

EUROPE / NORTH AMERICA

VJETRENICA CAVE, RAVNO

BOSNIA AND HERZEGOVINA



Vjetrenica Cave, Ravno © IUCN / Zsuzsa Tolnay

WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

VJETRENICA CAVE, RAVNO (BOSNIA AND HERZEGOVINA) – ID N° 1673

IUCN RECOMMENDATION TO WORLD HERITAGE COMMITTEE: To refer the nomination under natural criterion (x).

Key paragraphs of Operational Guidelines:

Paragraph 77: Nominated property does not meet World Heritage criterion (vii) but has the potential to meet criterion (x).

Paragraph 78: Nominated property meets integrity requirements but only partially meets protection and management requirements.

Background note: The World Heritage Committee's attention is drawn to Decision 35 COM 12C in which the Committee took note of the selection of 10 pilot projects considering nominations before their preparation (Upstream Process), including a pilot project on the Dinaric Karst Serial Nomination (Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro, Serbia and Slovenia). The progress report to the Committee on the Upstream Process of 2018 (WHC-15/39.COM/9A), related to Decision 39 COM 9A, noted that despite a good start there had been no indication of progress reported from States Parties regarding the Dinaric Karst Serial Nomination since the 38th session of the Committee. The States Parties have requested to phase out the Dinaric Karst Serial Nomination as one of the Upstream Process pilots. Whilst criterion (viii) would have been the likely focus of a potential Dinaric Karst nomination, further to the 2008 study of IUCN on World Heritage Caves and Karst, IUCN notes that the present nomination has not been proposed under this criterion.

1. DOCUMENTATION

a) Date nomination received by IUCN: March 2023

b) Additional information officially requested from and provided by the States Parties: Following the session of the IUCN World Heritage Panel, a progress report was sent to the State Party on 14 December 2023. This letter advised on the status of the evaluation process and requested supplementary information on the exact area of the nominated property and its buffer zone; the protection regime provided by the Protected landscape Vjetrenica-Popovo polje, maps, information on stakeholders, ownership and inhabitants within the nominated property and its buffer zone, including consultation processes, as well as an update on the threats affecting the nominated property; and the current and planned funding and staffing for the nominated property.

c) Additional literature consulted: IUCN's evaluation consulted relevant reference materials for the geology, biology, ecology, protection and management as well as the comparative values of the nominated property. References used in this evaluation included: Baković, N., Pipan, T., Baković, R., Ozimec, R., Rubinić, J., & Matonićkin Kepčija, R. (2022). Algae and cyanobacteria in the aphotic habitats of Vjetrenica Cave (Medvednica Mt., Croatia) and selected caves of the Dinaric karst (South-Eastern Europe). *International Journal of Speleology*, 51(3), 3; Culver, D.C., Deharveng, L., Pipan, T., & Bedos, A. (2021). An Overview of Subterranean Biodiversity Hotspots.

