

Revision of the occurrence of *Rhinolophus euryale* in the Carpathian region, Central Europe

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Abstract. The records of *Rhinolophus euryale* at the northernmost margin of its range in southern Slovakia and northern Hungary represent isolated spots of the species occurrence and together with the parts of the species range in Romania and Serbia are associated with the Carpathian mountain system. We revised distribution status of *R. euryale* in this mountain range and gathered more than 1600 records, both published and original. Five more or less isolated groups of records within the Carpathian range, bounded by 43–48° N and 18–23° E, have been recognised: (1) Southern Carpathians (NE Serbia and SW Romania), (2) Transylvania (W Romania), (3) Bükkvidék Region (N Hungary), (4) Gemer-Turňa / Gömör-Torna Region (S Slovakia and N Hungary) and (5) Dunazug-hegyvidék Region (NW Hungary), being separated from each other by river valleys, high mountains or mountains without extensive karst areas, and/or by the Pannonian Lowland. Analysis of roost types showed that attics of buildings nowadays represent 26.3% of all known roosts of nursery colonies; hence, in the Carpathian region *R. euryale* uses a more diversified roosting strategy compared to the remaining parts of the species distribution range. The evidenced distances of movements were rather small (range 0.5–16.7 km), suggesting sedentary character of the local Carpathian populations. Considering these results, based on evaluation of the banding data and on the data from simultaneous censuses (both summer and winter colonies) in some parts of this range (Slovakia, Hungary), we estimate the abundance of *R. euryale* in the whole Carpathian system at some 30,000 individuals only.

Faunistics, roosts, recovery, banding data, Hungary, Romania, Serbia, Slovakia

Introduction

The Mediterranean horseshoe bat, *Rhinolophus euryale* Blasius, 1853, is a typical bat of the thermo-Mediterranean zone of Europe. The species is distributed from northwestern Africa through most of southern Europe to the Middle East and the Caucasus. Southern and eastern limits of its distribution range lie in the Levant and Iran (Ibáñez 1999, Horáček et al. 2000, Gaisler 2001). The northernmost margin of its range is found in southern Slovakia and northern Hungary, where isolated populations occur in separate karst areas (Uhrin et al. 1996a, Boldogh 2007d, Hanák et al. 2010). To these Central European parts of *R. euryale* range, the closest areas of the species occurrence are present in Romania and Serbia (Fig. 1), all these patches of distribution are associated with the Carpathian mountain system. Romanian and Serbian spots of this range are represented by populations directly connected to the continuous south-European parts of the species range in the Balkans and Dalmatia (Gaisler 2001).

The Mediterranean horseshoe bat is considered a species under risk, with conservation status evaluated as near threatened or vulnerable on the global level (Hutson et al. 2001, Temple & Terry 2009). An evidence of population decrease has been observed in some parts of Europe; this is perhaps due to a high level of human pressure (e.g. Brosset et al. 1988). In the Carpathian part of its range, *R. euryale* was evaluated as a rare species with only a limited abundance (e.g. Topál 1954, 1969). The only exception is the occurrence in Serbia, the species is considered to be common in suitable regions of this country (Paunović & Stamenković 1998). Anyway, the species is listed among the most threatened mammals in almost all countries of its distribution range (Stollmann et al. 1997, Báldi et al. 2001, Witkowski et al. 2003, Paunović et al. 2004, Murariu 2005). However, e.g. in Slovakia, no remarkable trend of long-term decrease in population numbers has been observed in the last years (Uhrin et al. 2010). In contrast to this evaluation, some marginal sub-populations in Hungary have been considered decreasing in the local scale and under a high risk of extinction (Boldogh 2007a, d, Paulovics & Juhász 2008). In addition, in the northern part of the Carpathian range, original roost preferences have been documented in maternity colonies, which occupy rather man-made structures (house attics) than natural roosts (caves); this suggests a certain shift in roost selection in the particular populations (see Horáček & Zima 1979). Considering these facts, a revision of distribution range of *R. euryale* in the Carpathian region is thus urgently needed.

A detailed review of *Rhinolophus euryale* occurrence in the Carpathian region has been provided only for Slovakia so far (Uhrin et al. 1996a). Although the data were quite intensively gathered also in all other Carpathian countries, their reviews remained unpublished (e.g. Paunović 2001, Paunović et al. 2004, Szodoray-Parádi et al. 2002). However, these data were used as a basis for several publications generally presenting outlines of the species range with the help of various square mapping approaches on both European and national levels (Valenciuc 1993, Ibáñez 1999, Boldogh 2007d, Hanák et al. 2010, Uhrin et al. 2012). In the last several years, a significant number of new records of *R. euryale* has been gathered, enabling us to define precisely the pattern of distribution of this bat in its Carpathian range. This paper presents a summary of the occurrence of *R. euryale* in this unique promontory from the continuous range in the Mediterranean. Such account can naturally give an opportunity to analyse possible intrinsic trends in these populations, which will be presented in a subsequent study.

