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SOCIAL BEHAVIOUR OF CAVE BEAR (*URSUS SPELAEUS*) FROM ŞĂLITRARI CAVE, CERNA VALLEY (ROMANIA)

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Abstract. The authors found unusual large cave bear (*Ursus spelaeus*) chests, 3 to 6 meters in diameter, in a passage of the Şălitrari Cave, Cerna Valley (Romania). Some of the chests still have parts of bear skeletons. All observations lead to the conclusion that the bears have dug collective dens for hybernation, an unusual behaviour for this species.

Résumé. Les auteurs ont découvert dans une galerie de la caverne Şălitrari des gîtes de *Ursus spelaeus* de dimensions anormalement grandes, ayant un diamètre de 3-6 m. Dans quelques-uns de ces gîtes sont conservés des restes de squelettes des ours. Toutes les observations portent vers la conclusion que les ours ont creusé des gîtes collectifs afin d'hiberné, fait inhabitual pour cette espèce.

Key words: *Ursus spelaeus*, social behaviour, hybernation collective dens, Şălitrari Cave, Cerna Valley, Romania.

1.1. Geological and Geomorphological Setting

Şălitrari Cave, through its length (1,500 meters) and cavern volume, is the largest cavity of the about 500 registered in Cerna Valley. The cave is located in the right side of the Prisacina Valley, tributary of Cerna, with a maximum altitude of 550 meters. Access is relatively difficult because the entrance of the cave is in a vertical wall at above 150 m relative altitude.

The cavity is hosted in Mezozoic limestones of Malm - Neocomian age of the Cerna geological unit (Codarcea, 1940) and it is not active anymore.

The presence of horizontal rock therasis correlated with a stalagmitic rafts and gravel accumulations suggest an epifreatic origin. It seems that a long time ago a huge alluvial depozit filled the valley up to the cave level. Şălitrari cave is a beacon feature for a karstification level morfologically well defined, the most obvious in all Cerna Valley. Several caves point out this level, two of them exceeding 300 meters in length. It is possible that a longer frost period during the last stages of the Ice Age (Riss or Würm) has put a dam of a 100 meters thickness. Suspended remains of these accumulations of Quaternary age have been found by us on the left mountainside 150 meters above the Cerna river.

1.2. Progress of Şălitrari Cave Research.

Although access is only by vertical climbing, the cave has been discovered since the Middle Ages. It seems that Turkish soldiers from Ada Kaleh island (presently submerged land in the Danube river) have been aware of its existence. During wars with Austrians, they extracted Salpether for gunpowder from the cave, when navigation on the Danube was not possible. This explains the origin of the cave name, since *şalitru* is a Romanian archaic term for Salpether.

Recently, based on the samples collected from the main gallery we had positive results confirming the presence of Natrium Salpether (NaNO3) (Diaconu, Lascu, 1989). This mineral is specific in tropical dry caves due to its extreme solubility, thus making its presence in a Carpathian cave an unusual occurance.

The first survey of the cave was performed by a team from "Emil Racoviţă" Spelaeological Institute (Bucharest). They have maped 500 meters of passages (mainly the Salpether gallery) (Fig. 1). They also detached two cave bear skulls and a big lower jaw. Terzea (1966) further studied them.

In 1981 "Focul Viu Club" discovered a new gallery which ended with a large hall well decorated with varied and big spelaeothemes. "Speotimiş caving Club" climbing a vertical chimney and entering on a higher level rich in cave bear remains achieved another significant discovery. Cave bear wall-marks at the beginning of this section have been described by Lascu (2001). "Prusik Timişoara Club" carried out the final remaping of the cave and the conservation measures, with Radu Puşcaş coordinating.

Recent investigation done by the authors, in Speotimiş Gallery (also known to us as Hybernation Gallery) have led to the identification of at least 15 hibernation dens, numerous claw wall marks and several encrusted skulls. New assumptions regarding cave bear social behaviour can be asserted to these findings.

2.1. Cave Bear Dens in Sălitrari Cave.

Dens have been found only in the Hibernation Gallery (Fig. 1). This gallery extends some 500 meters NW-SE. It is mostly horizontal, spacious, with average sections 4x4 meters, sometimes reaching 8 meters. The floor is covered in thick clay, in some places exceeding 100 cm. The collapsed blocks and the large dropping spelaeothems creat a tormented appearance.

