ROMÂNIA
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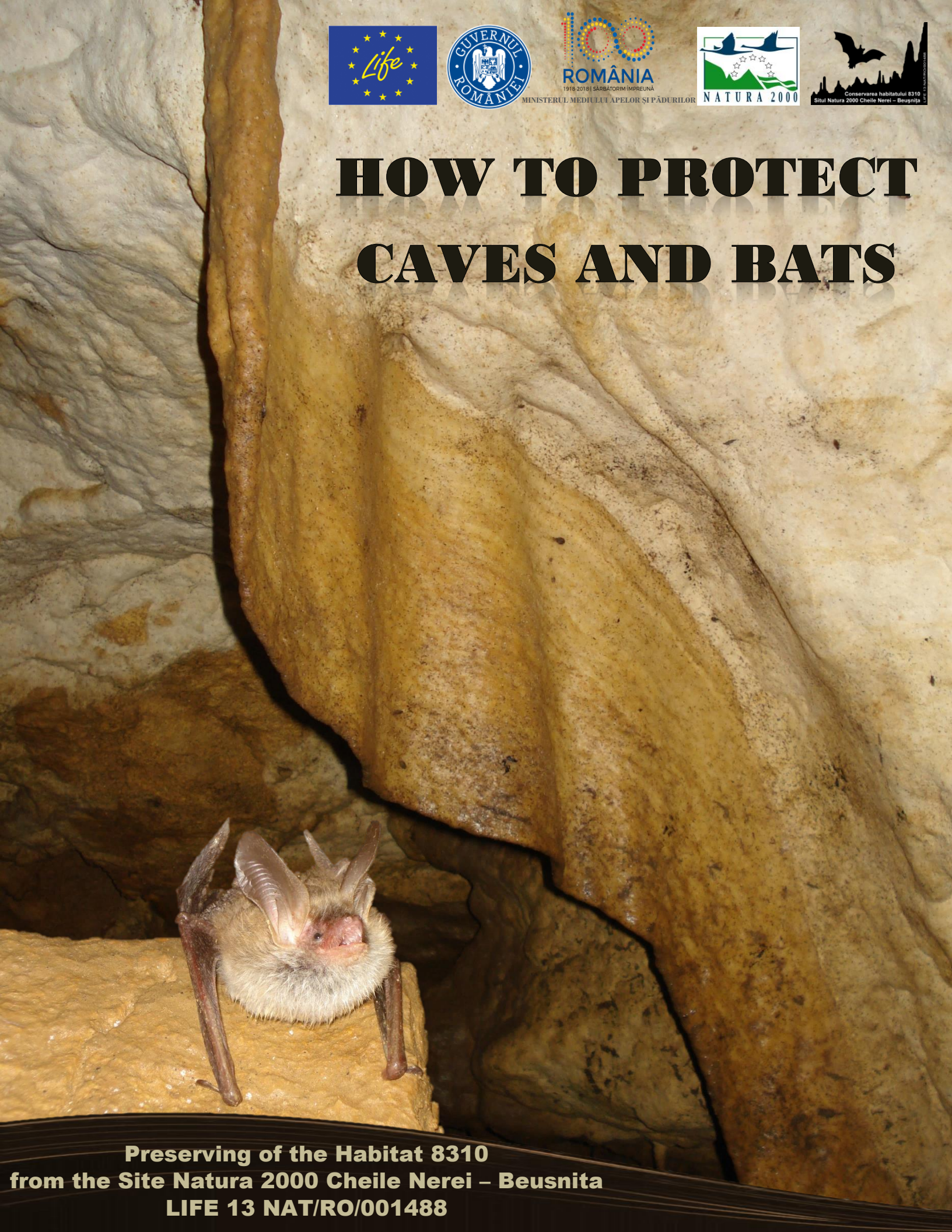
NATURA 2000

Conservarea habitatului 8310
Situl Natura 2000 Cheile Nerei – Beușnița

HOW TO PROTECT CAVES AND BATS



Preserving of the Habitat 8310
from the Site Natura 2000 Cheile Nerei – Beusnita
LIFE 13 NAT/RO/001488

Habitat 8310 – Caves closed to public access

What is a cave?

