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RAZPADANJE IN UNIČEVANJE KAPNIKOV POD VPLIVOM NARAVNIH DOGAJANJ IN ČLOVEKOVEGA POSEGANJA V KRAS

DECOMPOSITION AND DESTRUCTION OF SPELEOTHEMS UNDER THE INFLUENCE OF NATURAL OCCURRENCES AND HUMAN IMPACT TO KARST

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Uvod

Posledice raztapljanja apnencev in prenikanja vode skozi razpokano kamnino se na eni strani održajo v zniževanju površja in izvotljevanju podzemlja, na drugi strani pa v rasti kapnikov in nastajanju sige. Ravnotežje v raztopini in razmerje med raztapljanjem in izločanjem apnenca iz vode je precej občutljivo. O tem so napisane številne razprave, ki slone na opazovanjih in konkretnih meritvah, pa tudi na teoretičnih izračunih. Praktično se naravne razmere odražajo v večji ali manjši rasti kapnikov, pa tudi v njihovem razpadanju. Na rast in razpadanje jamskega okrasa pa vse huje posredno in neposredno vpliva človek.

Ob tej priložnosti ne bomo posebej obravnavali zakonitosti nastajanja, ampak predvsem razpadanja in uničevanja kapnikov in sige in to ob primerih naravne destrukcije in človekove devastacije kapniškega bogastva.

Naravna destrukcija kapnikov in sige

Podiranje kapnikov zaradi posedanja nasutih in naplavljenih jamskih tal je zlasti v Postojnski jami doslej najbolj podrobno

Introduction

The result of limestone dissolution and water percolation trought the fissured rocks is reflected on one hand in the surface lowering and in the underground excavation, and on the other hand in the speleothems growing and flowstone formation. The equilibrium in the solution and the rate between dissolving and deposition of limestone from water is rather sensible. Several treatises were written on this topics, based either on observations and concrete measurements or on theoretical calculations. The natural conditions are practically reflected in slow or slower speleothems growing as well as in their decomposition. The growing and destruction of cave decorations are more and more, directly or indirectly, influenced by a man.

On this occasion we shall not discuss specially the lawfulness of formation but mostly decomposition and destruction of speleothems and flowstones in the cases of natural decomposition and human destruction of flowstone decorations.

Natural decomposition of speleothems and flowstone

Collapsing of speleothems because of lowering of alluvial material on the cave

preučeval R. Gospodarič (1968, 1977). S sodelovanjem W.H. Frankeja in M.A. Geyha (1971, 1976) je ugotovil, da se je največ kapnikov podrlo pred okrog 10.000 leti. Podrti kapniki so na posedenih ravnih ali položnih tleh, v predelih močnejšega vertikalnega prenikanja ter v območju podorov. Oblike razpadanja in podiranja kapnikov so zelo pestre od posedenih in razlomljenih sigovih plošč, od sten odmaknjenih in nagnjenih ter s stropa in sten odpadlih sig in kapnikov, zasukanih in nagnjenih, počez in po dolgem počenih in razklanih, vendar še stoječih stebrov in stalagmitov, do povsem podrtih in prevrnjenih kapnikov. Podrte so predvsem starejše generacije sig, medtem ko so holocenski kapniki skoraj nepoškodovani. Vzroki podiranja so verjetno skupni z velikimi jamskimi podori, ki jih je časovno možno uvrstiti v obdobje wurmskega glaciala, zlasti pa na prehod postglaciala v holocen. Podiranje in posedanje jamskega stropa in tal ter z njim vred kapnikov pripisujejo spremenjenim klimatskim razmeram, ki naj bi se odrazile tudi globlje v kraškem podzemlju. Nekaj podrtih kapnikov pa je možno pripisati tudi zelo hudim, če ne kar katastrofalnim potresom z jakostjo preko 9 in 12^{0} po MCS. Le razpokani in nagnjeni ter neenako obteženi stalagmiti so se lahko podrli že ob šibkejših potresih. Statistična analiza usmerjenosti podrtih kapnikov pa ni potrdila značilne potresne orientacije, ker so na neravnih tleh podrti kapniki v sekundarni legi (R. Gospodarič, F. Šušteršič 1977).

