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ACCESSES FROM THE SURFACE TO THE POSTOJNA CAVE SYSTEM

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ABSTRACT

Besides known entrances into the Postojna cave system there are also other, less known accesses from the surface. Some are just widened fissures not big enough for a man to pass, functioning as breathing holes; others are smaller entrances that were in use 100 or more years ago and are no longer accessible. With the use of surface topographic maps (1:5000) and cave maps (1:500), the thickness of the cave roof on selected places in the Postojna cave system was calculated. Six interesting places with great potentials for cave continuation were determined (Matevžev Rov, chimney south of Koncertna Dvorana, side passage in Lepe Jame, Ruglovica, Puharnik Pri Pivki Jami and breathing holes in Vodni Dol and Kozja Jama collapse dolines). Velika Jeršanova doline is regarding the results of manual drilling of the sediments at its bottom not only a former collapse doline but a roofless cave as well.

Key words: Postojna karst, cave entrances, history of explorations, Postojna cave system, Slovenia

ACCESSI DALLA SUPERFICIE NEL SISTEMA DELLE GROTTA DI POSTUMIA

SINTESI

Il sistema delle grotte di Postumia vanta, oltre che i ben noti ingressi principali, anche altri minori e meno conosciuti, accessibili dalla superficie. Alcuni accessi sono fessure allargate, non abbastanza larghe per il passaggio dell'uomo, ma che funzionano quali fori per il passaggio dell'aria. Altre entrate minori che ora non sono più accessibili, venivano usate più di 100 anni or sono. Con l'uso di mappe topografiche superficiali (1:5000) e mappe delle grotte (1:500) è stato calcolato lo spessore del tetto in determinate aree del sistema delle grotte di Postumia. Sei aree interessanti, con grandi potenziali per la continuazione delle grotte, sono state localizzate (la Galleria di Matevž, il camino a sud della Sala dei Concerti, la galleria secondaria nelle Grotte Belle, Ruglovica, Puharnik vicino alla Grotta di Pivka e i fori per il passaggio dell'aria nelle doline collassate di Vodni Dol e Kozja Jama). In seguito a risultati sedimentologici di trivellazioni manuali, la Velika Jeršanova dolina è considerata non solo quale antica dolina collassata ma anche come grotta senza tetto.

Parole chiave: carso di Postumia, entrate delle grotte, storia delle esplorazioni, sistema delle grotte di Postumia, Slovenia

INTRODUCTION

Even if cavers are working hard to extend many Slovene caves, the Postojna cave system still represents the longest known cave system (20,570 m) in Slovenia. The cave system has several known entrances:

1. ponor entrance of the Pivka River (511 m) (Fig. 1)
2. entrances from the artificial platform (529.5 m) (Fig. 2)
3. entrance to the Otoška Jama (531.7 m) (Fig. 3)
4. Magdalena shaft entrance (562 m) (Fig. 4)
5. Črna Jama entrance (531 m) (Fig. 5)
6. Pivka Jama entrance (550 m) (Fig. 6)

Gospodarič (1985) defined the entrances to Otoška, Magdalena, Črna and Pivka Jama as secondary collapse dolines.

Besides known entrances there are also other, less known accesses from the surface. Some are just widened fissures not big enough for a man to pass, functioning as breathing holes, others are small entrances that were in use 100 or more years ago and are no longer accessible (e.g., Matevžev Rov). There are also some old entrances that are completely filled with sediments, as the one east of Biospeleološka Postaja (Bavdek, 2003), and cases where the karstological processes on the surface draw the dolines or collapse dolines near the underlying cave passages, as in the case of Pisani Rov.

In Postojna karst area there are also some horizontal caves and shafts that do not have the connection with

the Postojna cave system, but at least some of them probably belong to the older stages of the speleogenesis, meaning that in the past they were connected with active passages of the Postojna cave system (Zguba Jama, Jama Koliševka, Jama Na Poti (Šebela, 1994a)).

The area between the Postojna and Planina cave system was always of a big interest due to the unknown underground connection between both caves. There are still at least 1,450 m of unknown passages. The dives in 1998 and 1999 performed by Vrhovec made a big step in understanding the underground Pivka flow towards the Planina cave system.

METHODOLOGY

Geodetic map (Gallino, 1924/28) of cave passages together with digital model relief of the surface (10 m contour lines) were used to represent the position of cave passages regarding the surface karst features (Fig. 7). The position of registered caves in the area (Kataster jam IZRK ZRC SAZU) and position of other caves (Šebela, 1994a, 1994b) were marked on the map as well. From the map of the cave (1:500; Gallino, 1924/28) and from the topographic maps (1:5000), the thickness of particular parts of the cave roof was calculated (Table 1, Fig. 8). Old records (Kataster jam IZRK ZRC SAZU) were studied to better understand the historic connections between the surface and the underground.