The cave is a natural cavity formed in the earth's crust, sufficiently wide and deep to allow the access of humans (Lowe and Waltham, 2002; Palmer, 2007). A parameter suggestive in this regard, established by convention, is the minimum length of 5 meters (Povară et al., 1990). The cave enlargement must be greater than the diameter of its portal. By extension, the cave can be a system that can have more than one entrance and consists of several galleries, halls, shafts and chimneys. The term also applies to cavities defined above, which are partially or completely flooded or which have been opened by shooting or cleaning the alluvia.

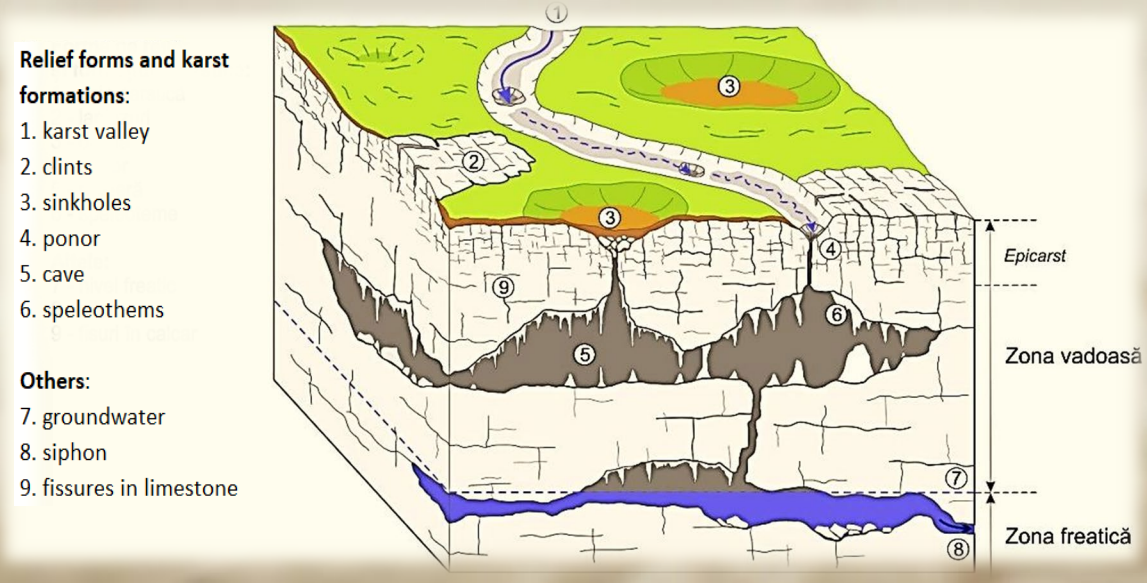
Synonyms: *cavern, grotto*

How are caves formed?

Caves can be formed by **chemical processes** (*corrosion*: the existence of soluble rocks is required - limestone, dolomite, salt or gypsum - as well as a solvent - water), **mechanical processes** (*erosion*: can occur in any type of rock, and as generating agent - water, wind) or **tectonic processes** (*rock collapse*, *gravitational traction, tectonics*).

The most numerous and well-known caves are formed in limestone, through their dissolution by the water that infiltrates and runs through it. The formation of a cave begins when precipitation water enriched with carbon dioxide (CO_2) reacts chemically with limestone, developing pre-existing cavities.