Recentno razpadanje kapnikov in sige najlepše opazujemo ob vhodih v jame, kjer se najmočneje uveljavljajo zumanji klimatski vplivi in kjer se intenzivno izmenjavata zunanji in jamski zrak. Še posebno očitne so spremembe na kapnikih ob sekundarnih jamskih vhodih, nastalih z udorom jamskega stropa. Prvotni kapniki so začeli razpadati, spremenili so barvo in kristalno površino, zdaj so bolj gobasti in skorjasti ter mehansko načeti zaradi zmrzali.

floor has been till now studied the most in detail in Postojnska jama by R. Gospodarič (1968, 1977). Cooperating with W. H. Franke and M. A. Geyh (1971, 1976) he inferred that the majority of speleothems had collapsed 10.000 years ago. The collapsed speleothems are usually found on flat or inclined floor in the areas of strounger vertical percolation and in the regions of breakdowns. The forms of destruction and speleothems collapse are variegated, from lowered or cracked flowstone plates, to those, distant from walls and inclined, and again from roof and walls fallen flowstones and speleothems, distorted and inclined, cracked and splitted across and along, but still standing columns and stalagmites, to completely collapsed and overturned speleothems. Older flowstone generations are mostly collapsed, while Holocene speleothems remained mostly undamaged. The reasons for collapse are probably common to big cave breakdowns, which could be temporally classified into period of Wurm glacial and especially into transition of Postglacial to Holocene. Collapse and settling of cave roof and floor and together with them of speleothems are contributed to changed climatic conditions which were reflected deeper in the karst underground too. Some collapsed speleothems can be attributed even to strong, catastrophical earthquakes, over 9–12 MCS. Only cracked and inclined and unevenly weighted stalagmites can fall down during the weak earthquakes. Statistical analyses of collapsed speleothems orientation did not prove characteristical earthquake orientation as the collapsed speleothems on the uneven floor are lying in the cesundary position (R. Gospodarič & F. Šušteršič, 1977).

Recent speleothems and flowstone destruction can be the best observed in the cave entrances where the external climatic influences are the most felt and where the external and the cave air are intesively exchanged. Especially obvious are the changes on speleothems near the secondary cave

Opazovanja v Jami pod Predjamskim gradom so pokazala, da razpada siga še daleč v notranjost predvsem zaradi zmrzovanja. Led se tvori še okrog 400 m od vhoda v precej vodoravnem rovu, največ sige pa odpade proti koncu zime, ko se topi led po stenah. (A. K r a nj c 1983). Debele plasti sigastega grušča smo našli ob steni Hauerjeve dvorane v Gradišnici pri Logatcu okrog 120 m pod površjem. S stropa odpadle sige so našli pomešane med hladnodobnimi grušči pri številnih paleolitskih izkopavanjih v okolici Postojne in v drugih jamah (S. B r o d a r 1966).

Najlepši kapniki in sige so ohranjeni v zatišnih jamskih prostorih, kamor ne sežejo zunanji klimatski vplivi. Zlasti v vodoravnih jamah z velikimi vhodi in izdatnim izmenjavanjem zraka so na kapnikih vidni sledovi razpadanja tudi pod vplivom kondenzirane vlage ob stiku jamskega in zunanjega zraka. Zaviti, gobasti in hrapavi kapniki so pogosti v velikih ponornih jamah ob podzemeljski Pivki, Raku in Notranjski Reki, v Škocjanskih jamah in drugod. Ob vodi prodira v podzemlje ne le hladen zimski, temveč tudi topel poletni zrak, ki se meša z jamskim in vpliva na nihanje temperature in vlage.

Destrukcijo kapnikov in sig lahko spremljamo tudi v številnih drugih jamah, še posebno izrazite pa so posledice zunanjih vplivov v Dimnicah pri Markovščini.