Diversity, 13, 487. <https://doi.org/10.3390/d13100487>; Culver, D. C. & Pipan, T. (2019). Geography of Subterranean Biodiversity. In *The Biology of Caves and Other Subterranean Habitats*, 2nd edn, Biology of Habitats Series, <https://doi.org/10.1093/oso/9780198820765.003.0008>; Culver, D. C., & Pipan, T. (2018). Insects in caves. In *Insect Biodiversity: Science and Society*, 123-152; Culver, D.C. & Sket, B. (2000). Hotspots of Subterranean Biodiversity in Caves and Wells. *Journal of Cave and Karst Studies*, 62(1); DeliĆ, T., Pipan, T., Ozimec, R., Culver, D. C., & Zigmajster, M. (2023). The Subterranean Species of the Vjetrenica Cave System in Bosnia and Herzegovina. *Diversity*, 15(8), pp. 912; Dumnicka, E., Pipan, T., & Culver, D. C. (2020). Habitats and diversity of subterranean macroscopic freshwater invertebrates: Main gaps and future trends. *Water*, 12(8), 2170; Footitt, R.G., Adler, P.H., Eds., Culver, D.C. (2016). Karst environment. *Zeitschrift für Geomorphologie*, 60, Suppl. 2, 103-117. IUCN (2021). Classical Karst. Slovenia. In *IUCN World Heritage Evaluations 2020*, Vol. II, WHC/21/44.COM/INF.8B2; Pipan, T., Deharveng, L., & Culver, D. C. (2020). Hotspots of subterranean biodiversity. *Diversity*, 12(5), 209; Lučić, I. (2019). Vjetrenica Cave, Bosnia and Herzegovina. In *Encyclopaedia of Caves* pp. 1110- 1117. Academic Press; Ozimec, R., & Lučić, I. (2009). The Vjetrenica cave (Bosnia & Herzegovina)—one of the world's most prominent biodiversity hotspots for cave-dwelling fauna. *Subterranean biology*, 7, pp. 17-24; Ozimec, R. (2021). Vjetrenica: centar špiljske bioraznolikosti Dinarida. Javno puđuzeće Vjetrenica. Ravno; Redžić, S. (ed.) (2007). Evaluacija stanja biodiverziteta

ekosustava kraških polja na području Federacije BiH kao doprinos tematskim programima rada Konvencije o biološkoj raznolikosti u skladu sa Targets 2010. NVO EKO BiH – Društvo za zaštitu i unapređenje životne sredine, *Sarajevo*, pp. 1-223; Zagmajster, M.; Polak, S.; Fišer, C. (2021). Postojna Planina Cave System in Slovenia, a hotspot of subterranean biodiversity and a cradle of speleobiology. *Diversity*, 13, 271.

d) Consultations: 11 desk reviews received. The field evaluation met representatives from a wide range of stakeholders and rightsholders, including: Vjetrenica Public Company Ltd. Ravno, the Mayor of Ravno, officials from the municipality, hunting association, NGOs, public utility services and small businesses, owners, and scientists.

e) Field Visit: Ms. Zsuzsa Tolnay, from 22-25 August 2023.

f) Date of IUCN approval of this report: May 2024

2. SUMMARY OF NATURAL VALUES

The nominated property “Vjetrenica Cave, Ravno” is located in the South Dinaric Karst, which is a mountain range stretching from Popovo Polje to the Adriatic Sea. Vjetrenica Cave and the surrounding area constitute the nominated property, with a total surface area of 413.97 ha, surrounded by a buffer zone of 4,623.60 ha. Both the nominated property and its buffer zone are part of the municipality of Ravno in the Herzegovina-Neretva Canton.

With a length of 7,324 m, the Vjetrenica Cave is one of the longest caves in Bosnia and Herzegovina. It has been known since antiquity as the Roman naturalist Pliny the Elder makes a reference to the cave in his *Historia Naturalis*. It is also reported to boast one of the richest cave faunas worldwide. The nominated property is part of the Trebišnjica river system, and includes separate watercourses, as well as a number of smaller, periodical streams and underground lakes. Its entrance is located 300 m east of the centre of the village of Zavala. Bio-speleological research in Vjetrenica Cave discovered a hygropetric habitat in a cave for the first time (i.e. a habitat composed of a thin layer of water covering a rock surface).

The property is nominated under criteria (vii) and (x). Regarding criterion (vii), the cave system of Vjetrenica and its surroundings is presented as a well-conserved manifestation of karst topography that boasts a wide range of natural features. Most passages in Vjetrenica Cave are wide and high along their entire length across four levels: Main Level, Upper Level, Lower Level and Vertical Level. The Main Level is semi-horizontal and the longest passage in the cave, running from the cave entrance almost to the furthestmost point of the cave while the Upper Level consists of five passages which are up to 120 m above the Main Level. The Lower Level is approximately 10 to 30 m below Main Level. The Vertical Level, is reported to consist of deep pits that lead from the surface to the cave, and allow strong winds up to 8.5m

per second in the cave system. The cave also harbours several smaller streams and water pools, the largest of which is the Great Lake (*Veliko jezero*), some 180 m in length. Several sizeable chambers are almost entirely filled with rock blocks, slabs, in the form of piles tens of metres high.

