

THE STRUCTURE AND DYNAMIC OF A MIXED HIBERNATION COLONY AND THE MICROCLIMATE CONDITIONS FROM GROTA MARE (REPEDEA, IAȘI)

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KEY WORDS: hibernation, ecology, cave, Chiroptera, Repedea - Iași

INTRODUCTION

Pieces of information referring to the ecology of the bats from the caves in Moldavia are few. Valenciuc N. (1973, 1989), starting from 1963s, studied the dynamic and the microclimate conditions from 2 caves in Moldavia: Peștera Liliacilor from Rarău (the Bats' Cave) and Peștera Toșorog (the Toșorog Cave) from the county of Neamț.

The cave was discovered and studied beginning with the hibernation. They signalled 4 species (*Myotis blythii*, *Myotis bechsteinii*, *Myotis nattereri* and *Myotis daubentonii*), out of which 3 new species for the Chiroptera fauna of Moldavia (Valenciuc, Chachula 2001a, 2001b). Under the same competent guidance we continued the study of Chiroptera, with a view to present the results of monitoring the Chiroptera community from the cave. In the years that followed, December 2002 – April 2005, besides the species earlier recorded we registered other 6 species (*Myotis myotis*, *Myotis mystacinus*, *Myotis brandtii*, *Plecotus auritus*, *Plecotus austriacus*¹ and *Barbastella barbastellus*¹), *Myotis brandtii* being for the first time signalled in Moldavia. Four of them are presented in the annex II of the Habitats Directive (92/43 concerning the Conservation of the Natural Habitats of Wild Fauna and Flora): *Myotis myotis*, *Myotis blythii*, *Myotis bechsteinii* and *Barbastella barbastellus*.

The geological reservation "Dealul Repedea (the Repedea Hill)" lies at 9 km from the city of Iași, close to the National Road Iași-Vaslui; Grota Mare is the biggest cave from the reservation. It is dug in oolitic limestone. Coordinates : E 27° 38.629' / N 47° 05.122' / 322 m.a.s.l. Cod UTM: NN 42

The cave is flanked by the wooden vegetation represented especially by scattered shruberry (*Ulmus foliacea*, *Cornus mas*, *Rhamnus tinctoria*, *Crataegus monogyna*, *Rosa canina*, *Sambucus nigra*), to which a few solitary trees are added, remaining from the old forest, vegetation that extends itself southwards up to the Repedea-Bârnova forest (with a surface of 15,000 ha), part of the Bârnova-Dobrovăț massif.

In 3 caves near Grota Mare (the Big Cave) (fig. 1) specimens from the following species were found accidentally: *Myotis myotis*, *Myotis bechsteinii*, *Myotis nattereri* *Myotis daubentonii*, *Myotis brandtii* and *Myotis sp.* (table 2).

Grota Mare is a transitional shelter for the „stray” specimens during the winter season. The colony inside the cave represent a pattern of the chiropterofauna living in the area, that wasn't search until now. Because of that the cave entered into the National Monitoring Program.

METHODS AND MATERIAL

The entrance has 67 cm in height and 103 cm in width, the chambers have between 1,8 m and 2,2 m. The cave has numerous galleries, being even labyrinthine. The sum of all these galleries is of 120 m.

The (E) gallery presents signs of water leaking. Together with the variety of sediments and the morphological ensemble of the landscape is more probably a part of the cave created by nature. Nevertheless, the exact genesis must still be analyzed.

The rectangular diameter of the galleries, the comfortable and equal dimension of the height in the entire cave, as well as the abrupt endings and the space almost regular among the lateral passages are a clear proof of the anthropogenic intervention. The only passages from the anthropogenic part that could be due to nature are the first passages that lead to the entrance and to the passage with big blocks embedded in the silty matrix (D). All the others (A, B, C) are either entirely artificial or enlarged in such a measure that the original cave cannot be seen (Platon 2005) (fig. 1).

24 visits were totally made: 6 in December 2002 – April 2003, 7 in September 2003 – April 2004 and 11 in October 2004 – April 2005. They took place on an average once a month, and in the last year (2004/2005) they alternated with researches once a week/ every two weeks.

