

**PRELIMINARY DATA ON THE PRESENCE OF *MYOTIS MYOTIS*  
(BORKHAUSEN, 1797) AND *MYOTIS BLYTHII* (TOMES, 1857) IN AVENUL DE  
SUB COLTII GRINDULUI PIT – 2020m ALTITUDE – ROMANIA  
(CHIROPTERA, VESPERTILIONIDÆ)**

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**Abstract**

The presence of *Myotis myotis* and *Myotis blythii* in a hibernation habitat situated at an altitude of 2020m is a record that modifies with more than 500m the anterior information. Because of the species *Myotis myotis* and *Rhinolophus ferrumequinum*, Avenul de sub Coltii Grindului pit becomes a habitat signalled in the project “Natura 2000”. The research of the site will continue to inventory the specific composition of the bats in the habitat, to upgrade the information on the biology of the species in the shelter and to gather information on the morphological and geophysical characteristics which favour the transforming of the pit in a hibernation habitat for bats.

**Keywords:** chiroptera, habitat protection, Natura 2000, *Myotis myotis*, *Myotis blythii*, altitude record, Romania

**Introduction**

The site used by the bats observed by us is on the first place in Romania because of its depth of –540m and is catalogued as natural monument on geomorphologic criteria. The pit is situated on the eastern side of the Piatra Craiului Mountain at 200m under the ridge and was discovered in 1985 by I. Dobrescu and I. Bostan, after many years of seeking. The vertical potential is of 1200m by the possible resurgence; today the cavity has a developing of 853m and a real extension of 631m. The first half is developed along an alignment of a fault with great verticality; in the second half the developing was made on a layer face having less verticality but an increasing diameter and length of the wells. The infiltration water and the small tributary inner streams drain the pit, except in the frost periods (Coca S., 2000) (Fig. 1).

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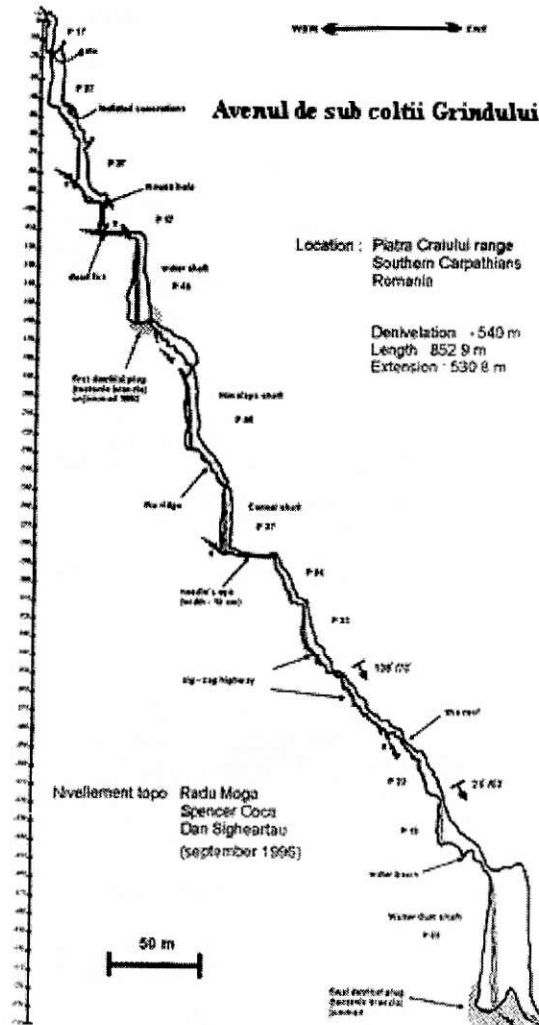


Fig. 1

The number of chiroptera species known in Romania is 30; they represent 79% of the total of species signalled in Europe, including the Atlantic and Mediterranean islands (Gheorghiu and Murariu, 2002, printing).

### Materials and methods

The only information about the presence of bats in the pit (Popescu, 2001) attested their presence at level -160m. During the digging works (August 31 – September 2, 1990) the bats emerged from the inferior gallery by the clefts. We assume that the bats were situated in the warm air near the ceiling of the inferior gallery. This record presumes the reality of other galleries that, together with the main one, are connecting with the exterior. Crossing the pit is extremely difficult; knowledge of alpine speleology techniques is required.

