TRACES OF THE CAVE BEAR'S LIFE

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Data based on special literature concerning the life traces of the cave bear are summarised and the life traces discovered in Romanian caves are presented.

Ursus spelaeus, Rosenmüller and Heinroth, 1794, was the most widespread representative of the Ursidae in the glacial Quaternary; it survived from the Holsteinian interglacial (Mindel-Riss), until the end of the Würm glaciation (B. Kurten, 1958).

Referring to its area of distribution, *Ursus spelaeus* populated the Europen caves, from Britain to Caucasus, Iberia, Northern Africa, Indochina, Birmania and Jawa. In 1935 W. C. Pei discovered the remains of the cave bear in Hsingans Cave, in Southern China. In Baia de Fier Cave the bear belongs to the late Mousterian and to the Aurignacian (G. Bombita, 1954). The cave bear occurrence in Romania and its characteristics have been comprehensively studied by M. Mottl (1933), I. Simionescu (1942), C. Rădulescu and P. Samson (1959), E. Terzea (1966, 1969 and 1978), I. Viehmann (1973) and T. Jurcsak et al. (1981). Studies on skulls have been made by I. Simionescu in 1942 and G. Bombita (1954). In Peştera Ursilor (Bears' Cave) at Chişcău, five paleontologic excavations were carried out at a depth of 170 cm and 1660 bones belonging to *Ursus spelaeus* studied, out of which 99 skulls and 107 femurs.

Regarding the cave bear's paleobiology, F. Koby (1951) considers that only a few individuals lived in a specific cave. The bears were compelled to a community life in the cave. "No organism prefers an isolated life, even a splendid one" (K. Ehrenberg, 1952). The cave bears walked and digged more than *Ursus arctos*. They looked like the North American Grizzly bear, reaching a height of 2.5 m in standing position. They attacked the man only in self-defense. Their excessively worn mollars reveal a vegetal nutrition, chiefly buds, roots and fruits. The cave bear is easy to differentiate from the brown bear. Their maximum life expectancy ranges from 15 to 20 years.

The cave bear's extinction in the Würm fauna is as strange as its troglophile character. There is a collection of explicative hypothesis and the perspective of choosing a valid one in the future. Some of them are the following : natural disasters which blocked the bears in the caves, disproportion in sex ratio, congenital degeneratedness, lack of adaptability to the climate changes, demographic explosion, extinction due to man's competition, deseases, absence of fight for existence, diminution to the intraspecific variability, etc.

The traces of the cave bear's life. They are extremely important due to the large number of information concerning the paleobiology of this animal. The relatively limited area in which these traces are inscribed — the cave — facilitate their observation and counting. These *traces*, in number of 20 in our paper, are also called "activity traces" (T. Rusu

and Gh. Racoviță, 1981), "physiological traces" (T. Jurcsak, et al., 1981), "habitat traces" (J. M. Barthe, 1984) and "bioglyphs" (D. Rădulescu and N. Anastasiu, 1979). The traces of the bear's life in Romania's caves were described for the first time by I. Viehmann (1973).

We have classified the traces of the cave bear's life in three groups, as follows :

I. TRACES OF MOTION

1° *Planter footprints of the cave bear.* The bears are plantigrades and, considering the shape of the footprints visible on the cave ground (e. g. in Haspia Cave, discovered in 1977 by J. P. Besson at Aussurucq), they had an "*in varus*" walk. In Peștera Ursilor two full footprints (static) have been observed and four traces of the front side of the paw (dynamic footprint), N. Casteret discovered all the four footprints of the same individual in Pénéblanque Cave, Haute Garonne (F. Trombe, 1952). Until 1952, 17 caves were known in France alone, to preserve such traces of the cave bear's life. The comprehensive study of these footprints, with respect to the ground consistency, can give information about the rhythm and the kind of movement adopted by the cave bear (K. Ehrenberg, 1952).

2° *Clay balls.* N. Casteret has described in the Aldine Cave (Hérault) a kind of "clay balls" produced by the bear during a descending motion.

