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**NURSERY COLONY OF *RHINOLOPHUS HIPPOSIDEROS*  
(BECHSTEIN, 1800) (MAMMALIA: CHIROPTERA) FROM  
VÂNĂTORI-NEAMŢ NATURAL PARK (ROMANIA)**

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**Abstract.** The paper contains data about the first nursery colony of *Rhinolophus hipposideros* (Bechstein, 1800) identified on the territory of Moldova (Romania), one of the most endangered bat species in Europe. In this paper aspects regarding the number of bats and seasonal dynamic and dynamic inside the shelter during the summer season: June-September 2005, May-July 2006 are represented.

**Résumé.** On présente des données concernant la première colonie de maternité de *Rhinolophus hipposideros* (Bechstein, 1800) identifiée sur le territoire de la Moldavie (Roumanie), l'espèce étant parmi les plus périlées d'Europe. On présente le nombre d'exemplaires, la dynamique saisonnière et dans l'abri, au cours de la saison estivale: août-septembre 2005, mai-juillet 2006.

**Key words:** *Rhinolophus hipposideros*, nursery roost, dynamics, woodland, Vânători Neamţ Natural Park, Romania.

INTRODUCTION

Since the 1950s or 1960s, *Rhinolophus hipposideros* (Bechstein, 1800) have undergone a severe decline in most of Western and Central Europe (Bontandina et al., 2001). Aware of this overall deteriorating situation, in Belgium, the authorities and some conservation groups began to protect hibernation caves and nurseries from the late 1970s. Moreover, on international level, some legal protection was progressively given to the species themselves as well as their habitats (Bern Convention, EC Directive 92/43, annex 2, Bonn Convention). It became a species of special concern under the European Bats Agreement (e.g. species selected for Consistent Monitoring and proposed as a Priority Species for Autecological Studies) (Motte & Libois, 2002).

Availability of summer and winter roosts together with foraging habitats are considered key factors for the distribution of European bat species. The fragmentation of woodland is an important process with impact on bat faunas, and this process could furthermore be regarded as a major reason for species extinction (Reiter, 2004). Woodland is a key foraging habitat for *Rhinolophus hipposideros*, these results were subsequently confirmed by radio-tracking studies (Bontadina et al., 1999; Holzhaider et al., 2002; Motte & Libois, 2002) and showed that lesser horseshoe bats nearly exclusively forage in different types of woodland.

The Vânători-Neamţ Natural Park is located in the North of city Neamţ (Moldova, North East of Romania). Relatively new in the protected areas from Neamţ, the Vânători-Neamţ Natural Park has become a natural park in 1999, with a surface of 30,818 hectares, from which over 26,300 are covered by forest.

In October 2004, in one of the Secu Monastery attics four bats belonging to *Rhinolophus hipposideros* species were identified. The large quantity of guano from

the shelter has pointed out that a nursery colony might exist. It's the only nursery colony of *Rhinolophus hipposideros* discovered until now in Moldova. The species has been reported only in 4 hibernating shelters (caves) from Moldova (with a few bats): Peștera Jgheabu cu Gaură (Neamț county) (Valenciuc, 1972), Peștera Munticelu from Bicaz Gorges (Neamț county), Peștera cu Var from Ceahlău Mountain (Neamț county) and Peștera Liliiecilor from Rarău Mountains (Suceava county).

Previous researches in the Vânători-Neamț Natural Park about the bats fauna took place in the summer of 2004 by APLR (The Protecting Bats Association from Romania), when there were inventoried 9 bats species: *Pipistrellus pipistrellus*, *P. nathusii*, *Nyctalus noctula*, *Eptesicus serotinus*, *Myotis bechsteinii*, *M. nattereri*, *M. daubentonii*, *M. mystacinus* / *M. brandtii*, *Plecotus* sp.

#### MATERIAL AND METHODS

The preliminary data was collected after 8 terrain researches, in the period July-September 2005 and May-July 2006.

