

BAT SPECIFIC STRUCTURE OVER THE YEAR IN THE GURA PONICOVEI CAVE FROM SOUTH-WESTERN CARPATHIANS (ROMANIA)

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Abstract. Optimum climatic conditions from the Gura Ponicovei Cave allowed the temporary sheltering of 15 bat species, only in hibernation colonies, or only in nursery colonies, or in both of them successively: 4 rhinolophids and 11 vespertilionids. *Rhinolophus mehelyi* is reported from South-Western Romania for the first time, and *Myotis dasycneme*, reported from Gura Ponicovei also for the first time.

Résumé. Les conditions climatiques optimales de la grotte Gura Ponicovei permettent le refuge temporaire des 15 espèces de chauve-souris, seulement en colonies d'hibernation où seulement en colonies maternelles, où successif en tous les deux types de colonies: 4 rhinolophidés et 11 vespertilionidés. *Rhinolophus mehelyi* est mentionné pour la première fois dans le sud-ouest de la Roumanie et en même temps *Myotis dasycneme* est mentionné pour la première fois dans la grotte Gura Ponicovei.

Key words: bat species and colonies, first report, conservation, protected areas.

South-Western Carpathians are under the Mediterranean climatic influences. There are four seasons with enough rain and snow all along the year. Mean temperature in the hottest month (July) is of 20–22°C. Considering seasons, the mean temperature in winter is of between – 1 and – 3°C, in spring it is of 9–10°C, in summer it is of 18–20°C, and 9–10°C in autumn. However, the most important precipitations are in May-June and the relative humidity is 82–86% outside and 97–98% in caves.

In this area, for Chiroptera there are important roosts as caves in limestone mountains as well as the foraging habitats with forests (with *Quercus*, *Acer*, *Tilia*, *Fraxinus*, *Carpinus*, *Cornus* etc.) and bushy zones with *Prunus*, *Crataegus*, *Cotynus* and grassy clearings. A phytophagous fauna on the living tree trunks and branches and saprophagous fauna in the layers of leaves as well as in pastures represent the most important food for bats in this area.

This karstic region from Romania offers the most appropriate roosts for bat species, both for hibernating and for nursery colonies. The Gura Ponicovei Cave is situated on the left bank of the Danube river, between Plavișevița and Dubova localities. Its structure is formed of three high galleries, two perpendicular on the Danube river (East-West) and another one, oblique, oriented N.W.-S.E., as a bridge between the former two. There are three entrances, one in Ponicova gorges (West), one from the Danube river and another one very close to the first, named „Bat Gallery” (Fig. 1).

The Gura Ponicovei Cave is warm, with relative dry zones and important circulation of air. In summer (August) the air temperature was of 19.3°C in the Concretions Passage and of 22.1°C in the Big Room from the Bat Gallery. In winter (December) the air temperature was of 13°C in the Concretions Passage and up to

