

H1.1 Cave

Summary

Caves originate over very long time periods and are very diverse in extent, configuration and character - some dry, others permanently or seasonally wet, others warm, deoxygenated or affected by sea spray and variously lit at cave entrances. They occur throughout Europe but are most extensive in karstic areas. The flora and fauna are specialised, adapted to often extreme environmental conditions and include some remarkable troglophiles or distinctive roosting or seasonally dormant creatures. Mountainous caves may need little protection except from excessive visitors for caving or tourism which can cause physical or atmospheric damage but sinkholes can allow water pollution from agriculture and waste deposition and mining and quarrying, construction of roads, railways and tunnels may result to their complete destruction.

Synthesis

Only limited data were available for calculation. Some countries with expected karst systems are missing, e.g. the localities in Albania, Bosnia and FYROM (Former Yugoslavian Republic of Macedonia), some data are questionable, e.g. 4 km² in Romania and 15,000 km² in Austria. Several other countries gave only number of caves, e.g. Germany and Poland. All this information makes the final calculation of trends in quality and quantity, range (EEO) and distribution (AEO) complicated. It is generally very subjective to decide, which part of the cave should be considered as the habitat H1.1 (like cave entrances with evident occurrence of plants or animals), and which part could be considered as a cave without biota.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Least Concern	-	Least Concern	-

Sub-habitat types that may require further examination

Some subtypes can be expected due to the large distribution and broad habitat definition of the unit, but there is limited knowledge on distinction of subtypes so far.

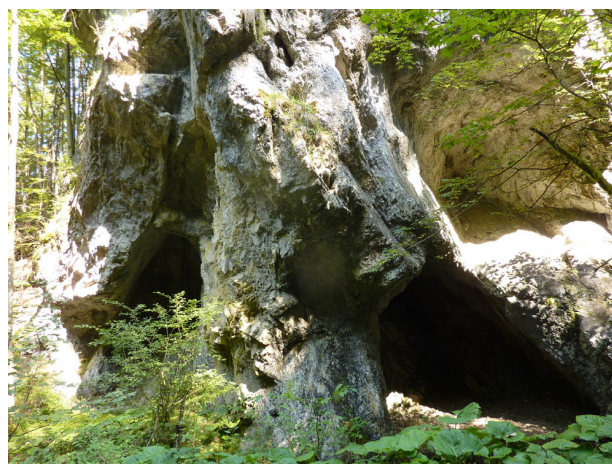
Habitat Type

Code and name

H1.1 Cave



Cave entrance with population of *Saxifraga cernua*, Mt. Nový, Belianské Tatry Mts, Slovakia (Photo: Daniel Dítě).



Small caves in Seleneč, Veľká Fatra Mts, Slovakia (Photo: Judita Kochjarová).

Habitat description

The habitat includes natural caves and cave systems with their associated cave water basins. Caves and their associated waters harbor various biotic communities (plants, animals, fungi and algae) that are restricted to them (troglonit organisms), or are physiologically and ecologically capable of conducting their entire life cycle inside them (troglonit organisms), or are dependent on them for part of their life cycle (subtroglonit organisms). The habitat is very diverse, but is mainly formed by the karst processes at the calcareous rocks. The caves also vary in size and extent. Their exterior part (cave entrances) includes the twilight zone where light penetrating from the outer world is sufficient to permit human vision. The habitat is rarely vegetated, and in this case dominant plants are mostly algae and mosses, and sometimes also vascular plant species such as *Cortusa matthioli* occur. At the interior part of the caves, light is completely lacking. This part is with or without troglonit or troglonit organisms. The vertebrate fauna includes unique amphibians such as *Proteus anguinus* in the Adriatic karst systems and bats. Bats are not typical troglonits because they use the caves only for breeding and wintering. Invertebrate species belong to a limited number of groups, and include remarkable relict species from *Gastropoda*, *Opiliones*, *Chilopoda* (Lithobiidae), *Collembola*, *Coleoptera* (Bathysciinae and Trechinae subfamilies) among the terrestrial fauna and *Turbellaria*, *Gastropoda* and *Urodela*, among the aquatic fauna. They form characteristic fauna communities, which are essentially restricted to caves in temperate regions. The majority of the rich in invertebrates' caves are situated in Southern and South-Eastern Europe (Mediterranean and Balkan Peninsula). The caves may be of different types: dry caves or caves crossed by permanent or temporary watercourses (habitat C6.1), warm caves and caves humidified by geothermal waters, relatively warm deoxygenated caves, rich in carbon dioxide and sulphur vapor or methane and hydrogen sulphide harboring relict thermophile invertebrate fauna. In the regions with active volcanic activities there are caves formed in lava flows by open-ended tubes or passages resulting from the cooling of the surface (whose molten interior continued to flow). Some large lava tubes on the Canary Islands harbor unique communities of invertebrates, in particular, decapod crustaceans. Caves near the coast, which may contain salt water and can be colonized by specialized (anchihaline) communities, whether or not connected to the sea, are included to the marine habitats.