Razpadanje kapnikov v Dimnicah

Že pred leti smo v Dimnicah opazili številne razpadle kapnike in sige. Predvsem v Podorni dvorani so glavice stalagmitov razpokane in siga razpada na drobne ploščnate košče, velikosti do 10 cm in debeline do 5 mm. Na številnih stalagmitih, ki pripadajo predvsem mlajši generaciji kapnikov, so skledaste vdolbine v razpokanih sigovih skorjah. Zgledajo kot narezane zeljnate glave (Slika 1). Sigovih skorij in grušča je polno tudi ob stenah in po tleh marsikje prekriva podorno skalovje.

entrances, originated by the cave roof collapse. The former speleothems stardet to decompose, they changed the colour and crystal surface, they are more spongy and crusty and mechanically weathered because of freezing.

The observations in the Jama pod Predjamskim gradom showed that the flowstone decompose far in the underground because of freezing. The ice is formed about 400 m from the entrance in rather horizontal channel, the majority of flowstone fells off at the end of the winter, when the ice on the walls is melting (A. Kranjc, 1983). Thick layers of flowstone rubble were found near the wall of Hauer Hall in Gradišnica near Logatec, some 120 m under the surface. Flowstone pieces, fallen from the roof were found, mixed with cold climate rubbles during several palaeolithic excavations near Postojna as well as in the other caves (S. Brodar, 1966).

The pretties speleothems and flowstone are preserved in calm cave spaces out of reach of external climatic influences. Mostly in horizontal caves with big entrances and abundant air exchange the traces of speleothems destruction under the influence of condensed dampness on the contact of cave and external air are seen. Distorted, spongy and rough speleothems are frequent in big ponor caves near the underground Pivka, Rak and Notranjska Reka, in Škocjanske jame and elsewhere. Along the water channels not only cold winter but warm summer air penetrate into the underground, mixing with cave air and influencing to temperature and humidity oscillations.

Speleothems and flowstone destruction can be observed in several other caves too, especially expressive are the consequences of external influences in Dimnice near Markovščina.

Speleothems decomposition in Dimnice

Several years ago in Dimnice we have observed numerous destroyed speleothems



Sl. 1. Razkrajanje glave stalagmita pod vplivom zmrzovanja v Podorni dvorani Dimnic.
Fig. 1. Decomposition of stalagmite head under the influence of freezing in the Breakdown in Dimnice.

Nenavadno razpadanje kapnikov in sig smo skušali pojasniti z učinki zmrzali. Vendar nismo mogli verjeti, da sega hladen zunanji zrak tako globoko v kraško podzemlje Primorskega krasa.

V letošnji hudi zimi smo imeli lepo priložnost opazovati in meriti temperaturne spremembe v Dimnicah. Na dnu vhodne dvorane smo postavili termograf, občasno pa smo merili temperature po vsej jami. Ob radnih tedenskih obiskih smo spremljali tudi cirkulacijo zraka in slikali ledene tvorbe, ki so nastajale na podornem skalo-

and flowstone. In Breakdown Hall mostly the stalagmite heads are cracked and flowstone desintegrate into small flat pieces, 10 cm big and up to 5 mm thick. On several stalagmites, belonging mostly to younger speleothem generation, there are dish like forms in cracked flowstone crusts. They look like cut cabbages (Fig. 1). There are a lot of flowstone crusts and rubbles near the wall, covering the be rakdown rocks on the floor even.

Unusual speleothems and flowstone destruction was tried to be explained by

vju, pa tudi na stalagmitih in stalaktitih (Slika 2). V najhujšem mrazu, ko so zunanje temperature segle pod $-20^{\circ}C$, se je led tvoril še okrog 100 m pod površjem v neposredni bližini podzemeljskega potoka, ki je imel temperaturo od 5° do $7^{\circ}C$.