Regarding criterion (x), the Vjetrenica Cave hosts a total of 231 recorded taxa, according to the nomination dossier, including 14 fungi, 35 protist and 180 animals, with 96 cave-dwelling taxa. More than half of the species recorded are endemic to the Popovo polje, whilst further species are known to only inhabit Vjetrenica Cave. Vjetrenica Cave hosts 36 Crustaceans, 11 gastropods, 11 Insects, nine Arachnids and eight Myriapods, among other species. Vjetrenica (together with Lukavac spring and Bjelušica Cave, which are part of the same cave system) is a type locality for 28 taxa. Three taxa are monotypic (i.e. part of a taxonomic group that has only one subordinate taxon): *Zavalka (Narentiana vjetrenicae*, EN, a gastropod species), *Troglomysis vjetrenicensis* (a crustacean species) and *Nauticiella stygivaga* (a beetle species). According to the nomination dossier, the nominated property is inhabited by more than 49 troglobites (i.e. species strictly bound to underground habitats) and 56 stygobites (i.e. species living in underground water). The nominated property's biodiversity is understood to be an example of the phenomenon of local radiation, evidenced by the existence of nine species of the genus *Niphargus*.

In addition, the nominated property also holds important fossils, including from a leopard and a cave bear, which are considered as the best preserved and most complete skeleton of its kind globally. These remains are a testament to a period spanning from 29,000 to 37,000 years. Furthermore, Vjetrenica Cave is also noted as an important archaeological site.

3. COMPARISONS WITH OTHER AREAS

The nomination contends that the beauty of the cave has been noted since ancient times. The comparative analysis provided in the nomination document presents seven parameters under which the nominated property is regarded as significant in relation to (vii). However, a systematic comparison with other sites following these parameters is not included. Furthermore, IUCN notes that none of these parameters relate to criterion (vii) as they only include aspects that relate to criterion (x) (species diversity) and to criterion (viii) (karst features), even though the property is not nominated under the latter. Whilst the nominated property is not nominated under criterion (viii), the field evaluation mission and several expert reviewers noted the potential the nominated property holds as potential component part of a serial transnational nomination representing the Dinaric Karst.

Based on the inputs from external desk reviewers and the field evaluation mission, IUCN notes that there does not appear to be a strong case in relation to the natural beauty of the nominated property or in relation

to superlative natural phenomena. There are other cave sites on the World Heritage List that are more remarkable than the nominated property in this regard. For instance, Mammoth Cave National Park contains the longest cave system in the world with huge and stunning chambers, vertical shafts, stalagmites and stalactites. Expert reviewers noted that the claim of the cave form being outstanding is not justified as there are many breakdown caves with streams found in many places around the world. In fact, the features described are typical of many hundreds of caves globally, which would however make the nominated property's faunistic diversity presented under criterion (x) even more remarkable.

With respect to criterion (x), the nomination dossier presents a comparative analysis based on biodiversity data. The caves selected for the comparison host either more than 25 stigobionts or more than 25 troglobionts. Based on this comparison, the species numbers of the nominated property clearly stand out for both parameters. However, research on Subterranean Biodiversity Hotspots published after the preparation of the nomination reported higher species numbers in the Postojna Planina Cave System. Subsequently, further research also corrected species numbers for Vjetrenica Cave recording a total of 85 troglobionts, which is by far the highest number reported globally and resulting in a total species count that clearly surpasses the Postojna Planina Cave System. Nevertheless, whilst there appears to be a stronger case for Vjetrenica Cave based on current research, IUCN considers that the nomination of Postojna Planina Cave System as well as further cave sites in the Dinaric Karst could possibly be explored within the framework of an extension and renomination of the World Heritage property of the Škocjan Caves (Slovenia). This has also been noted in IUCN's 2020 evaluation of the Classical Karst.