Material and Methods

All available data, both published and original, on the occurrence of *Rhinolophus euryale* in four countries of its Carpathian range (Slovakia, Hungary, Romania, Serbia) were gathered; these records cover the period from before 1859 till 2012

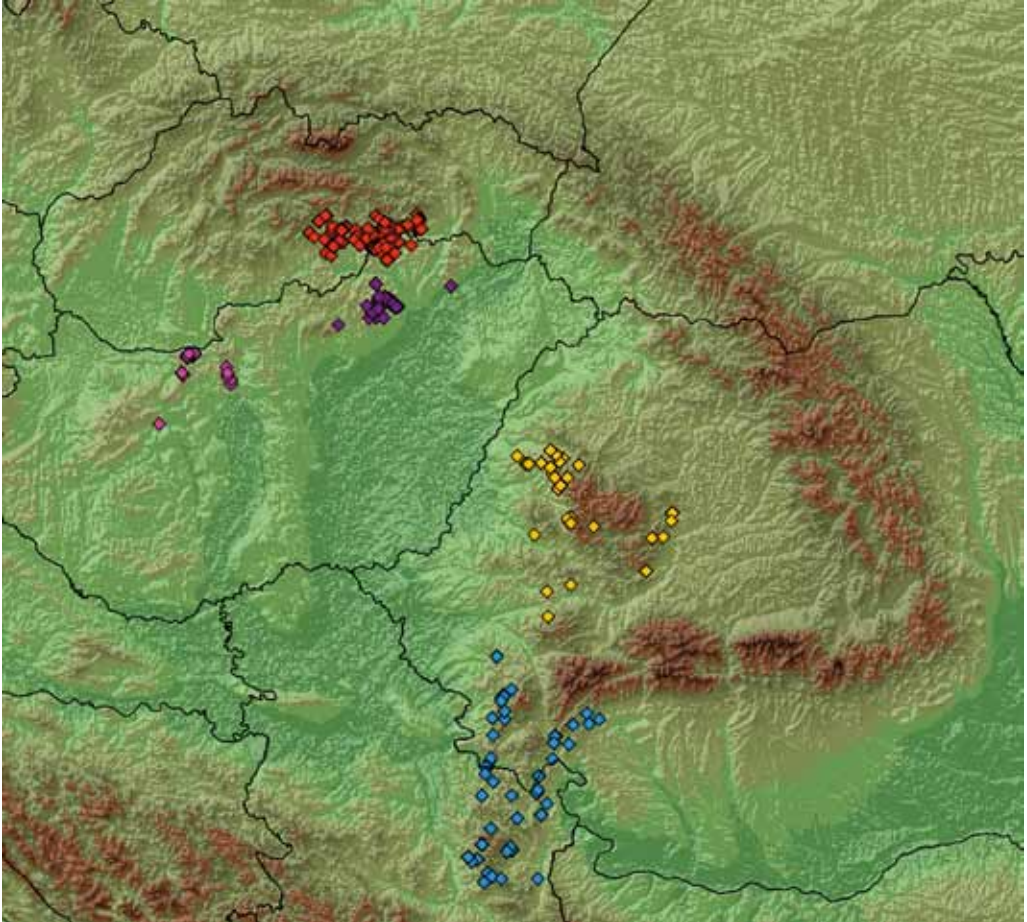


Fig. 1. Map of records of *Rhinolophus euryale* in the Carpathian region. Southern Carpathians – blue, Transylvania – light orange, Bükkvidék Region – violet, Gemer-Turňa / Gömör-Torna Region – red, Dunazug-hegyvidék Region – pink. For detailed description of regional groups of records see text in chapter General Patterns of Distribution.

(see Appendix). Field data were collected applying common bat research techniques, e.g. inspections of potential roosts (lofts, mines, and caves), nettings of bats in various habitats (mainly at the entrances to roosts) and using bat detectors. In the whole range under study, echolocation parameters of the species described from the core of the species range (e.g. Russo & Jones 2002, Papadatou et al. 2008) were used for evaluation of the recorded calls. Besides these approaches, some records of the species originate also from the analysis of owl pellets.

The complete database comprises more than 1,600 records of *R. euryale* (see Table 1). All records of *R. euryale* were set to coordinates in the World Geodetic System (wgs84) and visualised in the Quantum GIS (2012) software environment using free spatial data available at DIVA-GIS (<http://www.diva-gis.org>). To estimate extent of the species range in particular regions (Fig. 1, Table 2), a minimum convex polygon was calculated in Quantum GIS.