Data regarding the microclimate (temperature and humidity variations) were recorded by the aid of a termohygrometer (HANNA HI 9065).

The species were determined on the basis of determination keys (Grimmberger 1996, Valenciuc 2002, Decu et al. 2003, Dietz and Helversen 2004) as a result of the morphometric measurements (mainly of the length of the forearm) or, for confirmation, on the basis of photographs. The material used: sliding callipers, magnifying glass (x10), gloves, lantern, flash light, digital camera. The fewest specimens possible were manipulated, knowing the fact that bats should not be disturbed during their hibernation period. More rigid determinations were made in autumn (October-November).

¹ These two species were find on 12.02.2006

In the autumn of 2005 we placed the mist net to localize possible mating shelters and it appeared that Grota Mare and Peștera Anei are used in this purpose by *Myotis bechsteinii*.

I also calculate some ecological analytical parameters: abundance (A), dominance (D) and constancy (C).

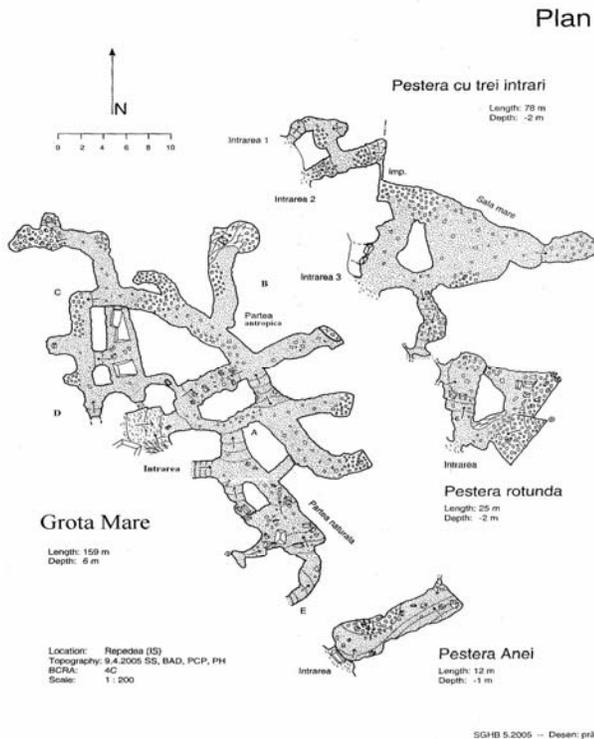


Fig. 1 Outline: Grota Mare, P. cu trei intrări (the Cave with three entrances), P. Rotundă (the Round Cave) and P. Anei (Anne's Cave) (after Platon, 2005)

RESULTS AND DISCUSSIONS

The seasonal or yearly changes in the number of bats and of species outline the character of transitional shelter offered by Grota Mare and the 3 adjacent caves (tables 1 and 2). This aspect is due to an unstable microclimate, with a variable temperature and a relatively low humidity, as well as to the morphological characters of the cave (low galleries, clayey sediments).

The average of temperatures, recorded in the cave during the hibernation period, oscillated in the limits: min of 8,5°C and max. of 11,5°C (first year); min. of 7,5°C and max. of 13,6°C (second year) and min. of 8,5°C and max. of 13,5°C (third year) (fig. 2).

Comparatively with other caves from Moldavia (Valenciuc 1973), the values of the relative humidity from Grota Mare are low, with an average of 77% (2003/2004) and 72% (2004/2005).

The maximum number = 54 (15.03.2005), at the same date the biggest growths were recorded in the number of specimens belonging to the species: *Myotis bechsteinii* (18 ex.) and *Myotis daubentonii* (19 ex.) (fig. 3). *Myotis myotis/Myotis blythii*, *Myotis daubentonii*, *Myotis*

mystacinus/Myotis brandtii, *Myotis bechsteinii* (with few exceptions) come in the cave in October and leave the cave in April (table 2).

