

“PEŞTERA MARE DE LA ȘĂLITRARI” (CERNA VALLEY) – AN IMPORTANT BAT SHELTER (CHIROPTERA, MAMMALIA) FROM SW ROMANIA

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Abstract. “Peștera Mare de la Șălitrari” is located in the Cerna Valley, Șălitrari Mountain, being a very important site for chiropterans from SW Romania, but also from Europe. This shelter is still unknown for the researchers, this being the first presentation in the specialized literature. This cave shelters has three types of bat colonies: two are hibernating type, being composed of the species *Pipistrellus pipistrellus* / *P. pygmaeus*, *Miniopterus schreibersii*, *Rhinolophus ferrumequinum*, *R. euryale*, while the other is a nursery, formed by the species *Miniopterus schreibersii* and *Myotis nattereri*. This cave represents an important place for swarming activity of species like *Myotis capaccinii*, *M. dasycneme*, *M. daubentonii* and *Rhinolophus hipposideros*, which come for matting. This paper presents our collected data from 2003 till 2016; we give the location of bat colonies inside the cave and their descriptions. We present the dynamics of bats during the year inside the cave, too. The research is still on-going.

Keywords: bats, cave, hibernation, nursery, conservation.

Rezumat. Peștera Mare de la Șălitrari (Valea Cernei) – un adăpost important pentru lileci (Chiroptera, Mammalia) din sud-vestul României. Peștera Mare de la Șălitrari, situată în Valea Cernei, Muntele Șălitrari este un adăpost important de chiroptere pentru SV României, dar și pentru Europa. Acesta a rămas necunoscut pentru specialiști, fiind pentru prima dată semnalat și descris în literatura de specialitate. Peștera adăpostește trei colonii distincte de hibernare formate din speciile *Pipistrellus pipistrellus* / *P. pygmaeus*, *Miniopterus schreibersii*, *Rhinolophus ferrumequinum*, *R. euryale* și una de naștere, formată din speciile *Miniopterus schreibersii* și *M. nattereri*. De asemenea, ea reprezintă și un important loc pentru activitatea de împerechere, aici întâlnindu-se și speciile *Myotis capaccinii*, *M. dasycneme*, *M. daubentonii* și *Rhinolophus hipposideros*. Lucrarea prezintă datele colectate în perioada 2003 - 2016, incluzând precizarea locațiilor coloniilor din peșteră și descrierea acestora. De asemenea, prezintăm dinamica chiropterelor în interiorul peșterii pe parcursul unui an. Cercetările continuă.

Cuvinte cheie: lileci, peșteră, hibernare, naștere, conservare.

INTRODUCTION

“Peștera Mare de la Șălitrari” (peștera = cave) is located in middle hydrogeological basin of the Cerna, (the Southern Carpathians - Godeanu Mountains Group, Șălitrari Mountain), about 15 kilometres north of Băile Herculane and 675 m a.s.l (PONTA & SOLOMON, 1982). The access is very difficult during winter. It is part of Domogled National Park – Cerna Valley. The total surface of the Park is 63,580 hectares, being the third largest National Park in Romania.

“Peștera Mare de la Șălitrari” was explored starting in 1960 by researchers from the Speleological Institute “Emil Racoviță”, and then, in 1978, by the Caving Club “Focul Viu” Bucharest (PONTA & SOLOMON, 1982). Other caving clubs were actively involved in the exploration and mapping of this cave, including the Speleological Club “Speotimiș” – Timișoara and Speleological Association “Prusik” – Timișoara, the last one finishing the mapping of the cave in 2008.