On Secu Valley the association *Pulmonario rubrae* – *Fagetum* (Soo 1964) Tauber 1987 is prevalent, in a proportion of 70-80%. The association is characteristic to the middle mountain under-level, known as “level of beech forest mixed with fir and spruce”, which lies on the mountainside between (700) 1000 – 1259 (1450) m, creating a distinct zonal strip, with large extension, especially in Subcarpathians. In this under-level, the forests are of by beech, fir and spruce, which are co-dominating. Under floristically aspect *Fagus sylvatica*, *Abies alba* and *Picea abies* are prevalent, followed by *Acer pseudoplatanus*, *Rubus idaeus*, *Pulmonaria rubra*, *Oxalis acetosella*, *Hieracium transsilvanicum*, etc. It seems that most of foraging time is spent by *Rhinolophus hipposideros* in habitats where *Fagus sylvatica* is the dominating tree species (Holzhaider et al., 2002).

In Secu Valley, the covering with trees is of 80-95%, with bushes and juvenile 5-30% and 15-40% with grass. The trees coat also contain: *Acer platanoides*, *Quercus petraea*, *Carpinus betulus*, *Populus tremula*, *Betula pendula*, *Alnus glutinosa*, *Sorbus aucuparia*. The bushy coat contains: *Daphne mezereum*, *Clematis vitalba*, *Corylus avelana*, *Rosa canina*, *Rosa pendulina*.

Secu Monastery. Coordinates: lat. N 47°19'963'', long. E 26°18'422'', 536 m.a.

It is located on the riverside with the same name. It was built in 1602 by Nestor Ureche (the father of Grigore Ureche the chronicle), over an older hermitage made of wood. Protected from all parts by heights covered by forests, Secu Monastery has the aspect of an impressive fortress, being surrounded by commanding walls with strong defending towers at the corners.

The buildings that form the compound were built in different steps, surrounding the defending wall or even over it. In the northern part of the monastery the attic that shelters the birth colony of *Rhinolophus hipposideros* is located. The attic was renovated about 30 years ago. It is built with coniferous wood, covered with iron sheet – inferior attic (8x12 m, 4-5 m height). A narrow opening (80 cm x 1 m) in the old wall leads into a stone cupola (2x5 m, 2 m height) which continues on the sideways with a narrow tunnel (1x4 m, 1.1 m height), closed at the end. In the ceiling of the small cupola there is another opening which leads to the superior attic (6-7 m height), higher, covered with shingle, with a small opening (60x80 cm), used probably by bats to exit. The attic orientation is East-West.

Material used: ultrasound detector (BATBOX DUET), thermohygrometer, digital photo camera, determination key (Grimmberger & Schober, 1996; Murariu et al., 2003).

#### RESULTS AND DISCUSSIONS

Starting with 1960, in Eastern Europe the species has registered a dramatic decline, the exact cause isn't known, the factors that led to this decline could be: the contamination with pesticides, the wrecking of the habitats and the climatic changes; Arlettaz et al. (2000) specifies that the decline could be due to the competition with the sympatric species *Pipistrellus pipistrellus*, for food. Such a competition doesn't take place in the Vânători-Neamț Natural Park, because this kind of competition can be met in case that near the hunting area of *Rhinolophus hipposideros* species there are roads limited by lights; it looks like this lights are attracting the moths from the forest and the *Pipistrellus pipistrellus* is seizing the opportunity. *Rhinolophus hipposideros* doesn't hunt at those lights, but inside the forest. At Secu Monastery there are just a few illuminating pillars, in its compound.

Over 80% of the nursery colonies of *Rhinolophus hipposideros* (over 300 colonies), in Austria, there were found in monasteries and castles attics (Reiter, 2004).

The size of the nursery colony grows depending of the proportions of surrounding forests: small areas support only small birth colonies, while the big colonies are located in the vicinity of large areas of forests. Leafy forests represent the essential habitat which offers feeding place to this species (Reiter, 2004; Boye & Dietz, 2005). 85% of the Vânători-Neamț Natural Park surface is covered by forest, mostly leafy forests.

The forest is located at few hundreds meters from the shelter, and the link between this and the shelter contains planted firs, walls, high fences and tree rows. It seems that this specie avoids passing through open habitats, towards the feeding place. If the forest area isn't near, then in the colony vicinity must be a chain of trees or bushes towards the feeding place (Motte & Libois, 2002).

It seems that the feeding habitat is strongly influenced by the water flows (Schofield et al., 2000). The monastery is located on Secu riverside.

In Central Europe, the colonies count ~200 bats (adults and sub-adults) (Reiter, 2004; Bontadina et al., 1999), but in Wales the colonies count up to 450 bats (adults and sub-adults) (Schofield et al., 2000), even if the covering with forests is lower. The nursery colony from Secu Monastery contains about 160 bats (adults and sub-adults), at the end of July (Tab. 1).