Vjetrenica Cave not only holds one of the richest, if not the richest cave fauna in the world, it also includes the richest subterranean amphipod community worldwide. Moreover, the nominated property has been recognised as one of the world's most important biodiversity hotspots for cave-dwelling fauna. The nominated property also harbours gastropods with a high variability in size and ecology out of which all but one are endemic to either Popovo Polje or the southeastern Dinaric Karst.

IUCN, in collaboration with UNEP-WCMC, has undertaken supplementary comparative analysis, based on spatial analyses and literature review. The WCMC Comparative Analysis concludes that the biodiversity of the nominated property appears to be of global significance due to its exceptional subterranean biodiversity. Despite its small size and scope for further study, the nominated property hosts a very high diversity of plant and animal species compared to similar cave and karst sites found in a temperate climate. Vjetrenica Cave is also considered an exceptional example of single-genus diversity. For instance, there are nine species of the subterranean amphipod genus *Niphargus* found at the nominated property, which might be the highest example of

subterranean single-genus diversity of any location in the world. The nominated property shows similar levels of plant, mammal, bird and fish species diversity as significantly larger sites included in WCMC's comparative analysis.

In terms of endemism, IUCN and WCMC note a high level of both floral and faunal endemism in the nominated area. In particular, up to 78% of the stygofauna are endemic to the Dinaric region, according to the nomination dossier. One endemic subterranean faunal species of particular interest is *Marifugia cavatica*, the only subterranean tubeworm in the world. According to the nomination file, many of the 14 endemic faunal species are restricted to the small area around the nominated property. Additionally, several of these species are tertiary and pre-tertiary relict species, meaning that many of these endemic species are living fossils as their closest relatives went extinct. The nominated property is also reported to host 21 plant species that are endemic to the Balkans.

Furthermore, the nominated property hosts a number of vertebrate species assessed as globally threatened. There is at least one threatened mammal – Balkan snow vole (*Dinaromys bogdanovi*, VU) –, at least one threatened bird – Red-footed falcon (*Falco vespertinus*; VU) –, and one threatened amphibian – Olm (*Proteus anguinus*, VU). The Olm is an aquatic salamander that is restricted to subterranean aquatic habitats within the Dinaric Karst and the largest animal of the subterranean habitats of the Dinaric Karst. Moreover, there are four species of birds, one species of reptile, two species of fish (Neretva cub, *Squalius svallize*, VU, and Southern Dalmatian Minnow, *Delminichthys ghetaldii*, VU), and three species of molluscs, all of which are globally threatened (*Congerius kuseri*, VU, *Lanzaia vjetrenicae*, VU, and *Zavalka, Narentiana vjetrenica*, EN). According to the nomination file, around 40% of all known stygofauna of Mollusca inhabit the Dinaric region. There are likely only between four and nine sub-populations of *Lanzaia vjetrenicae* globally.

In addition, it deserves to be noted that a total of 484 species of flora have been recorded in the above-ground part of the wider area around Vjetrenica Cave, including endemic species. Nine fish species and 248 invertebrate species are reported in the wider Vjetrenica - Popovo polje area.

In conclusion, IUCN considers that the nominated property does not demonstrate global significance under criterion (vii) whilst it could potentially be considered under criterion (viii) if proposed as part of a wider series representing the Dinaric Karst. In IUCN's view, the nominated property, alone, demonstrates a strong case for global significance under criterion (x).