“Peștera Mare de la Șălitrari” is about 1,500 m long and has two entrances that join together after 15 m. The big entrance portal is about 10 m high and 6 m wide. It consists of three galleries: the Access Gallery, the Speotimiș Gallery and the Final Gallery. The Access Gallery is the largest in the cave and almost 30 m high. The cave was mined for saltpetre (since Ottoman and Austro-Hungarian Empires), formed from bat guano. The cave is important also due to the minerals formed from guano (PUŞCAŞ et al., 2010). The others two galleries begin from the end of this passage, respectively, Speotimiș Gallery on the left side while the Final Gallery goes on after the Access Gallery. Speotimiș Gallery presents numerous hibernating fossil bear shelters and a few skulls well preserved in limestone. The Final Gallery is one of the most beautiful concreted ones in this cave and it is also more difficult to go in (ALBUICĂ et al., 2014).

Beside the mineralogical, paleontological and landscape importance, the cave has huge biological importance, too. The cave has 3 distinctive bat hibernating colonies: one is located in the Access Gallery, formed by *Pipistrellus pipistrellus* / *P. pygmaeus*, and *Miniopterus schreibersii* species (19,500 individuals), while the second one is located in the Final Gallery, formed by only one bat species – *Rhinolophus ferrumequinum* (100 individuals), and another one about 2,500 individuals of *R. euryale* (located in the Access and Final Gallery). During summer, a nursery colony of *Miniopterus schreibersii* and *Myotis nattereri* species is present in the Access Gallery. It is an important site for swarming activities for *Myotis capaccinii*, *M. dasycneme*, *M. daubentonii* and *Rhinolophus hipposideros*. For these reasons, “Peștera Mare de la Șălitrari” from Cerna Valley, Șălitrari Mountain is one of the most important and one of the largest bat hibernacula from Romania for the populations of *Miniopterus schreibersii* and *Pipistrellus pipistrellus* / *P. pygmaeus*, together with “Șura Mare” Cave (CHACHULA et al., 2009; SOPINCEAN et al., 2015), or “Huda lui Papară” Cave (COROIU & DAVID, 2008).

This shelter was recently recorded in the scientific literature by Oana Mirela Chachula, Radu Pușcaș and Andreea Farcaș (CHACHULA et al., 2009) as one of the most important bat shelter in the South-western Romania and Europe.

MATERIAL AND METHODS

We collected data on the dynamics of bats and specific composition of bat fauna during the last sixteen years through eleven study trips, covering all significant periods in the annual biological cycle of bats: hibernation (January - April), nursery (July), swarming and pre hibernation (September - October). For this study, the cave was split in three parts according to the galleries: the Access Gallery, Speotimiş Gallery and the Final Gallery (Fig. 1).

We used mountain equipment such as: backpack, boots, ropes and caving equipment, as well: helmet with light. We used photo and video cameras Nikon D 3100, Digital Hygro Thermometer 800041R model.

We used the method of photograph in order to assess the bat hibernating and nursery colonies. Thus, the numerous bat colonies were photographed, were uploaded on the computer to be numbered each bat or estimated per m² (CRUCITTI et al., 1998). After the identification of the bat species for all the colonies, we estimated the effectives using the covered surface on the walls (square meters – m²), using the existing literature. For example, for the species *Miniopterus schreibersii*, we know that there exist 1,700 individuals/m², respective, 3,000 individuals/m² for *Pipistrellus pipistrellus* / *P. pygmaeus*. We counted the bats one by one where it was possible. We used also bat nets in the swarming time and the identification key (VALENCIUC, 2002; DIETZ & von HELVERSEN, 2004).