If the colony contains a few hundred bats, the competition for food near the shelter would grow. A colony of 400-500 bats would split because of this (Schofield et al., 2000). It seems that this has happened to the colony from Secu Monastery colony in 2005 because in June there were 171 adults, and in July there were only 85 females with newborns (Tab. 1). We haven't found yet the place where they are sheltering in the birth and taking care of newborns period the others members of the colony (Fig. 2). In 2006, we didn't found the same situation, probably a big part of the colony was already sheltered in one of the near buildings attics, or from the near monasteries. Holzhaider et al., 2002, specifies that the bats from the same birth colony can use more near placed shelters.

The maternity shelters are occupied starting with April of about 10-100 females, together with a few males (20%) (Grimmberger & Schober, 1996). From 4

bats captured in 2006, 1 was a male. On the 20<sup>th</sup> of May 2006, the colony was formed.

The females are showing a high level of attachment towards the birth shelter along many years and generations.

Table 1

Bat dynamics in the shelter through summer.

Date	Hour	No. of bats in 4 areas of the shelter				Adults	Newborns	Total	Notices
		Inf. attic	Cupola	Tunnel	Sup. attic				
28.06.05	19.00	30	17	10	?	57	-	57	1 ♀ captured
29.06.05	12.00	75	33	28	35	171	-	171	
29.07.05	1.30	-	115	35	10	85	75	160	
23.08.05	11.00	61	-	2	-	60	5	63	+ 1 dead young
30.09.05	2.00	4	-	-	-	4	-	4	1 ♀ captured
20.05.06	12.00	45	10	20	5	80	-	80	3 ♀ captured
12.06.06	13.25	85	2	-	-	87	-	87	
5.07.06	13.30	43	24	5	10	82	10	92	1 ♂ captured

As concerns the diurnal dynamics, in the first part of the day, most of the bats are staying in the inferior attic, on the eastern side, near the top, where the sun is warming better, near noon, they are moving on the top, and after 12 o'clock they are moving on the western side of the attic. In the taking care of newborns period, or when the outside temperature is higher, the bats retreat in the stone part of the shelter: cupola and tunnel (29.07.2005, tab. 1). In the evening, most of the bats are camping in the superior attic, where there was noticed a small quantity of guano, in comparison with the other areas from the shelter. On 28.06.2005, at 7 pm, 67% of the bats were camping in the superior attic.

As concerns the seasonal dynamics, during summer, in May and June, the bats prefer the inferior attic. In the period of taking care of the newborns (second half of July) the whole colony is camping in the stone area: cupola (2 groups) and tunnel (1 group) (Photo 2) (Tab. 1, figs 1, 4). Probably they prefer this sector, where even the temperature is lower than the other shelter places, the temperature is more constant because of disturbing. In this period, the monk are depositing granaries into the inferior attic. In August, when already most of the colony has left the shelter, the bats prefer the inferior attic.

In the room below the attic, in which the colony takes shelter, a oven in which the monks bake bread is located. The chimneys are important for *Rhinolopus hipposideros* species, the heat that comes from them is important when the temperature is low. In the inferior attic of the shelter there are 2 chimneys. It is also important the texture of the material with which the attic is roofed (covered) and that the attic must be exposed to sunlight the entire day

The graphics about the dynamics in the shelter and the seasonal one were made with the data obtained in 2005, they being more complete then those from 2006 (Figs 1, 2).

Fig. 1 – The bats dynamics in the 4 areas of the shelter.

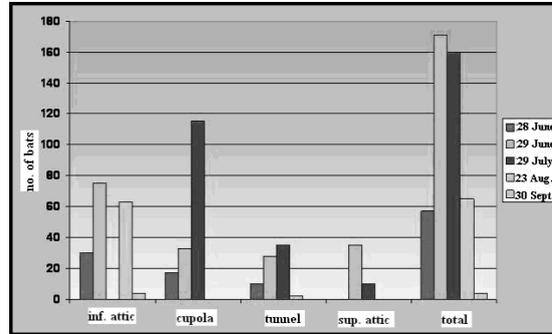
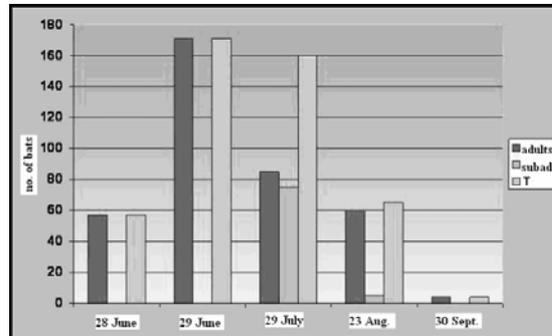


Fig. 2 – Seasonal dynamics of bats from the maternity shelter.



