 2005). The main economic activity, although it is not widespread, is agriculture, principally the cultivation of ocumo, yucca, and cacao, which occurs on a fairly limited basis. The majority of agricultural land lies fallow because the inhabitants mostly conduct these activities in areas outside the monument. However, two newly deforested sites that are being prepared for agricultural use have recently been observed within the protected area. In one area, a stand of medium size trees was clear cut, while the other site was burned, killing off all of the vegetation.



*Ocumo and yucca crops in the village of Casupal*



*A burned area cleared for agriculture in the Village of Casupal*

In the areas surrounding the natural monument, there is a great deal of agricultural activity, predominantly the cultivation of yucca, mapuey, ñame, corn, plantains, bananas, and cacao. These activities threaten the continued integrity of the geologic processes of the cave because they occur within the watershed of the Cambural Creek, which feeds the hydrologic system of the cave. In view of this situation, the boundaries of the natural monument (which reach 300 m ASL) do not actually meet the objective of complete protection of this geologic formation. The surrounding boundaries of El Ávila National Park extend to nearly 400 m ASL, but this still does not protect the entire Cambural watershed.

According to a study of the Cambural and Casupal sub-basins, 83.5% of the 2,640 ha studied were natural vegetation with only minor interference. The forest continues to be well-preserved, as well as those savannas with no practical use. The remaining 16.5 % consist of conucos (raised gardens) and populated areas (Ríos et al. 1991). Various

environmental groups worry that deforestation will decrease the flow of the Cambural



Creek and, as a result, affect the geologic processes of the cave. There is also concern that a drier interior environment would favor the propagation of the fungus *Histoplasma capsulatum*, potentially increasing the incidence of histoplasmosis.



*Deforested area near the Casupal Creek*



*The Cambural Creek is important for the geologic processes of the cave*

***Lack of personnel and equipment***

Currently, the Alfredo Jahn cave has park rangers, however their jurisdiction is not limited to the 58 ha of the natural monument; they are also responsible for monitoring the



eastern sector of El Ávila National Park. The park rangers lack transportation, equipment or infrastructure, and there is no guard post to serve as a headquarters and information center for visitors. There is not a sufficient institutional presence to address the magnitude of the issues associated with human activities in the area.

## Future Threats

### *Tourism*

Even though there have been no studies regarding the carrying capacity of the cave, it has been recommended that groups entering the cave be of no more than eight people (Ríos et al. 1991). There are natural restrictions for large tourist groups, such as the narrow passages and small chambers. The type of activity that occurs today, adventure tourism and naturalism, is an ideal scheme that could be continued without installing additional facilities such as interior paths or lights (Ríos et al. 1991, Perez 1978). When promoting the cave as a tourist attraction of Miranda State, these limitations should be taken into consideration. A few of the potential impacts of tourism are already being observed in the cave at the current rate of visitation. The damages include painting on the walls (graffiti), broken stalactites, litter, and carbide remnants, a type of solid combustible material used for lighting.

Occasionally, people enter the cave without prior knowledge of the structure of the passages and chambers or without proper equipment such as helmets and flashlights, which puts them at risk of physical harm. Because the cave is humid the entire year, it is not considered a high risk environment for contracting histoplasmosis, however, one of the largest recorded outbreaks of the disease did occur in the cave (Suárez et al. 2002).

### *Agriculture frontier expansion and human colonization*

The population growth being experienced in the Brión municipality indicates that the agricultural frontier will probably continue to expand in order to provide food, shelter, and livelihood for the growing population. Despite the legal protection that the natural monument provides, not implementing the measures necessary to regulate land use around the monument could have negative consequences.



*Unforested slopes covered by savannas and ferns, adjacent to the monument (left); this school was constructed within the boundaries of the natural monument*

## Recommended Solutions



*The expansion of the El Ávila National Park protects those areas adjacent to the monument*

### ***Agricultural expansion, human colonization, and deforestation***

The recent proposal formulated by the National Parks Institute and the Ministry of the Environment and Natural Resources to expand the boundaries of El Ávila National Park is an initial step toward guaranteeing the legal protection of the Alfredo Jahn Cave basin. However, this proposal should take into account the fact that there are already inhabitants conducting agricultural activities within the proposed area of expansion. This problem will require a social solution. One option would be to limit agricultural use to those zones presently being cultivated and offer technical advice to farmers regarding better use of soils. The Ministry of Land and Agriculture could participate in such a project. If it is taken into account that damages affecting the geologic processes of the cave are already occurring in the Cambural sub-basin, it may be considered necessary to relocate these inhabitants. In this case, the Ministry of Land and Agriculture could become involved through the National Land Institute program.