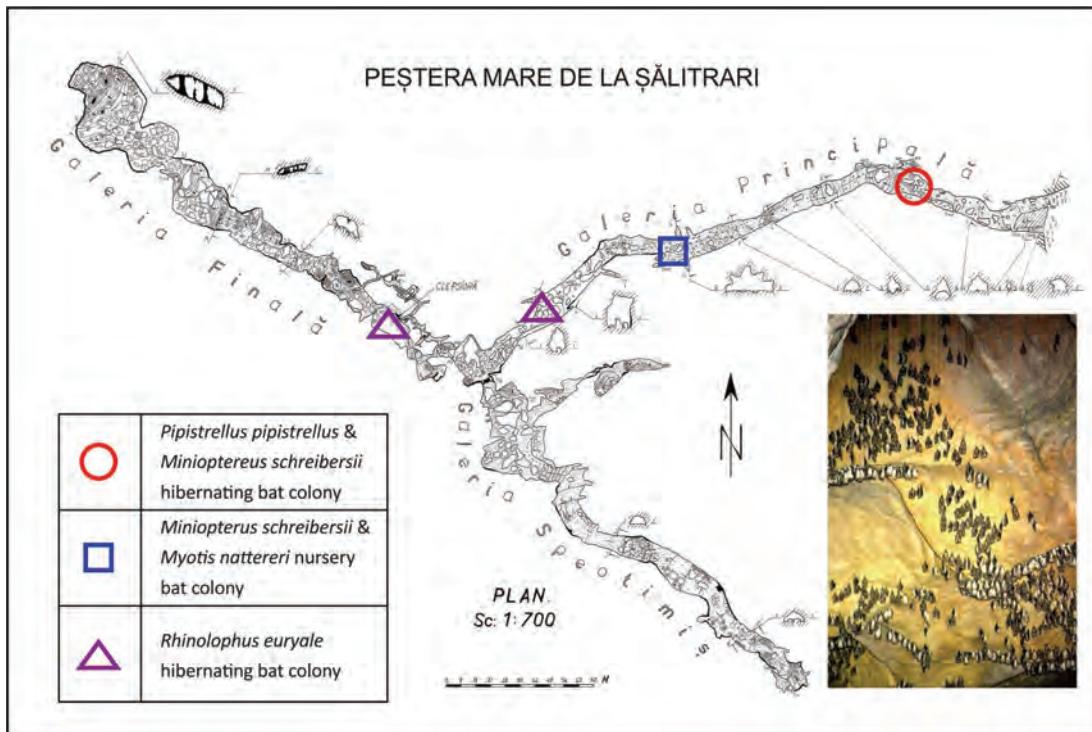


Figure 1. Map of “Peștera Mare from Șălitrari” made by Speleological Association “Prusik”- Timișoara showing the location of bat colonies within the cave with the insert image illustrating the wintering group of *Rhinolophus euryale* (photo Oana Mirela Chachula, 2014).

RESULTS AND DISCUSSION

During the eleven trips made to “Peștera Mare de la Șălitrari” during different periods of the year (in 2003, 2009, 2011 - 2014 and 2016) we identified the bat species and assessed the specific compositions and dynamics of the bat colonies inside the cave. There were no previous references regarding the bat colonies in this cave despite the fact that it was systematically explored from 1960 onwards by the Speleological Institute “Emil Racoviță” and then, in 1978, by the Speleological Association “Focul Viu”, both from Bucharest and, since 1990, there has been ongoing exploration by the Speleological Association “Prusik” - Timișoara and Speleological Club “Speotimiş” - Timișoara. We can evaluate the bat presence inside the cave using the existent deposit of guano phosphate mineral that has been exploited since 19th century in this cave. The long-standing presence of bats in this cave are indicated by records that show that since the 19th century deposits of guano phosphate mineral have been exploited for the manufacture of gun powder and fertiliser.

We can talk about the existence of 5 distinct bat colonies that are inside this cave: 3 of them are bat hibernating colonies, one represents a nursery colony and one is a matting colony. The first scientific observations started on April 12, 2003, at the end of hibernating time. This bat colony was observed in the Access Gallery, being composed of 300 individuals of *Miniopterus schreibersii* and 10 individuals of *Rhinolophus ferrumequinum* (Table 1). During the other two study trips in the same year, we recorded about 100 individuals of *Myotis capaccinii* (August 23, 2003), respectively, *M. capaccinii* (6), *Rhinolophus hipposideros* (4), *M. dasycneme* (1) and *M. daubentonii* (1)

(September 20, 2003). In September 2003, Alice Ghițescu and Sorin Fițu identified the species *M. capaccinii*, *M. dasycneme* and *R. hipposideros* using nets (ALBUICĂ et al., 2014), but we did not observe this bats in other period. For this reason, we assume that the bats are in the cave during their swarming time.