Our interest for this pit was risen by the identification of a ♂ *Myotis myotis* (Borkhausen, 1787) collected by Cristina Capac on September 29, 2000. The individual was found dead on the bottom of the well P37 (-90m), before the Gaura de Soarece

narrow passage. The walls of the pit have 37m length and the diameter varies between 6 and 10m. Visual observations in the collecting area revealed morphologically identical bats, disposed frequently in groups of two, rarely three, with an average gap of 1,5m between groups, on the pit's walls, along the whole vertical passage, except the zone naturally exposed to dropping stones. The group was estimated at about 200 individuals. (Except the collected one, the composition of the group is unknown.) The temperature measured was 6°C. By correlating the information received from the exploring team members, we had estimated the total count to a minimum of 500 individuals, spread on the whole length of the pit, including the final level of -540m. On the same date, Cristina Capac collected near the same -90m level fragments of an actual skeleton which proved to be of *Myotis blythii* (Tomes, 1857). The last collection, made on May 19, 2002 was done by the following speleologists from Norbert Casteret Club: Noni Burcea – 1♂ *M. myotis*, 1♂ *M. blythii* (-99m level, base of the P37 well and the lateral niche near Gaura de Soarece); Gabi Iorgulescu – 1♂ *M. myotis* (-55m level, lateral niche at base of vertical passage R6); Stelu Ciocârlan – 1♂ *M. myotis*, 1♀ *M. blythii* (-21m level, base of the P17 well). The study material consists of recent bodies in different stages of putrefaction. On the same date the presence of *Rhinolophus ferrumequinum* (Schreiber, 1774) was signalled by Noni Burcea.

## Results and discussions

The date when the observations were made coincides with the transition to hibernation shelters period (September/ October) for *Myotis myotis* and *M. blythii*. We exclude the possibility for a maternal shelter to be here because for birth these species prefer warm caves or house garrets, where the temperature sometimes reaches 45°C. The habitat temperature measured was 6°C, which is the temperature preferred for hibernation (*M. myotis* 7-12°C, *M. blythii* 6-12°C). We assume that the temperature of 6°C makes *M. blythii* to be dominant compared with *M. myotis*. The location was also visited in June 2001 and May 2002; no birth colony was observed.

The presence of *Myotis myotis* and *M. blythii* in this winter shelter, situated at an altitude of 2020m, assures an European priority. Until today, in Europe, the highest summer shelter for *M. myotis* was signalled in Bretolet, Alpes, at 1923m, and the highest winter shelter in Tatra Mountains, Slovak Republic, at an altitude of 1460m. *M. blythii* was reported at a height of 1000m (Schroeber and Grimmberger, 1991) and in Rarau cave at a height of 1500m (Valenciuc, 1965). The altitude increase is of 550m for *M. myotis* and about 500 m for *M. blythii*.

The way the Grind pit become a hibernation colony, with a constant 6°C in winter, is not exactly known. The speleologists from Colibasi observed that in winter the snow is not always completely obturating the pit entrance. Also in the narrow places of the pit, an airflow switching sense at 15-20 minutes was observed. It is possible that the airflow to be a thermal regulating factor, by an air supply coming from probably big underground spaces situated beneath level -540m, through the clefts. Further research will try to explain this behaviour.

*Myotis myotis* and *M. blythii* are related species, difficult to discriminate and easy confusing. By comparative analysis of the external morphological characteristics, taxonomic distinction elements emerge. The identification of the two species in flight,

using the ultrasonic detector, is impossible; the ultrasonic frequency is the same and the differences of outline, size and flying and hunting style are not discernible.

***Myotis myotis* (Borkhausen, 1797)**

**Morphological and biometrical characteristics:** big size (105 – 144mm). Short and flat mouth, long and large ears (folded ahead, beyond nostrils with 4mm), with 7 – 8 transverse folds at the external edge, anterior edge curved behind and having a large termination; large tragus at base, about half of the ear (Fig. 2); thick, grey-brown fur, seldom turning red on the dorsal size and white or grey on the ventral size; mouth, ears and patagium grey-brown; plagiopatagium inserted at the base of fingers; the spur ends at the uropatagium half.

Head + body: (65) 67 – 80 (84)mm; tail: (40) 45 – 60mm; forearm 54 – 67(68)mm; ear 26 – 31mm; span 350 – 430mm; condilobasal length: (21,5) 22 – 24mm; length of the superior dental row: 9,8 – 10,6mm (Fig. 3).