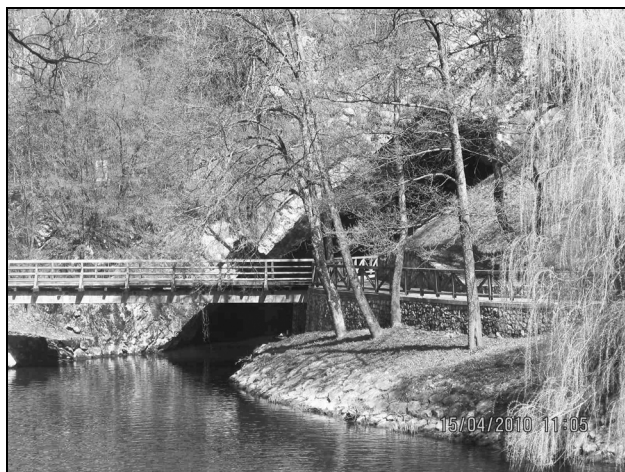


Fig. 1: Ponor entrance of the Pivka River (511 m). (Photo: S. Šebela)

Sl. 1: Ponorni vhod reke Pivke (511 m). (Foto: S. Šebela)

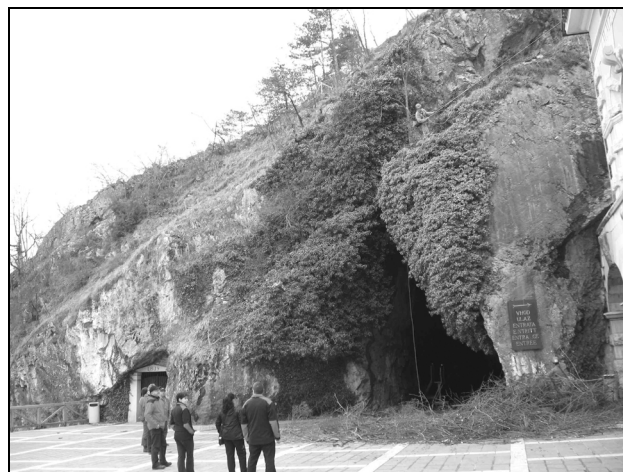


Fig. 2: Entrances from the artificial platform (529.5 m), 15th March 2008. The bigger entrance on the right was filled with sediments until 1866. (Photo: S. Šebela)

Sl. 2: Vhoda z umetne ploščadi (529,5 m), 15. marec 2008. Večji vhod na desni je bil do leta 1866 zasut s sedimenti. (Foto: S. Šebela)



Fig. 3: The entrance to Otoška Jama (531.7 m). (Photo: S. Šebela)

Sl. 3: Vhod v Otoško jamo (531,7 m). (Foto: S. Šebela)



Fig. 4: Magdalena shaft entrance (562 m). (Photo: S. Glažar)

Sl. 4: Vhod v Magdaleno jamo (562 m). (Foto: S. Glažar)

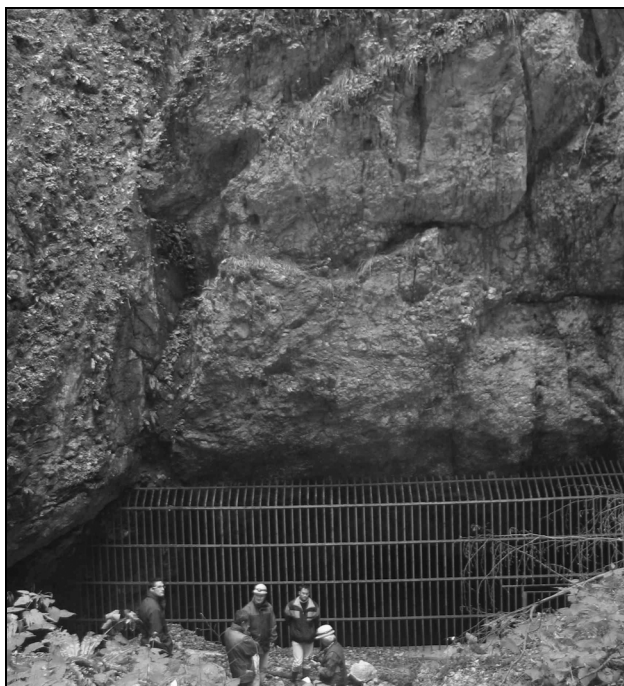


Fig. 5: Črna Jama entrance (531 m). (Photo: S. Šebela)

Sl. 5: Vhod v Črno jamo (562 m). (Foto: S. Šebela)