Table 1. Identified species in “Peștera Mare de la Șalitari” during our study.

Date	Species	Effectives
April 12, 2003	<i>M. schreibersii</i>	300
	<i>R. ferrumequinum</i>	10
August 23, 2003	<i>M. capaccinii</i>	100
September 20, 2003	<i>M. capaccinii</i>	6
	<i>R. hipposideros</i>	4
	<i>M. dasycneme</i>	1
	<i>M. daubentonii</i>	1
January 15, 2009	<i>R. euryale</i>	2,500
	<i>P. pipistrellus / P. pygmaeus</i>	19,000
	<i>M. schreibersii</i>	500
	<i>R. ferrumequinum</i>	100
September 30, 2011	<i>R. euryale</i>	200
	<i>M. schreibersii</i>	102
	<i>R. ferrumequinum</i>	3
July 21, 2012	<i>M. nattereri</i>	1
	<i>R. ferrumequinum</i>	11
October 27, 2012	<i>R. euryale</i>	592
	<i>M. schreibersii</i>	160
December 14, 2014	<i>R. euryale</i>	2,500
	<i>P. pipistrellus / P. pygmaeus + M. schreibersii</i>	14,700
	<i>R. ferrumequinum</i>	86
January 16, 2016	<i>R. euryale</i>	2,000
	<i>P. pipistrellus / P. pygmaeus + M. schreibersii</i>	-

The first images of the bat colony were made in January 2009, by a team from the Speleological Associations “Prusik” - Timișoara (Radu Pușcaș, Anamaria Hulban and Geza Gabor). For the first time these images permitted us to estimate the number of the bats that hibernated in the cave (CHACHULA et al., 2009). The access to the cave is very difficult especially during the winter time as a lot of ice forms on the track. Throughout the year, regardless of it being Summer or Winter it is necessary to use a rope to access the caves and as a result it was not until December 2014, that other images of the bats were recorded. On January 15th 2009, inside the final gallery, we observed 100 individuals of what were believed to be: *Rhinolophus ferrumequinum*, 19,500 of *Pipistrellus pipistrellus / P. pygmaeus* and *Miniopterus schreibersii* together. However, this observation proved to be erroneous as the identifications of bat species (presenting it in various abstracts) was incorrect due the fact the colony was situated very high on the ceiling and due the poor resolution of the pictures (CHACHULA et al., 2009; ALBUICĂ et al., 2014). When we visited the cave on September 30, 2011, we recorded 200 individuals of *Rhinolophus euryale*, 102 of *M. schreibersii* and 3 of *R. ferrumequinum*. During the year 2012, two visits were made to the cave, recording the following types of bats: 11 individuals of *R. ferrumequinum* (July 21, 2012), 592 individuals of *R. euryale* and 160 individuals of *M. schreibersii* (October 27, 2012). We notice that these bats, *R. euryale* remain in this gallery during the first part of the hibernating period, but when the outside temperature decreased they move on, inside the next gallery, where the microclimate is more constant.