Results and Discussion

General pattern of distribution

Despite the great number of new records gathered for this account, these data did not change considerably the general extent of the distribution of *Rhinolophus euryale* in areas at the northern margin of the species range in Central Europe, as summarized earlier by Ibáñez (1999) and Gaisler (2001). However, the presented data enable us to describe the patterns of its occurrence in more details. The Carpathian range of the species is clearly restricted to the warmest parts of the mountain system, covering solely the inner edges of the arch of the Carpathian chain. Geographically, the records were made in three sub-provinces of the mountain system, the Serbian Carpathians, Romanian Western Carpathians and the Inner Western Carpathians (Král 2001; Fig. 1). The records were made solely in the hilly areas of the region (Fig. 16) and the species has never been recorded in lowland landscapes; with most probability, *R. euryale* penetrates neither westward to the lowland Pannonia, nor eastward to the Danube basin of Romanian Walachia. In the neighbouring Bulgaria, the species does not approach closely the Danube River and records at lower altitudes are rather scarce (Benda et al. 2003). It also seems likely that the species does not inhabit the basins in the Transylvanian Plateau and does not occur in the highest parts of mountain ranges within the delineated range (e.g. the Bucegi, Făgăraş, Parâng, Retezat, and Godeanu Mts. in the Southern Carpathians and elevated parts of the Bihor, Gilău or the Vlădeasa Mts. in Romania or in the rather elevated positions of the Slovenské rudohorie Mts. [Slovak Ore Mts.] in central Slovakia). Generally, there are no obvious differences between summer and winter ranges of the species in the respective regions (Fig. 2).

All records of *R. euryale* documented in the region could be divided into five groups rather isolated from each other; only one of them is situated outside the proper Carpathian mountain system. These groups of localities are separated from each other by large river valleys (Timiş, Mureş, Slaná/Sajó rivers), high mountains (Semenic, Cernei, Ţarcu, Godeanu Mts.), rather low mountains without extensive limestone/karst areas providing suitable roosts (Cserhát and Mátra Mts.) and mainly by the vast Pannonian Lowland (Fig. 1).

Table 1. Number of sites (s) and records (r) of *Rhinolophus euryale* in the Carpathian part of the species range. Number of nursery colonies is provided in brackets

site / record type	Hungary		Romania		Serbia		Slovakia	
	s	r	s	r	s	r	s	r
hibernacula								
caves	12	233	28	60	9	41	23	288
mines	1	2	1	1			8	21
summer roosts								
buildings	6 [5]	13 [12]	2 [1]	2 [1]	1 [1]	1 [1]	12 [9]	63 [53]
caves	8 [7]	72 [71]	37 [13]	89 [35]	16 [10]	61 [23]	17 [8]	99 [39]
mines	5 [2]	39 [33]			1 [0]	1 [0]	7 [1]	35 [6]
transient roosts	41	193	4	5	11	19	11	44
nettings	11	29	6	7	2	3	29	162
osteological remains								
owl pellets			1	1			9	16
tapho- & thanatocoenoses	2	4	2	4			7	13
others	18	23	8	8			5	6
total	80		55		30		72	