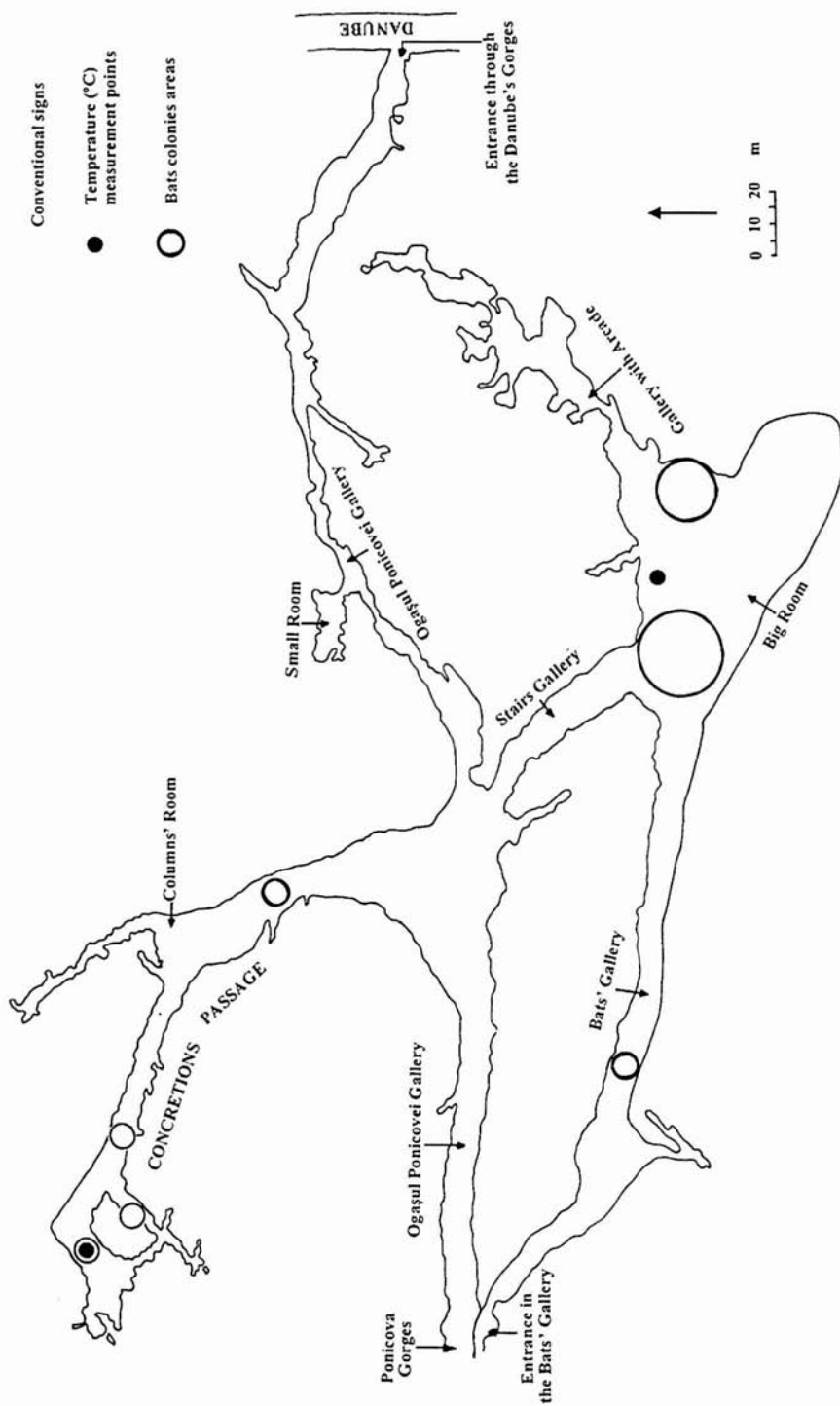


Fig. 1 – Map of the Gura Ponticovei Cave (after Negrea & Negrea, 1971 modified).

11.5°C in the Big Room (Tab. 1). These temperatures were measured at about 4 m high in zones with bats.

In the Ogaşul Ponicevei Gallery (with a structure of a tunnel opened in both ends) air temperature is highly fluctuating according to the external temperatures, because of the permanent air circulation. In winter, in this gallery, an ice bridge appears.

Table 1

Temperature values (°C) in the Gura Ponicevei Cave.

DATE	HOUR	OUT	ENTR	LOCATION	AIR	WALL
1.08.2002	13.15	26.6	18.5	"Concretions Passage"	19.30*	18.7
				"Big Room"	22.1*	
				"Small Room"	18.5	
26.10.2002	12.00	17.4	16.9	"Concretions Passage" (colony zone)	16.4	
20.12.2002	11.30	-2.7	-1.6	Idem	12.5	12.1
				Idem (final zone)	13.0*	13.0
				"Big Room"	11.5*	11
13.03.2003	12.30	4.5	3.9	"Concretions Passage" (colony zone)	11.0*	10.6
11.06.2003	13.15	36.8	23.1	Idem	19.1*	18.2
				"Big Room"	21.4 *	18.5
				"Small Room"	18.6	

*) The asterisk indicates temperature [°C] near the bat colonies (air, wall).