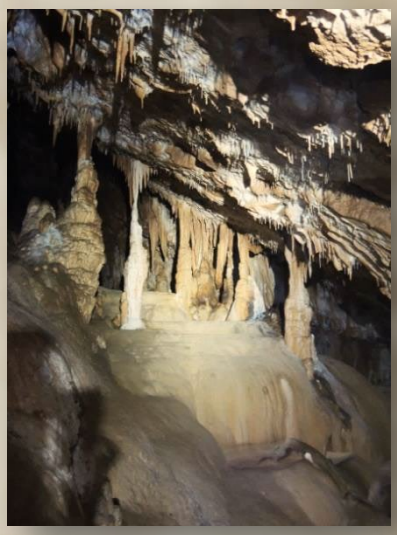
During the flow of water through the rock, in addition to the dissolution, there is also the erosion process, whereby the water with sand grains will widen the underground cavities. **Thus, over hundreds of thousands or even millions of years, today' caves were formed.**



Cave within the karst system (relief developed in soluble rocks)

Cave formations

Once the water crosses the limestone mass and enters a larger cavity in the rock, the physical and chemical conditions of the water change (pressure decreases, temperature increases, etc.), carbon dioxide is released from solution and thus dissolved calcium carbonate is deposited. This way the cave formations appear - the **speleothems**.



The main speleothems encountered in caves are (Bleahu, 1982):

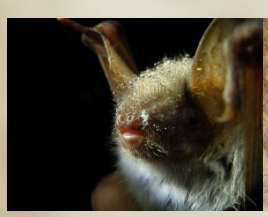
- ***stalactites*** - formations of cylindrical or conical shape, hanging from the ceiling or from any prominence and which are generated by water droplets that come off as a result of gravity;
- ***stalagmites*** - formations encountered on the cave floor, growing from the bottom up and emerging from water droplets falling from the ceiling;
- ***columns*** - are formed by joining a stalactite with a stalagmite;
- ***rimstones*** - speleothems that have the shape of calcite dams, behind which water usually accumulates;
- ***parietal draperies*** - calcite deposits that cover the walls of underground cavities, with a wide variety of shapes.



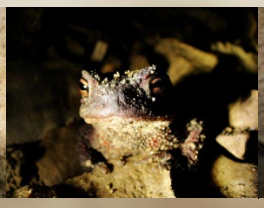
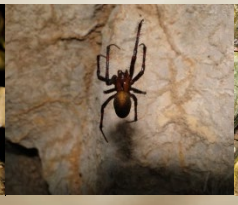
Life in the cave. The caves host not only spectacular underground landscapes, but also extremely interesting life forms. The flora is present only in the area where natural light enters, being represented by upper and lower plants (moss, algae, lichens).

The animals inhabiting the cave represent the cave fauna, which has adapted over time to living in the underground world. Some species live permanently in caves, others frequently, but they are equally adapted to living in the external environment, and others appear only here and there.

Among the most common representatives of cave fauna are the bats. In the cave we also find various species of arachnids, arthropods and amphibians, such as the salamander (Salamandra salamandra).





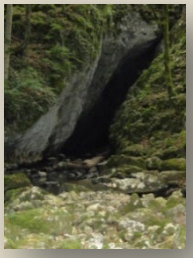
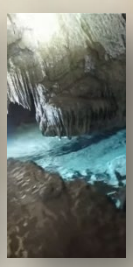

Habitat 8310 in the Natura 2000 site Cheile Nerei – Beuşniţa

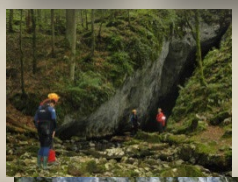
The Natura 2000 site Cheile Nerei - Beușnița is located in southwestern Romania (Caraş-Severin County), on the territory of the Anina Mountains and occupies an area of 37,719 ha. The karst plateaus fragmented by deep valleys are characteristic: Cheile Nerei, Cheile Minișului, Cheile Șușarei, Valea Beușniței, etc.

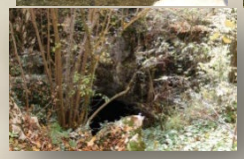
Habitat 8310 is well developed, being characterized by numerous inactive cavities, arranged in the slopes of the valleys or in the karst plateaus, respectively active resurgent cavities at the level of the main valleys. The number of habitat 8310 units from the Cheile Nerei - Beușnița site represents at regional level (Caraş-Severin county) a share of 25%, and at national level (Romania) a share of 4.2%, given that currently there is no complete inventory, and the prospects are for an increase in the number of caves.