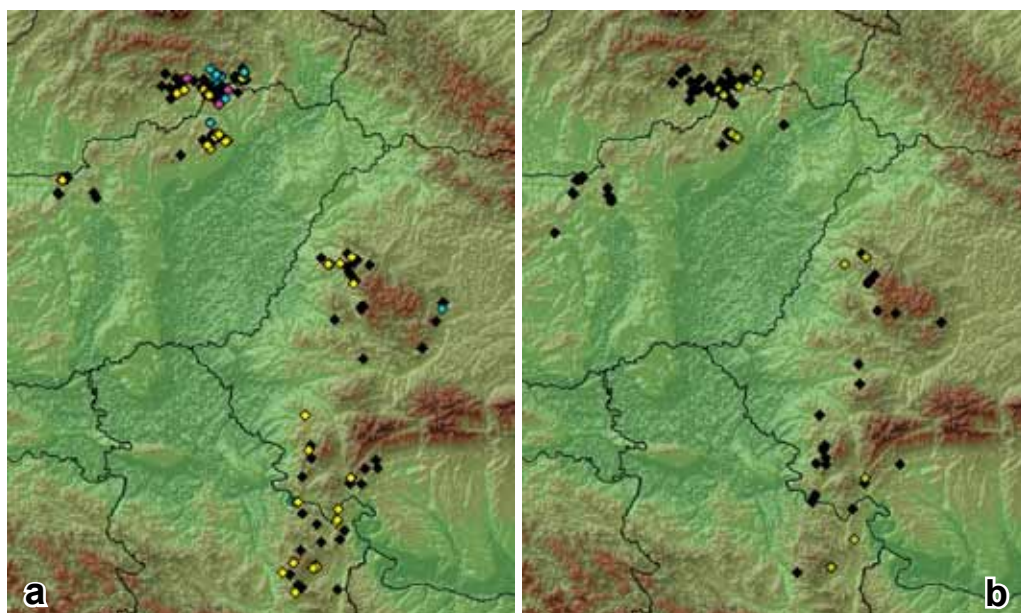


Fig. 2. Map of summer and winter records of *Rhinolophus euryale* in the Carpathian region. a – nursery colonies with more than 30 individuals (caves – yellow diamonds, mines – pink diamonds, buildings – blue diamonds) are shown in the map of other summer records (black diamonds). b – hibernacula with more than 100 individuals (light green diamonds) are shown in the map of other winter records (black diamonds).

Southern Carpathians. The southernmost group of the Carpathian records of *R. euryale* comes from northeastern Serbia and southwestern Romania; this area continues to the core range of the species in the Balkans (Gaisler 2001). Among the registered records, the sites situated most southward within the Carpathian system lie in the Rtanj and Tupižnica Mts. (ca. 43° 47' N; Serbia), on the southern geographical/geological border of the Serbian Carpathians (Marković 1980). The species was recorded in the Romanian part of Banat already in the 19th century, the records are available from the Peștera Gaura cu Muscă cave (Kolenati 1860, Méhely 1900). This roost is contemporarily used both as a hibernaculum and a nursery of *R. euryale* together with several other bat species (max. 400 individuals; Nagy & Postawa 2010). The record sites are situated in limestone mountain ranges covered by deciduous forests on both sides of the Iron Gate gorge of the Danube (= Porțile de Fier / Đerdapska klisura; Figs. 1, 2; Paunović & Stamenković 1998, Nagy & Postawa 2010). Most of the records have been documented in the Kučajske planine Mts., Šomrda Mts., and the Miroč Mts. in Serbia, as well as in the Locvei and Aninei Mts. in Romania. The region is rather limited in its area (some 13,000 km²; Table 2) with about 60–100 km in the maximum longitudinal extent. The easternmost sites in this region are situated in Romania, on the southern slopes of the Southern Carpathians and are represented by both winter and summer roosts in caves (the Peștera Bulba, Peștera Lazului, and the Peștera Fușteica caves; ca. 22° 54' N). The northernmost roost in Banat (Peștera Padina Matei cave, ca. 45° 30' N) is also the site lying most closely to the agricultural landscape of Pannonia (ca. 21° 48' E). *R. euryale* still remains unknown from the whole Serbian part of Banat (Vršački breg Mts.) and from quite a large area in

Table 2. Range area (ra), number of sites (s), density of sites (s-d) and estimated abundance (ea) in particular regions within the Carpathian range of *Rhinolophus euryale* (see text for details). Legend: w – winter period, s – summer period

region	ra [km ²]	s	s-d [s/km ²]	ea [inds.]	
				w	s
Southern Carpathians (NE RS, SW RO)	13,112	54	0.004	2,400–2,800	5,000–7,000
Transylvania (W RO)	14,126	32	0.002	570–700	1,200–1,500
Bükkvidék Region (N HU)	1,356	46	0.034	1,200–1,300	9,300–10,000
Gemer-Turňa / Gömör-Torna Region (S SK, N HU)	2,537	89	0.035	5,500–7,000	11,600–11,900
Dunazug-hegyvidék Region (N HU)	1,513	21	0.014	100–200	150–200
total	32,644	242	0.007	9770–12000	27250–31600

the central part of Romanian Banat (Munții Almăjului and Munții Semenic Mts.; Fig. 1). Considering the lack of larger limestone layers and suitable caves in this region (cf. Bleahu et al. 1976, Orghidan et al. 1984), the absence of this bat is not surprising there. Besides some less important roosts in the Semenic Mts. (e.g. the caves of Peștera Găurile lui Miloi, Peștera cu Apă din Cheile Gârliștei, and Peștera Liliecilor din Cheile Carașului), the only noteworthy roost is known from the southern part of the Almăjului Mts. near the Danube, where an abundant nursery colony was reported from the Peștera Gura Ponicovei cave in 2002 and 2003 (900–1500 individuals; Murariu et al. 2004). However, rather intensive inspections of this cave during the last decade have not confirmed the existence of this colony (Uhrin et al., unpubl. data).