MATERIAL AND METHODS

Our methods for estimating the bat populations in the Gura Ponicevei Cave suppose direct counting and visual estimation of compact bat colonies, with an applied coefficient for number of individuals/surface according to each species: with small, medium and large sized individuals. Identification of species was based on observations, using the batdetectors and examinations in laboratory of found skeletons and died but complete bodies of some individuals. Nursery colonies were described only after written data on the size of the roosts, temperature and relative humidity, the distance of colonies from the entrance, etc. Netting (with Japanese nets) we used less, and avoided it completely in the nursery period. More often, isolated individuals from colonies were captured with a net of 40 cm diameter, fixed in a 5 m long telescopic stick. This system does not damage bat individuals and does not disturb the colonies.

RESULTS

In the Gura Ponicevei Cave there are both hibernating and nursery colonies. The first category is localized in the Concretions Passage, Small Hall and Large Hall as well as in Bat Gallery. These colonies are mixed, with *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. mehelyi*, *Myotis myotis*/*M. blythii*, *M. dasycneme*, *M. capaccinii*, *M. daubentonii*, *Plecotus auritus*/*P. austriacus* and *Miniopterus schreibersii*, only in small colonies with only 5–15 specimens (e.g. *Plecotus* sp.) or

even isolated individuals (e.g. *R. hipposideros*). The second category is mixed: *M. myotis* is mixed with *M. blythii* and the colonies of *M. capaccinii*, *M. dasycneme* and *M. daubentonii* are also mixed. The number of *M. dasycneme* individuals is prevalent in all mixed colonies and *M. daubentonii* has probably the smallest number of individuals. *Miniopterus schreibersii* is not always separated by *Myotis myotis*/*M. blythii* groups. *Rhinolophus euryale* forms isolated groups and are sensitive to the human presence. Walking under the colony, determined the change of its location. The colony of *Rhinolophus mehelyi* was isolated but less sensitive to the human presence.

Rhinolophus ferrumequinum can be considered a relatively frequent species in Dobrogea and in the Western part of Romania. Even if it appears in small colonies distributed in these zones it is present among the species from almost all identified roosts. In spite of the early reports (by Călinescu, 1931) for the South-Western part of Romania, yet *R. ferrumequinum* was not cited from the Gura Ponicevei Cave up to 2001 (Gheorghiu and col.). In our survey it was found by us all along the year. Thus, in August 2002, the species was represented by small groups of individuals (only 32 totally); the same small number was found in prehibernation period (total = 30 individuals). In hibernating period, the number of individuals of *R. ferrumequinum* increased up to 570 in both galleries (Tab. 2). This means that the species uses other roosts (tree hollows, constructions), leaving caves in the maternal period. However, some adult males and young individuals remain in the caves over the summer time. It is a vulnerable species because of destruction of habitats and perturbances in the hibernating colonies.

R. hipposideros is represented mainly by solitary individuals. In summer, this species was not found in the cave at all. This means that *R. hipposideros* leaves totally the caves and shelter in other types of roosts for nursery colonies. Appearing in the Gura Ponicevei Cave starting with October, the hibernating colonies count up to 130–150 individuals.

In spite of its large distribution it is a vulnerable species because of anthropic threats.

R. mehelyi was reported in the Romanian literature only from South-Eastern part of Romania (Miller, 1912; Bunesco, 1959). It is recognized as a species with discontinuous distribution, now having small and isolated populations all over its range, between Spain and the Caspian Sea. Most of the individuals (150–160) were observed in Gura Ponicevei Cave only in winter. Usually, the nursery colonies of *R. mehelyi* roost also in caves, but in summer only 60 individuals were observed in the same cave. Dumitrescu and col. (1962–1963) and Valenciuc & Valenciuc (1973) reported large colonies, with more than 5000 individuals, from Bats' Cave – Dobrogea. Decu and col. (2003) reported the present stage of the colony almost in extinction in this roost. However, this colony counts only several tens of individuals and in other roosts the largest colonies of this species are with maximum 300 individuals. They are both in separate colonies and mixed ones with *Myotis myotis* and *Miniopterus schreibersii*. Its vulnerability appears because of the tourists' uncontrolled entrance who destroy habitats, making fire and noise. It should be the first report out of South-East part of Romania and the fifth shelter known in Romania, according to the chiropterological literature. It is an extremely vulnerable species.