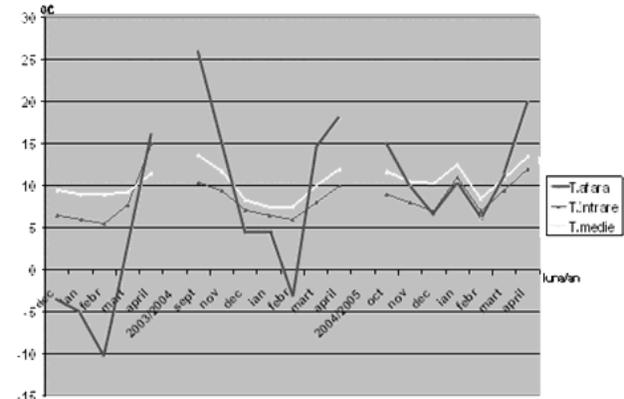


Fig. 2 The variation in temperatures (from outside, entrance and inside) recorded in Grota Mare

The average of the ecological analytic indices (D% and C%) for the three years of study, divides the Chiropterofauna from Grota Mare in 3 classes of dominance:

eudominant species: *Myotis myotis/Myotis blythii* (49%), *Myotis bechsteinii* (20,5%), *Myotis daubentonii* (12,5%)

dominant species: *Myotis mystacinus/Myotis brandtii* (9,33%)

subdominant species: *Myotis nattereri* (3,7%) and *Plecotus auritus* (3,6%).

and 3 classes of constancy:

euconstant species: *Myotis myotis/Myotis blythii* (91,1%), *Myotis daubentonii* (81,9%), *Myotis bechsteinii* (77,9%) and *Myotis mystacinus/Myotis brandtii* (87,4%).

accessory species: *Myotis nattereri* (47,3%) and *Plecotus auritus* (40,6%).

accidental species: *Eptesicus serotinus* (23.02.2003), *Plecotus austriacus* and *Barbastella barbastellus* (12.01.2006).

We summed up the data regarding the related species *Myotis myotis/ Myotis blythii* and *Myotis mystacinus/ Myotis brandtii*, taking into account the fact that they are more difficult to determine, especially during the hibernation period.

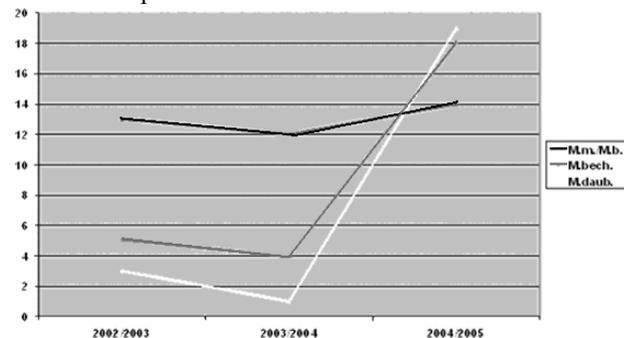


Fig. 3 Changes in the total number of bats that belong to the eudominant species: *Myotis myotis/Myotis blythii*, *Myotis bechsteinii* and *Myotis daubentonii* inside Grota Mare

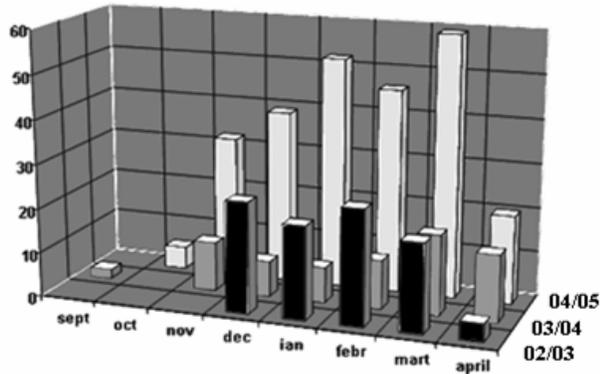


Fig. 3 Seasonal dynamic inside Grota Mare and in the 3 adjacent caves in September - April 2002/2003, 2003/2004, 2004/2005

The number of the catalogued bats are within the limits of: minimum - 4 (April) and maximum - 26 (February) in 2002/2003; minimum - 2 (September) and maximum - 18 (March) in 2003/2004, minimum - 2 (October) and maximum - 59 (March) in 2004/2005; with an average of the number of specimens, in the period of profound hibernation (December-February), of 24 (2002/2003), 9 (2003/2004) and 45 (2004/2005). The seasonal dynamic differs from the dynamic in other winter shelters. The total number of Chiroptera that populate these caves usually reaches the maximum at the beginning of the migration period in the spring (with its peak in March) (fig. 3).