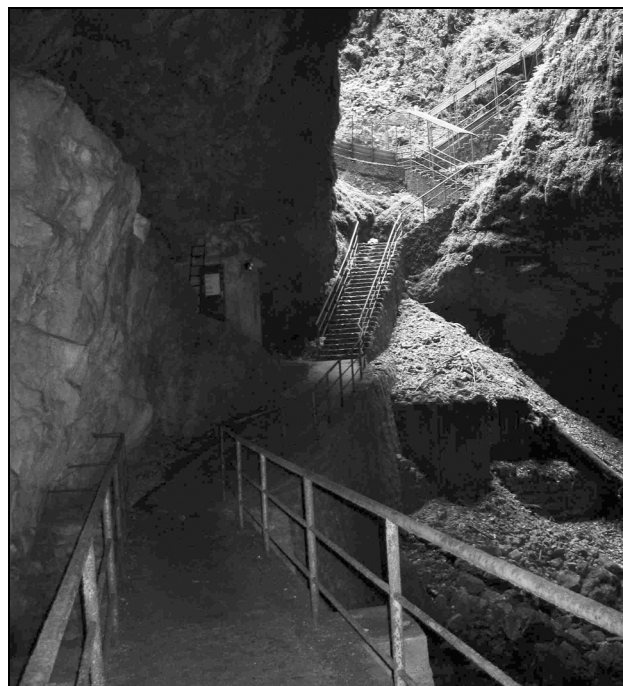


Fig. 6: Pivka Jama entrance (550 m), 30th July 2007. (Photo: S. Šebela)

Sl. 6: Vhod v Pivko jamo (550 m), 30. julij 2007. (Foto: S. Šebela)

RESULTS AND DISCUSSION

Cave entrances and breathing holes

Matevžev Rov, accessible from Črna Jama, was discovered by Matevž Vilhar from the village of Otok around the year 1900 (Kataster jam IZRK ZRC SAZU).

On 16th May 1956, Ivan Michler, Franc Hribar, Silvo Modrijan and Zmago Žele (at point R, Fig. 9) enlarged the continuation of Matevžev Rov towards the west. They reached a smaller room decorated with stalagmites. On the western wall of the room marked with Š (Fig. 9), they noticed the inscription: *Matevž Črnač*

from Veliki Otok and Franc Dolenc were here in 1852. It was partly written in Gothic letters. But the passage did not finish there, it continued further to the west into the high room decorated with stalagmites, stalactites and colourful flowstone (the room marked with Z on Fig. 9). At the northern edge of the room, they found a pile (1 m high and 0.75 m long and wide) of broken or sawn off stalagmites and stalactites (10–15 cm in diameter). This was the evidence of unofficial trade with stalagmites and stalactites (Kataster jam IZRK ZRC SAZU). Namely, people used to bring stalactites from Matevžev Rov and sell them at the entrance of the Postojna caves (Habe, 1986).

Tab. 1: The thickness of cave roof for 35 selected areas in the Postojna cave system.

Tab. 1: Debelina jamskega stropa za 35 izbranih mest v Postojnskem jamskem sistemu.

Point	Bottom (m)	Ceiling (m)	Surface (m)	Thickness of the roof (m)	Bottom of collapse doline (m)	Top of the hill (m)
1	523	525	576	51		
2	530	532	577	45		
3	535.2	537.2	578.5	41.3		
4	546	548	613	65		
5	565.2	567.2	612	44.8		
6	533	536	617	81		
7	527	542	618	76		
8	525.52	533.52	639	105.48		
9-Rov brez imena	552.6	554	633	79		
10	556.7	558	594.3	36.3		
11-Pisani Rov	535.5	537.5	572	34.5	535 (Velika Jeršanova doline)	
12	520.2	525.2	622	96.8		
13	557	559	620	61		
14-Velika Gora	561.4	565.4	630	64.6		632.7 (Nemčji Vrh)
15	523	528	592	64		
16	526	527	585	58		
17	540	543	587	44		
18	549.8	552	600	48		
19	520.4	528.4	573	44.6		
20	517.2	527.2	572	44.8		
21	526.4	530	567	37		
22-Matevžev Rov	509	512	550	38	523	
23	496	498	547	49	529	
24-Otoška Jama	539.7	543	562	19		
25-Zgornji Tartarus	533.2	536.2	570	33.8	554 (Stara Apnenica)	
26-Tartarus	529.8	532	608	76	573	
27	506	509	605	96		
28-Koncertna Dvorana side passage	524	526	596	70		
29-Pivka ponor	511					
30-entrance to Otoška Jama	531.7	533				
31	498	500	569	69		
32-entrance to Magdalena Jama	562					
33	492	500	558 (506)	6	506 (Ruglovica)	
34-entrance to Pivka Jama	485		550	55		
35-end sifon in Pivka Jama	477.2	481	550	69		

Matevžev Rov is not on the cave map by Perko & Gradenigo (1924). It was not drawn on the map by Gallino (Gallino, 1924/28) either. According to Shaw (2006), the name Matthäusgang (Matevžev Rov) appears for the first time in Šerko & Michler (1958).

During the construction works for the underground railway in 1966 in the southern part of Koncertna Dvorana, a chimney (Fig. 8, number 28) following the fault 205/75 was discovered. Alojz Vadnjal and Zmago Žele followed a strong wind blow and after about 60 m reached the gravels. While digging the gravels, they reached the bottom of a collapsed doline (580 m), which led them to think they were close to the surface (Gospodarič, 1969). The Dinaric-oriented (NW-SE) passage is 64 m long and 72 m high. The passage represents corrosionally widened fault. The passage was never connected with the surface because there is still about 8 m of gravel plugging the upper-most end of the passage (Kataster jam IZRK ZRC SAZU).