4. INTEGRITY, PROTECTION AND MANAGEMENT

4.1. Protection

The nominated property and its buffer zone are subject to a multi-layer governance, including federal, cantonal

and municipal levels. A range of different ministries hold responsibilities for the protection of the nominated property: Bosnia and Herzegovina Ministry of Foreign Trade and Economic Relations, Federal ministry of environment and tourism to the Federal Ministry of Agriculture, Water Management and Forestry of the Federation of Bosnia and Herzegovina, Ministry of Construction and Spatial Planning of the Herzegovina-Neretva Canton and the Ministry of Trade, Tourism and Environmental Protection of the Herzegovina-Neretva Canton. In addition to government bodies, there is a wide range of relevant stakeholders including small tourism businesses, the local hunting association, and local community organizations. The Vjetrenica Public Company Ltd. Ravno serves as the managing body for the nominated property coordinating decision-making and implementation of management actions. This overall complex governance structure for the nominated property requires a high degree of coordination efforts. Thus, it is important that sufficient capacity in terms of funding and staffing is provided to the nominated property.

The surface area of Vjetrenica Cave is protected as a Strict Nature Reserve in mostly municipal ownership. The nominated property and its buffer zone are embedded in the Protected landscape Vjetrenica-Popovo polje, an IUCN Category V Protected Landscape declared in 2021. The protection of Vjetrenica Cave has a long history going back to 1952 when it was firstly declared a natural monument (Decision of the Institute for the Protection of Cultural Monuments and Natural Rarities of the People's Republic of Bosnia and Herzegovina, No. 979/52 of 25 December 1952). Subsequently, the 1981-2000 Spatial Plan of Bosnia and Herzegovina ensured protection of the wider area as a special natural landscape (Official Gazette of the Federation Bosnia and Herzegovina, No. 2/06). From 2003 onwards, the nominated property was provided with additional protection under the 2003 Law on Nature Protection, in line with Directives of the European Union. Finally, based on further scientific findings on the Vjetrenica cave system and its wider area, the Protected landscape Vjetrenica-Popovo polje was declared in accordance with the Law on Nature Protection of the Herzegovina-Neretva Canton (Official Gazette of the Herzegovina-Neretva Canton No. 12/17). This designation provides another layer of formal legal protection in line with the Federal Law on Nature Protection of Bosnia and Herzegovina.

In supplementary information, the State Party provided the Law designating the Vjetrenica Cave Area with a part of the Popovo Polje as Protected Landscape Vjetrenica-Popovo Polje. This designation covers the key values of the nominated property and defines the zonation of the protected area and which activities are prohibited where, in order to conserve these values. However, these zones have not been mapped and designated yet according to supplementary information. In addition, IUCN notes the importance of careful watershed management to ensure water supply and water quality will be maintained in the long-term, and this is crucial to protection of the potential OUV under criterion (x). This is also reinforced by recent

science suggesting for instance that due to changes in water regimes, the Olm population may be more vulnerable to changes in the hydrological regime and quality than previously thought. Historically, the regulation of Trebišnjica river in the mid of the last century has already had a negative impact on at least two threatened fish species (Neretva chub, *Squalius svallize*; VU), and southern Dalmatian minnow (*Delminichthys ghetaldii*; VU), which were more abundant in the area before the Trebišnjica river was regulated.

These examples illustrate the importance of a stringent protection of the upstream areas of Vjetrenica Cave. As the cave biodiversity depends on the inflow and quality of groundwater, IUCN considers that this element is key in defining the zonation in the upstream areas of the nominated property. However, supplementary information did not include the requested further information on the nominated property's watershed.

Therefore, IUCN considers that the nominated property's protection regime has the potential to provide an appropriate level of protection to the potential OUV of the nominated property; however, the zonation of Protected landscape Vjetrenica-Popovo polje would need to be finalised and clearly mapped out. IUCN recommends to incorporate, to the extent possible, the catchment area of Vjetrenica Cave and to ensure that the inflow into Vjetrenica Cave and water quality is guaranteed in the long term. In conclusion, IUCN considers that the nominated property partially meets protection requirements.