Transylvania. In western Romania, records of *R. euryale* are concentrated to several sections of the Apuseni Mts. This region is known to be the richest in karst phenomena in Romania (cf. Bleahu et al. 1976, Orghidan et al. 1984; Figs. 1, 2) and thus, it possesses rich availability of roosts for cave dwelling bats. The area is, among all identified groups of the Carpathian records, geographically the most extensive (Table 2), however, the prevailing number of sites is concentrated to the northwestern part of the area, to the Pădurea Craiului Mts. as well as to the Trascău Mts. in the northeast (cf. Bücs et al. 2012). This region is separated from the southern group of *R. euryale* records by the Timiș river valley and by the rather high Poiana Ruscă Mts., giving a distance of some 40 km only. In the Românești cave (48° 47' N), situated at the northern edge of the Poiana Ruscă Mts., the southernmost record of the species in Transylvania was documented. In the Zarandului and Metaliferi mountain chains only a few records of *R. euryale* were made (Dumitreșcu et al. 1963, Barti 2005, Bücs et al. 2012). In the Peștera Igrîța cave (47° 01' N) situated in the Pădurea Craiului Mts., *R. euryale* reaches the northernmost margin of the Serbian-Romanian distribution range (cf. Topál 1954, Borda 2002). The species reaches the easternmost occurrence point in the whole Carpathians in the limestone region of the Turzii Gorge in the Cluj District (the Cetățuia Mare and Cetățuia Mică caves; 23° 40' E). Although one record situated more eastward was reported from Romania, from the Piatra Craiului Mts. in 2000 (Szántó 2000), credibility of this report is rather limited. Until any further data are provided and mainly, with respect to the known pattern of *R. euryale* distribution in Romania, we tentatively consider this record as doubtful. The only known synanthropic roost of a nursery colony in an attic in Romania was found in a church in Moldovenești, the Trascău Mts. In Southern Carpathians and Transylvania, *R. euryale* occurs at most of the sites in sympatry or even syntopy with its congener *Rhinolophus blasii* Peters, 1866 (e.g. Kryštufek & Petrov 1989, Paunović & Stamenković 1998, Paunović et al. 1998, Bücs et al. 2012).

While the latter two groups of records are in direct connection with the core range of the species distribution in the Mediterranean (Gaisler 2001) and the populations most probably communicate with each other, the other three groups of records of *R. euryale* are situated at the northern margin of the Pannonian Lowland in Hungary and Slovakia, far from the continuous species range. These groups are separated from the two southern groups of the Carpathian records (Southern Carpathians, Transylvania) by the extensive steppes of Pannonia by about 140 km of aerial distance and clearly represent an island of occurrence out of the Mediterranean arboreal zone. Although an impact of such isolation on the population structure has not been studied in detail, the geographical separation was emphasised by several authors (Uhrin et al. 1996a, 2012, Schober 1998, Dietz et al. 2009b) and led to a wide research interest in these populations (see Miková et al. 2012). The area of these three spots of occurrence is geographically rather limited and covers some 6,000 km² only. In the northern part of this area, the highest density of sites of *R. euryale* records was documented, considering the whole Carpathian range (Fig. 1, Table 2).

Bükkvidék Region. This region of *R. euryale* occurrence is situated close to the northern margin of the Pannonian Lowland. Geographically, the records come from three mountain ranges in total; the Bükk, Mátra and Tokaj-Zempléni-hegyvidék Mts. (Fig. 1). Relatively the highest number of records of *R. euryale* has been documented in the karst landscape of the Bükk Mts., where more than 40 sites are available (e.g. Vásárhelyi 1939, 1942, Czajlik 1986, Dobrosi 1994, Boldogh 2008). Almost all roosts of *R. euryale* found in these mountains were situated in caves; several noteworthy hibernation sites (e.g. the Kőlyuk-barlang and Vár-tetői-barlang caves) as well as roosts of large nursery colonies (e.g. the Kecse-lyuk, Herman Ottó-barlang caves) are available there. The only exception in this region is a nursery colony roost in a church attic in Bánhorváti, where a large colony has been registered since 2008 (Table 3). In the Mátra Mts., only one site of summer occurrence has been documented, from the Antal-taró mine; similarly, only one site has been registered in the Tokaj-Hegyalja Mts., where the species has been found to hibernate in the Bomboly-bánya mine near Mád (Bihari et al. 2000).