During the water tracing test in 1993 (Kogovšek, 1995), Franjo Drole and Jurij Hajna climbed the chimney called Rov Pri Mumiji from the cave towards the

surface. In 1998 a map was drawn by F. Drole and J. Hajna, representing a system of vertical passages 28 m high (Kataster jam IZRK ZRC SAZU). There was still about 70 m of vertical distance to the surface, but due to the narrow passage the continuation was not possible. On the surface, in a doline two breathing holes that are connected with this vertical passage were detected already in 1994 (Šebela, 1994b).

Number 16 (Fig. 8) represents a small side passage in Lepe Jame that was about 50 years ago artificially enlarged by Alojz Vadnjal and Zmago Žele to turn it into a strong blowhole. There were suggestions of cave continuation at this point. Since after about 5–6 m of digging the new passages were not found, the continuation stopped.

In cold winter days early in the morning, warm cave air comes out of breathing holes and melts the snow. One of such breathing holes in the Postojna karst area is situated in the zone with obvious gravimetric deficiency detected by geophysical research in years 1931–1932 (Anelli, 1936).

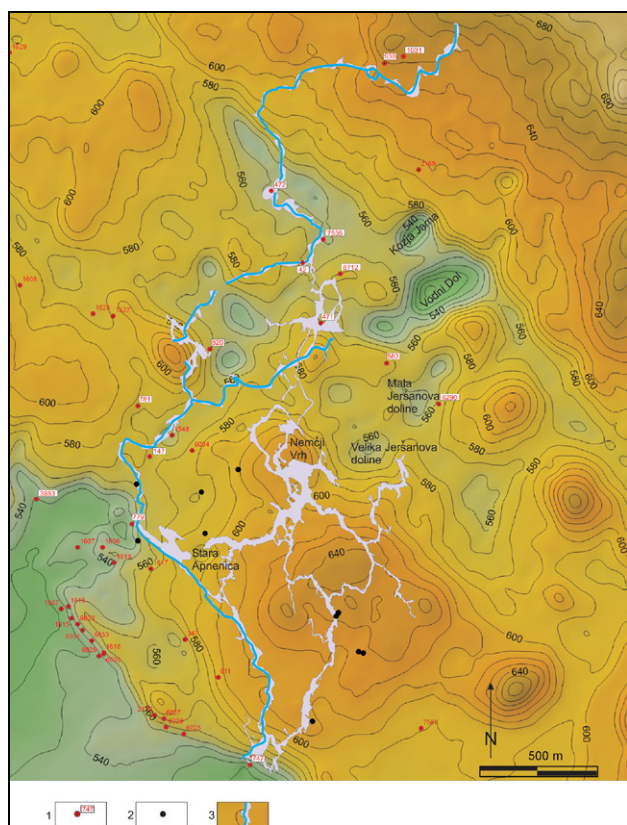


Fig. 7: Digital model relief of the surface with 10 m contour lines, the Postojna cave system ground plan and other known caves in the area. Cartography of digital model relief by J. Hajna. Legend: 1: cave entrance with cave register number (Kataster jam IZRK ZRC SAZU): 42-Ruglovica, 147-Jama Koliševka, 471-Črna Jama, 472-Pivka Jama, 583-Jama Na Poti, 747-Postojnska Jama, 779-Otoška Jama, 781-Ledena Jama Pod Magdaleno Goro, 820-Magdalena Jama, 930-Brezno V Hrenovških Talih, 1031-Jama V Hrenovških Talih, 3883-Spodmol V Risovcu, 6290-Zguba Jama, 7536-Puhalik Pri Pivki Jami, 8712-Brezno Pri Črni Jami; 2: smaller caves not registered in Kataster jam IZRK ZRC SAZU, 3: cave ground plan with the underground Pivka River.

Sl. 7: Digitalni model reliefa površja z izohipsami na 10 m, tlorisom Postojnskega jamskega sistema in drugimi poznanimi jamami. Kartografijo digitalnega modela reliefa je opravil Jurij Hajna. Legenda: 1: jamski vhod s katastrsko številko (Kataster jam IZRK ZRC SAZU), 42-Ruglovica, 147-Jama Koliševka, 471-Črna jama, 472-Pivka jama, 583-Jama na poti, 747-Postojnska jama, 779-Otoška jama, 781-Ledena jama pod Magdaleno goro, 820-Magdalena jama, 930-Brezno v Hrenovških talih, 1031-Jama v Hrenovških talih, 3883-Spodmol v Risovcu, 6290-Zguba jama, 7536-Puhalik pri Pivki jami, 8712-Brezno pri Črni jami; 2: manjše jame, ki niso registrirane v Katastru jam IZRK ZRC SAZU; 3: tloris jamskih rogov s podzemeljsko Pivko.

Above the known passages of the Postojna cave system Anelli (1937) determined 8 breathing holes with very possible interconnection and 7 breathing holes between the Postojna and Planina cave systems. In Vodni Dol collapse doline (Fig. 7), the air coming out of the breathing hole had a temperature of 6 °C with outer temperature of 0.5 °C on 7th February 1935 (Anelli, 1937). Very prospective breathing holes in Vodni Dol and Kozja Jama are nowadays still not connected with possible underground passages.