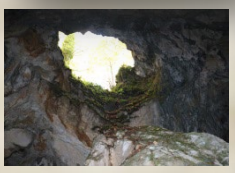
955 karst openings were inventoried in the site, out of which 360 horizontal/vertical cavities, 55 temporarily impenetrable openings, 540 sinkholes and springs. In terms of lithology, 310 cavities are developed in carbonate rocks (limestone, dolomite, travertine) and 44 cavities in cemented clastic carbonate rocks (conglomerates, sandstones). In the central-eastern flank of the Reșița - Moldova Nouă syncline, due to the sandstone with a variable behaviour (impermeable/permeable), large karst systems such as Liciovacea - Bigăr, Roșchii-Lăpușnic developed. In the northern part, at the contact of the limestones with the crystalline rocks, other large karst systems have developed: Ponor-Plopa, Ponor Uscată, Uteriș-Irma, Izvorul Înfundat-Ponească. Some of these caves (Ponor-Plopa, Ponor Dry) are currently in an advanced stage of degradation and have a poor state of preservation.

Habitat 8310 is also important because it represents the temporary or accidental habitat of species of large mammals, amphibians, reptiles and birds.






Ponor - Plopa cave

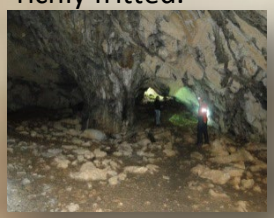
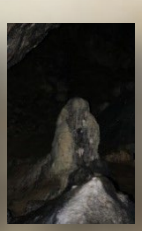
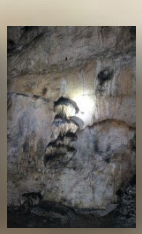
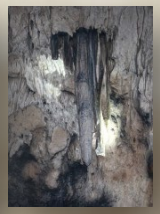
Location: Crivina hill, Valea Minişului

Description: The cavity has two entrances, separated by a gallery of 1152 m, representing the active level, through which the Ponor Stream flows. The inactive level is small with many sediments. The route that can be visited has a length of 600 m with large galleries and formations. The first sector of active gallery is followed by an area with rimstones and basins, continuing with a new active gallery, syphoned in the end.