IUCN considers that the protection status of the nominated property partially meets the requirements of the Operational Guidelines.

4.2 Boundaries

The area of Vjetrenica Cave projected to the surface amounts to 22.87 ha, which is embedded within the larger area of the nominated property of 413.97 ha. Whilst the nominated property as a whole is small, the boundaries comprise the remarkable biodiversity making it one of the most faunistically rich caves in the world. Nevertheless, it is noted that the wider karst landscape also harbours further significant and similar values and unexplored cavities so that an extension may possibly be envisaged in future, depending on the results of further research.

The buffer zone is surrounds the nominated area, covering an area totalling 4,623.60 ha. The boundaries of the buffer zone largely follow the topography of the landscape and in the eastern section along the border to the Srpska Republic. The boundary design of the nominated area and its buffer zone adequately represent and fully include the surface area below which the main cave features and habitats of Vjetrenica cave are found, whilst ensuring that a generous area beyond the horizontal extent of the cave is included within the nominated area, which is

already providing a buffering function to the attributes of potential OUV.

Supplementary information confirms coherence between the cave area, the nominated property and the Law designating the Protected landscape Vjetrenica-Popovo polje. However, the zoning regime applying to the areas within and beyond the buffer zone is not fully clear yet as several zones still remain to be mapped out according to the supplementary information (see also section 4.1). Whilst the approximate watershed of Vjetrenica Cave has not been indicated in the supplementary information, the buffer zone appears to cover a significant portion of the cave's catchment (see also sections 4.1 and 4.3). However, it is important to bear in mind that determining watersheds is highly complex in karst areas.

Overall, IUCN considers that the current boundary design appears to meet the requirements of the *Operational Guidelines* in relation to criterion (x), whilst noting that there may be potential for further (including possibly serial) extensions (see also section 5).

IUCN considers that the boundaries of the nominated property and buffer zones meet the requirements of the *Operational Guidelines*.

4.3 Management

The management of the nominated property is guided by a management plan that was adopted by the government of the Herzegovina Neretva Canton and the Municipality of Ravno in 2021 and remains valid until 2031. The plan caps visitation to Vjetrenica Cave at 240 visitors per day and guides the work of the Vjetrenica Public Company Ltd. Ravno in managing the nominated property. The management plan has been harmonized with the Law designating the Protected landscape Vjetrenica-Popovo polje and with the Spatial Plan of the Municipality of Ravno. The procedure for preparing the Spatial Plan of the Herzegovina-Neretva Canton was initiated back in 2008; however, the document has not been formally adopted by the Assembly of the Canton yet, which is expected to happen in the course of 2024. IUCN considers that this spatial plan would address the conservation needs of the wider protected landscape and the nominated property and its buffer zone; however, IUCN notes that this mechanism is not in place at the time of the completion of the present evaluation.

Based on the information available, IUCN notes that Vjetrenica Public Company Ltd. Ravno, in charge of site management, is provided with limited capacity to ensure the management of the nominated property. Only seven permanent and three seasonal staff are available to respond to the high degree of coordination required (see section 4.1) whilst ensuring the day-to-day management of the nominated property, which is anticipated to face increased visitation as result of a potential inscription as World Heritage property. The nomination dossier also notes that the current level of

staffing is very limited to ensure an effective management and protection the fragile cave ecosystem and the successful implementation of all foreseen management action. This is exacerbated by the fact that the management plan does not detail how the coordination and responsibility of each relevant entity will be achieved. Furthermore, there is a need to complement the focus on tourism management with enhanced management for nature conservation, including biodiversity monitoring, to inform adequate management action within the nominated property, its buffer zone and the wider area. In terms of funding, supplementary information details the share of funding support provided by various institutions sharing the responsibility; however, no information is provided on the actual amounts of funding provided at the time of this evaluation or on the funding committed to ensure an adequate management of the nominated property in the long-term.