Connecting the position of Anelli's (1937) breathing holes with actual known caves (Kataster jam IZRK ZRC SAZU) is not easy, because of the probable location mistakes in the past.

In the Postojna karst area, there are some interesting caves that are not connected with the actual Postojna cave system, but are probably part of the same hydrologic system. The passage of Jama Koliševka (Fig. 7, 147) is situated at 527 m (Michler & Hribar, 1959) and about 27 m below there is an underground passage of the Pivka River. Jama Na Poti and Zguba jama (Fig. 7, 583 and 6290) were already known by Martel (1894). Jama Na Poti is described as a former continuation of Pisani Rov (Martel, 1894; Gospodarič, 1969; Šebela, 1994a; Šebela & Čar, 2000). Today its entrance is hidden by collapsed blocks and soil.

Ledena Jama Pod Magdaleno Goro (Fig. 7, 781) is 46 m deep and reaches 544 m at its bottom. It is situated about 100 m north of Jama Koliševka.

Spodmol V Risovcu (Fig. 7, 3883) is known for Paleolithic findings (Brodar, 1970). The cave's entrance is at 532 m, the cave is about 50 m long.

About 50–100 m north of the underground Pivka following the siphon in Pivka Jama there are two caves, Jama V Hrenovških Talih and Brezno V Hrenovških Talih (Fig. 7, 1031 and 930). The first one is a gently dipping shorter cave and the second one is a 105 m deep shaft (*Catasto storico Venezia Giulia* (VG) 3041 – *Pozzo a N del Abisso della Piuca* (Kataster jam IZRK ZRC SAZU)). The bottom of the shaft is about 25 m above the underground Pivka level.

The shaft Puhlnik Pri Pivki Jami (Fig. 7, 7536) is 30 m deep. Its entrance is at 550 m and is situated directly above the passages of Pivka Jama. There is still about 25 m of unknown connection between the shaft and the underground passage. The shaft is a strong breathing hole.

Brezno Pri Črni Jami (Fig. 7, 8712) is 40 m long and 14 m deep with two entrances. The cave is situated about 50 m north of the known passages of Črna Jama with the lowest level at 550 m, which is about 40 m higher than passages of Črna Jama. The cave was described by Anelli (1936) and classified under the number 1220 VG (Kataster jam IZRK ZRC SAZU).

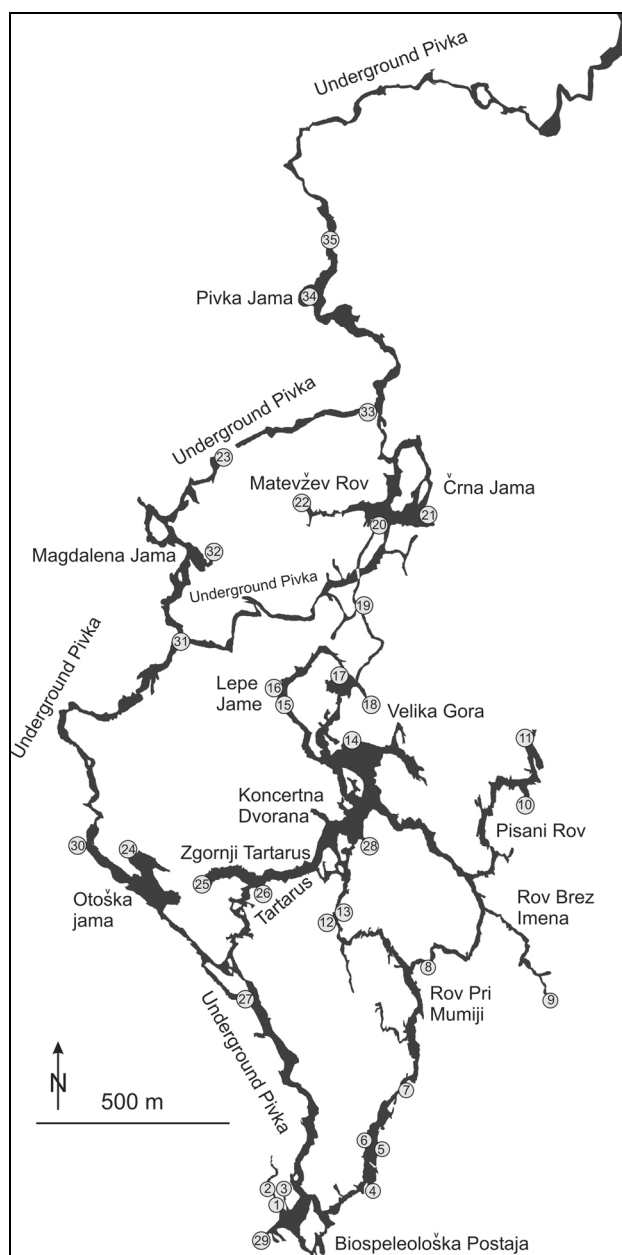


Fig. 8: Selected places for the calculation of thickness of cave ceiling between the surface and the Postojna cave system regarding Table 1.