Indicators of quality:

Caves in good condition are considered the ones that are without any anthropogenic structures and are impacted only by natural processes. These are dynamic systems due to water erosion and collapse of rocks. The main threat is from rehabilitation and lighting for tourist attraction, which would allow non-typical animal and plant species to invade the cave's interior. Plants growing in caves are equipped with electric lights known as "lampenflora". They tend to be less vibrant in color and somewhat disfigured. Typically, lampenflora are mosses, ferns and algae. In caves that are lit constantly by lamps, these invasive plants can cause problems to the cave's natural structure or any prehistoric wall art present. It also may form a threat to troglonit and troglonit fauna. Indicators of good quality are:

- Stable water regime and annual course of temperature
- Absence of invasive organisms
- No disturbance by humans

Characteristic species:

Vascular plants (only in the cave entrances): *Arabis nova*, *Chenopodium foliosum*, *Hackelia deflexa*, *Hymenolobus pauciflorus*, *Asperugo procumbens*, *Sisymbrium austriacum*, *Galium spurium*, *Saxifraga arachnoidea*. Mosses: *Eucladium verticillatum*, *Fissidens cristatus*, *F. pusillus*, *Isopterygium elegans*, *Pohlia nutans*, *Schistostega pennata*.

Fauna (Invertebrates): Worms (*Delacya bureschi*); Snails (*Lindbergia* spp.) Crustacean (*Muridopsis polymorpha*, *Diacyclops* spp., *Speocyclus* spp., *Niphargus* spp., *Hyloniscus* spp.), Arachnida

(*Troglohyphantes* spp., *Lepthyphantes* spp., *Porrhomma* spp., *Paranemastoma* spp.), Myriapods (*Lithobius* spp., *Bacillidesmus* spp.), Insects (*Pheggomisetes* spp., *Duvalius* spp.)

Amphibians: *Proteus anguis*, *Speleomantes* spp.

Mammals: *Eptesicus serotinus*, *Hypsugo savii*, *Miniopterus schreibersii*, *Myotis* spp. *Plecotus* spp., *Rhinolophus* spp.

Classification

This habitat may be equivalent to, or broader than, or narrower than the habitats or ecosystems in the following typologies.

EUNIS:

H1.1 Cave entrances

H1.2 Cave interiors

H1.3 Dark underground passages

H1.4 Lava tubes

EuroVegChecklist:

Erysimo wittmanii-Hackelion deflexae Bernátová 1986

Annex 1:

8310 Caves not open to the public

Emerald:

H1 Terrestrial underground caves, cave systems, passages and waterbodies

MAES:

Unvegetated or sparsely vegetated habitats (naturally unvegetated areas)

IUCN:

7. Caves and Subterranean Habitats (non-aquatic)

Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?

No

Justification

Caves are known across whole Europe, less in boreal biogeographical region.

Geographic occurrence and trends

EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Austria</i>	Present	15000 Km ²	Stable	Stable
<i>Belgium</i>	Present	0.5 Km ²	Stable	Stable
<i>Bulgaria</i>	Present	19 Km ²	Decreasing	Unknown
<i>Czech Republic</i>	Present	Unknown Km ²	Stable	Stable