Therefore, IUCN considers that the management requirements are not fully met at the time of the present evaluation, and recommends that the State Party increases staffing and details out current and long-term funding for the effective management of the nominated property, whilst ensuring that the adopted spatial plan will indeed support the management of the nominated property and its buffer zone. IUCN encourages the State Party to further enhance exchange and cooperation with other cave and karst sites across the region, including World Heritage properties containing karst features.

IUCN considers that the management of the nominated property partially meets the requirements of the *Operational Guidelines*.

4.4 Community

Based on the nomination dossier and the field evaluation mission, IUCN notes that a wide range of local stakeholders appear to have been involved in the process of preparing the nomination for Vjetrenica Cave, Ravno for more than two decades. The nomination states that the initiative to nominate Vjetrenica Cave to the World Heritage List emerged from an initiative by local communities, which later gained support from scientists. Whilst it is reported that there is a strong consensus across the local, cantonal, and federal levels, IUCN notes that the nomination does not provide documented evidence as to how the consultation process enabled this consensus to be reached, especially after 2013 in relation to the population inhabiting the nominated property. Small-scale tourism has already benefited from the promotion of the area through the nomination process. Vjetrenica Cave also plays an important role for the local identity. The nomination dossier also confirms that the nomination of the property has not affected any existing tenure rights. In supplementary information, the State Party confirms that the nominated area is not inhabited whilst the buffer zone is home to 678 people, however the last census is dating back to 2013.

4.5 Threats

As noted in the preceding sections, the attributes of the potential OUV of the nominated property are fragile, and prone to impacts from upstream sections. Changes in water regimes and quality can negatively affect the abundance of important cave-dwelling species. Therefore, it is important to ensure careful analysis and mitigation of factors affecting the hydrological regime and water quality at the scale of the catchment of Vjetrenica Cave.

Nevertheless, based on the information provided in the nomination document and supplementary information, IUCN notes that, currently, the nominated property is not facing any significant threats that would be likely to impact the natural values of the nominated property. Nevertheless, IUCN notes that there is a need for a high level of vigilance regarding potential threats from increased visitation, associated pollution, and any impactful development projects, including further interventions affecting the hydrological regime of the nominated property. According to monitoring results reported in the nomination, tourism has thus far not negatively affected the cave biodiversity. Potential pollution from new weekend homes and tourist facilities require careful attention to ensure septic tanks can absorb all wastewater as long as gaps remain in the sewage treatment infrastructure. Similarly, careful attention to waste management is required in the absence of a waste control system, an issue which is also evidenced by some illegal landfills noted in the nomination dossier.

In summary, IUCN considers that the integrity requirements of the Operational Guidelines are met whilst the protection and management requirements of the Operational Guidelines are only partially met.

5. ADDITIONAL COMMENTS

5.1 Potential serial nomination in the Dinaric Karst

Although criterion (viii) has not been proposed in the present nomination, the field evaluation mission and several expert reviewers suggested that the nominated property may also hold the potential to serve as a component part in a serial transboundary extension nomination under criterion (viii). However, as this evaluation suggests a referral of the nominated property under criterion (x), IUCN recommends the State Party to firstly focus on implementing the actions recommended in the sections above and the draft decision below, and to provide the required evidence of their implementation as supplementary information within the three-year timeframe of the referral procedure. As a second step, following potential inscription under criterion (x), a transnational serial extension under criterion (viii) could potentially be considered. In this regard, IUCN also recalls its 2020 evaluation of the Classical Karst (Slovenia), found in document WHC/21/44COM/INF.8B2 and to the Committee's Decision 35 COM 12C concerning an upstream pilot project on a Dinaric Karst Serial Nomination (Albania, Bosnia and Herzegovina,

Croatia, Italy, Montenegro, Serbia and Slovenia). Whilst the progress report to the Committee on this Upstream Process (WHC-15/39.COM/9A), related to Decision 39 COM 9A, noted that the States Parties have requested to phase out the Dinaric Karst Serial Nomination as one of the Upstream Process pilots, there may be scope to explore the possibility of an extension to comprise further biodiverse caves in the Dinaric Karst, including through an extension and renomination under criterion (x) of the Škocjan Caves World Heritage property.