Hladen zrak se je zadrževal v vsej veliki Podorni dvorani in je segal tudi čez prehod v Malo Dimnico. Temperature so bile pri dnu dvorane okrog $-10^{\circ}C$, ko se je pod stropom pretakal toplejši in vlažnejši jamski zrak in se skozi vhod v Malo Dimnico prebijal na površje. Zunaj se je na drevju delalo ivje, v jami pa je ob stiku hladnega in toplega zraka kondenzirala vlaga, ki je v suhem obdobju zime največ prispevala k tvorbi ledu. Kondenzna cona je očitno precej stalna, saj so na sigah in kapnikih vidni sledovi. Na spodnji hladni polovici so kapniki svetlejši in bolj hrapavi kot na zgornji, ki je stalno v toplejšem jamskem zraku. Kondenzno cono lahko spremljamo po značilnih spremembah na kapnikih še globoko v notranjost jame, tudi v predele, kjer več ne zmrzuje.

Po odjugi in dežju v začetku februarja je del jamskega ledu že skoraj razpadel in se stopil, nakar je spet pritisni mraz, da se je led po kapnikih in tleh spet obnobil. V drugem delu zime mraz ni bil več tako hud in v jami temperatura ni padla pod $-10^{\circ}C$. Prodori hladnega zraka so bili šibkejši in kratkotrajnejši. Led je nastajal le pri tleh, pod stropom je krožil zrak s temperaturo nad $0^{\circ}C$. Ker je skozi strop močno kapljalo, se je na tleh nabralo precej več ledu kot prej ob nižji temperaturi. Zmrzovanje in taljenje se lahko v eni zimi večkrat ponovi. Nihanje temperature okrog $0^{\circ}C$ pa le pospešuje mehansko razpadanje sige.

Ob obiskih v januarju in februarju smo izmerili naslednje temperature (Slika 3).

Ob prvem mrazu so nihale temperature v Podorni dvorani med -5° in $-10^{\circ}C$.

frost effect. But we could not believe that the cold external air can reach so deep into littoral karst underground.

In 1985. extremely cold winter gave us nice opportunity to observe and measure the temperature changes in Dimnice. On the bottom of the entrance hall thermograph was located, and periodically we measured the temperatures in the entire cave. During regular week visits we observed the air circulation and took the photographs of ice formations, originated on the breakdown rocks and on stalagmites and stalactites even (Fig. 2). During the trongest cold, when the external temperature reached under $-20^{\circ}C$, the ice was formed about 100 m under the surface in the direct vicinity of the underground brook, having the temperature from 5° to $7^{\circ}C$.

The cold air remained in the whole big Breakdown Hall reaching througt the transition to Mala Dimnica. In the bottom of the hall the temperatures were $-10^{\circ}C$, while under the roof warmer and more humid cave air circulated, penetrating through the enetrance to Mala Dimnica to the surface. Uotside the trees were covered with rime, while in the cave dampness condensed on the contact of cold and warm air thus contributing the most to the formation of ice ine the dry winter period. Obviously condensed zone is rather permanent, as there are traces seen on flowstone and speleothems. On lower, colder half the speleothems are brighter and more rough than on the upper one which is in warmer cave air all the time. Condensed zone can be followed regarding typical changes on the speleothems deep in the interior of the cave, even into the areas where it does not freeze anymore.

After thaw and rain in the beginning of February a part of cave ice was almost destroyed and melted, when cold came again and ice on speleothems and floor was renewed. In the second part of the winter the

Dimnice, 1985		11/1	22/1	29/1	13/2	20/2	27/2	22/3
Na površju	on the surface	− 10	+ 7	+ 2	− 5	− 3	+ 1	+ 3
Pod vhodom	under the entrance	− 5	+ 1	+ 1	− 2	− 3	+ 1	+ 1
Podorna dvorana	Breakdown Hall	− 10	0	+ 1	− 4	− 6	0	+ 1
Mala Dimnica	Mala Dimnica	− 1	+ 1	+ 1	0	− 1	+ 1	+ 2
Vilinska dvorana	Fair Hall	+ 7	+ 7	+ 7	+ 7	+ 7	+ 7	+ 7
Suhi rov	Dry gallery	+ 12	+12	+12	+12	+ 12	+12	+12
Potok	Brook	+ 7	+ 7	+ 7	+ 6	+ 5	+ 7	+ 7