3° *Ergonomic steps of passage.* We discovered in 1979 in Peștera Ursilor, in the scientific reserve area on the inferior level, such steps produced by treading the ground in the same spots, in a downward and narrow incline. The narrowness forced the bear to a two-paws walk, fact which explains the formation of these "steps of passage".

4° *Claw scratches on the cave floor.* They are usually associated with the plantar footprints, but at other times they appear alone and distinctively marked — four or five linelike cuts on the cave floor. We have met such samples in the caves : Ciurului Izbuc (Pădurea Craiului Mountains), Peștera Ursilor at Chișcău and Măgura (Bihor Mountains).

5° *Claw scratches on the cave walls.* These are items more frequently observed. The claw scratches specific to the cave bear are well preserved if inscribed on stalagmitic formations, or on clay walls. They are in groups of three, and mainly four or five. The scratches of *Ursus spelaeus* are less deep, but wider than those made by *Ursus arctos*. The design of the scratches (F. Koby, 1953) could represent a property "coat of arms" for a particular spot used by a bear. In Peche Merle Cave these scratches are associated with the prehistorical petroglyphs.

6° *Coasting traces, toboggans.* These are voluntary slidings of the cave bear. The first such traces were inspected by count Bégouen in Tuc d'Audoufert Cave in France (F. Trombe, 1952). A true bear toboggan has been described in this cave.

7° *Fur traces.* They have been surveyed by N. Casteret (1964) in Aldine Cave. In the same site, traces of grease, characteristic of the bear fur have been discovered. In Măgura Cave (Sighiștel Valley in Bihor Mountains), a clay slope has been discovered (I. Viehmann, 1973), on which the bear, in a 2 m involuntary slide, clearly printed the fur pattern. The same fur traces have also been discovered in the cave d'Oyanbeltza à St. Michel (Pyr. Atl.) in 1981 by A. Clot.

8° *Polished surfaces by rubbing — "Bärenschliff".* These traces can be found on collapsed blocks, stalagmites and on the cave walls. They are usually located at the normal height of the bear walk (40—150 cm). The first report on such traces (F. Koby, 1953) was made at the beginning of the last century by Nöggerath, corroborated in 1821 by the paleontologist Goldfuss and in 1936 by Boué. The bear could produce such polished surfaces by rubbing with its body or its paws. The polishing is sometimes so close to a true mirror, that Bacher elaborated the fantastic hypothesis according to which, in Drachenloch Cave, the polishing would have been produced by cultic touches and kisses of the Paleolithic men ! (F. Koby, 1953). Rubbing the walls, the bear was able to orientate itself in the cave. In Saint-Brais Cave (Switzerland) the polished areas have bee covered by a layer of calcite. In Meziad Cave (Bihor Mountains), such calcite crusts have been stripped off and analysed by spectrometery (VARIAN AMP-4) at the Institute for Atomic Physics in Cluj-Napoca. The spectres of organic compounds of amonia, amides, N. and NH_3OH, all belonging to the cave bear's fur, have been evidenced. The first report on a "Bärenschliff" in Romania is due to O. Abel in 1935, in connection with Lucia Cave in the neighborhood of Cîmpeni (Apuseni Mountains). Other caves are well known for their polished areas : Peretele Dîrnini (Albac Valley, Apuseni Mountains), Peștera Ursilor, Ciurului Izbuc and Igrița (Pădurea Craiului Mountains).

9° *Holes and diggings in order to clear an obstruction or to advance.* The first such traces were discovered by us in 1949 in Pojarul Poliței Cave in the Bihor Mountains (I. Viehmann, 1973). The bear dug an opening at the bottom of the wall, linking the Crystal Room to the room below, called "the Bear Hole". Behind the excavation, the dislocated material is pilled up in a pyramid. We discovered another case in Ciurului Izbuc Cave, the Pădurea Craiului Mountains (I. Viehmann, Gh. Racovita and C. Riscutia, 1970). There, the bear dug in the clay wall at the end of a terminal gallery, making two attempts, at 45 and 60 cm above the ground; again, it gathered the clay removed by its front paws in a pile 21 cm high. This time the digging proved worthless : the gallery remained obstructed.