We organised a new trip on December 14, 2014 and we managed to identify the bat species and to estimate the real number of bats that hibernated there, using a modern camera, that produced a higher resolution images that allowed precise species identifications. The big wintering bat colony is situated at 100 m distance from the entrance and at 30 m height. Using the methods of photograph, we estimated about 14,700 individuals of *Pipistrellus pipistrellus / P. pygmaeus* and *Miniopterus schreibersii*, starting from the covered surface of about 6 m² (Photo 1) and 86 individuals of *R. ferrumequinum*. In the same passage, towards its end, we recorded about 2,500 individuals of *Rhinolophus euryale* that started to hibernate in the Access Gallery (Fig. 1) and, in the middle of the winter, when temperature decreased, they moved to the Final Gallery (Photo 3). Presenting these effectives, this wintering bat colony appears like one of the most important ones from Romania and Europe. There were also noted many individuals of Soprano pipistrelle (*P. pygmaeus*) that dwelt in the cracks in the walls of the Access Gallery. The finding of one dead specimen allowed measurements to be taken along with a study of the wing character, where the wing cell connecting the first joint of the fifth finger with the elbow and the next cell above connecting forearm and the fifth finger confirmed the exact species (DIETZ & von HELVERSEN, 2004), (Photo 2a, b). We assess that this is just one preliminary counting because we do not know exactly the percentage of occupancy level inside the cracks. We could hear the bat calls up to 20 - 30 m height inside of the cracks from the walls of this passage and estimated the effectives of this species at 1,000. We will continue our studies regarding this aspect.

Our investigations on the Final Gallery allowed us to collect data since 2009 (CHACHULA et al., 2009). First time we identified the colony through this picture as being formed by the *Rhinolophus ferrumequinum*, due the lack of resolution (Photo 3), but during the trip in the winter of 2014, we observed that this colony was formed by the species

R. euryale (Fig. 1). The effectives of about 2,500 individuals make it one the most important and larger wintering colony for this species in Romania, along with the one from “Gura Ponicovei” Cave, were there are 5,000 individuals of the same species during summer time (Coroiu, personal communication). On January 16, 2016, the colony about 2,500 individuals of *R. euryale* was in the Final Gallery, but the known existing colony formed by the species *Pipistrellus pipistrellus* / *P. pygmaeus* and *Miniopterus schreibersii* from the Access Gallery was not observed anymore; most probably, the bats chose another shelter in the area nearby.

The nursery colony is located as well in the Access Gallery, at the height of the ceiling, being a mixed colony formed by *R. ferrumequinum* and *M. schreibersii*. We visited the cave on July 21, 2012, in the end of this time in the annual biological cycle and we observed just 11 individuals of *R. ferrumequinum*. We could not estimate the total effectives of this colony due its position on the very high ceiling of gallery but we observed fresh guano in different parts of the platform. In the same day, Simona Elena Buduran found one dead juvenile ♂ that was identified as *Myotis nattereri*, representing the first recorded presence of the species for this cave. We collected also some bat bones that were very useful in the identifications of bat species, otherwise we could not use any other method due to ethic reasons, especially in this time of the year.

The mating colony is also a mixed one, composed of the species *M. capaccinii*, *M. dasycneme* and *M. daubentonii*. It is very well known that various species of bats, including the forest species, come together inside the underground shelters during this time of the year in order to find their partners during mating season.

Ecology of the cave. The first measurements of the microclimate inside the cave (Table 2) were done by DIACONU & LASCU (1998-1999). There was recorded a constant temperature in the deep area of the cave, 11.5 °C, while relative humidity (RH) was between 97% and 99%. The microclimate has a strong influence in the vicinity of the bat colony due to the large entrance. In the far end of the cave, furthest away from the entrance in the Final Gallery presents a constant temperature of about 12°C. At the gate between the Final Gallery and Speotimiş Gallery, the temperature is of about 10°C. This cave offers a very good microclimate for the presence of bats during the whole year due to the constant values of temperatures and humidity, but also due to the air currents.

Table 2. Outside and inside temperatures (°C/RH%) of -"Peștera Mare de la Șălitrari" during our study.