Twelve obvious dens and at least five other partially degraded dens have been identified. The eastern end of the gallery is richer in dens. The dens are shaped as depressions with various perimeters: elliptical, crescentous and irregular, with the longest axis oriented parallel to the gallerie's axis (Fig. 2). Depths vary between 35 to 60 cm. The bottom is relatively neat, while the walls are steep or vertical. An axial asymmetry in the dens' section is noticeble. The steep and taller wall is always oriented southeastward, in fact facing the former exit of this gallery. We presume that the shelter was thus less exposed to the winter draft.

A similar cold draft has been detected in the Salpether Gallerry during winter visits.

Clear claw scrapes left on the hardened clay walls by bears during excavations have been recorded. Such claw marks are 4-10 mm deep, they are parallel and vertical, and present themselves as a regular pattern around all surfaces of the den.

The displaced residue was deposited by bears between the pits as clay heap that later flattened. While some dens heve been dug close to the galleries axes, most of them are situate close to walls or among rocks. It is obvious that bears have tried to exploit local topography when they dug their shelters.

An individual adult bear pit was 120-150 cm in diameter. These dimensions were enough for a large bear of 220-250 cm, since inside it would have stayed tucked in order to preserve bodyheat. Consequently, a 5-6 meter diameter pit could hoast at least 3-4 bears (Figs 2, 3).