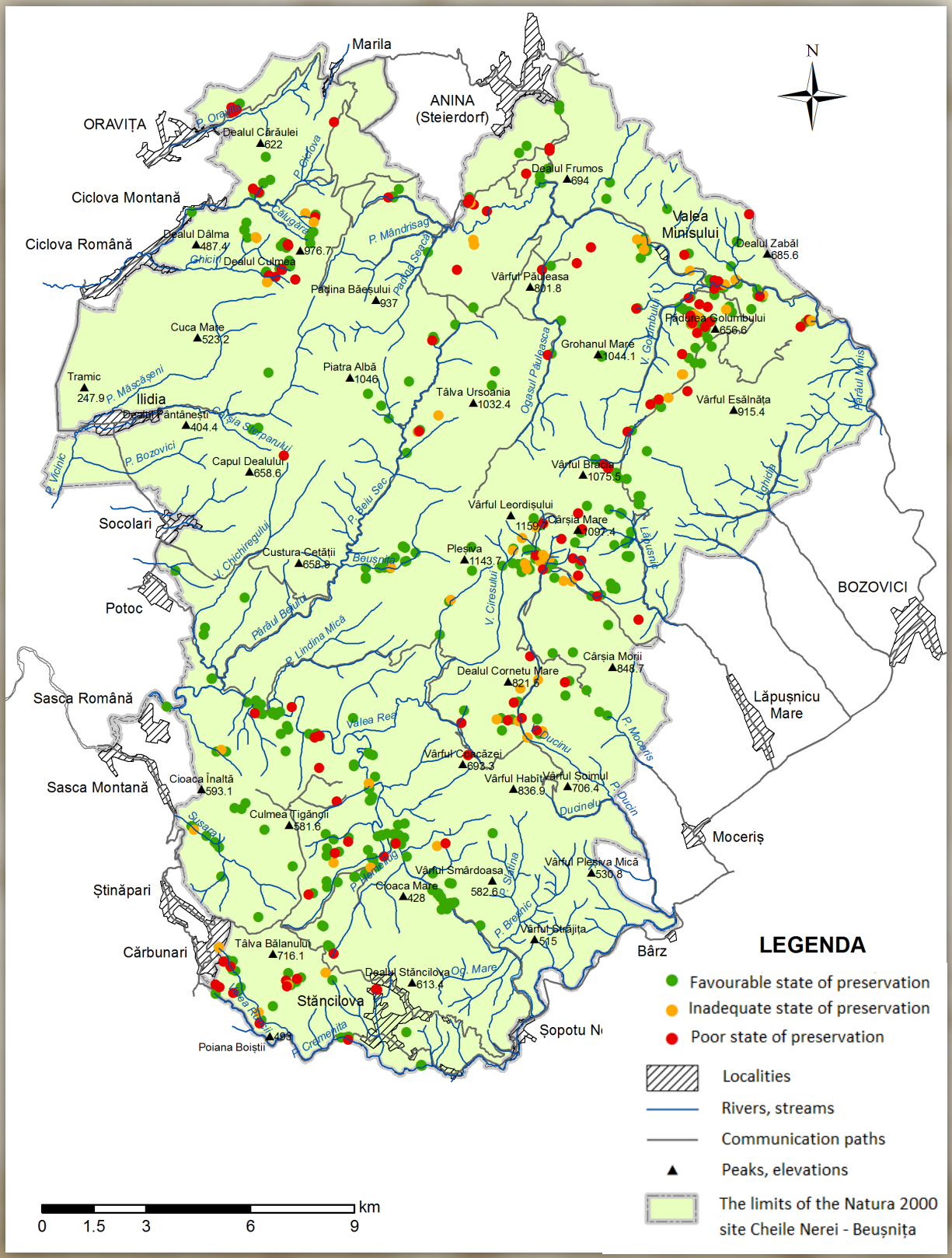
Ponor – Uscată cave

Location: Crivina hill, Valea Minişului

Description: The cavity has two horizontal entrances and an entrance through a shaft of 15 m, which reaches a central hall, on a slope, with a diameter of about 40 m. In the lower part of the hall there is a gallery of 15 m that ends in a small syphon. In the western part of the hall there is a horizontal gallery, richly fritted.


Preservation state of Habitat 8310 from the Natura 2000 site Cheile Nerei - Beuşniţa



Threats to Habitat 8310

Crossing the caves - disturbing and settling the sediment by stepping, degradation or accidental destruction of formations (stalactites, stalagmites, the edge of rimstones), fossils, artifacts, imprints, traces of habitation, decrease in the water level in a gallery sector, increased turbidity, temporary change of the microclimate (1 - 10 minutes).

Short/long term stay (minutes/hours/days) - temporary change of the microclimate, temporary disturbance of invertebrate and mammal fauna, certain impacts similar to those of crossing, possible degradation of cave paintings.

Rock excavation (shooting) - change in the gallery morphology, destruction of forms of erosion, corrosion, chemical precipitation, temporary release of rock dust, temporary generation of noise, temporary disturbance of invertebrate and mammal fauna.

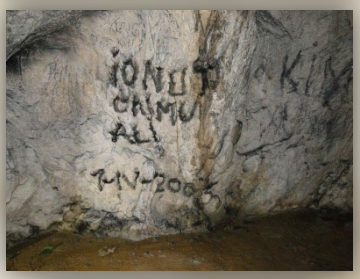
Sediment excavation (digging) - changing the gallery morphology, destruction of sedimentation forms, destruction of fossils, artifacts, imprints, traces of habitation, destruction of the context of the paleontological or archaeological site.

Collection - reduction of the number of individuals of a species, extinction of the species in the site/sector (collection with traps/abandonment of traps), mortality of some mammal individuals (bats) caught in the net, reduction of fossils or artifacts preserved in situ in the sediment or above ground, the decrease of the heritage value of the cave, the degradation of the cave walls by sampling the fossils from the rock, the destruction of the calcite formations.