R. euryale, the fourth rhinolophid, was reported for the first time from Gura Ponicevei Cave. In the Romanian literature it was reported in South-West part of the

country, starting with the beginning of 20th century. So it should be expected to be present in Gura Ponicovei Cave too, for small nursery colonies. However, during our visits to Gura Ponicovei Cave, this species was observed only in summer (900 individuals in 2002, and, in 2003, with 1,500 individuals). They were grouped separately by other bat species. It is a rare species because of the destroying of its preferred habitats.

Myotis myotis/M. blythii were found in summer colonies counting up to 3,000 individuals, while in hibernating colonies they were less than 100. Probably the hibernating colonies were in other neighbouring caves or migrated towards the South-Western part of Romania. This species was reported since the beginning of the 20th century, starting with Paszlawzsky (1918), then Călinescu (1931), Dumitrescu and col. (1962–1963) and Murariu (2000). Gura Ponicovei Cave was mentioned together with Plavișevița and Veteranilor Caves near Orșova city. The distribution of the species is all over in the Western half of the country. Caves, tree hollows and garrets are the preferable roosts for nursery colonies. Caves from the Southern part of their range are preferable for hibernation. However, in the Ponicovei cave they were the dominant species in summer, when the total number of bat species was 6, comparing with 9 in autumn and 10 in winter. *Myotis blythii* is usually mixed with *M. myotis*, especially in caves. The species are in recover process of populations (based on observations on several roosts).

Myotis capaccinii is mainly distributed in South-Western part of Romania. In Gura Ponicovei Cave the species was present in all seasons over the year: 2,000 individuals in summer and the same number during winter. It is considered a rare species with populations at risk, having small colonies only in several caves from South-Western part of Romania. This species was never numerous in the Romanian and European range. Therefore it is a vulnerable species and needs special protection maintaining the preferred roosts (caves) with foraging and protected habitats.

Myotis dasycneme could be considered the most important report in the Romanian bat fauna, because nobody reported it again since Paszlawzsky (1918) from Ianoș Cave – South-West part of the country. Specialists doubted the existence of this species and most of them considered it already extinct. Excepting Ponicovei Cave, *M. dasycneme* can move in summer in tree hollows. However, the species was present in Ponicovei Cave with a permanent colony. Excepting caves, *M. dasycneme* uses tree hollows, garrets and any kind of construction.

Pipistrellus pipistrellus/P. pygmaeus are species poorly represented in Gura Ponicovei Cave. Colonies were not observed neither in summer nor in winter. Only in October, 10 individuals were found, probably staying there till another roost for hibernation is available for them. Both species can stay in very varied roosts: tree hollows, garrets and towers of different constructions, under the tiles of the roofs, in pantries and cellars, but where there aren't colonies of several thousands of bats as in some large caves of the Carpathian Mountains (Dumitrescu & Orghidan, 1963; Gheorghiu & Murariu, 2002; Murariu and col., 2004). Although they seem to be common species, their populations decreased very much, therefore they need to be protected by law.

Nyctalus noctula is maybe the species with the largest distribution on the Romanian territory, being able to adapt to all kind of roosts: caves and stone cracks, tree hollows and refuges under the tree bark, garrets, pantries, window lintels and any profile of the walls which allow the keeping of a higher temperature than the

outer one. In Gura Ponicevei Cave only 20 individuals occurred, gathered in a fissure of the Bats' Gallery for hibernation (in December and in March). We can assert that it is a common species, with a large adaptive plasticity to varied ecological conditions, but yet it needs protection measures, as an faunistic element used in pest control of the cultures.