6. APPLICATION OF CRITERIA

The **Vjetrenica Cave, Ravno (Bosnia and Herzegovina)** has been nominated under natural criteria (vii) and (x).

Criterion (vii): Superlative natural phenomena or natural beauty or aesthetic importance

The nomination dossier highlights the historical recognition of Vjetrenica Cave's beauty but does not provide a systematic comparative analysis under this criterion. Expert reviewers noted that the features of Vjetrenica Cave are common to many other cave sites around the globe whilst several World Heritage properties include caves recognised under criterion (vii), which boast significantly larger and more geologically diverse cave systems. Whilst the aesthetic values of Vjetrenica Cave deserve to be protected, IUCN notes that there does not appear to be any evidence that these stand out from other caves at global level. The features described are typical of many hundreds of caves globally. Therefore, IUCN concludes that criterion (vii) is not met.

IUCN considers that the nominated property does not meet this criterion.

Criterion (x): Natural Habitat for in situ conservation of biological diversity

The nominated property stands out with its remarkable cave biodiversity and endemism. Vjetrenica Cave is considered one of world's most important biodiversity hotspots for cave-dwelling fauna. There are 85 troglobitic taxa and 56 stygobites, which is unparalleled globally. A total of 231 taxa of subterranean biodiversity has been recorded, including 14 fungi and 35 protist species. Vjetrenica Cave also stands out as an exceptional example of single-genus diversity – the nine species of the subterranean amphipod genus *Niphargus*, which may represent the highest subterranean single-genus diversity of any location in the world.

The exceptional endemism of the nominated property is illustrated by its stygofauna, of which 78% are only found in the Dinaric region. The only subterranean tubeworm in the world (*Marifugia cavatica*) dwells in Vjetrenica Cave. In addition, several of the species found in Vjetrenica Cave are tertiary and pre-tertiary

relict species, which can be considered living fossils, whose closest living relatives went extinct a long time ago. The nominated property is also reported to host 21 plant species that are endemic to the Balkans.

Therefore, IUCN considers that the nominated property holds a very strong potential to meet criterion (x), provided the remaining concerns regarding protection and management necessary are addressed.

IUCN considers that the nominated property has the potential to meet this criterion.

7. RECOMMENDATIONS

IUCN recommends that the World Heritage Committee adopts the following draft decision:

The World Heritage Committee,

1. Having examined Documents WHC/24/46.COM/8B and WHC/24/46.COM/INF.8B2;

2. Refers the nomination of **Vjetrenica Cave, Ravno, Bosnia and Herzegovina**, back to the State Party,

taking note of the potential of the nominated property to meet criterion (x), in order to allow the State Party to

- a) Complete, clearly map out and adopt the zonation of the Protected landscape Vjetrenica-Popovo polje, and demonstrate in supplementary information that sufficient water quality and water inflow into the Vjetrenica cave system will be guaranteed in the long term,
- b) Increase funding and staffing for the management of the nominated property, and provide supplementary information to demonstrate that sufficient funding and staffing is provided for the implementation of the management plan and for the protection and management of the nominated property in the long term;

3. Recommends the State Party to:

- a) Explore to what extent it could be possible to envisage in future a potential serial transnational extension to enable a complete representation of the Dinaric Karst, including in relation to criteria (viii) and (x),
- b) Provide in the supplementary information maps detailing the zonation of Protected landscape Vjetrenica-Popovo polje.

Map 1: Boundaries of the nominated property and buffer zone (Source: nomination dossier)