### ***Tourism***

The capacity of Alfredo Jahn Cave for tourism should be considered when promoting it as a tourist attraction. Recommendations should be made that visitors only enter the cave in small groups, with adequate equipment and guides who know the system of passages. The importance of the natural monument and its conservation should also be highlighted for visitors.

### ***Lack of personnel and equipment***

Taking into account the overlapping functions of the El Ávila National Park rangers, it will at least be necessary to hire additional park rangers, and obtain the corresponding infrastructure and equipment, in order to improve monitoring and enforcement of the

area. One of the existing advantages of the monument is the warehouse located near the cave. It serves as a point of reference and information, where the park ranger and guides can be found and equipment, such as flashlight and helmets, can be rented. The volunteer groups that have made signs orienting visitors to the cave are important allies.

[Arco; Rodolfo Castillo] and [Sign 1; Rodolfo Castillo] [Sign and Warehouse; Rodolfo Castillo] Signs made by volunteer groups located near the warehouse and on the path to Boca 6 of the Alfredo Jahn Cave

## Conclusions

The Alfredo Jahn Cave Natural Monument protects a geologic formation that is the largest cave in Central Venezuela and sixth largest in the entire country. There are 4,292 meters (4,694 yards) of horizontal galleries which reach a depth of 67 meters (220 feet), as well as 15 entrances, or mouths, in the cave. The two villages situated within the protected area, as well as the various agricultural practices in the surrounding hydrologic basin, pose a threat to continued integrity of the geologic processes of the cave. Thus, this natural monument is categorized as threatened. The proposed expansion of the boundaries of El Ávila National Park would allow a broader legal protection of those areas adjacent to the monument, although increased land use regulation will still be necessary.



*Stalactites in the Galería Codazzi*

## References

- Bordón, C. 1973. Fauna de la Cueva Alfredo Jahn. Boletín de la Sociedad Venezolana de Espeleología 4: 72.
- Carlsen, M. 1999. Recopilación y reproducción de información sobre las investigaciones en el Sistema de Parques Nacionales. INPARQUES. Dirección General Sectorial de Parques Nacionales. División de Evaluación, Inventario y Monitoreo Ambiental.
- Galán, C. 1995. Fauna troglobia de Venezuela: sinopsis, biología, ambiente, distribución y evolución. Boletín de la Sociedad Venezolana de Espeleología 29:20-38.
- Galán, C. y Urbani, F. 1987. El desarrollo de la espeleología y aspectos generales de las áreas cársticas venezolanas. pgs. 15-22. En: Décu et al. Fauna hipógea y hemiedáfica de Venezuela y otros países de América del Sur.
- Gonzáles, L.A. y Gómez, R. 2002. High resolution speleothem paleoclimatology of Northern Venezuela: a progress report. Boletín de la Sociedad Venezolana de Espeleología Vol. 36.
- Forti, P., Urbani, F. y Rossi, A. 1999. Minerales secundarios de las Cuevas del Indio y Alfredo Jahn, Estado Miranda, Venezuela. Boletín Informativo de la Comisión de Geoespeleología. Federación Espeleológica de América Latina y el Caribe. No. 7.
- Fundación Polar. 1997. Diccionario de Historia de Venezuela. 2da Edición. Caracas.
- INE. 2005. Censo 2001. Primeros resultados. Instituto Nacional de Estadística. Caracas. Disponible en internet: <http://www.ine.gov.ve/>
- Linares, O. 1998. Mamíferos de Venezuela. Sociedad Conservacionista Audubon de Venezuela - BP de Venezuela. 591 p.
- MARNR. 1992. Áreas naturales protegidas de Venezuela. Serie Aspectos Conceptuales y Metodológicos. DGPOA/ACM/01. Ministerio del Ambiente y de los Recursos Naturales Renovables. Caracas.
- OCEI. 1994. Nomenclador de centros poblados. Total nacional. Oficina Central de Estadística e Informática. Caracas. 540 p.
- PDV. 1997. Léxico Estratigráfico de Venezuela. Disponible en internet: [www.pdvsa.com/lexico/](http://www.pdvsa.com/lexico/)
- Perez, F. 1978. Problemas ambientales de áreas cársticas. Parte 2: el efecto de la ocupación humana sobre el sistema cavernícola. Boletín de la Sociedad Venezolana de Espeleología 9(17): 73-96.
- República de Venezuela. 1979. Decreto N° 2.989 del 12 de Diciembre de 1978, mediante el cual se declara Monumento Natural "Cueva Alfredo Jahn", la zona comprendida dentro de los linderos señalados y ubicado en jurisdicción del Distrito Acevedo del Estado Miranda. Gaceta Oficial N° 2.417. Caracas, 7 de marzo.