Sl. 8: Izbrana mesta za izračunano debelino jamskega stropa, med površjem in Postojnskim jamskim sistemom glede na Tabelo 1.

Collapse dolines and cave passages

Geodetic measurements of the bottom of Velika Jeršanova doline and the position of Pisani Rov were performed in 1969 (Gospodarič) and in 1993 (Šebela, 1994a). The bottom of Velika Jeršanova doline was determined with a laser theodolite by Franjo Drole at 535

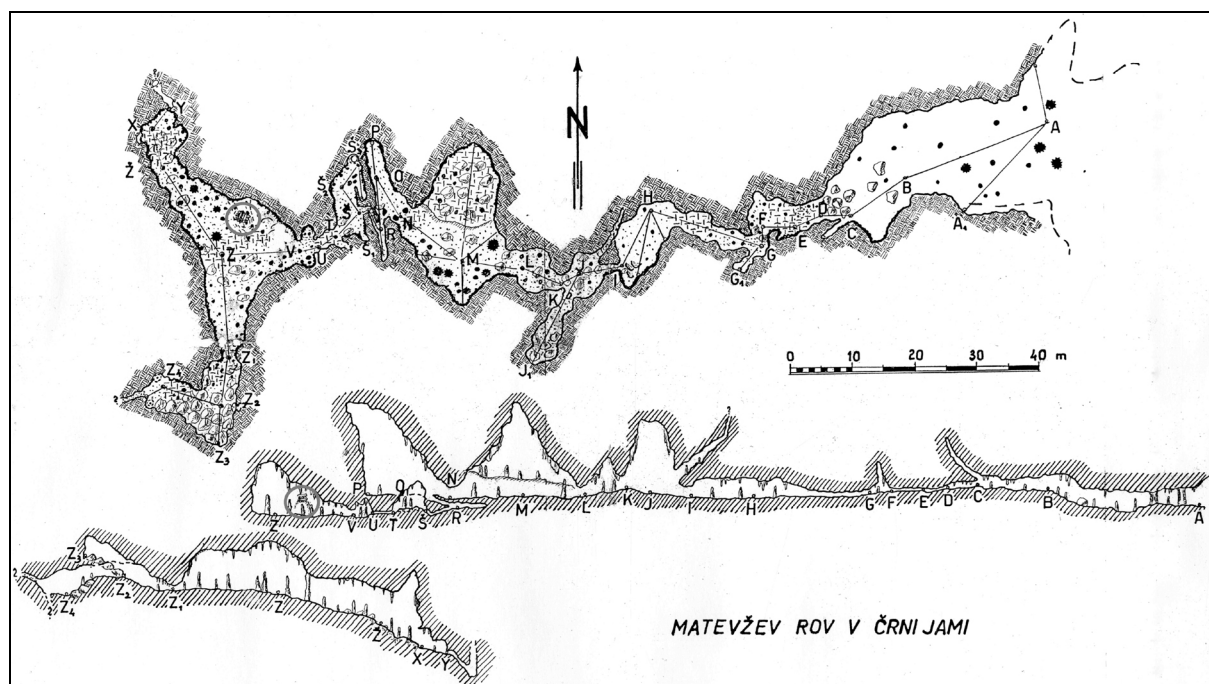


Fig. 9: Matevžev Rov after 1956 (Kataster jam IZRK ZRC SAZU). The circles near point Z mark a pile of stalagmites and stalactites ready to be transported to the surface and unofficially sold to cave visitors.

Sl. 9: Matevžev Rov po letu 1956 (Kataster jam IZRK ZRC SAZU). Kroga pri točki Z označujeta skladišnico stalagmitov in stalaktitov pripravljenih za prenos na površje in neuradno prodajo jamskim obiskovalcem.

m (Šebela, 1994a), while on topographic map 1:5000 it is set at 539.0 m. The bottom of the northern edge of Pisani Rov is at 535.5 m (Šebela & Čar, 2000). In February 1949, Pretner found two live troglodene beetles species *Stomis rostratus* Sturm, some spiders (*Troglyphus cavicola* Kollar and *Troglyphus neglectus* Krauss) and some crickets in Pisani Rov; the species can be found at cave entrances (Gospodarič, 1969).

The ground-level in Črna Jama (number 20, Fig. 8, Tab. 1) is situated at 517.2 m. The bottom of Vodni Dol collapse doline (Fig. 7) is in its central part at 496 m, eastern part at 520 m and western part at 521 m. Kozja Jama collapse doline (Fig. 7) has the bottom at 502 m. Deepening of both collapse dolines cut off the former connection from Črna Jama towards probably unknown passages in the area of Vodni Dol and Kozja Jama.

The origin of Stara Apnenica (Fig. 7) is closely connected with an important crushed zone in the direction almost E-W (160-190/90). The bottom of Stara Apnenica is at 554 m. The development and deepening of Stara Apnenica cut off the possible connection between Otoška Jama and Zgornji Tartarus passage (Gospodarič, 1976, 1985).