Plecotus auritus/P. austriacus are two species with continuous decreasing of populations. Usually they are not gregarious species (Barbu & Sorescu, 1968), excepting the nursery colonies which can count up to 60 individuals. The largest hibernating groups were with 5–6 individuals roosting in Gura Ponicevei Cave, but they shelter in tree hollows and in buildings from all over the country. Even with this large distribution and their possibilities to adapt to any kind of roosts, they remain with small and isolated populations, with a very low number of individuals. Considering Romanian bat fauna, they need to be protected.

Miniopterus schreibersii is the species with important colonies for hibernation and nursery. In summer, a nursery colony of some thousands of individuals was observed, but later on, in October, only 30–50 individuals remained. Often the individuals of this species form mixed colonies with *M. myotis/M. blythii* (Gheorghiu and col., 2004). During prehibernation period (October) the colony was not observed in the roost. We presume that it was in other roosts, for breeding. Population dynamics of *M. schreibersii* can be a subject for further observations.

Although it is mainly reported from the Circum-Mediterranean Europe its range reaches the South of Poland.

In Romanian territory important populations still exist, with large colonies (Barbu, 1960). A continuous numerical regress is present. We have mentioned before that the Gura Ponicevei Cave is warm, the lowest temperature being of -2.7°C and the heighest one of $+26.6^{\circ}\text{C}$, this conditions being permanently optimum for *Miniopterus schreibersii*. Maybe the unfavourable climatic factor limited the northwards distribution besides the anthropic pressure (uncontrolled tourism in the caves, distroyings and polluting of the foraging habitats). It is already known that *M. schreibersii* consists of very good flying individuals, they being able to migrate on large distances (frequently till 100 km between the roosts with nursery and hibernation colonies), and the pressure of the mentioned factors can generate their retreating in front of the unfavourable conditions.

Conclusions

Gura Ponicevei Cave is a refuge with optimum conditions for sheltering some bat species during hibernation (e.g. *Rhinolophus hipposideros*, *R. ferrumeuquinum*, *Pipistrellus pipistrellus/P. pygmaeus*, *Nyctalus noctula*, *Plecotus auritus/P. austriacus*). Other species shelter here both for hibernation and nursery (e.g. *Rhinolophus mehelyi*, *Myotis capaccinii*, *M. dasyncneme*, *M. daubentonii*, *Miniopterus schreibersii*), and others, only for nursery (e.g. *Rhinolophus euryale*).

The populations of 3 from the 15 species mentioned for this roost were not estimated in absolute figures, staying in very high places, mixed with similar species (*Myotis myotis/M. blythii*, *M. capaccinii*, *M. dasyncneme*, *M. daubentonii*), or hidden in the wall cracks (*Pipistrellus pipistrellus/P. pygmaeus* and *Plecotus auritus/P. austriacus*). For such cases the estimations were made for species complexes.

R. mehelyi, a species which became vulnerable in the Romanian fauna, is mentioned in S-W Romania for the first time, till now the distribution of this species being recorded only in Dobrogea.

Table 2

Biological cycle of bats in Gura Ponicevei Cave*

GENUS, SPECIES	PERIOD / OBSERVATION DATES				
	MATERNITY 11.08.2002	PREHIBER- NATION 26.10.2002	HIBER- NATION 20.12.2002	HIBER- NATION 13.03.2003	MATERNITY 11.06.2003
<i>Pipistrellus pipistrellus</i> / <i>P. pygmaeus</i>		10			
<i>Miniopterus schreibersii</i>	1100	30	1450	1300	1500
<i>Rhinolophus ferrumequinum</i>	32	30	572	150	19
<i>Myotis myotis</i> / <i>M. blythii</i>	3000		80	80	2500
<i>M. capaccinii</i> 1	(1+2+3) 2000	5	(1+2+3)2000	(1+2+3)2000	(1+2+3) 1700
<i>M. dasycneme</i> 2		5			
<i>M. daubentonii</i> 3		3			
<i>Rhinolophus mehelyi</i>	60		162	150	
<i>R. euryale</i>	900				1500
<i>R. hipposideros</i>		9	130	40	
<i>Plecotus auritus</i> / <i>P. austriacus</i>			6	2	
<i>Nyctalus noctula</i>			20	20	
TOTAL INDIVIDUALS	7092	92	4420	3742	7219

