

“BISERNA” CAVE - AS A TOURIST SITE

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Abstract

As a tourist resource, the cave combines natural uniqueness with opportunities for sustainable tourism. Access to it is regulated in order to protect the ecosystem, by organizing controlled visits with guides. This allows for the simultaneous promotion of natural heritage and the minimization of anthropogenic pressure.

From a scientific point of view, the cave is of interest with the rich variety of speleothems, such as stalactites, stalagmites and other calcite formations. It is also of significant importance as a habitat for protected species of bats, which necessitates the application of assessed measures to comply with and limit the safe impact.

From the geomorphological point of view, the cave is distinguished by a complex structure of galleries, halls and underground water bodies. The presence of various speleothems - stalactites, stalagmites and sintered formations - effect for its scientific significance and visual appeal.

In conclusion, the cave has significant potential for development as a tourist destination, provided the balance between tourism activity and effective conservation of its natural resources is maintained.

Keywords: *“Biserma” cave, tourist destination, bats.*

Geographical and Morphological Overview

Biserma Cave is located on the Shumen Plateau, which is situated in Northeastern Bulgaria.

The length of the Shumen Plateau from west to east averages about 12 km, varying from south to north - from 7-8 km in the southernmost part, 9-10 km in the central part, 11-12 km further north, up to about 20 km in the northernmost part of the plateau. In the north-south direction, the width of the Shumen Plateau varies less - between 15-17 km. Within these defined boundaries, the plateau covers an area of 73,13 km², of which 182 km² are karstified.

The highest point of the Shumen Plateau is Tarnovtabia Peak (501,9 m), while the lowest point is at about 200 m above sea level in the Kortalaka area, northwest of Kazaltepe (269,3 m). The boundary of the Shumen Plateau drops to 230 m above sea level along the southern slopes of the Troytsa Gorge,

the Osmar Gorge, and the vineyards above the Divdyadovo neighborhood. The average elevation of the plateau is 350 m.

The contemporary manifestation of morphogenetic processes on the plateau is determined by hydroclimatic conditions and the shielding effect of subhorizontal Maastrichtian limestones. The latter model the periphery of the plateau into vertical slopes, rock wreaths, landslides, rockfalls, and screes. Karst processes also play a significant role, forming sinkholes (over 200), karst depressions (over 16), uvalas, blind karst valleys, and numerous karst springs. Nearly 150 ponors, karren, karren fields, karstified rock wreaths, karst niches, and caves have been identified on the plateau.



Fig. 1 The geographical location of the "Biserna" cave on the topographical map

Historical Overview of the Development of Biserna Cave

Biserna Cave was also referred to by the name Zandana. It received its name „Biserna“ from the pearly brilliance of the droplets illuminated on the stalactites by the lanterns of its explorers. It is the longest cave in Northeastern Bulgaria, located on the Shumen Plateau.

Its path of exploration began back in 1818, when the Bulgarian Federation of Speleology entered Biserna Cave into the register under No. 215. Not long after, in 1828, Bulgarian lands were visited by the French geographer Jean-Denis Barbié du Bocage, who provided information about the city in his work „Description of the City of Shoumla and its Surroundings“. The French traveler also recounts and describes interesting facts about the city, mentioning Ich Bunar (Cave Spring) in the Dag Bunar (Mountain Spring) locality. Biserna Cave continued to attract researchers, and in 1868 in the city of Shumen, the Frenchman Colman Ronge, who was a teacher in Shumen at the time, kept records and visited karst springs across the Shumen Plateau together with his students, but they did not provide detailed information.

In 1925, the water on the plateau was tapped, being utilized for the needs of the railway station, and was later intended to be used to supply the holiday retreats that began to be built in the Kyoshkovete area.

In 1968, speleologists from Shumen and Sofia began serious studies of Biserna Cave, with the first expedition taking place at the beginning of 1969, during which the speleologists spent 10 days underground for the purpose of mapping the passages and galleries.

Following long studies and research, scientists realized that the cave was exceptionally beautiful and rich in karst formations and decided that it should be shown to the world. Therefore, in 1975–1976, the development of the cave began with the support of the Executive Committee of the District Council – Shumen (the goal was for the cave to be opened in 1980, when 1300 years since the creation of the Bulgarian State was being celebrated, but a year earlier, funding was diverted to other important sites and work stopped). Up to that point, researchers had successfully dug a 25-meter artificial entrance. The monetary flow and development regarding the improvement of this natural phenomenon stopped for a rather long period, until 2015 when Biserna Cave passed under the management of the Shumen Plateau Nature Park Directorate, and construction and renovation were resumed.

And in 2019, the official opening of Biserna Cave took place. Awaiting its visitors.