Research / Documentation - assembly of permanent installations/fittings, changing the morphology of the stream bed (measurements of hydrodynamic parameters), damage to invertebrate and mammal fauna by light pollution (reflectors), certain threats similar to those in the paragraphs “crossing, stay, excavation, collection.”

Another form of use or exploitation of cave resources - changing the hydrodynamic parameters in the case of groundwater catchment, fragmentation of groundwater flow through catchment constructions, change of microclimate by obstructing the cave entrances where water is caught, blocking the use of underground habitat by mammals by obstructing the entrances to the cave where water is caught, destruction of the ecosystem through the exploitation of guano.

Arrangement of tourism infrastructure – changing the gallery morphology, degradation of sediments and calcite deposits, changing the microclimate, affecting the invertebrates and mammal fauna through light pollution and additional trophic resources.



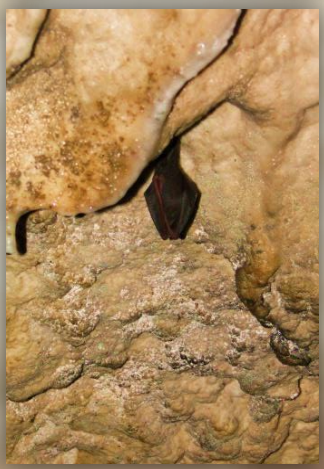
Why protect caves?

Caves form a completely different environment from the earth's surface, with a very limited capacity to support human impact. The absence of essential factors such as light, heat, precipitation, winds, as well as others, make it a fragile environment, with its own evolution.

Concretions of calcite or other minerals, some very rare, are unique to each cave and are formed in thousands or tens of thousands of years, sometimes even longer.

The cave climate is very sensitive and can be substantially altered following the incursions of visitors with a major impact on the underground balance.

Therefore, caves require increased protection and preservation measures, primarily from the authorities, as well as from local communities and visitors, whether they are tourists, researchers, amateur or professional speleologists.



How to protect caves?

- **We do not collect or destroy speleothems!** There are many ways to protect caves, and the first step is to keep the beauties of the underground untouched, without collecting or destroying existing speleothems or crystals. We must keep in mind that they form over a very long period of time, and the damage caused is irreparable.
- **We do not leave household or other waste in caves, thus leading to their pollution!** The accumulation of waste, biodegradable or not, in caves and in the waters that cross them, causes long-term pollution of potable water sources in the limestone massif and deterioration of water quality for humans and animals alike.
- **We do not light the fire!** The lighting of fire is another destructive factor, which causes the smoking of the ceiling and formations, and the remaining fireplaces damage the underground landscape. There are now more efficient and much less harmful means of lighting, such as special headlights attached to helmets.
- **We do not deviate from the predetermined route** in the caves arranged for tourism, and in the unarranged ones we maintain as much as possible the route previously travelled by the other visitors. Thus, we reduce the risk of damaging the calcite formations on the floor by destruction or loading with clay.
- **Limiting as much as possible the impact on the cave creatures by keeping quiet, advancing in a group as compact as possible and avoiding the direct light on them.** The cave fauna is negatively influenced by the presence of visitors in the caves, by disturbing their peace and habitat both immediately (at the time of the visit) and on the long run, by altering the microclimate parameters. That is why we will avoid visiting caves as much as possible during the hibernation and maternity periods of bats, when they are most exposed to disturbances.

What are bats?

Bats make up the *Chiroptera* order (Gr. *kheir* = hand, *pteron* = wing) and are the only mammals capable of sustained flight. They are divided into two suborders: *Megachiroptera* (greater bats or mega bats), containing the 170 species of fruit bats in the *Pteropodidae* family, and *Microchiroptera* (small bats or micro bats), which includes the rest of the bats, about 800 species in 18 families (Dietz and Kiefer, 2016).