Date	Outside the cave	Access Gallery	Speotimiş Gallery	Final Gallery
1998 - 1999	-	74 – 77 RH%	-	11.5 °C/97 – 99 RH %
September 30, 2011	14.3 °C/76.6 RH %	12.4 °C/94.4 RH %	-	10.9 °C/99 RH %
July 21, 2012	17.2 °C/60.5 RH %	12.1 °C	11.6 °C/96.1 RH %	11.5 °C/90.6 RH %
December 14, 2014	-	-	-	11.5 °C/97 – 99 RH %

Conservation status of the cave. The protection of the cave started in 1997, when the Speleological Association Prusik - Timișoara installed a gate at the entrance of Speotimiş Gallery. After three years, they installed a second gate in the Final Gallery and also blocked with cement another small entrance in this gallery, leaving open a small yet appropriate space for bat activities. In very short time, the second gate was vandalised, so, Radu Puşcaş (President of Association at that time) installed a replacement gate that still resists.

Cleaning activities were undertaken in the cave that involved the removal of rubbish and items discarded by previous visitors. Defined tracks/routes for cavers' to follow were marked along both galleries, in order to preserve the underground landscape and paleontological sites by containing traffic to discrete areas. In 2013, the flag way-markers in Speotimiş Gallery were replaced with red and white marker tape in order to more clearly define the route to be used when traversing the passage thereby protecting the adjacent areas. The gates are checked frequently and the visits by Speleologist are strictly limited during bat hibernation and nursery time (ALBUICĂ et al., 2014).



Photo 1. *Pipistrellus pipistrellus* / *P. pygmaeus* wintering colony (photo Geza Gabor).

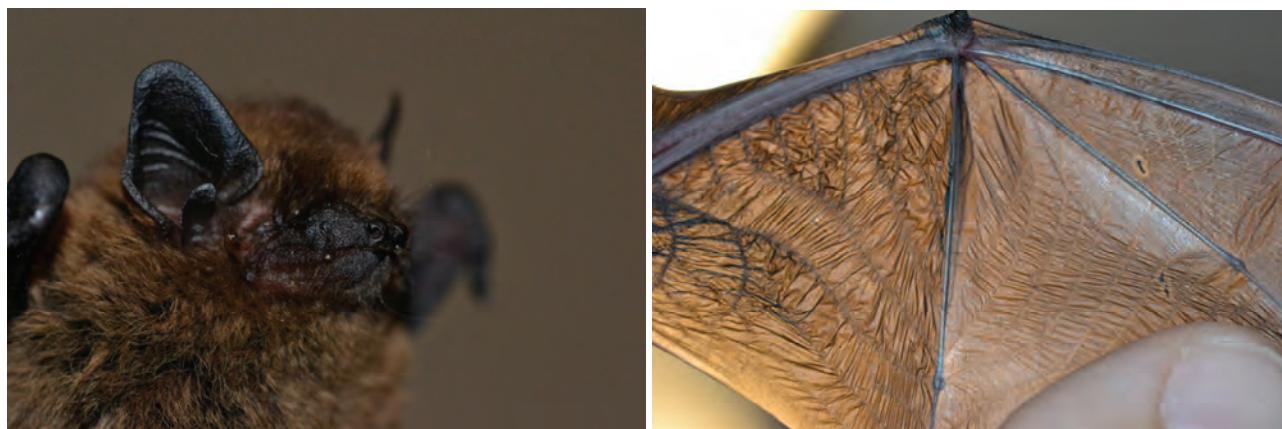


Photo 2 (a, b.). *Pipistrellus pygmaeus* – wing character for the species (photo Oana Mirela Chachula).



Photo 3. *Rhinolophus euryale* wintering colony in 2009 (photo Radu Pușcaș).

CONCLUSIONS

“Peștera Mare de la Șalitrari” represents a nursery, transition/swarming and hibernation shelter for 10 species of bats, all of which are included on the list of vulnerable species requiring high protection.

Our research work permitted us to identify and monitor these bat colonies over a period of more than 10 years, as these colonies are among the most important in Europe comparable with the ones from “Șura Mare” Cave from SW Romania (NAGY & SZANTO, 2003; CHACHULA et al., 2009; SOPINCEAN et al., 2015) and “Huda lui Papară” Cave from NW Romania (COROIU & DAVID, 2008).

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