Fig. 2 Timeline of "Birena" cave

Physical-Geographical Factors of the Biserna Cave System

It was formed in Upper Cretaceous organogenic limestones (Kalyane Limestone Formation (kK2m) (Cheshitev & Nedyalkova, 1995)). The presence of carbonate content is very high (98,8-99,5%, according to Nachev and Slavova, 1961) and contains isolated chert. The limestone is situated upon the Mezdra Chert-Carbonate Formation (mzK2cp-m), which has a thickness of 11-15 m. It is built of massive chalky limestone with numerous chert concretions and represents a local barrier for underground karst waters in the geosystem, including the cave river.

The area of Biserna Cave is 10,420 km², and the volume is about 50,000 m³. After numerous expeditions and mapping, the length of the cave is 2716 m, with numerous branches and galleries explored, some of which are not accessible. Visitors have the opportunity to view the cave up to 800 m.

Within the terrain thus explored, two stories are distinguished in the cave - the Upper Dry Gallery and the Lower Water Gallery. The difference between them is in the height, which varies from 5-10 m. The Upper Gallery is about 5-8 m wide, reaching 10 m in places, and the predominance of height varies from 1-2 m at the end of the tourist route, changing to 3-4 m in the middle part. Reaching the beginning of the cave - the height is 6-8 m. The Water Gallery is about 1,5-2 m wide. The cave has an ascending denivelation, which from the natural entrance to the end parts of the Muddy Gallery increases by 19,5 m (accordingly, the denivelation of the underground river from the cave spring /natural entrance to the end parts/ siphon after the Sinter Hall is +18 m, and the denivelation from the tunnel at the tourist entrance to the end parts at the Muddy Gallery is +13 m).

Upon entering the cave, we witness unique cave beauty sculpted by nature, with each hall expressing itself through its characteristic features.

The main gallery, bearing the name the "Dry One", has a flat ceiling and an uneven floor. In places, it is covered with small and large rock blocks broken off from the ceiling. Winding between them is a solid concrete path and stairs. The "Dry Gallery" is saturated with beautiful multicolored formations of various whimsical shapes, where imagination is a must. Below the main gallery is the Water Gallery. Its bottom stands out by being strewn predominantly with rocky formations. The transition from one gallery to the other is made by means of a bridge.

The largest cave cavity is the "Great Hall". The "Great Hall" has a width of up to 16-20 m and is the largest cavity in the cave, about 35 m long and up to 4-5 m high (if blockages are ignored, the hall would have a length of 60 m, a width of 20 m, and a height of 15 m). It is distinguished by its unique vault, which is covered with numerous differently colored stalactites whose length reaches no more than 50 cm. Translucent curtains up to 15 cm long are also observed. In the highest part of the "Great Hall", a platform has formed over the years, which is extremely convenient for contemplating the beautiful view opening up from there.

The masterpiece of nature in "Biserka" is its "Beautiful Hall", which is rich in diverse formations and shapes that capture attention and arouse admiration in everyone who looks at them.