Distribution

Bats are found all over the world except the Arctic, Antarctica and a few isolated islands in the ocean. Bats are thought to have appeared in a warm climate, probably in the early Eocene (the oldest bat fossil is about 60 million years old), and the centre of their spread remains tropical and subtropical areas, with the number of species declining as the area gets closer to the poles (Bücs, 2017).

Body composition

The head is small and elongated, has a wide mouth, very small eyes, and the ears have long conchae. The body with the size of a mouse, is short, thick, with a light skeleton made of thin bones. The chest bone has a small keel (elongated ridge-shaped protrusion of the sternum) on which the chest muscles are fixed and which operates the wings. The wings of bats are made of two skin membranes with elastic tissues and muscles in between, stretched among the 4 very long fingers of each forelimb and hind limbs. The thumb is loose, being used mainly for movement and to handle food. The feet, with 5 clawed toes, are mainly used to cling to the walls of caves.

Sense organs

Flying mostly at night, it has poor eyesight, but its sense of smell, touch and hearing are very well developed.

Behavior

With few exceptions, bats are nocturnal animals. During the day they rest in various places such as caves, crevices, hollows of trees, under stones or in buildings.

Feeding

Our species feed on insects, but there are also species that consume fruit, pollen, nectar or even carnivorous species (which feed on amphibians, lizards, birds, mice and even other smaller bats). At least three species of bats also feed on small fish, which they catch flying above the water, with their hind limbs in the water.

Echolocation

All bats of the *Microchiroptera* suborder guide and feed based on echolocation. Echolocation consists of the emission of high frequency sound vibrations, which are reflected back as echoes to the bat's ears from the surrounding surfaces, indicating the position, relative distance and even the nature of objects in the environment, like a sonar. In this way, micro-bats acoustically "see", allowing them to guide themselves in pitch dark.

The importance of bats

Bats consume every night an amount of insects that is equal to or exceeds one third of their own weight. During the rearing period, females in maternity colonies can consume an amount of food that is equal to their own weight. Among the insects consumed, there are generally those harmful to agriculture and forestry, mosquitoes, moths and other species.

Nectarivores bats consume nectar from flowers that open only at night, but in parallel, by visiting dozens, even hundreds of plants every night, the activity of bats is closely linked to pollination and spread of species.

Some species of bats in the tropics help to reforest deforested areas by eating fruit with seeds and releasing them through guano in locations away from the place of consumption. A single frugivorous bat in the tropics can "carry" up to 60,000 seeds to new locations each night. Guano can be used as a natural fertilizer for garden plants, containing plenty of essential nutrients, nitrogen, potassium and phosphorus.

Causes of the decrease in the number of bats

The population of bats in Europe is declining sharply. The causes of the decrease in the number of bats are natural, but especially anthropic.

Natural causes:

- Low birth rate (1-2 pups/year);
- The vulnerability of bat pups;
- Rapid rise in water levels in cave galleries;
- Extension of cold periods;
- Internal and external parasites;
- Presence of predators: stone marten, fox, rat, cat; birds such as the barn owl, the Eurasian hobby, the peregrine falcon, the strix, etc.

Anthropic causes:

- Destruction of feeding habitats by deforestation;
- Cutting down old trees, which can be a shelter for bats;
- The use of pesticides in agriculture leads to their accumulation in the body of insects, which, being consumed by bats, lead to their intoxication;
- The widespread practice of monocultures in agriculture (a single type of cultivated plant) greatly reduces the food supply of bats;
- Drainage and other land improvements have reduced swamp areas and bat feeding habitats;
- Demolition of old buildings or their renovation, given that the roofs are not provided with entrances to allow the shelter of bat species with anthropophilic behaviour;
- Uncontrolled increase in cave tourism (visits during hibernation or maternity, hostile behaviour of tourists, artificial lighting, noise);
- Increase in the number of wind farms (bats frequently hit the propellers of such facilities).