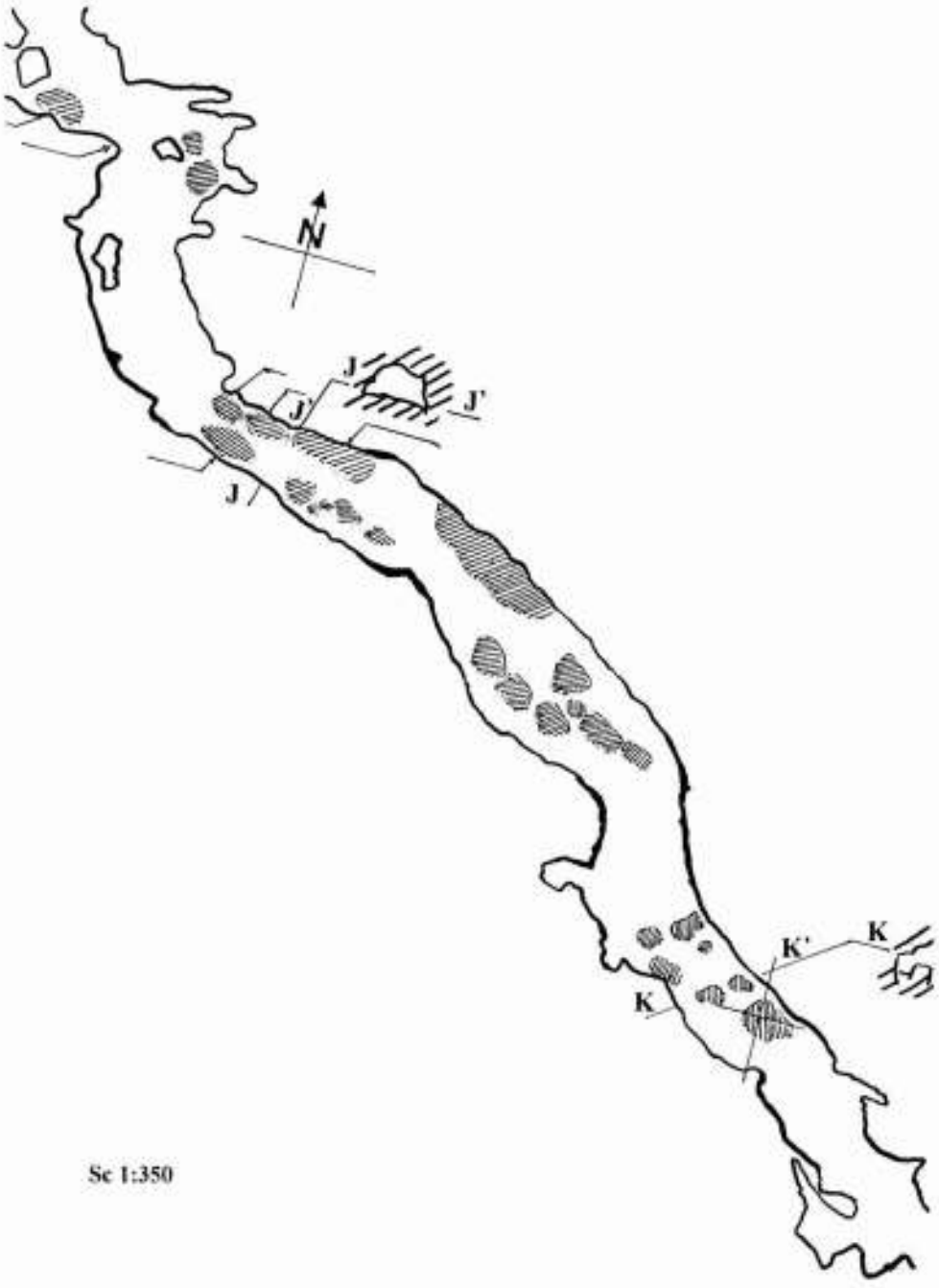

Fig. 1 – Şălitrari Cave: the Hibernation Gallery and the location of the cave – bear dens.

2.2. Wall Marks Significance.

In the close vecinity of the dens wall marks are noticeble on cave walls and on limestone blocks, having different dimensions, positions and geometries and probably also different behaviour signification (Fig. 2 a-c). Usually the markings consist of three or four parallel scratches, with a medium thickness of 13 to 15 cm, representing the upper limit dimensions for a *Ursus spelaeus*. For *Ursus arctos* this opening is an average 10 cm (Kurten, 1958).

There are markings as fascicles of shorter parallel stripes, located just a little higher above the dens. They are the product of one scratch, from down upwards. I used to belive that these markings appeared as a result of the bears' attempt to clear the clay off their claws. Other markings are present on tough lune spar and have a crossed appearance. They could be the product of keratin cleaning from claws or even sharpening.

Long and parallel markings, located at hights of 2-2.5 meters, resemble the ones left by modern black bears on tree trunks, as a territorial instinct (Fig. 4). On one occasion a bear slipping on the very steep wall of a stone block has done long markings. The bear climbed on the top of the rock on the less steeper slope and than let himself slide on the other side.

According to Bednarik in his synthesis work regarding *Ursus spelaeus* marking behaviour, it is possible that these are signs of a ludic behaviour (Bednarik, 1994).

2.3. Şălitrari Bears' Environmental Setting.

Based on three adult bear skulls measurements we conclude that the Şălitrari cave bear display typical spelaeal morphology due to a steep frontal bone conformation, that is on a 52 degree angle above the nasal area. Also a peculiar doming or "step" of the forehead, which is rounded just over the eyes is yet another characteristic feature. The P4 premolar has a molarization tendency through its tricuspid morphology. Molars have the chewing surface much wider and a highly sophisticated surface.

One of the skulls has an exceptional dimension of 530 mm, confirming Elena Terzea's observation that the Şălitrari bear was a large scale bear. Its dentition is very used, the chewing surface of the molars is entirely flat. This confirms two aspects of the cave bears' ecology:

- its mostly grass feeding was composed of xerophitic plants, bushes and hard fiber grasses, rich in sylicae, causing an aggravated and sometimes premature uttrition of the teeth;

- despite of the handicap of a flat dentition, older bears could survive as a result of lack of competition and could even reproduce, which led to a natural taming and probably by the end of the Pleistocen, possibly degeneration.

The clues that we have on the bears from Şălitrari make us believe that they were typical examples of the best individuals of the species, from the superior Pleistocene. Cerna and Godeanu mountains, with large areas of alpine empty spots, at altitudes of 1,700- 2,000 meters, together with forests situated on lower grounds, were for *Ursus spelaeus* an ideal habitat. It provided a varied food supply: grass and cold weather bushes but also bulbs, beach nut and tree bark. If we admit that the territory of a specimen was of about 1,000 ha, the present day *Ursus arctos* territory, it is posible that the entire area could host simultanously about 50-80 bears. In winter, finding a place suitable for hibernation became sort of a problem, although