10° *Digging balls.* In both cases mentionned above, the bear gathered the material removed in a pile consisting of *balls*, 2—7 cm in diameter. The pyramid-shaped pile in Ciurul Izbuc Cave is formed of about 160 such balls, some of them presenting very clearly the marks of the claws. Balls of similar shape have been found in different sites (A. Dropa, 1957; J. Charrier, 1960), but their origin was attributed to some water processes.

II. VESTIGES OF BONES AND SKELETONS

11° *Bone deposits, accumulations and cemeteries.* Concerning the quantity of bear bones that a cave could contain, it is interesting to recall A. Badin's classification (1876). Among his six types of caves, one is "caverne ossifère" (bone deposits caves). The bone deposits should not be attributed to a large bear population. On the contrary, a few isolated individuals populating permanently a particular cave are sufficient to explain the large bone accumulations we discover in our days. It is inaccurate to believe that the bones are to be found at a great distance from the cave entrance, fact which would mean a deep penetration into the cave. The bear knew other ways of access, closer to the bone deposits, very likely collapsed or filled up thereafter. C. Bombiţa (1954) calls these deposits "cemeteries". Heumann made the first report on such bone deposits in caves, in 1716 (B. Horvath, 1916). The bones are always scattered and chaotically mixed, usually stocked in particular areas of the cave. The great majority of the bone deposits are considered to date back to the periods between the great dramatic changes in climate : early Würm (Würm I), Göttwieger interstadial (warm) and main Würm (Würm II). The age of these bones has been determined by means of radioactive carbon. Thus, in Salzofenhöhle Cave in Austria, the deposits are 34,000, and in Istálloskö-Bükk in Hungary, 30,670 years old. In Romania, among the caves known for their bone deposits of cave bear, are : Peştera Muierii (Baia de Fier), Meziad, Igriţa, Onceasa (Bihor Mountains), Peştera Urşilor, Ciurului Izbuc and Măgura, Not yet completely explained is the way these deposits were formed, why particular areas of the cave were chosen and why are the bones so chaotically mixed.

12° *Bones breccias.* H. Trimmel (1968) was the first to draw the attention upon this fossile conglomerate, cemented through concretion.

13° *Skeletons in anatomic connection.* We have not found in the literature any report of a complete skeleton of *Ursus spelaeus* in anatomic connection, discovered *in situ*, except for the case we describe below. In Peştera Urşilor, at Chişcău, in the scientific reserve area, on one of the terraces of the right bank of the underground river, there is *in situ* the whole skeleton in anatomic connection of a cave bear. The worst preserved part is the skull. In the same area of the cave there is also the classic deposit of bear bones, i.e. mixed and scattered. However, small groups of bones could be found in anatomic connection. Thus, L. Tombale and L. Dor (1958) have found in Esneux Cave (Belgium) a few metacarpals and a cubitus — radius couple in anatomic connection. The difficulty of discovering skeletons in anatomic connection has been stated as follows : "Exceptional circumstances are to be fulfilled in order to pick out a complete skeleton. It is doubtful that somebody can have the chance to find all the almost 200 bones of one individual" (F. Koby, 1953).

14° *Pathological bones.* T. Jurcsak et al. (1981) mentioned a number of bone diseases the bear would have suffered during its life and which could be traced by the pathological aspects of the bones :

osteomyelitis, ankylosed vertebras, osteoporosis, arthrosis, periostitis, spondylitis and exostosis. In his turn, K. Ehrenberg (1952) adds: pachyostosis and osteosclerosis. All these pathological data help the description of the cave bear's paleobiology.