How to protect bats

Rules for the protection of bats in caves:

- Avoid visiting bat caves. In case of such visits, the group will not exceed 5 people;
- Avoid visiting caves when there are maternity colonies (May - August);
- Avoid visiting caves during hibernation (late October - mid-April);
- Do not stay where bats are found;
- Walk quietly, do not run, do not throw stones at bats;
- In the cave one should move after the other, in a single row, on a single path;
- Do not use flame light sources (carbide lamps, torches, candles), but only electric lights;
- Do not smoke in the cave;
- Do not step on piles of guano (these are a trophic source for some cave creatures);
- Do not leave in the caves food scraps, rubbish, carbide sludge;
- Do not point the light directly to bats (with flashlights, flashes, projectors);
- Follow the directions of the guides or cave keepers;
- Do not damage the gates of protected caves;
- The construction of gates in bat caves must comply with the distance of 15 cm between the horizontal bars and 70 cm between the vertical bars.

Protection of bats and forest shelters:

- Awareness of forest rangers and forest owners;
- Avoiding deforestation;
- Avoid cutting down old trees with holes because they are shelters for bats;
- Reforestation of deforested areas;
- Prohibition of the use of chemicals, toxic to mammals, when aiming to control forest pests;
- Installation of artificial shelters (bat houses) in young forests, in forests without old trees (the location of the houses is at least 4 m, in places with easy access for bats).

Bats from the Natura 2000 site Cheile Nerei - Beuşniţa

The standard Natura 2000 form of the site ROSCI0031 Cheile Nerei - Beuşniţa lists 14 species of bats, respectively *Barbastella barbastellus* (barbastelle bat), *Miniopterus schreibersi* (long-winged bat), *Myotis bechsteini* (wide-eared bat), *Myotilia blythii* (small common bat), *Myotis capaccinii* (long-fingered bat), *Myotis dasycneme* (pond bat), *Myotis emarginatus*, *Myotis myotis* (common bat), *Rhinolophus blasii* (Blasius' horseshoe bat), *Rhinolophus euryale* (Mediterranean horseshoe bat), *Rhinolophus ferrumequinum* (greater horseshoe bat), *Rhinolophus hipposideros* (small horseshoe bat), *Myotis mystacinus* (whiskered bat), *Plecotus auritus* (brown-eared bat).

Greater horseshoe bat *(Rhinolophus ferrumequinum)*

It is the largest horseshoe bat in Europe. Large, pointed ears, lacking tragus. The upper protrusion of the saddle is high and well rounded. Seen from the front, the saddle has a characteristic shape, usually contracted in the middle, and the spear is generally long and has a thin tip. The base of the fur bristles is light grey, and the distal part is brown-grey with a reddish tint. The ventral colour is white, yellowish shade. During hibernation and daytime rest, it completely covers its body with its patagium.

Horseshoe bats possess one of the most sophisticated location mechanisms among animals, a highly sensitive biological radar that uses ultrasound. They emit ultrasound at the highest frequencies, usually easily crossing the 100 kHz threshold. These sounds allow for such fine details that they can make a clear distinction between a leaf and a moth in the dark, flying at 15 km/h. Horseshoe bats orient themselves so well with this radar that in many cases they can even avoid nets placed by researchers, especially for their capture.

The preservation status in Romania of the large horseshoe bat is included in the IUCN Red List: LC (least concern) European Union Red List: NT (nearly threatened) and the Romanian Red Book of Vertebrates: vulnerable.

Curiosities in the world of bats:

- Bats appeared 50 million years ago, and more than 1,300 species are currently known. They exist on Earth since the age of dinosaurs.
- In Romania, 32 species of bats have been identified so far, a colony of over 100,000 bats in caves, and in buildings a colony of over 2,000 bats
- Consumed insects are often harmful to agriculture and forestry, but also to our lives. A single individual of the dwarf bat (the smallest bat species in Romania) consumes about 2000 mosquitoes per night.
- Bats emit ultrasounds through their mouth and nose.

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*** Acţiuni de conservare durabilă pentru liliecii din ariile Natura 2000 din Nord-Vestul României – Proiect LIFE+ Conservarea speciilor de lilieci în Munţii Pădurea Craiului, Bihor şi Trascău.

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