Unlike the other winter shelters (Valenciuc 1989), in Grota Mare, along the hibernation season, no change of place of the bats towards the more profound areas of the cave (C, D, E) can be noticed in the cold months. On the contrary, a preference for the A and B galleries during the entire period of hibernation, probably due to the fact that the cave is not extended in line but in semicircle (the microclimate of the C, D and E galleries being influenced by the exterior, C and D are continued with a small opening towards the exterior and E is close to the surface).

The specific composition. During the three years of study it maintained on almost the same positions: *Myotis myotis/Myotis blythii* (48% - 70% - 30%) → *Myotis bechsteinii* (24% - 12% - 26%) → *Myotis daubentonii* (12% - 7% - 20%) → *Myotis mystacinus/Myotis brandtii* (5% - 7% - 16%) → *Myotis nattereri* (3% - 3% - 6%) → *Plecotus auritus* (8% - 1% - 2%).

CONCLUSIONS

Although is not a shelter for hibernation due to an unstable microclimate, with a variable temperature, a relatively low humidity, as well as to the morphological

characters of the cave (low galleries, clayey sediments), Grota Mare offer a transitional shelter to the chiropterofauna in the area (phytophilic bats).

In the 24 field researches, in the course of three years of study (December 2002 – April 2005), we registered 6 new species for the cave (*Myotis myotis*, *Myotis mystacinus*, *Myotis brandtii*, *Plecotus auritus*, *Plecotus austriacus*¹ and *Barbastella barbastellus*¹), *Myotis brandtii* being for the first time signalled in Moldavia.

The dynamic of the total number of Chiroptera and the changes in the specific composition from a year to another are, it appears, in close connection with the variation of values of the environment temperature.

The seasonal dynamic differs from the dynamic in other winter shelters. The total number of Chiroptera that populate these caves usually reaches the maximum at the beginning of the migration period in the spring (with its peak in March).

Unlike the other winter shelters, in Grota Mare, along the hibernation season, no change of place of the bats towards the more profound areas of the cave (C, D, E) can be noticed in the cold months, on the contrary, a preference for the A and B galleries.

The average of the ecological analytic indices (D% and C%) for the three years of study, divides the Chiropterofauna from Grota Mare (the Big Cave) in 3 classes of dominance and 3 of constancy. *Myotis myotis/Myotis blythii* is the euconstant and eudominant species with the highest value.

ABSTRACT

Lucrarea cuprinde observații realizate în perioada sezonului de hibernare decembrie 2002 – aprilie 2005. În decursul a trei ani s-au urmărit: schimbări ale microclimatului, dinamica numărului de chiroptere (în adăpost, sezonieră și anuală), precum și diferențele anuale privind compoziția specifică a chiropterelor. În cadrul coloniei au fost identificate până în prezent 10 specii (*Myotis myotis*, *Myotis blythii*, *Myotis bechsteinii*, *Myotis brandtii*, *Myotis mystacinus*, *Myotis daubentonii*, *Myotis nattereri*, *Plecotus auritus*, *Plecotus austriacus* și *Barbastella barbastellus*). Speciile *Myotis myotis/Myotis blythii*, luate împreună, sunt cele mai abundente (38,2%), *Myotis bechsteinii* (26,5%) și *Myotis daubentonii* (22%) fiind specii relativ abundente.