Few bats are staying in lonely in the shelter (Tab. 2). The largest met group was of 41 bats (in June 2006), in the inferior attic.

Table 2

Notices from the study period June – September 2005, May-July 2006.

Date	Hour	T. outside °C	T. shelter °C	No. groups	No. solitary bats	Total bats
28.06.05	19.00	22	25	4	9	57
29.06.05	12.00	25	25	7	22	171
29.07.05	1.30	30	35	3	-	160
23.08.05	11.00	20	20	2	8	63
30.09.05	2.00	10	12	-	-	4
20.05.06	12.00	18	20	6	4	80
12.06.06	13.25	20	22	6	7	87
5.07.06	13.30	25	25	7	10	82

Medium relative humidity in the shelter: 73-80%.

*Rhinolophus hipposideros* is a K-strategist that exhibit long average lifespan, delayed sexual maturity and reduced reproductive rate (one newborn per year).

Unlike other bat species, the birth period at *Rhinolophus hipposideros* takes place later, Grimmberger & Schober, 1996, specifies that the nursery colony of *Rhinolophus hipposideros* takes place starting with the second half of June until early July, they says that 1/2 - 2/3 of the females from the colony are giving birth in

June. In the maternity shelter from Secu Monastery, the births are taking place in the first half of July, therefore later than the specification from literature.

At the end of July 2005, we found 50 newborns of two weeks old, which were all still carried by the mother and 25 newborns of three weeks old which were flying themselves. At the end of August we counted three newborns of two weeks old. We believe that the females were older, because it's known that they give birth later. In the first week of July 2006 only 11% of the females were having newborns of a few days old. About 80% from the rest of the females were pregnant. Few pregnant females we met at the end of May 2006.

The female percentage that gave birth to one newborn in the birth colony from Secu, in 2005 was of 90% (Fig. 2), maximum of 80% were met in Switzerland, the average being of 45% (Bontadina et al., 1999). The newborns aren't completely naked, they have dainty hair on dorsal part (Fig. 3), thing signalized by Grimmberger & Schober in 1996.

The presented data are incomplete. In the next years we want to study more about the ecology and etiology of *Rhinolophus hipposideros* species, endangered species in Romania (Botnariuc & Tatole, 2005).



Fig. 3 – Nursing female with newborn (Photo Viorel Pocora).



Fig. 4 – Part of the nursing colony, in the tunnel (Photo Viorel Pocora).

### Conclusions

*Rhinolophus hipposideros* colony from Secu Monastery attic, in 2005 was formed from of 170 adults, but in the birth period there were 85 adults and 78 newborns left, in 2006 there were count about 85 adults, there wasn't noticed the split of the colony. The colony divides before the birth period, probably because of the food competition (Schofield et al., 2000).

The female percentage that gave birth to newborns in the nursery colony from Secu, in 2005, was of about 90% (in specialized literature the maximum met – 80%, the average being of 45%, Bontadina et al., 1999).

In the birth period and taking care of newborns period, the colony is camping in the stone area of the shelter (cupola and tunnel), probably this place gives the bats more security.

Woodland is an important factor explaining the distribution and selection of maternity roosts and should therefore strongly be considered when conservation measures for this species are required.

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### COLONIA DE MATERNITATE A SPECIEI *RHINOLOPHUS HIPPOSIDEROS* (BECHSTEIN, 1800) (MAMMALIA: CHIROPTERA) DIN PARCUL NATURAL VÂNĂTORI NEAMȚ (ROMÂNIA)

### REZUMAT

Lucrarea prezintă date referitoare la prima colonie de naștere de *Rhinolophus hipposideros* (Bechstein, 1800) identificată pe teritoriul Moldovei (România), specia fiind printre cele mai periclitate din Europa. Sunt redade aspecte privind numărul de exemplare, precum și dinamica sezonieră și în adăpost, pe parcursul sezonului estival: iunie-septembrie 2005, mai-iulie 2006.

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