Gemer-Turňa / Gömör-Torna Region. In this region, the highest number of record sites of *R. euryale* has been documented so far, considering its whole Carpathian range. A comprehensive evaluation of distribution of *R. euryale* in this area has already been published previously (Uhrin et al. 1996a, Boldogh 2006); the recent review of records (Fig. 1) shows a very similar geographical picture to those given by the latter authors. The record sites are concentrated to a small area of ca. 2,500 km² (Table 2) and are more or less evenly distributed over the whole region. Most of the sites are situated in the large limestone areas of the Slovenský kras Mts. (Slovak Karst) and of the Aggtelek-Rudabányai-hegyvidék and Aggteleki-karszt Mts. From the latter region, the most abundant aggregation of *R. euryale* within the whole Carpathian range is known, from the Baradla cave (Hungary) comprising some 4,500 bats (Fig. 12). In the Gemer-Turňa / Gömör-Torna region, *R. euryale* reaches the northernmost known occurrence within its whole distribution range, approaching 48° 42' N. Several *R. euryale* records were reported at this latitude (e.g. the Šarkanica cave, record in *S. aluco* diet; the Adam mine and the Dielik railway tunnel, hibernacula; the Betliar castle attic, nursery; Uhrin et al. 1996a, Matis 2002c) and all these sites are situated on southern slopes of rather high mountains (e.g. the Muránska planina, Volovské vrchy and the Revúcka vrchovina Mts.). Most probably, the species is unable to cross high altitudes of these mountain ranges. Three other records have been reported from Slovakia, situated more northwards from the above mentioned latitude (they are not shown in the maps in Figs. 1 and 2; for positions of these records see the map by Uhrin et al. 1996a: Fig. 3A); we consider all these records questionable. These records were reported from regions situated too far from the currently known species

Table 3. List of the most important roosts of *Rhinolophus euryale* within the Carpathian range. Legend: max. – maximum number of individuals counted

site	roost type	colony type	max.	country
Bánhorváti, church	attic	reproduction	400	Hungary
Jasov, monastery	attic	reproduction	350	Slovakia
Silická Jablonica, church	attic	reproduction	300	Slovakia
Biserica Unitariană din Moldovenești	attic	reproduction	207	Romania
Drnava, mansion	attic	reproduction	75	Slovakia
Csehi-hegy	building	reproduction	730	Hungary
Baradla-barlang	cave	hibernation	4651	Hungary
Lazareva pećina	cave	hibernation	1500	Serbia
Kőlyuk-barlang	cave	hibernation	700	Hungary
Drienovská jaskyňa	cave	hibernation	693	Slovakia
Arđovská jaskyňa	cave	hibernation	309	Slovakia
Peștera de la Stracoș	cave	hibernation	300	Romania
Canetova pećina	cave	hibernation	200	Serbia
Peștera de la Gălășeni	cave	hibernation	195	Romania
Pisznice-barlang	cave	hibernation	101	Hungary
Pećina Bela Sala	cave	male summer roost	120	Serbia
Kecske-lyuk	cave	reproduction	4500	Hungary
Herman Ottó-barlang	cave	reproduction	3000	Hungary
Peștera Gura Ponicovei	cave	reproduction	1500	Romania
Ljubinkova pećina	cave	reproduction	1200	Serbia
Krásnohorské Podhradie, church	cave	reproduction	750	Slovakia
Peștera de la Tășad	cave	reproduction	600	Romania
Pećina Pećurski kamen	cave	reproduction	500	Serbia
Peștera Gaura cu Muscă	cave	reproduction	400	Romania
Peștera Padina Matei	cave	reproduction	400	Romania
Miskolctapolcai tavasbarlang	cave	reproduction	241	Hungary
Chvalovská jaskyňa	cave	reproduction	200	Slovakia
Pećina Hajdućica	cave	reproduction	200	Serbia
Hajdućka pećina	cave	reproduction	100	Serbia
Peștera cu Apă din Cheile Gârliștei	cave	reproduction	40	Romania
Domica	cave	transitory	2658	Slovakia
Jasovská jaskyňa	cave	transitory	750	Slovakia
Veľká Drienčanská jaskyňa	cave	transitory	200	Slovakia
Lök-völgyi-barlang	cave	transitory	150	Hungary
Pisznicei Határ-barlang	cave	transitory	45	Hungary
Bradlo	mine	reproduction	4000	Slovakia
Andrássy-bánya	mine	reproduction	1840	Hungary
Avenul lui Adam	mine	reproduction	1500	Romania
Esztramos-hegy	mine	reproduction	700	Hungary

range (Pružinská jaskyňa cave; Zajonc 1960) and/or from climatically very different regions, the Nízke Tatry Mts. (Lower Tatra Mts.). From the latter mountains, the records of *R. euryale* have been reported from two sites. In ca. 1933, several individuals of *R. euryale* were collected in the Demänovské jaskyne caves (49° 00' N) (Gaisler 1956); six appropriately labelled specimens are still deposited in the collections of the National Museum, Prague, Czech Republic. However, in the same period (1932), the species was also collected in the Domica cave by V. J. Staněk, then a volunteer in the museum (see e.g. Staněk 1932) and by V. Benický (caretaker of the Domica cave), and the mislabelling of the former specimens thus cannot be excluded. The second record site in the Nízke Tatry Mts. is the Pustá jaskyňa cave, from which a finding of *R. euryale* was