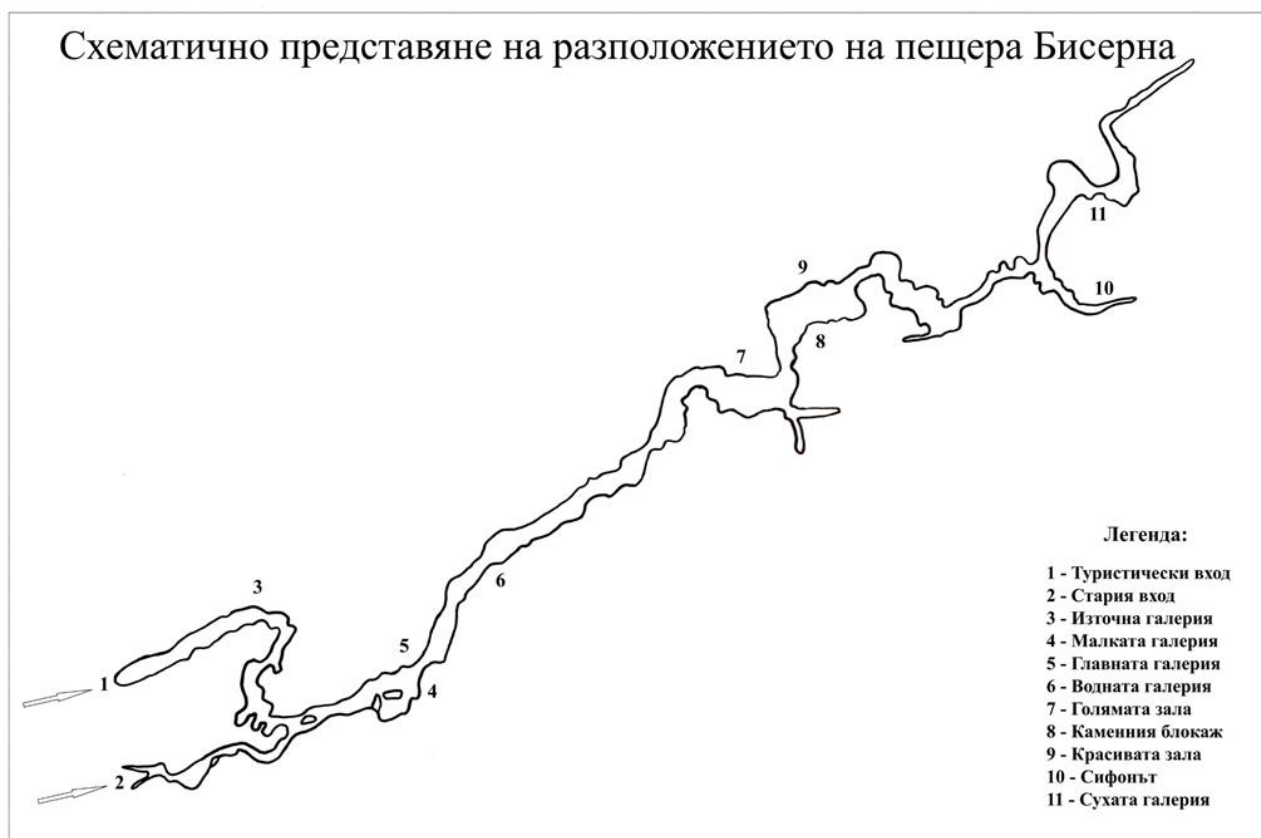


Fig. 3 Source: <https://shumenskoplato.bg/pestheri/pesthera-biserna/> , renovated with addition
Microclimate, Flora, and Fauna

Among the many measurements taken, speleologists report that the temperature in the cave is 10-11°C, with the difference between winter and summer being 1,5 °C . Another important indicator is the humidity, which is 96-98%. Since 2010, the National Institute of Geophysics, Geodesy, and Geography at the Bulgarian Academy of Sciences (BAS) regularly performs microclimatic measurements. Measurements are made not only of the air temperature and relative humidity, but also of rock temperature and water temperature.

The underground river creates numerous meanders. During torrential downpours, the gallery floods, but tourists pass at a safe height.

In addition to speleologists, the cave is also interesting to chiroptologists. Biserna Cave is inhabited by 14 species of bats (Greater horseshoe bat - *Rhinolophus ferrumequinum*, Lesser horseshoe bat - *Rhinolophus hipposideros*, Mehely's horseshoe bat - *Rhinolophus mehelyi*, Greater mouse-eared bat - *Myotis myotis* and Lesser mouse-eared bat - *Myotis blythii*, Schreiber's long-winged bat - *Miniopterus schreibersii*, etc.).

In recent years, a population between 1,000 - 1,200 specimens has been observed. There is data showing them reaching between 2,400 - 2,500 units. Given that Biserna Cave ranks first as a habitat for bats, which are a protected species, visitors, enthusiasts, and researchers must comply with their breeding period. Precisely for this reason, the cave has regulated access for visits.

In many places in the “Great Hall”, there is the presence of bat guano, which indicates that not long ago it was a haven for a large number of bat colonies. Today, of the bats that still inhabit the cave, the Greater mouse-eared bat is the most frequently encountered.

As has already become clear, Biserna Cave is exceptionally rich in its diverse cave formations (speleothems), which are mineral forms created by salts dissolved in water (mainly calcium carbonate) that deposit in caves. The main types include stalactites (hanging from the ceiling), stalagmites (growing from the floor), and stalagnates (joined columns). Other forms are draperies, rimstone pools, cave pearls, and sinter pockets.

“Tiger skin” (often also called leopard skin) is a specific cave formation that represents an interesting natural pattern across the ceilings and walls of some caves.



Sn. 1 Stalactites, Stalagmites and Stalacton (personal archive)



Sn. 2 "Steamboats" (personal archive)



Sn. 3 A multitude of stalactites (personal archive)



Sn. 4 "Pearl drops" (personal archive)



Sn. 5 So-called "Leopard Skin" (personal archive)



Sn. 6 Draperies (personal archive)

Since 1980, the karst geosystem has been located within a protected territory (Shumen Plateau Nature Park with an area of 3,930.7 ha). It has a very high tourist and recreational load, which is a source of serious pollution to karst geosystems and karst waters.

Biserna Cave as a Tourist Site

A study was conducted on the tourist flow in “Biserna” Cave for the period 2019 - 2025, based on quantitative and comparative analysis. The method of statistical analysis was used, including the processing of absolute values, calculation of relative shares, and growth rates. To establish trends, a temporal (dynamic) analysis was applied, which allows tracking the changes in the number of visitors during the period under review.