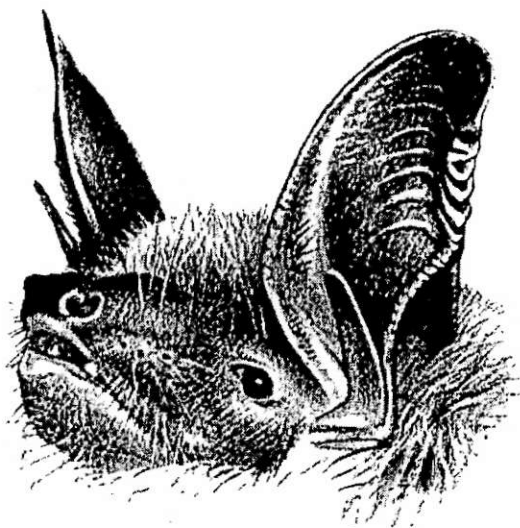


Fig. 2. Head of *Myotis myotis* (after Catalano, in Spagnesi et al., 2000)

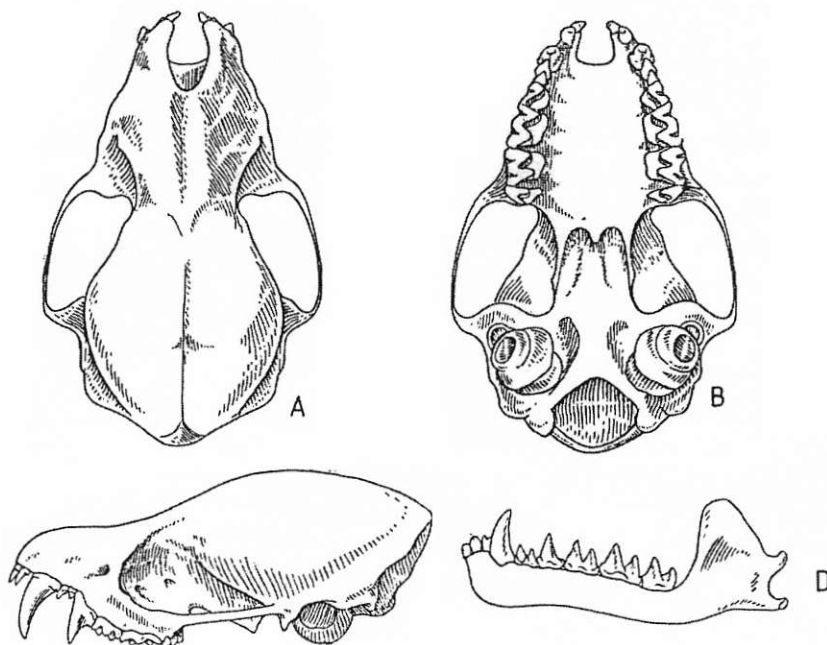


Fig. 3. *Myotis myotis*. Skull: A-dorsal; B-ventral; C-lateral; D-mandible (after Kuzyakin, 1965)

**Geographical distribution:** W. Palearctica: Azores, Malta, Mediterranean islands, NW Africa including Morocco, Algeria, Tunis, Libya; in Europe: S of England, Spain, centre and south Europe with Ukraine and Poland, Turkey, Syria, Lebanon, Israel (Horacek et al., 2000) (Fig. 4).