* The presented bat species and numerical estimation are based on the direct observations. We presume that next investigation can deeply modify our presented data. (Some zones are difficultly accessed for making observations).

Another strictly protected species, with a low number of roosts in Romania, and mentioned in Gura Ponicevei Cave is *Myotis dasycneme*.

From the 11 vespertilionid species, *Pipistrellus pipistrellus*/*P. pygmaeus*, *Nyctalus noctula* can be considered accidental presences, with a low number of individuals, sometimes only during the prehibernation period.

A different bat category belongs to the species considered common for this area, either by their large number of individuals within a population (*Rhinolophus ferrumequinum*, *Myotis myotis*/*M. blythii*) or with a large distribution, even in small and isolated populations, as *R. hipposideros*. All these species require a special protection because of the severe diminishing of their populations all around Europe. Genofund present here can assure a recovering of the diminished populations from other areas. Other species, considered common due to their continental distribution (e.g. *Pipistrellus pipistrellus*/*P. pygmaeus*, *Nyctalus noctula*, *Plecotus auritus*/*P. austriacus*) need protection, especially for their important part in the biological pest control.

Gura Ponicevei Cave proved to be one of the most important roosts for the chiropterans from the Danube Gorge, where 9 of the 14 bat species are preserved, with special protection laws, according to the legislation of the European Union. Under these circumstances it is necessary this cave to be included within the list of the protected areas according to Nature 2000 Project. For this reason, the cave needs urgently a specialized custody for the bat protection and conservation.

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STRUCTURA SPECIFICĂ A LILIECILOR DE-A LUNGUL ANULUI ÎN PEȘTERA GURA PONICOVEI DIN CARPAȚII DE SUD-VEST (ROMÂNIA)

REZUMAT

Condițiile climatice optime din peștera Gura Ponicovei permit instalarea coloniilor de lilieci, fie numai pentru hibernare (*Rhinolophus hipposideros*, *R. ferrumeuquinum*, *Pipistrellus pipistrellus*/*P. pygmaeus*, *Nyctalus noctula*, *Plecotus auritus*/*P. austriacus*), fie pentru hibernare și creșterea puilor (*Rhinolophus mehelyi*, *Myotis capaccinii*, *M. dasycneme*, *M. daubentonii*, *Miniopterus schreibersii*). Specia *Rhinolophus euryale* este dată ca exemplu cu colonie în această peșteră numai pentru creșterea puilor. Din totalul de 15 specii identificate, 4 aparțin familiei Rhinolophidae, iar 11 – familiei Vespertilionidae. Din ultima familie, speciile *Pipistrellus pipistrellus*/*P. pygmaeus* și *Nyctalus noctula* au fost reprezentate printr-un număr mic de indivizi (a doua specie fiind întâlnită de fapt numai în perioada de prehibernare) și de aceea sunt considerate ca prezențe ocazionale.

Rhinolophus mehelyi este la prima semnalare în sud-vestul României, iar *Myotis dasycneme* este la prima raportare din peștera Gura Ponicovei.

Ținând seama de constatarea generală privind scăderea numerică a populațiilor fiecăreia din cele 15 specii de lilieci și că 9 din ele figurează între speciile de interes comunitar (trecute în legislația europeană de conservare a speciilor), apreciem necesitatea ocrotirii lor pe orice cale, inclusiv printr-o documentație pentru includerea peșterii Gura Ponicovei între zonele/ariile protejate din România.

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