On the surface, on the gravel bottom of Stara Apnenica collapse doline Pretner found a cave beetle *Bathyscymorphus byssinus* Schiödt that probably originated in Zgornji Tartarus or Otoška Jama (Gospodarič, 1969).

Characteristics of sediments at the bottom of Velika Jeršanova doline

Because of the supposed cut-off of Pisani Rov passage with the lowering of Velika Jeršanova doline the drilling with manual drilling set was performed on 18th May 2000 (Fig. 10). The idea was to determine the thickness and the origin of sediments. After 2.5 m we reached the cave sediments (Fig. 11). The first change in colour appeared at 2.35 m where the colour changed from dark brown and brown to dark yellowish brown 10YR4/6 (Munsell Soil Color Charts, 1975). At 2.5 m the colour of the sediments was between dark brown and brown 7.5YR4/4. That's the layer of sediments, which can be followed to the depth of 5 m (7.5 YR 5/6 – strong brown) and probably further on. It's cross bedded loam. We did not expect sediments as thick as that and after reaching the depth of 5 m due to the lack of drilling tubes the drilling was stopped. But we can state, with great probability that cave sediments go on for at least a few meters.

The northern end of Pisani Rov is filled with cave sediments that are as regards the texture and colour very similar to other cave sediment fills in the Postojna and Planina cave systems (Šebela & Sasowsky, 1999). The age of such laminated loam was by paleomagnetic analyses detected at less than 730,000 years. In this sense also the deepening of Velika Jeršanova doline to



Fig. 10: Velika Jeršanova doline, manual drilling on 18th May 2000. (Photo: S. Šebela)

Sl. 10: Velika Jeršanova dolina, ročno vrtanje 18. maja 2000. (Foto: S. Šebela)

the level of Pisani Rov can be associated to the same time period (Šebela & Sasowsky, 1999). Zupan Hajna *et al.* (2008) determined Normal polarity and assumed that deposition of the sediment profile at the end of Pisani Rov occurred within the Brunhes chron (<780,000).

Stepišnik (2004) connected loamy sediments from Velika and Mala Jeršanova dolines with the sediment level in Pisani Rov. Loamy material probably originated from Pivka flysch basin.

Velika Jeršanova doline was in 2000 (Šebela & Čar, 2000) described as former collapse doline and by reaching the cave sediments at its bottom by manual drilling, Velika Jeršanova doline is defined as a so-called roofless cave (Mihevc *et al.*, 1998) as well.

The thickness of the ceiling between the surface and the Postojna cave system

On the basis of topographic maps of the surface (1:5000) and cave maps (1:500), the thickness of the selected parts of the ceiling between the surface and the cave (Fig. 8) was calculated (Tab. 1).

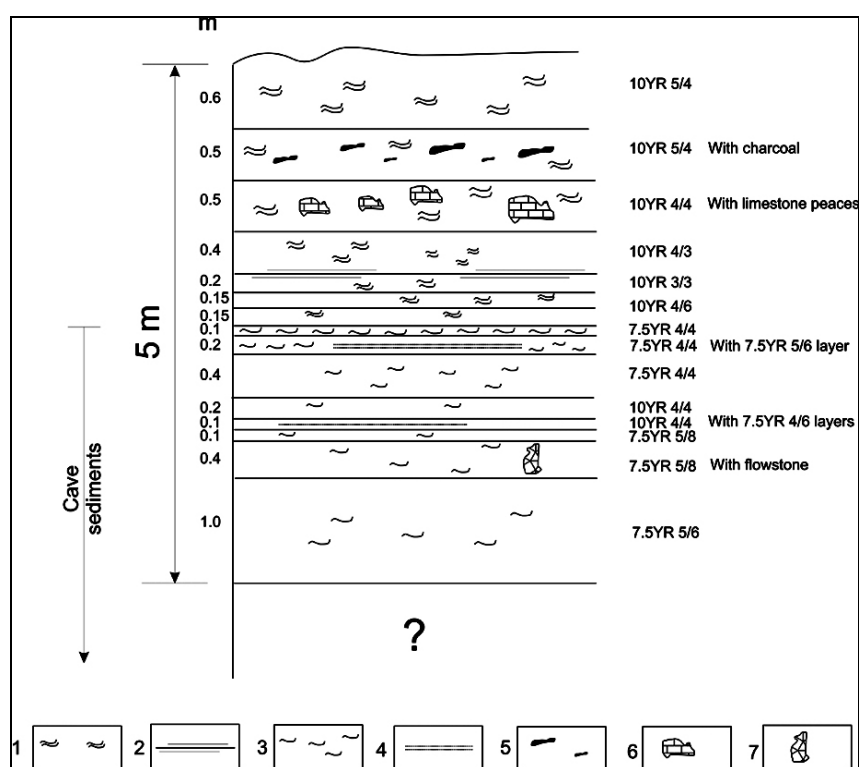


Fig. 11: Sediment profile in Velika Jeršanova doline (colours after Munsell Soil Color Charts, 1975). Legend: 1-loam, 2-laminated loam, 3-laminated cave loam, 4-laminated cave loam with sandy layers, 5-charcoal, 6-limestone pieces, 7-flowstone.