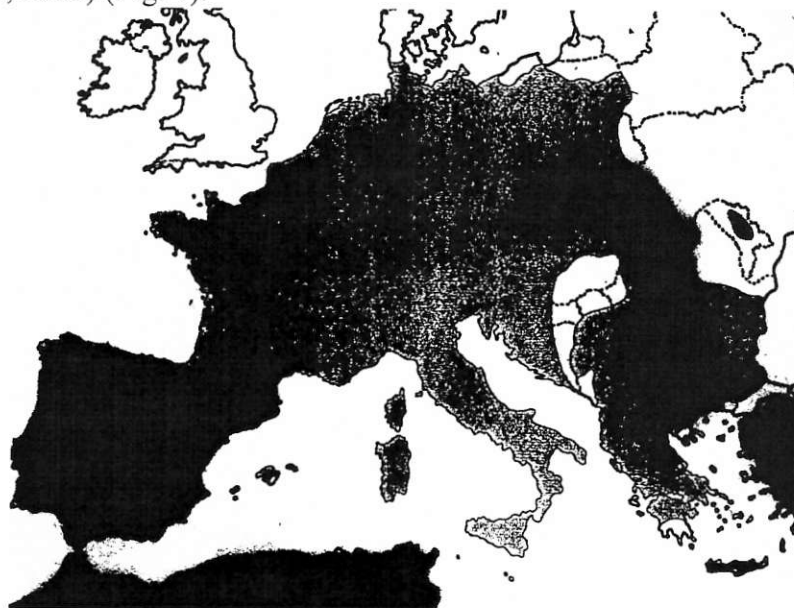


Fig. 4. Spread of *Myotis myotis* in Europe

For Romania the distribution is illustrated in UTM system (Fig. 5).

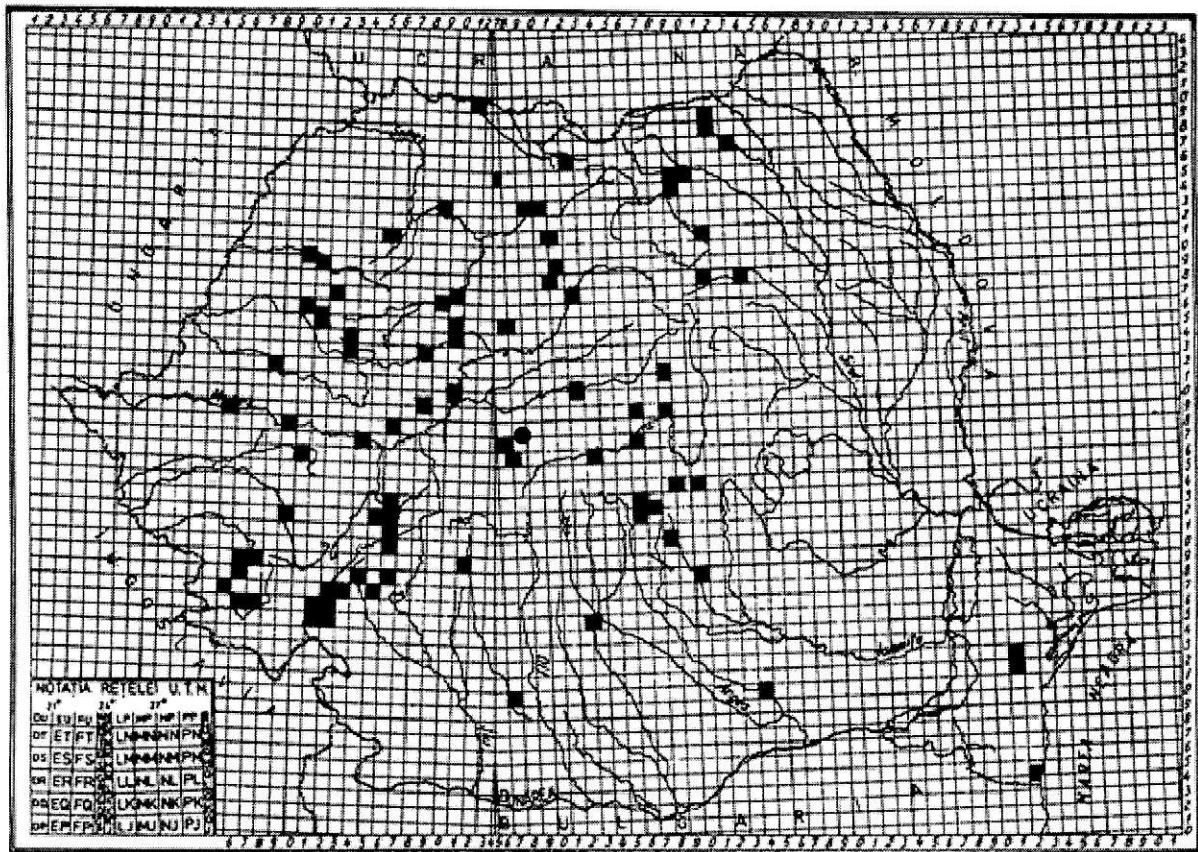


Fig. 5. Spread of *Myotis myotis* in Romania

**Statute:** internationally *M. myotis* is included in “World List of Microchiroptera with IUCN Red List” edited by International Union for the Conservation of Nature and Natural Resources, in the category “Lower Risk: near threatened” (LR:nt). The protection of *M. myotis*, considered as rare (Murariu, 2000) in Europe do benefit of a series of conventions and agreements to which Romania had adhered by the Law 90/ May 20, 2000, as follows:

- The Bern Convention (Sept. 1982) – states the wildlife and natural environment conservation in Europe. Annex II lists the strictly protected species, including the European chiroptera species.