3



5



4



6

Figs. 3–6. Examples of landscape in the surroundings of roosts inhabited by *Rhinolophus euryale* in the Carpathians: 3 – extensive agricultural fields and deciduous forests (mostly *Quercus* spp.) in surroundings of the Peștera de la Gălășeni cave, hibernaculum and roost of *R. euryale* and *R. blasii* nursery colony of ca. 100 individuals, Romania (photo by Sz. Bűcs). 4 – Klisura Lazareve reke Gorge from above the Lazareva pečina cave entrance, hibernaculum of ca. 1,500 individuals of *R. euryale* and *R. blasii*, Serbia (photo by B. Karapandža). 5 – extensive deciduous forests in vicinity of the Jasovská jaskyňa cave (under the stone in the centre of the picture) and Jasov Monastery, where ca. 500 individuals of *R. euryale* form a nursery colony in the loft space and a transient aggregation in the cave, Slovakia (photo by M. Uhrin). 6 – mining landscape in surroundings of the Rudabánya Mine, where a nursery colony of ca. 1,500 individuals *R. euryale* occurs in the Andrásy-bánya Mine (photo by S. Boldogh).

reported by Rybář (1980) from a Holocene bat thanatocoenosis. The specimen from the latter site was recently revised; a skull of an adult individual is deposited in the Museum of East Bohemia, Hradec Králové, Czech Republic. Anyway, this record indicates more extensive range of distribution of *R. euryale* in Europe over the Holocene, since the Boreal period (see e.g. Horáček 1995); however, the Recent occurrence of the species in the northern slopes of the Nízke Tatry Mts. where the Pustá jaskyňa cave lies, is quite unlikely (see also Bačkor et al. 2010).

While some roosts localised in the Gemer-Turňa / Gömör-Torna region are known for a very long time and also, they are under long-term monitoring (e.g. the Baradla barlang and Domica caves; Dudich 1930, 1932, Kettner 1932, Štěpánek 1936, 1939, Boldogh 2006), some other important roosts have been discovered only recently. This is certainly true for example for the mining regions in the Revúcka vrchovina Mts. in central Slovakia or for the vicinity of Rudabánya in northern Hungary (e.g. the Bradlo and Andrassy-bánya mines; Table 3, Figs. 6, 10, 11) or for some roosts in attics or in aboveground rooms in buildings, e.g. the Jasov monastery, the churches at Silická Jablonica (Slovakia), Szinpetri and Perkupa (Hungary), and/or an abandoned building near Szalonna in the Csehi-hegy Mts. (Hungary).

Dunazug-hegyvidék Region. Records of *R. euryale* in the Budai-Hegység, Gerecsevidék, Északi-Bakony, Pilis-hegység and Vértes-hegység Mts. are the westernmost occurrence sites in the Carpathian region (comprising less than twenty sites in total) and represent the only region outside the arch of the Carpathians. This population is the only inhabiting the right side of the Danube in central Europe; it reaches its westernmost point in the Inotai karsztvíz-akna ürege cave (18° 11' E; Paulovics & Juhász 2008) and *R. euryale* was recorded there only once. This locality is isolated from other sites of the respective region by a distance of ca. 40 km (Fig. 1). This conspicuous occurrence spot can be explained as a result of serious human disturbance which dispersed the colony from the most important hibernaculum, situated in the Pisznice-barlang cave (see Paulovics & Juhász 2008). All other localities are situated more closely to the Danube, at the distance of ca. 20 km from the closest mountain part of the Carpathians, the Börzsöny Mts. These sites were formerly known as noteworthy bat roosts, first documented in 1955 and 1988 respectively; in both caves, very rapid declines of the numbers of roosting bats were observed (Juhász 1994, 2007, Molnár 1997). This situation resulted in a special translocation project in order to strengthen this relic population (Paulovics & Juhász 2008, Juhász et al. 2009). Within this project, a long distance (>180 km) translocation of individuals has been repeatedly conducted since 2008. The bats were captured at the beginning of the hibernation period in a cave roost at Rudabánya (N Hungary) and translocated to the Pisznice-barlang cave.