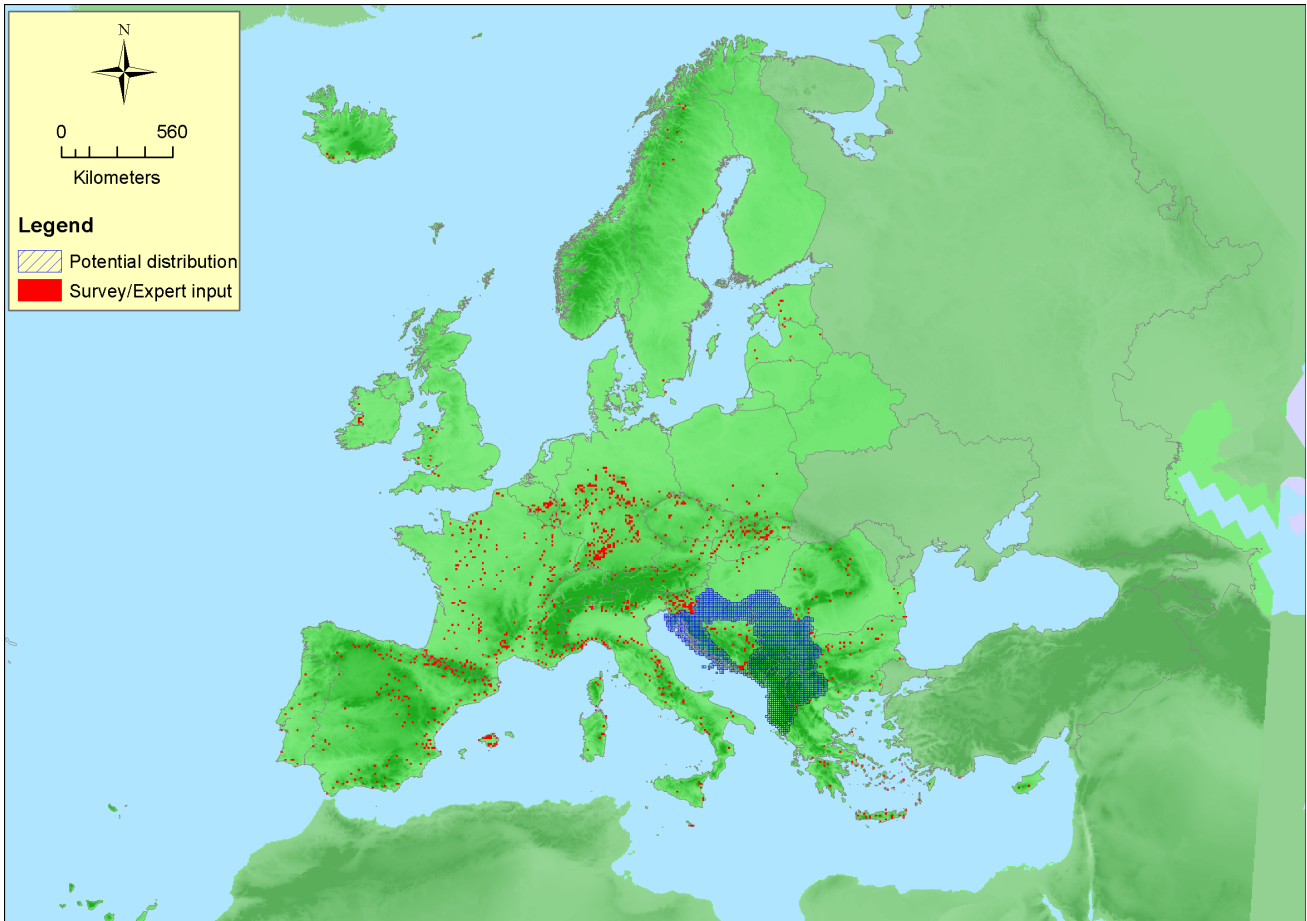
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Finland</i>	Aland Islands: Present Finland mainland: Present	Unknown Km ²	Unknown	Unknown
<i>France</i>	Corsica: Present France mainland: Present	5800 Km ²	Stable	Stable
<i>Germany</i>	Present	Unknown Km ²	Stable	Decreasing
<i>Greece</i>	Crete: Present East Aegean: Present Greece (mainland and other islands): Present	Unknown Km ²	Stable	Unknown
<i>Hungary</i>	Present	180 Km ²	Stable	Stable
<i>Ireland</i>	Present	Unknown Km ²	Stable	Stable
<i>Italy</i>	Italy mainland: Present Sardinia: Present Sicily: Present	191 Km ²	Unknown	Unknown
<i>Poland</i>	Present	Unknown Km ²	Stable	Stable
<i>Portugal</i>	Madeira: Present Portugal Azores: Present Portugal mainland: Present Savage Islands: Present	Unknown Km ²	Unknown	Unknown
<i>Romania</i>	Present	4 Km ²	Stable	Stable
<i>Slovakia</i>	Present	407 Km ²	Stable	Stable
<i>Spain</i>	Balearic Islands: Present Canary Islands: Present Spain mainland: Present	360 Km ²	Stable	Stable