- The Bonn Convention (June 1983) – states the protection of migratory species; in 1985 the European chiroptera species were included.

- The London Agreement (Dec. 1991) – is the most important; well detailed, it coerce the signing states to forbid capture and killing of bats, to inventory and to conserve the important bat sites, to replace pesticides that are poisonous for mammals. In 1994 the Agreement became the “EUROBATS” statute, including the precedent conventions, and having had the scope to protect by national laws, conservation measures, education and international co-operation between signatory members and non-signatory member parties.

- The European Directive fauna, flora, habitats (May 1992) – has the scope to create a network of special protected areas, named “Natura 2000”. Annex II lists 8

chiroptera species including *Myotis myotis* and *Rhinolophus ferrumequinum*, for these species the setting up of special conservation zones for habitat protection being defined as priority. Annex IV includes all the strictly protected species.

In the context of this European Directive wherein Romania is signatory member, the Piatra Craiului National Park Administration is entitled to start the process of including the Avenul de sub Coltii Grindului pit between the special habitat conservation zones. It is necessary to impose compulsory conduit rules for an underground environment inhabited by bats to whom have access in the pit, especially in September to April, when the site is populated. All these norms are already publicised (Gheorghiu and Petculescu, 2001) and (Murariu and Gheorghiu, 2002, printing).

### *Myotis blythii* (Tomes, 1857)

**Morphological and biometrical characteristics:** size (107 – 136mm) a little smaller than *M. myotis*, from which it can be discriminate with difficulty due to the shorter and narrow ears, the ear has 5 – 6 transverse folds; the tragus is pointed, coloured white-yellow; the mouth is longer and narrow, the folded ears do not end beyond the mouth (Fig. 6); the fur has shorter hair, coloured dark-grey at the base; mouth, ears and patagium are clear grey-brown; the spur reach the half of the uropatagium and has a thin skin border.

Head + body: (54) 62 – 71 (76)mm; tail: (45) 53 – 59 (60)mm; forearm: (50,5) 52 – 59 (61,5)mm; ear: 19,8 – 23,5 (26)mm; condilobasal length: 17,2 – 18,5 (21)mm; length of the superior dental row: 8,3 – 9,7mm (Fig. 7).



Fig. 6. Head of *Myotis blythii* (after Catalano, in Spagnesi et al., 2000)

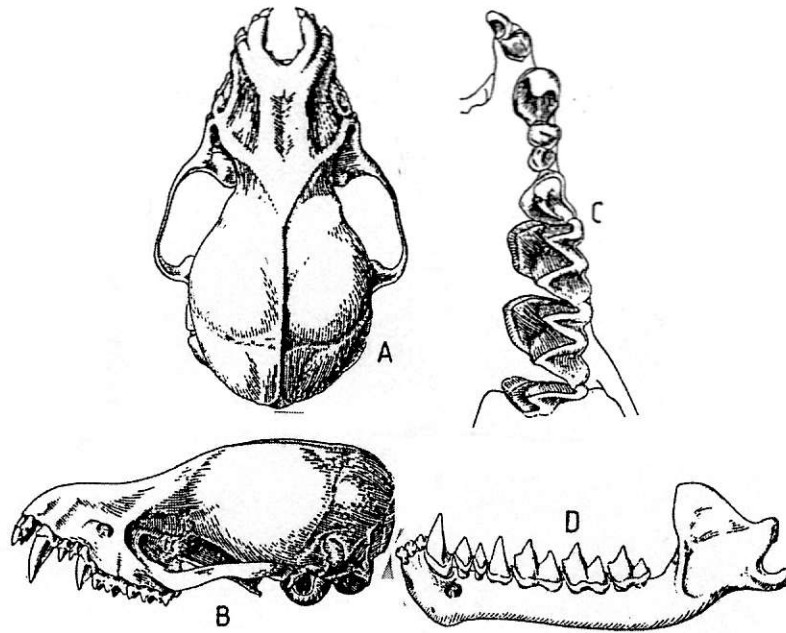


Fig. 7. *Myotis blythii*. Skull: A-dorsal; B-lateral; C-maxilla; D-mandible (after Kuzyakin, 1965)