Ko se je otoplilo med 22/1 in 6/2 so bile zunaj temperature med +2 in +9°C, v Podorni dvorani pa med 0° in 1°C. Med 12/2 in 23/2, ko je na površju spet pritisnil mraz do −15°C, so se v jami gibale temperature med −1 in −7°C. Termograf je beležil skladno nihanje z dnevnim ogrevanjem in nočnim ohlajanjem. V notranjosti jame so ostacold was not so strong and the temperature did not fall under −10° C. The attacks of cold air were weaker and shorter. Ice originated only near the floor, the air with temperature above 0° C circulated under the roof. As there was strong percolation through the roof, on the floor much more ice was gathered than fefore during lower temperatures. Freezing and thawing can be repeated in one winter several times. The temperature ascillations around 0° C accelerate the mechanical flowstone weathering.

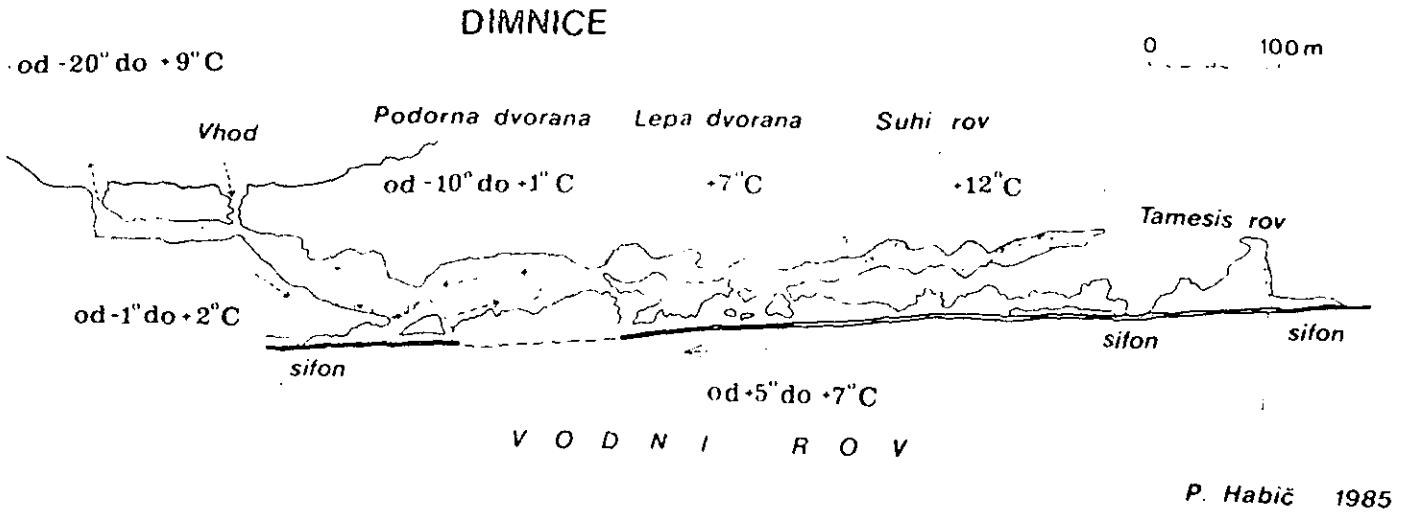


Sl. 2. Ledene sveče in obloge na stalagmitih in sigah v Dimnicah

Sl. 2. Ledene sveče in obloge na stalagmitih in sigah v Dimnicah 11.1.1985.
Fig. 2. Icicles and cover on stalagmites and flowstone in Dimnice on 11 January, 1985.