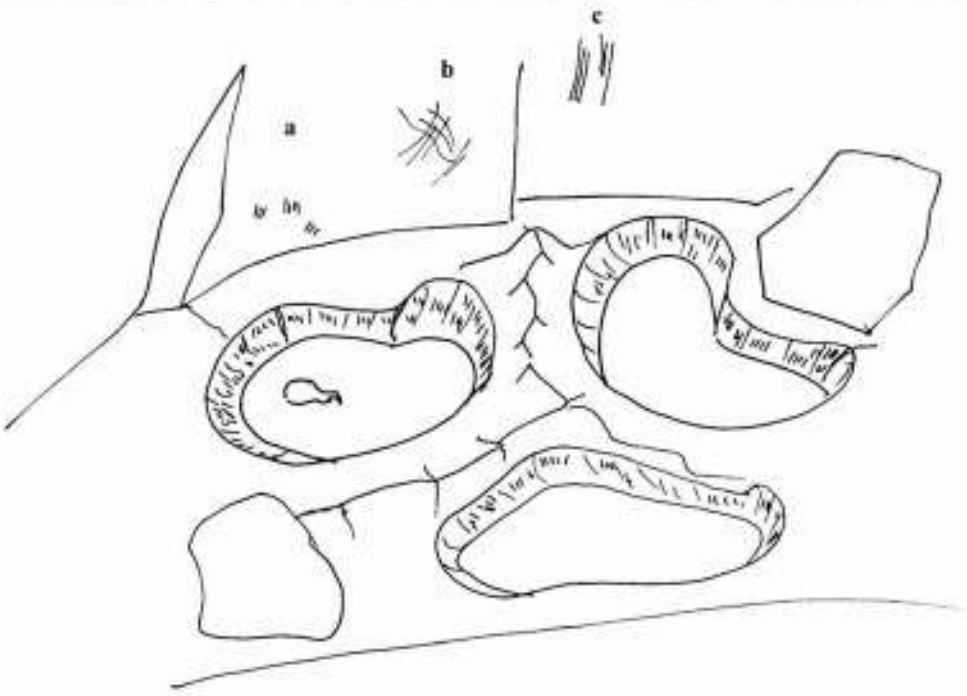

Fig. 2 – Dens in the K – K' section; a – c, claw wall marks.

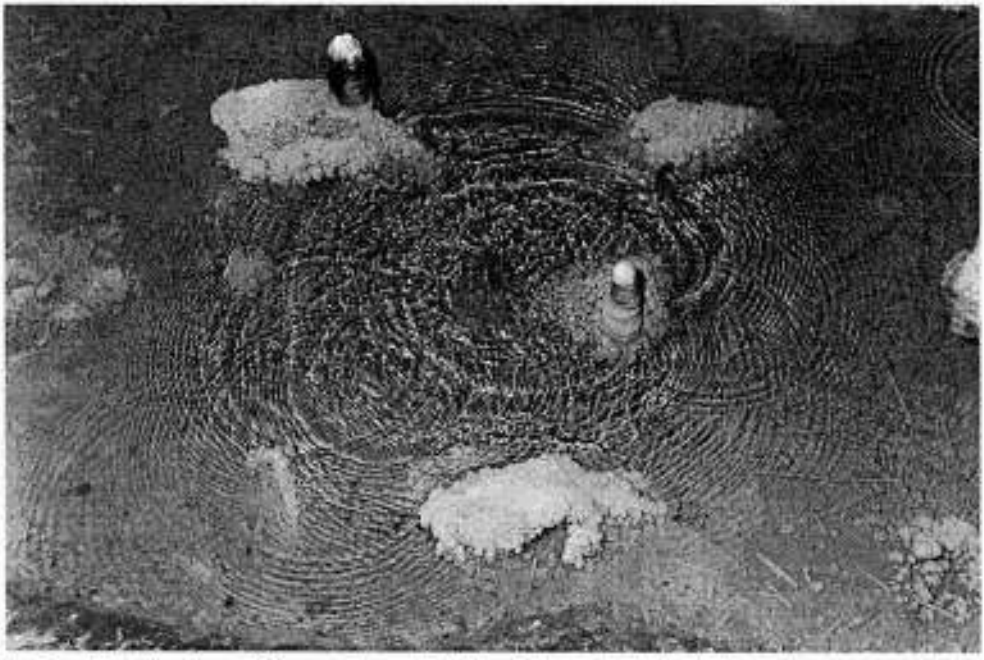

Fig. 3 – Collective dens of *Ursus spelaeus* in Şălitrari Cave; four skulls of *U. spelaeus* preserved in depression left in excavation, subsequently concreted in calcite (Photo C. Lascu).