15° *Phosphated soil.* The hundreds of tons of cave bear bones have normally been mineralised, mineralizing in their turn the cave ground, producing the so-called "phosphated soil". The commercial exploitation of this soil as fertilizer made the reputation of Mixnitz Cave in Austria. Such a phosphated soil has a concentration of 55.26% $Ca_3(PO_4)_2$ in the deposit at Igrița Cave (Pădurea Craiului Mountains). In Cioclovina Cave (Hațeg Basin) the phosphatization has been enriched by bat guano, giving a clay soil, in vivid colours and rich in phosphates. It is deemed that the deposit of this site had contained at least 15,000 m^3, exploited and used as a fertilizer after World War I.

16° *Phosphatic concretions.* Also called "noix phosphatées" (F. Koby, 1953), they are to be found in the phosphated soil. Pieces of rock could be turned in concretions, having a limestone core surrounded by concentric layers of tribasic and dibasic phosphate.

III. TRACES OF SURVIVING PROCESSES

17° *Traces of fightings, wounds, broken bones.* It is believed that the cave bear males fought against each other for the conquest of the females, whom they outnumbered. The studies of O. Abel (1935) have already stated cases of broken os penis, presumably in order to force the oppenent out of competition.

18° *Traces of claw sharpening*, discovered by N. Casteret in Tourtouse Cave (Ariège). They consist in scratches on the rocks, in all directions and of small depth (F. Trombe, 1952). In the Romanian endokarst they have been noticed in Peretele Dîrninii Cave (Albac Valley, Apuseni Mountains).

19° *Dens, nooks and gestation holes*, also called "nests". In Romania, the first such nooks were discovered in 1963 (I. Viehmann. 1973), then described in Ciurului Izbuc Cave and Peștera Urșilor. They are wide holes, up to 180 cm in diameter, with maximum depth of 60 cm, used for sleeping. Over 100 such nooks are visible in Peștera Urșilor at Chișcău. Sometimes the edges of the holes show the traces of claws or fur hair. O. Abel (1935) gave the first account of these traces of the cave bear's life. They could be "double" or "group nooks" (T. Jurcsak et al., 1981). These authors argue that they surveyed in Peștera Urșilor 14 very deep nooks, up to 200 cm in diameter, believed to serve for gestation. A. Clot (1986) also considers that such nooks could be gestation holes for females.

20° *Coprolites.* Their description is due to O. Abel (1935), who thinks they have been preserved mostly in the drier caves. In Drachenhöhle (Mixnitz) Cave they have been found buried in cheiropterite (mineralized guano). N. Casteret (1964), considers the hiena coprolites to be better preserved, since this animal fed on bones.

In our 1973 paper (I. Viehmann) we gave the description of eight traces of the cave bear's life, while in this paper we report a number of 20 such traces. The purpose of the studies dedicated to these traces is to clarify the question concerning the cave bear's paleobiology. The importance of these life traces was summarized by I. P. Widmer (1969) as follows — "Des traces d'empreintes, de pattes, de griffes sont visibles même dans des galeries profondes, ainsi que de nids d'ours qui peuvent atteindre de 2 m à 2,50 m de diamètre et 0,5 m profondeur. La présence de traces d'ours est un indice certain que les conditions climatiques souterraines sont favorables à la conservation d'autres vestiges" —.

REFERENCES

1953 ABEL O., *Vorzeitliche Lebensspuren*. Jena.

1876 BADIN A., *Grotte e caverne*. Edit. bibl. utile Milano.

1984 BARTHE J. M., *L'ours de caverne*. Spelunca, Paris, **16.**

1954 BOMBITA G., *Observații asupra mulajului endocranian la Ursus spelaeus, Blumb*. Bul. Șt. Secț. biol. geol. geograf., București, **VI**, *3*.

1964 CASTERET N., *Aventuri sub pământ*. Ed. Științifică, București.

1960 CHARRIER J., *Billes d'argiles dans la grotte d'en Gorner*. Ann. Spéléol., Moulis, **XV**, *2*.

1981 CLOT A., *Découvertes d'un ours Deningeri — espelaeus dans la grotte d'Oyanbeltza*. Cahier du G.A.P.O., Pau, **1**, 1—21.