During our visits in Jaunary and February the folwing temperatures were measured (Fig. 3):

During the first cold the temperatures in the Breakdown Hall oscillated from −5° C to −10° C. When between 22^{und} January and 6th February has warmed up the temperatures outside were between 2° C and 9° C, while in Breakdovn Hall between 0° and 1° C. Between 12th February and 13rd February when on the surface there was cold up to −15° C, the temperature in the cave was between −1° and −7° C. Thermograph noticed concordant oscillation to daily warming up and night cooling. Inside the cave the temperatures remained unchanged during the whole winter. In Nice or Fair Hall there are the influences of Lower Water Channel felt, in the back part of Dry Gallery the temperatures are adapted to unnual average of this area. Air circulation is limited by narrow



Sl. 3. Zimske temperature v Dimnicah 1985.
Fig. 3. Winter temperatures in Dimnice in 1985.

le vso zimo nespremenjene temperature. V Lepi ali Vilinski dvorani je čutiti vpliv spodnjega Vodnega rova, v zadnjem delu Suhega rova pa so temperature prilagojene letnemu povprečku tega predela. Kroženje zraka je omejeno z ozkimi zasiganimi prehodi in občutni so temperaturni prehodi zlasti med Podorno in Vilinsko dvorano.

Dimnice so vsekakor klimatsko zelo zanimive, ker imajo zgornjo suho in spodnjo vodno etažo ter dvojni sekundarni vhod. Večji glavni vhod omogoča vdiranje hladnega zraka v Podorno dvorano, to je s površja okrog 580 do spodnje etaže na 455 m. Manjši vhod v stropu Male Dimnice deluje kot dimnik, po katerem se topel jamski zrak dviga na površje. Prav ta morfološka posebnost je po našem mnenju odločilna za izdatno prodiranje hladnega zraka globoko v podzemlje in s tem povezanega zmrzovanja ter razpadanje sige in kapnikov.

Zanimivo bi bilo, če bi umetno zaprli oba sekundarna jamska vhoda. Prepričani smo, da bi ob visoki karbonatni nasičenosti, ki jo doseže prenikajoča voda v Dimnicah (J. K o g o v š e k 1984) lahko že v nekaj stoletjih nastale bistvene spremembe na kapnikih. Žal rezultatov takega poskusa, ki ne terja posebno velikih sredstev, ne bomo mogli sami spremljati. Lahko pa bi jih opazovali prihodnji rodovi jamarjev, tako kot lajko že po dobrih sto letih opažamo debele plasti sige na varovalnih žicah ob vklesani poti po Hankejevem kanalu v Škocjanskih jamah.

Na ta način bi vsaj na enem mestu poskušili izboljšati naravne razmere za rast kapnikov, ko v številnih durfih ne moremo dovolj učinkovito zavarovati in preprečiti uničevanja kapniškega okrasa.

Devastacija kapniškega bogatstva

Poleg naravnih destruktivnih procesov tudi človek iz različnih nagibov, posredno

calcited passages and the temperature transitions are sensible between Breakdown and Fair Hall.

In any case Dimnice is climatically very interesting, as it has upper dry and lower water level and double secundary entrance. Bigger main entrance enables the penetration of cold air into Breakdown Hall, it menas from the surface on about 580 m to the lower level on 455 m. Smaller entrance in the roof of Mala Dimnica acts as a chimney where warm cave air is lifted to the surface. After our opinion just this morphological property is decisive for abundant penetration of cold air deep into the underground and thus it is connected to freezing and destruction of flowstone and speleothems.

It would be interesting to close both secundary cave entrances. We are sure that because of high carbonate saturation which is characteristic for percolating water in Dimnice (J. Kogovšek, 1984) in some centuries essential changes on the speleothems should occur. Unfortunately the results of such experiment, which does not require a lot of means, could not be observed by us. But future generations of cavers could observe them as we can observe after good hundred years thick flowstone layers on protective wires along the cut path in Hanke channel in Škocjanske jame.

By such way we should try to ammeliorate the natural conditions for speleothems growth as in several others we cannot preserve enough efficaceously or prevent even the destruction of flowstone decorations.