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ANEXĂ

Table 1 – observations in the studied months (December 2002 - Arpil 2005): the dynamic (yealry, seasonal and inside the shelter) and the values of temperature and humudity

Observations date	T	Gallerys					Outside T. (°C)	Mean T. (°C)	Humidity (%)
		A	B	C	D	E			
7.12.2002	25	15	7	3	1	-	-3.5	9.5	-
30.01.2003	21	12	6	2	1	-	-5	9	-
23.02.2003	26	14	8	2	2	-	-10	9	-
2.03.2003	16	10	2	1	3	-	-3	8.5	-
11.03.2003	20	11	5	1	3	-	8	10	-
24.04.2003	4	-	-	1	3	-	16	11.5	-
23.09.2003	4	-	3	1	-	-	26	13.6	73,5
23.11.2003	11	5	3	2	1	-	15	11.7	77,25
14.12.2003	8	5	2	1	-	-	4.5	8.3	77,5
31.01.2004	8	5	2	-	1	-	4.5	7.5	77,5
22.02.2004	11	4	3	1	2	1	-3	7.5	77,5
14.03.2004	16	6	5	2	2	1	14.5	10	77,5
16.04.2004	15	8	4	2	-	1	18	12	75
15.10.2004	2	2	-	-	-	-	15	-	-
24.10.2004	6	3	2	-	-	1	20	-	-
30.10.2004	17	6	4	3	-	4	15	11.7	67.5
3.11.2004	17	7	5	1	1	3	15	11.7	70
19.11.2004	30	12	10	3	3	2	5	9.2	75
12.12.2004	38	8	12	10	3	5	9,7	10.3	74.8

9.01.2005	49	17	15	9	3	5	13,3	12,5	67,9
15.02.2005	44	24	9	6	1	4	5	8,5	74,9
15.03.2005	54	18	16	12	2	6	10	9,7	70,2
22.03.2005	40	16	12	7	1	4	15	12,2	-
4.04.2005	19	9	7	2	-	1	18	13,5	-

Table 2 – The specific composition of the hibernation colony inside Grota Mare and the adjacent caves

Date	<i>Myotis myotis</i>	<i>Myotis blythii</i>	<i>Myotis bechsteinii</i>	<i>Myotis daubentonii</i>	<i>Myotis nattereri</i>	<i>Myotis mystacinus</i>	<i>Eptesicus serotinus/M.brandtii</i>	<i>Plecotus auritus</i>	Nedet.	Total
7.12.02	-	13	5	3	1	1	-	2		25
30.01.03	-	11	5	3		1	-	1		21
23.02.03	-	11	5	3	1	1	1	4		26
2.03.03	-	8	4	2		1	-	1		16
11.03.03	-	10	5	2	1	1	-	1		20
	-	-	3	-	-	1	-	-		4
Average	8,83		4,5	2,16	0,5	1	-	1,5		18,49
23.09.03	-	-	2	-	-	-	-	-		2
23.11.03	2	5	-	1	1	1	-	1		11
14.12.03	2	5	-	1	-	-	-	-		8
31.01.04	2	4	-	-	1	1	-	-		8
22.02.04	3	6	-	1	-	1	-	-		11
14.03.04	3	9	2+2*	1	-	1	-	-		16+2
16.04.04	2	8	3	1	-	1	-	-		15
Average	7,28		1,28	0,71	0,28	0,71		0,14		10,4
15.10.04	1	-	-	-	-	1	-	-		2
24.10.04	2	-	1	2	-	-	1	-		6
30.10.04	5	5	1	3	-	3	-	-		17
3.11.04	6	1	24.04.03	3	-	4	1	1		17
19.11.04	10	1	3	2	1	8	1	3	2*	30+2
12.12.04	9	3	9	5	1	8	1***	3		38+1
9.01.05	9+1**	3	18	8	2+1***+1	6	-	3		49+3
15.02.05	9+1**	3	16	8	4+1*	4	-	-		44+2
15.03.05	10+1**	3	16+1**	17+2*	3+1**	5	-	-		54+5
22.03.05	8+1**	1	12+1**	10	3+1**	5	-	-		40+3
4.04.05	6+1**		5	4	1	3	-	-		19+1
Average	9,09		7,63	5,81	1,81	4,81		0,90		30,05

* Peștera Anei (Anne's Cave)

** Peștera Rotundă (the Round Cave)

*** Peștera cu trei intrări (the Cave with three entrances)