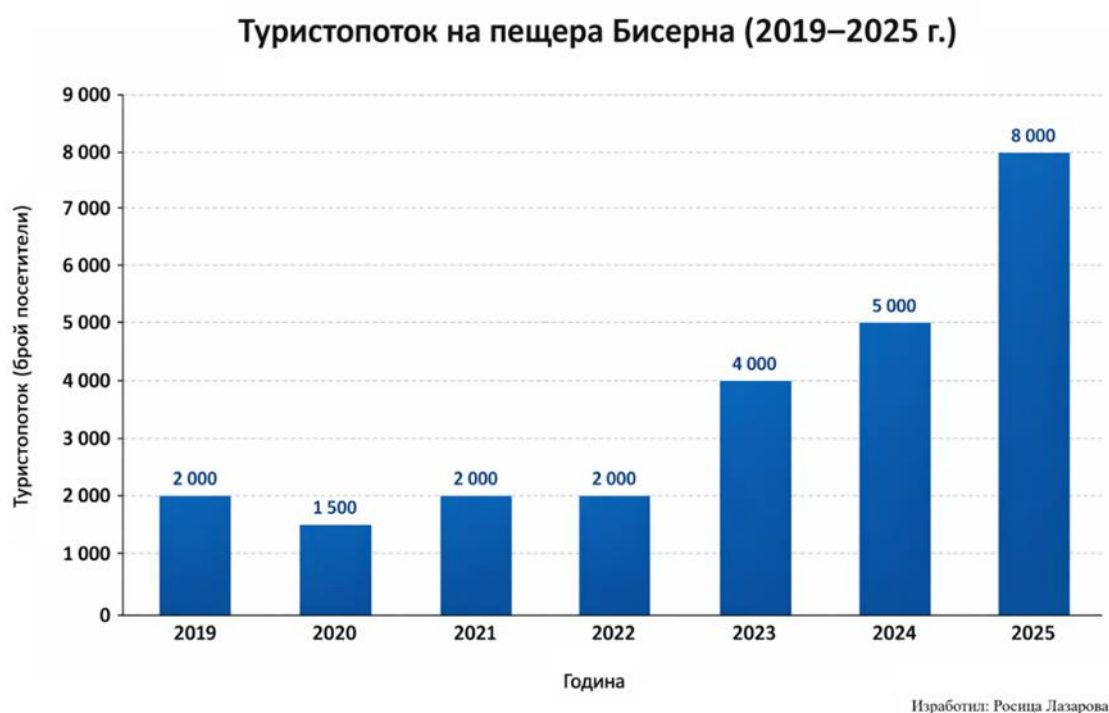


Fig. 4 Diagram of the tourist flow for the period 2019-2025.

In the initial stage (2019 - 2022), the site functioned under a limited seasonal regime - four months a year (April - May and September - October), with access provided solely on weekdays. This is because the karst and formations in the cave are under protection. When people visit, the thermal balance is disturbed, which raises the temperature in the cave. During our breathing, we exhale carbon dioxide, which reacts with the water vapors in the cave and turns into acid, which destroys the karst formations. This is yet another reason for access to the cave to be strictly regulated and different from other developed caves in our country.

The only interruption in the activity of the site was registered in April - May 2020, as a result of the restrictive measures imposed during the COVID -19 pandemic.

In 2022, the first significant expansion of the working hours was observed through the inclusion of weekends, which created prerequisites for an increase in the tourist flow.

From 2023, an expanded operational period was introduced (April - June and September - November), which has been maintained in the following years as well. Despite this, a seasonal unevenness in attendance is established, expressing itself in a drop after the middle of the months of

June and November. This can be explained by a combination of climatic factors, reduced tourist activity, and the exhaustion of the main peak periods.



Fig. 5 Scheme of a thematic route

source: https://shumenskoplato.bg/wp-content/uploads/2019/08/karstova_pateka_large.jpg

Conclusions:

1. The tourist flow in Biserna Cave demonstrates a sustainable upward trend after 2022.
2. The expansion of working hours and seasonality has a direct positive impact on attendance.
3. Educational initiatives and targeted advertising are key factors for attracting new visitors.
4. By 2025, the site is approaching its maximum capacity, which requires the introduction of sustainable management strategies.
5. There is potential for future development, but on the condition of a balance between tourist exploitation and preservation of the natural environment.
6. Biserna (Zandana) Cave near Shumen is worth visiting because it is the longest and most beautiful cave on the Shumen Plateau, offering a unique view of rich calcite formations, stalactites, and glowing pearly drops.
7. Nearby, the Shumen Plateau also offers other interesting sites that are worth visiting. For this purpose, routes have been prepared so that tourists (visitors) have the opportunity to observe and be part of the beauty of the plateau.

The publication is being implemented as a project (RD-08-65/28.01.2026) "REGIONAL RESEARCH OF THE TERRITORY OF NORTHEASTERN BULGARIA - PHASE 3"

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