- República de Venezuela. 1989. Decreto N° 276 del 7 de Junio de 1989: Reglamento Parcial de la Ley Orgánica para la Ordenación del Territorio sobre Administración y Manejo de Parques Nacionales y Monumentos Naturales. Gaceta Oficial N° 4.106. Caracas, 9 de Junio.
- Ríos, M., Szabadics, S. y N. Martinez. 1991. Aproximación metodológica para la planificación del aprovechamiento turístico recreacional en áreas cársticas: caso Cueva Alfredo Jahn, Municipio Foráneo Capaya. Estado Miranda. Tesis de Grado. Geografía. Facultad de Ciencias Económicas y Sociales. UCV. Caracas. 318 pp.
- Suárez, J. A., J. Torres, L. Naranjo, C. Torres, S. Abdul-Haidi, A. Ríos, J. Francoisi, M. Dolande, S. Rodríguez, N. Zerpa y J. Capino. 2002. Brote de histoplasmosis asociada a la Cueva Alfredo Jahn en Venezuela. VITAE, Academia Biomédica Digital, N° 12. Universidad Central de Venezuela. Disponible en internet: <http://caibco.ucv.ve/>
- SVE. 1973. Catastro Espeleológico Nacional. Mi.35 – Cueva Alfredo Jahn. Boletín de la Sociedad Venezolana de Espeleología 4(1): 63-72.
- Tapiquén, E., R. Lazo y C. Kalinhoff. 2004. Monumento Natural Cueva Alfredo Jahn. En: Rodríguez, J. P., R. Lazo, L. A. Solórzano y F. Rojas-Suárez (eds.) Cartografía Digital Básica de las Áreas Naturales Protegidas de Venezuela: Parques Nacionales, Monumentos Naturales, Refugios de Fauna, Reservas de Fauna y Reservas de Biósfera. Versión 1.0, CD ROM y en-línea. Centro Internacional de Ecología Tropical (CIET), Instituto Venezolano de Investigaciones Científicas (IVIC), Conservación Internacional Venezuela, UNESCO y Oficina Nacional de Diversidad Biológica del Ministerio del Ambiente y de los Recursos Naturales (MARN). Caracas, Venezuela. Disponible en Internet: <http://ecosig.ivic.ve/>
- Urbani, F. 1974. Carsos de Venezuela. Parte 2: Calizas metamorfozadas de la Cordillera de la Costa. Boletín de la Sociedad Venezolana de Espeleología 4(1): 15-38.
- Urbani, F. 1995. Composición fisicoquímica de las aguas kársticas de la zona de Birongo – Capaya, Estado Miranda. Boletín de la Sociedad Venezolana de Espeleología 29: 1-6.
- Urbani, F. 1996. Venezuelan Cave Minerals: a review. Boletín de la Sociedad Venezolana de Espeleología, No. 30.
- Uzcátegui, R. 1996. Mineralogía de los mármoles de la Cueva Alfredo Jahn, Birongo, Estado Miranda. El Guácharo, Sociedad Venezolana de Espeleología 38:4-9.