1986 — *L'ours brun. Pyrénées, Abruzes, Mts. Cantabriques, Alpes du Troutin*. Acta biol. montana, Pau, **6**, 182—206.

1957 DROPPA A., *Demänovske jaskyne*. Slovensk. Akad. Vied. Bratislava

1952 EHRENBERG K., *Paleobiologie und Stammgeschichte*. Springer Verlag, Wien.

1916 HORVATH B., *A barlangok phosphortartalmi anyagairol*. Barlang kutatás. Budapest, **IV**, 3—4.

1981 JURCSAK, T., POLLIS R., IGNET D., ȘERBAN M., POPA E., *Date privind fauna fosilă a Peșterii Urșilor (M. Bihor)*. Nymphaea, Folia naturae Bihariae, Oradea, **VIII—IX**, 161—257.

1951 KOBY F., *L'ours des cavernes et les paléolithiques*. L'antropologie, Paris, **55**, 3—4.

1953 — *Modifications que les ours des cavernes ont fait subir à leur habitat*. I Congr. Internat. Spéléologie, Paris, **IV**.

1958 KURTEN B., *Life and death of the Pleistocene cave bear*. Acta zool. Fennica, Helsinki, **95**, 4—56.

1941 LINDER K., *La chasse préhistorique*. Payot, Paris.

1979 RADULESCU D., ANASTASIU N., *Petrografia rocilor sedimentare*. Ed. didactică și pedagogică, București.

1981 RUSU T., RACOVIȚĂ GH., *Peștera Urșilor de la Cișcău*. Ocrot. nat. med. înconj., București, **25**, *1*, 57—71.

1964 SAMSON P., RĂDULESCU C., *Esquisse de stratigraphie würmienne en Roumanie*. VI Congr. on Quatern. Warszawa, **II**, 577.

1966 TERZEA E., *Particularități morfologice ale ursului de peșteră și răspîndirea sa pe teritoriul României*. Lucr. Inst. Speol. "Emil Racoviță", București, **V**, 195—231.

1969 — *Nouvelles données sur la dentition lactéale de l'Ursus spelaeus*. Actes IV. Congr. Internat. Spéléol., Ljubljana, **4—5**, 183—189.

1978 — *Dépot de remplissage et mammifères quaternaires de "Peștera Urșilor" de Chișcău, Départ. de Bihor*. Trav. Inst. Spéol. « Emile Racovitza », București, **XVIII**, 139—144.

1968 TRIMMEL H., *Hählenkunde*. Braunschweig.

1952 TROMBE F., *Traité de Spéléologie*. Payot, Paris.

1958 TOMBALE F., DOR L., *Les dépots de la grotte d'Esneux à ossements d'Ursus spelaeus*. Mém. Colloque Internat. Spéléol. Bruxelles, 4—16.

1970 VIEHMANN I., RACOVITA GH., RIȘCUTIA C., *Découvertes tracéologiques concernant la présence de l'homme et de l'ours de caverne dans la grotte „Ciurului — Izbuc" des Monts Pădurea Craiului.* Livre du centenaire Emil G. Racovitza 1868—1968, Ed. Academiei, Bucarest, 521—527.

1973 VIEHMANN I., *Les traces de vie de l'ours des cavernes (Ursus spelaeus) dans les grottes de Roumanie.* Livre du cinquantenaire de l'Institut de Spéologie « Emile Racovitza ». Ed. Acad. R.S.R., București, 451—461.

1982 VIEHMAN I., BUCUR I., RACOVITAN I., *Urme de picioare ale omului preistoric în peșterile României.* „Carst", Anuar. Club. Speol. „Cepromin.", Cluj-Napoca, **2**, 37—43.

1969 WIDMER J. P., *La maison des premiers hommes.* V. Internat. Kongr. Speläol., München, **3**.

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