EU 28 +	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
<i>Bosnia and Herzegovina</i>	Present	10 Km ²	Decreasing	Decreasing
<i>Former Yugoslavian Republic of Macedonia (FYROM)</i>	Present	Unknown Km ²	Unknown	Unknown
<i>Switzerland</i>	Present	12 Km ²	Stable	Stable

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
<i>EU 28</i>	8498200 Km ²	1425	>22000 Km ²	area data is uncertain
<i>EU 28+</i>	10010200 Km ²	3700	>22000 Km ²	AOO and EOO incl. potential distribution

Distribution map



The map is rather complete for the EU, except for - at least - Bulgaria, but has data gaps for the (ice caves) in Iceland, and the caves in Switzerland, and the karstic landscape of the Balkan countries (except for Bosnia & Herzegovina), where it is represented by potential distribution. Data sources: Art17, LIT.

How much of the current distribution of the habitat type lies within the EU 28?

The relatively amount of caves compared to the world total is not known. In Europe, outside the EU28 large karst system is also found in the Balkan countries, but it is assessed that >80/90% of caves in the EU28+ is found within the EU28.

Trends in quantity

Due to the incomplete territorial data, detailed calculations were not possible. Based on the territorial experts data the trend in quantity is considered as stable, although in few Balkan countries the trend is given as decreasing. In general, the caves in Europe are naturally protected landscape elements; nevertheless in some East European countries the transportation infrastructure projects (roads, tunnels construction) sometimes fail to respect the geological peculiarities of the territory, e.g. the upcoming construction of a highway through the karst area in Mala Fatra Mts. of Slovakia.

- Average current trend in quantity (extent)
EU 28: Stable
EU 28+: Stable
- Does the habitat type have a small natural range following regression?
No
Justification
The EOO is very large.
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
No

Justification

The occurrence of true caves is restricted to calcareous regions and amounts of underground water, but the area of caves can be very large.

Trends in quality

There are incomplete quantitative data, but the average quality is likely to have slightly decreased due to pressures (see list of pressures and threats).

- Average current trend in quality

EU 28: Decreasing

EU 28+: Decreasing

Pressures and threats

Caves form in limestone (calcium carbonate), and occasionally in dolomite (calcium magnesium carbonate), when water containing dissolved carbon dioxide (carbonic acid) seeps into rock crevices and joints. A limestone cave or cavern is a natural cavity that is formed underneath the Earth's surface that can range from a few meters to many kilometers in length and depth. Although they are old, caves are not a static but a dynamic system, which require relatively stable environmental conditions. Main factors leading to threat of extinction include: 1. Construction of roads and tunnels; 2. Mining of calcareous rock; 3. Landslides and earthquakes; 4. Fertilization and water pollution from agriculture; 5. Smaller danger are people and their sports activities, like speleoalpinismus.

List of pressures and threats

Agriculture

Fertilisation

Mining, extraction of materials and energy production

Mining and quarrying

Sand and gravel quarries

Open cast mining

Transportation and service corridors

Roads, motorways

Railway lines, TGV

Tunnel

Human intrusions and disturbances

Mountaineering & rock climbing

Speleology

Recreational cave visits

Pollution

Groundwater pollution by mine water discharges

Geological events, natural catastrophes

Earthquake

Collapse of terrain, landslide

Conservation and management

Caves in the less accessible mountainous sites do not require special conservation interventions, since the conditions are stable and also the trends in quality and quantity are stable. Caves at lower altitudes, where there might be certain conflicts with human activities, should be strictly protected and taken into account when spatial land use planning (transportation, construction works) is taking place. In areas with intensive agricultural activities the surface and ground waters should be protected.