**Geographical distribution:** S. Palearctica and Oriental. Palearctic distribution: S. Europe with S. France, Spain, Italy, Austria, Hungary, Czech Republic, Slovak Republic, S. Ukraine, Mediterranean zone, the Balkans, Turkey, Syria, Lebanon, Israel, Iraq, Iran, Afghanistan, S. Turkmenistan, Kazakhstan, Usbekistan, Kirkizia, Tadjikistan, Altai mountains with Mongolia and NE China, N. Africa: W Libya, Tunis, N. Algeria, Morocco (Horacek et al., 2000) (Fig. 8).



Fig. 8. Spread of *Myotis blythii* in Europe

For Romania the distribution is presented in UTM system (Fig. 9).



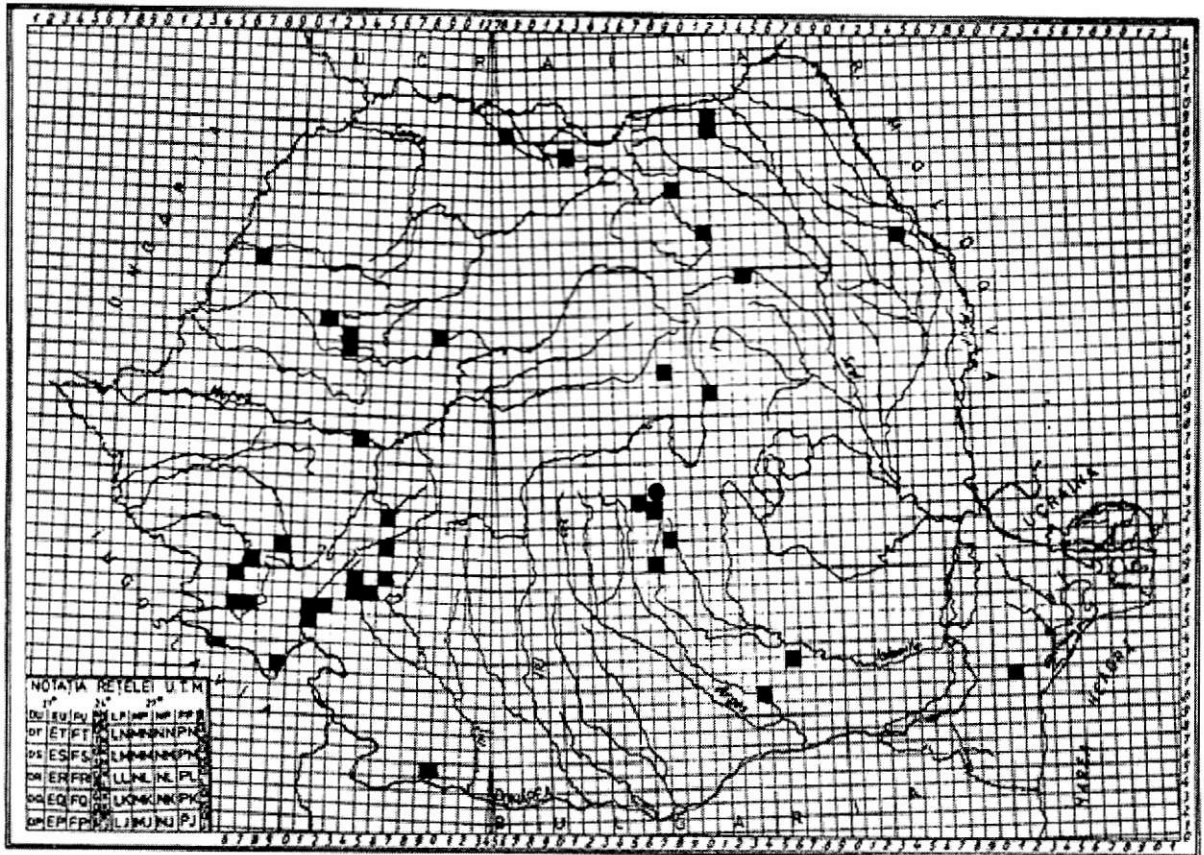


Fig. 9. Spread of *Myotis blythii* in Romania

**Statute:** On the Red List of IUCN protected categories *M. blythii* is included at the category Lower Risk: last concern (LR:lc).