Sl. 11: Sedimentni profil v Veliki Jeršanovi dolini (barve po Munsell Soil Color Charts, 1975). Legenda: 1-ilovica, 2-laminirana ilovica, 3-laminirana jamska ilovica, 4-laminirana jamska ilovica s peščenimi plastmi, 5-ogljje, 6-kosi apnenca, 7-siga.

The thickest ceiling is at number 8 (Tab. 1, Fig. 8), that is 105.48 m. At number 24 (Tab. 1, Fig. 8), in Otoška Jama, it is only 19 m thick. Above prosperous places for possible connections between the cave and the surface there is still 65 m for number 4 (Fig. 8), 34.5 m for the end of Pisani Rov (number 11, Fig. 8), 58 m for number 16 (Fig. 8) with a strong blowhole in Lepe Jame, 70 m (60 m already climbed) at the south side of the passage of Koncertna Dvorana (number 28, Fig. 8), 38 m at the end of Matevžev Rov (number 22, Fig. 8). Above Zgornji Tartarus (number 25, Fig. 8) there is still 33.8 m of cave roof. An interesting result was calculated for Ruglovica (number 33, Fig. 8). Between the bottom of a 52 m deep shaft and the underground Pivka River channel there is only 6 m of ceiling, making this place an interesting starting-point for reaching the underground Pivka by digging.

CONCLUSIONS

The study was performed to find possible prosperous connections between the surface and the underground passages of the Postojna cave system; therefore the thickness of the selected parts of the cave roof was calculated. Interesting places with great potentials are:

- The furthestmost western chamber of Matevžev Rov accessed by local people from the surface at least 100 years ago.
- The 60 m high chimney south of Koncertna Dvorana with still about 8 m of unexplored passage.
- The small side passage in Lepe Jame that was artificially enlarged about 50 years ago to turn it into a strong blowhole. Microclimate studies in this passage show local variability that could be the result of unknown passages in the back (Turk & Šebela, 2009). The place is 190 m south and 28 m above the underground Pivka River.

- Between the bottom of Ruglovica shaft and the underground Pivka River there is only 6 m of cave roof.
- Between the shaft Puhalik Pri Pivki Jami and the underground Pivka River there is still about 25 m of unknown connection.
- Vodni Dol and Kozja Jama collapse dolines are suitable for removing the material from the breathing holes and in this way reaching the unknown parts of the Postojna cave system.

In the Postojna karst area there are some interesting caves (Jama Koliševka, Jama Na Poti, Zguba Jama, Spodmol V Risovcu, Ledena Jama Pod Magdaleno Goro, Brezno Pri Črni Jami) that are not connected with the actual Postojna cave system but are probably part of the same hydrologic system. The deepening of collapse dolines in the Postojna karst area is connected with the development of cave passages. Velika Jeršanova doline is not only a former collapse doline (Šebela & Čar, 2000) but regarding the results of manual drilling of the sediments at its bottom a roofless cave as well.

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DOSTOPI S POVRŠJA V SISTEM POSTOJNSKIH JAM

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POVZETEK

Poleg znanih vhodov v Postojnski jamski sistem obstajajo tudi drugi, manj znani dostopi s površja. Nekateri so le razširjene razpoke, ki niso prehodne in predstavljajo dihalnike, nekateri pa so manjši vhodi, ki so jih uporabljali 100 ali več let nazaj in danes niso več dostopni. Ozemlje med Postojnskim in Planinskim jamskim sistemom je bilo vedno zanimivo zaradi neznane povezave med obema jamama. Med njima je še vedno vsaj 1.450 m neznanih rovov. Za izbrana mesta v Postojnskem jamskem sistemu smo izračunali debelino stropa. Uporabili smo podatke površinskih topografskih kart (1:5000) in jamske karte (1:500). Da bi razumeli zgodovinske dostope med površjem in

podzemljem, smo proučevali zgodovinske zapise. Namen študije je bil ugotoviti možne ugodne povezave med površjem in podzemljem. Določenih je bilo šest zanimivih mest z velikim potencialom za napredovanje (Matevžev rov, kamin južno od Koncertne dvorane, stranski rov v Lepih jamah, Ruglovica, Puhalik pri Pivki jami in dihalniki v udornicah Vodni dol in Kozja jama). Na Postojnskem krasu je tudi več jam (Jama Koliševka, Jama na poti, Zguba jama, Spodmol v Risovcu, Ledena jama pod Magdaleno goro, Brezno pri Črni jami), ki niso več povezane z rovi Postojnskega jamskega sistema, vendar so v svoji speleološki preteklosti verjetno pripadale istemu hidrološkemu sistemu. Poglobljanje udornic na Postojnskem krasu je povezano z razvojem jamskih rogov. Velika Jeršanova dolina ni le bivša udornica, ampak je glede na rezultate sedimentov na podlagi ročnega vrtanja v dnu doline tudi brezstropna jama.

Ključne besede: Postojnski kras, jamski vhodi, zgodovina raziskovanja, Postojnski jamski sistem, Slovenija

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