Devastation of flowstone reichness

Beside natural destructive processes, from different inclinations, directly or indirectly, consiciously or subconisiuously, annihilate a man too what had been created in centuries by the nature.

ali neposredno, zavestno ali nehote uničuje, kar narava le počasi ustvarja skozi stoletja in tisočletja.

Kapnike uničujejo že jamarji s svojim obiskom v podzemlju, ko pri prodiranju v ozke in nizke rove zavestno polomijo tudi najlepše oblike, samo da se prebijejo globlje v notranjost.

Veliko je uničenih kapnikov tudi v turističnih jamah. Za obiskovalce je treba napraviti primerne poti, tunele in prehode ali celo dvojne železniške proge kot v Postojnski jami. Še huje je v opuščenih turističnih jamah, ki spadajo med najbolj izropne. Ko ni več organiziranega varstva, nevestneži razbijejo in uničijo več, kot lahko odnesejo iz jame.

Kapnike lomimo in uničujemo tudi za zbirke in muzeje, za razne znanstvene raziskave, pa tudi za spominska priznanja, če jih celo ne prodajajo za souvenirje.

Veliko kapniškega bogatstva je uničenega med raznimi gradnjami na krasu. Še posebno uničujoči so veliki kamnolomi kot se je pokazalo pri Črnotičah, kjer je bila uničena in razstreljena več kot 300 m dolga lepo zakapana jama (Slika 4). Precej je primerov zavestnega uničevanja, nekaj pa tudi slučajnega, ko s cestnimi in železniškimi vseki, raznimi vkopi in miniranjem uničujemo neznane votline v kraškem podzemlju.

Človek uničuje kapnike tudi posredno s spremembami na površju. Z asfaltiranjem večjih površin spremenimo vodni režim v jamskem stropu. Pravočasno smo se izognili degradaciji najlepšega dela Škocjanskih jam. Obsežno parkirišče je bilo predvideno tik nad enkratno kapniško dvorano, v kateri stare kapnike Orjake obliva sveža bela siga.

V kras odteka vse več mestnih in industrijskih odplak, kar se prav gotovo negativno odraža na kapnikih in sigi. V spo-

The speleothems are destroyed by caver visits in the underground already, when penetrating into narrow and low passages they break even the most beautiful forms in order to get deeper into the underground.

A lot of destroyed speleothems exist in show-caves too. The visitors require suitable pathes, tunnels and passages or even double rail-way lines as in Postojnska jama. Still worse is in abandoned show-caves which are the most plundered. When there is no more the organized protection unscrupulous people break and destroy more than they can carry out of the cave. The speleothems are broken and destroyed even for collections and museums, for different scientific studies but also for memorial acknowledgements, if they are not sold as souvenirs even.

A lot of flowstone decorations were destroyed during construction works on karst. Especially devastating are big quarries as it was shown near Črnotiče, where more than 300 m long, well decorated cave was destroyed and blown up. There are several cases of conscious devastation, some of them are hatardeous too, when because of road or rail-way cuts by digging and blasting unknown in the karst underground are destroyed.

A man destroy speleothems indirectly by changes on the surface too. By asphalting bigger surfaces water regime in cave roof is changed. At right time we avoided the degradation of the most beautiful part of Škocjanske jame. Big parking place was foreseen just above the unique decorated hall, where old giant speleothems are coverd by fresh white flowstone.

More and more municialp and industrial waste waters are flowing into karst having negative influence to speleothems and flowstones without doubt. In lower channels of Kačna jama, 200 m under the railway station Divača, there have been alredy seen the



Sl. 4. Polomljeni in prevrnjeni stebri in sige v jami pod kamnolomom pri Crnotičah po masovnem miniranju.
Fig. 4. Broken and collapsed columns and flowstone in the cave under the quarry near Črnotiči after mass blasting.

dnjih rovih Kačne jame, ki so 200 m pod železniško postojo v Divači so že opazni sledovi spiranja olja, premogovega prahu in ugaskov.