The protection for the species in Europe is similar to *M. myotis* except Annex II of the European Directive issued May 1992.

The vertical distribution in the Grind pit for *M. myotis* and *M. blythii* is not an isolated situation in Romania. Our colleague Dumitru Pegulescu observed and identified isolated individuals of the above two species in two pits located in the alpine area: Avenul de sub Albele pit, situated at an altitude of 1750m, the presence of bats being observed at -80m level (Nov. 1, 1997) and Avenul de sub Borzii Vineti pit, situated at an altitude of 1800m. Another information received from Eduard Zaiu ("Rhinolophus" Speleological Club, Lupeni), mentioned the presence of vertical spread bats of species *Rhinolophus ferrumequinum* and *R. hipposideros*, from entrance to -150m level in the Cartianu cave, Valcan mountains. It is possible that the vertical spread of a colony to be the consequence of the shelter conformation and dependent on the date when observations were made (start of the hibernation period). The lowering of the temperature in the shelter increasing the difference between the general temperature and the one in the warm air pouches is probably determining a concentration of the chiroptera. Observations made on *M. myotis* and *M. blythii* colonies led to this conclusion. Future studies in this interesting shelter should clarify this problem.

## Conclusions

The existence of *Myotis myotis* in this shelter situated at a height of 2020m increase the known European altitude for a hibernation shelter of this species with 550m and for *M. blythii* with 500m.

The presence of *Myotis myotis* and *Rhinolophus ferrumequinum* in Avenul de sub Coltii Grindului pit assures for this site a possible statute of "Special conservation reserve" according to the CE Directive, May 1992, Annex II.

The observations on the bats colony in the Grind pit, the deepest known pit in Romania, pointed out the vertical spread of the colony from level -20m to -540m. The uniform vertical repartition of species and the exact specific composition inventory will be object of future research. It is a must for the Piatra Craiului National Park administration to establish and to enforce compulsory protection measures for the site.

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DATE PRELIMINARE ASUPRA PREZENȚEI LUI *MYOTIS MYOTIS* (BORKHAUSEN, 1797) ȘI *M. BLYTHII* (TOMES, 1857) ÎN AVENUL DE SUB COLȚII GRINDULUI – ALT. 2020m – ROMÂNIA (CHIROPTERA, VESPERTILIONIDAE)

**Cuvinte cheie:** chiroptera, protecție habitat, Natura 2000”, *Myotis myotis*, *Myotis blythii*, record de altitudine

## Rezumat

În Parcul Național Piatra Craiului a fost observată o colonie de chiroptere existentă în Avenul de sub Colții Grindului, cavitatea cu cea mai mare denivelare din România. Liliicii, aflați în perioada premergătoare hibernării, (29 sept. 2000) erau răspândiți în grupuri mici de 2-3 exemplare, pe verticală, de la –20m la –540m, cota finală a adăpostului. Speciile identificate au fost *Rhinolophus ferrumequinum*, *Myotis myotis* și *M. blythii*. Existența lui *Myotis myotis* în acest habitat de hibernare majorează cu 550m altitudinea maximă cunoscută în Europa pentru un adăpost de hibernare iar pentru *M. blythii* majorarea este de peste 500m. Prezența lui *Myotis myotis* și *Rhinolophus ferrumequinum*, specii înscrise în Cartea Roșie, fac obiectul unei protecții speciale, asigurată și de Directiva Comunității Europene din mai 1992, Anexa II, la care România este parte și care presupune crearea pentru *M. myotis* și *R. ferrumequinum* a unei “zone speciale de conservare” a adăpostului și a perimetrului înconjurător (Natura 2000). Pentru identificarea corectă a lui *Myotis myotis* și *M. blythii*, specii asemănătoare și greu de departajat, este prezentată diagnoza lor dihotomică și distribuția geografică, cu statutul de protecție de care beneficiază. Este ilustrat pentru fiecare specie câte un habitus de cap și craniu împreună cu hărțile de distribuție geografică europeană și națională. Viitoarele cercetări vor trebui să se concentreze asupra cunoașterii și inventarierii speciilor de lilieci aflate în compoziția coloniei, cât și a constanței repartizării pe verticală a indivizilor ei. În funcție de natura specifică a acestui habitat este necesară stabilirea propunerilor privind măsurile de protecție, conservare și monitorizare a sitului.