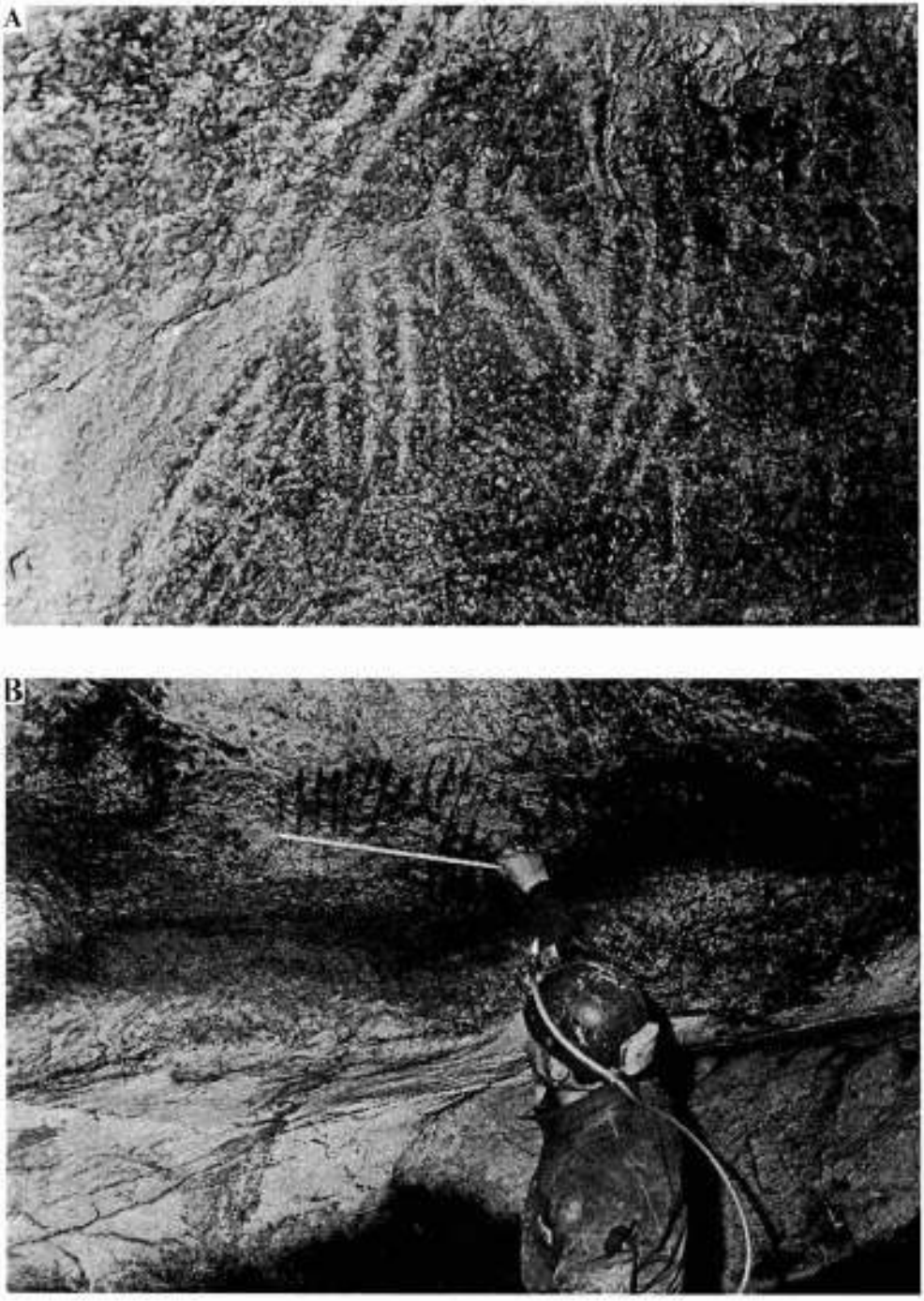

Fig. 4 – A, B, claw wall marks of *Ursus spelaeus* in Șălitrari Cave (Photo C. Lascu).