List of conservation and management needs

Measures related to agriculture and open habitats

Maintaining grasslands and other open habitats

Measures related to urban areas, industry, energy and transport

Specific management of traffic and energy transport systems

Conservation status

8310 ALP FV, ATL U1, BOR FV, CON U1, MAC FV, MED XX, PAN U1

When severely damaged, does the habitat retain the capacity to recover its typical character and functionality?

The development of large caves is a process for hundreds of thousands of years. It is a process which takes place constantly but very slowly. The natural recovery of habitats connected with caves (plants, animals) need shorter time, but probably many hundreds of years. Closure of caves and galleries may prevent caves to be inhabited by bats; the opening of these gives space to very quick settlement.

Effort required

200+ years
Naturally

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-3.7 %	unknown %	unknown %	unknown %
EU 28+	-3.7 %	unknown %	unknown %	unknown %

The average recent trend in quantity (last 50 years) has been calculated from (limited) territorial data. The more or less stable to slightly declining trend leads to the conclusion Least Concern.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	E00	a	b	c	A00	a	b	c	
EU 28	>50000 Km ²	No	No	No	>50	No	No	No	No
EU 28+	>50000 Km ²	No	No	No	>50	No	No	No	No

Criteria under B are assessed as Least Concern as E00, A00 and number of locations are much smaller than the thresholds for these criteria.

Criterion C and D: Reduction in abiotic and/or biotic quality

Criteria C/D	C/D1		C/D2		C/D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	22 %	32 %	unknown %	unknown %	unknown %	unknown %
EU 28+	22 %	32 %	unknown %	unknown %	unknown %	unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %
EU 28+	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %

Criterion D	D1		D2		D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %
EU 28+	unknown %	unknown %	unknown %	unknown %	unknown %	unknown %

The calculated average decline in quality (calculated from limited data) is far below the thresholds for Near Threatened.

Criterion E: Quantitative analysis to evaluate risk of habitat collapse

Criterion E	Probability of collapse
EU 28	unknown
EU 28+	unknown

There is no quantitative analysis available that estimates the probability of collapse of this habitat type.

Overall assessment "Balance sheet" for EU 28 and EU 28+

	A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	C1	C2	C3	D1	D2	D3	E
EU28	LC	DD	DD	DD	LC	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	LC	DD	DD	DD	LC	LC	LC	LC	DD	DD	DD	DD	DD	DD	DD	DD	DD

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Least Concern	-	Least Concern	-

Confidence in the assessment

Low (mainly based on uncertain or indirect information, inferred and suspected data values, and/or limited expert knowledge)

Assessors

M. Valachovič

Contributors

Type description: R. Tzonev

Territorial data: E. Agrillo, S. Armiraglio, S. Assini, F. Attorre, S. Bagella, C. Bitá-Nicolae, G. Buffa, J. Capelo, L. Casella, A. Čarni, M. Chytrý, R. Delarze, L.M. Delescaille, D. Espírito-Santo, P. Finck, D. Gigante, Z. Kaçki, N. Juvan, J. Loidi, C. Marcenò, V. Matevski, Zs. Molnár, Đ. Milanović, D. Paternoster, P. Perrin, G. Pezzi, U. Raths, U. Riecken, S. Sciandrello, A. Ssymank, Ž. Škvorc, R. Tzonev, D. Viciani.

Working Group Sparsely Vegetated Habitats: F. Essl, G. Giusso del Galdo, A. Mikolajczak, D. Paternoster, M. Valachovič, M. Valderrabano

Reviewers

P. Dimopoulos

Date of assessment

04/09/2015

Date of review

14/03/2016

References

Bernatová, D. 1991. Rastlinné spoločenstvá pod skalnými prevismi vo Veľkej Fatre. *Preslia*, 63(1): 21-46.

Gunn, J. (ed.). 2004. *Encyclopedia of caves and karst science*. Fitzroy Dearborn, Taylor and Francis Group New York London, 1970 pp.

Van der Meij, T., Van Strien, A.J., Haysom, K.A., Dekker, J., Russ, J., Biala, K., Bihari, Z., Jansen, E., Langton, S., Kurali, A., Limpens, H., Meschede, A., Petersons, G., Presetnik, P., Prüger, J., Reiter, G., Rodrigues, L., Schorcht, W., Uhrin, M. and Vintulis, V. 2015. Return of the bats? A prototype indicator of trends in European bat populations in underground hibernacula. *Mammalian Biology* 80: 170-177.