V jami Karlovici ob Cerkniškem jezeru smo opazili posledice starih ognjišč halštatskega naselja Cvinger pri Cerknici. V dvorani pod gradiščem so namreč kapniški stebri, stalaktiti in sigaste skorje prevlečene s črno žlindro in katranom, ki ga je sprala voda s površja.

Marsikje so jamarji našli sledove cestnega blata na kapnikih. V Postojnksi jami so se pred nekaj leti pojavili na sigastih

traces of oil, coal powder and brands washed off.

In the cave Karlovica on Cerknica lake we have observed the consequences of old fire-places of Halstatt settlement Cvinger near Cerknica. In the hall under the sconce there are flowstone columns, stalactites and flowstone crusts covered by black stags und tar washed off from the surface by the water.

On many places the caves found traces of road mud on speleothems. In Postojnska jama some years ago on flowstone fresh, brown oil trickles appeared because on the

kopali sveži rjavi oljnati curki, ker je na površju nad rovom začela delovati nekakšna mahanična delavnica.

Sklep

Izbrali smo nekaj primerov podiranja in razpadanja ter uničevanja kapnikov, ki kažejo, da je jamski okras marsikje zares ogrožen. Potrebno bi bilo vložiti še več truda v odkrivanje in spoznavanje posledic razpadanja kapnikov in sige pod vplivom naravnih razmer ter preprečiti nesmisleno človekovo uničevanje kapniških oblik. Stalno moramo opozarjati vse odgovorne in vzgajati mladino, da bi se v podzemlju ohranile lepote, ki jih narava počasi ustvarja pa tudi spreminja, le človek jih kaj lahko za vedno unuči. Pri urejenih turističnih jamah, pa tudi v drugih bi morali preprečevati vdiranje zunanjih klimatskih vplivov v kraško podzemlje. V Dimnicah bi z zatesnitvijo enega ali obeh vhodov lahko sprožili proces postopnega obnavljanja kapnikov, ki sedaj razpadajo zaradi zmrzovanja.

LITERATURA

BRODAR, S., 1966: Pleistocenski sedimenti in paleolitska najdišča v Postojnski jami. Acta carsologica, IV, 55-138, Ljubljana

FRANKE, H. W., M. A. GEYH, 1976: Zur Datierung von Verstuzeneigwissen. Proc. 6th CIS, 3, 95–100, Praha.

FRANKE, H. W., M. A. GEYH, 1971: 14 C – Datirungen von Kalksinter aus slowenischen Hohlen. Der Aufschluss, 22, 7–8, 235–237.

GOSPODARIČ, R., 1968: Podrti kapniki v Postojnski jami. Naše jame, 9 (1967), 15–31, Ljubljana.

surface above a sort of mechanical workshop started to work.

Conclusion

We have chosen some examples of collapses and decomposition and destroying of speleothems showing that cave decorations are really threatened on some places. It Would be necessary to take great pains into researches of effects of speleothems and flowstone decomposition under the influence of natural conditions and prevent absurd devastation of speleothems forms by a man. Permanently we have to warn all the responsables and educate youth to preserve the beauties in the underground which are slowly created and changed by the nature even, but man only can destroy them for ever. In organized show-caves as well as in the others we have to prevent the penetration of external climatic influences into karst underground. In Dimnice it should be possible by tighting one or both entrances to start the process of gradual speleothems restoration as they decompose because of freezing now.

GOSPODARIČ, R., 1977: The Collapse of Speleothems in the Postojna Cave System. Proc. 7th CIS, 223–225, Sheffield.

GOSPODARIČ, R., F. ŠUŠTERŠIČ, 1977: Vzroki podiranja kapnikov v kraških jamah. Rokopis, Arhiv IZRK ZRC SAZU, Postojna.

KOGOVŠEK, J., 1984: Vertikalno prenikanje vode v Škocjanskih jamah in Dimnicah. Acta carsologica, XII (1983), 49–65, Ljubljana.

KRANJC, A., 1983: Dinamika odpadanja sige v Golobji luknji, Predjama. Acta carsologica, XI (1982), 99–116, Ljubljana.