Cerna Valley had many small cavities, only few of them had the appropriate conditions for hibernation. As in other Carpathian areas, cave bears preferred large caves, where they found a constant microclimate. Water was necessary either for the short hibernation interruption periods, either for pregnant or nursing bears, and this is why spots close to a permanent underground water source were seeked (Jurcsak et al., 1980).

Cavities with significant bones accumulations are scarce, even in those areas with a high density of caves. Of about 12,000 caves indexed in Romania, only 250 - 300 have been mentioned to have bear fossils. This disproporpotion is even more obvious in areas of high altitude caves. Of the few hundreds of caves in Retezat mountains, only 4-5 larger cavities contain bear bones. A similar situation is found in Piatra Craiului, Bucegi, Hăghimaş, Buila - Vînturariţa limestone massives.

Şălitrari Cave is an ideal hibernation site, as it is a large sized cavity with constant temperature, with moderate atmospheric humidity (even not normally low in the Salpether'Gallery), with reduced ventilation, with permanent water basins. Thus, it is an unique site of its kind for the bears in the area.

It is likely that under these circumstances, the solution for collective dens was preferred to individual ones, in the limited space of the gallery. Collective dens could host simultaneously around 40 – 50 bears. It is likely that they were used on a longer period of time, maybe by more generations. On a sector of about 20 meters, next to bear dens, *Ibex* goat hoof marks have been printed on the floor (we have estimated several tens of individuals). We concluded that they were *Capra ibex* by the shape and size of the hoofs. An *Ibex* skull and skeleton parts have been found in the cave. The hoofs do not interfere with the dens. It is likely that the herd of goats stepped in the gallery when the bears were not there. But knowing that *Ursus spelaeus* was the most vegetarian and less agressive of all bear species, we ask ourselves if an episodic cohabitation between bears and goats would have been completely absurd. In unusually harsh winters animals gathered together could only improve their thermic conditions. A bear population that adopted the collective den proved a higher level of tollerance between their species, thus an inter-species high level of tolerance might have evolved under crises situations.

A particularity of *Ursus spelaeus* dens in Şălitrari Cave is that for the relatively high number of dens, the number of fossils is surprisingly small. We may certainly talk of the remains of 12 –15 individuals at most. In some classic *Ursus spelaeus* sites in Romania, as Igriţa, Onceasa, Mereşti, Muierilor, Cioclovina there are numerous skeletons but less hibernation dens.

The best preserved dens, always the individual ones, are located in Bear Cave at Chişcău, but also in Bones Cave in Alun Valley, and Ciur Izbuc.

The bones deposit in Cold Cave comprises some tens of skulls of which the majority are cubs and youngsters, or adults with slightly flat teeth, showing a premature death (Lascu et al., 1996).

Another characteristic of the bone deposits from the majority of the sites is the high frequence of cub skulls, thus a high level in juvenile mortality. Up to the day, with the exception of a juvenil maxilary, we haven't identified any cub skeleton in Şălitrari. All of these clues lead to the conclusion that generally dramatic incidents occurred in Şălitrari, as earthquakes or landslides which are generaly said to be responsible for rich bones deposits.

Regarding the catastrophic explanation of the *Ursus spelaeus* graveyards see Bombiţă (1954) and Diaconu, Lascu, Ponta (1980) for Peştera Muierilor, Jurcsak et al. (1980) for Bear Cave, Viehmann (1976) for Peretele Dîrninii Cave.

From our observations we have concluded that Sălitrari Cave was not a trap or a bear cemetery. On the contrary, it has all characteristics of a hospitable hibernation site in which bears left proof of their existance in a period probably still prosperous, before the severe climate changes of the geographic environment led to their extinction at the end of the Pleistocene era.

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COMPORTAMENTUL SOCIAL LA URSUL DE PEŞTERĂ (*URSUS SPELAEUS*) DIN PEŞTERA ŞĂLITRARI, VALEA CERNA (ROMÂNIA)

REZUMAT

Autorii au descoperit într-o galerie a Peşterii Şălitrari (Valea Cerna) culcuşuri de *Ursus spelaeus* de dimensiuni anormal de mari, de 3–6 metri diametru. În unele dintre culcuşuri se mai păstrează părţi din scheletul urşilor. Toate observaţiile duc la concluzia că urşii au săpat culcuşuri colective pentru hibernare, fapt neobişnuit la această specie.

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