Roosts and habitats

Rhinolophus euryale is traditionally considered to be a strictly cave-dwelling bat in its whole distribution range, using this roost type in all periods of its life cycle (e.g. Paunović & Stamenković 1998, Gaisler 2001, Benda et al. 2003, Kryštufek 2007, Koselj 2009). In the Carpathian part of the species range, caves still remain the most frequently selected roosts in all five regions (Fig. 2, Table 3). The bats use caves as hibernation roosts, nursery colony roosts or as shelters of pre-hibernation aggregations (Figs. 7–10, 15). According to Topál (1962), the sex ratio is normally more or less balanced in maternity roosts during summer. But within the whole Carpathian range one summer aggregation/roost has been identified, where only males were present – the Pečina Bela Sala cave, Serbia, where 40–120 male individuals were aggregated in a mixed colony of *R. euryale* and *R. blasii*. Since the early 1990s, several roosts in man-made underground spaces (abandoned mines, railway tunnels and military bunkers) have been identified in the area under



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Figs. 7–10. Examples of roosts inhabited by *Rhinolophus euryale* in the Carpathians. 7 – entrance to the Peștera de la Tășad cave, roost of a nursery colony of ca. 500 individuals of *R. euryale*, Romania (photo by Sz. Bűtes). 8 – entrance to the Lazareva pečina cave, roost of a nursery colony of ca. 100 inds. and hibernaculum of ca. 1,500 inds. of *R. euryale*, Serbia (photo by B. Karapandža). 9 – view of the Jasov Monastery; large lofts of the building are used as a roost by nursery colonies of four bat species (*R. euryale*, *R. hipposideros*, *R. ferrumequinum*, *Myotis emarginatus*), Slovakia (photo by M. Uhrin). 10 – entrance to the Bradlo mine, roost of a mixed nursery colony of ca. 3,000 inds. of *R. euryale* and *Miniopterus schreibersii*, Slovakia (photo by L. Dluhošová).

study; among them several sites represent very important *R. euryale* roosts (Table 3). Occurrence of the species in several aboveground rooms in buildings was known from the 1950s and 1960s (the Golubačka tvrđava castle, Serbia, in 1958, and the Krásna Hôrka castle, Slovakia, in 1969); however, these roosts are rather cave-like spaces and cannot be considered as real signs of a tendency to synanthropy in *R. euryale*. Nevertheless, the real process of synanthropisation in this species started rapidly in the 1970s, when the first individuals of *R. euryale* were found in attics of several buildings in Slovakia (Horáček & Zima 1979, Horáček et al. 1979, Horáček & Červený 1985). This roost type was very rare within the whole species range (Gaisler 2001); while in the period before 1974 all known nursery colonies were known solely from caves, nowadays nursery colonies consisting of numerous individuals have been recorded in three countries of the Carpathian species range (Table 3, Figs. 2a, 14) and the attic roosts represent 26.3% of all known roosts of nursery colonies in these countries. In Hungary, five attic roosts of nursery colonies have been documented and the church at Bánhorváti is the most noteworthy among them (up to 400 individuals of *R. euryale* at maximum). In addition, an aboveground roost in a building, where more than 700 individuals are present, has been discovered in the Csehi-hegy Mts. near Szalonna (Fig. 13). Solitary individuals in an attic roost in Romania were observed first in 2008 (Willemsen & Thomassen 2009), followed by the discovery of a more numerous colony in 2012 (more than 200 individuals in the church at Moldovenești). While this tendency to the shift of the roosting strategy in *R. euryale* could be now considered as a common trend in its Carpathian range, similar records in other parts of the species range are very rare. Few individual observations are available from Italy (D. Scaravelli, in litt.), Slovenia (Kryštufek & Donev 2005, Koselj 2009) and Bulgaria (Benda et al. 2003).

The altitudinal range of the distribution of *R. euryale* in the Carpathian region is 73–925 m a. s. l., however, the largest proportion of the record sites was found between 200 and 600 m a. s. l. (Fig. 16). The most elevated site is the Šarkanica cave (925 m a. s. l.) on the southern slope of the Muránska planina Mts., central Slovakia, where a skeleton remain was documented from an owl pellet. The most elevated roost of *R. euryale* is the hibernaculum in the Peștera Poarta lui Ionele cave (848 m a. s. l.) in the Bihor Mts. in Romania. In Serbia, nursery roosts have been mostly recorded at significantly higher altitudes than hibernacula. The surroundings of the roosts are a predominantly mosaic-like landscape with deciduous forests (e.g. with tree genera *Quercus*, *Fagus*, and *Carpinus*), disconnected by various, more or less extensive agricultural fields (Figs. 3, 5). Most of the sites are in limestone landscapes, with dramatic relief dynamics, rocky slopes and cliffs, karst phenomena as well as relevant bush-like vegetation cover (Fig. 4). The landscape structures observed in the Carpathian region conform with the data by Goiti et al. (2003, 2008) and Russo et al. (2002, 2005), indicating the structured forests to be the preferred foraging habitats of *R. euryale* in the Mediterranean. The same is also suggested by a study of foraging activity in *R. euryale* conducted in the Slovakian Carpathians (Miková et al. 2012).

Movements and abundance

The Mediterranean horseshoe bat is considered to be a sedentary species, showing strong roost philopatry and undertaking only short-distance movements (up to 50 km on average) between summer, winter and transient period roosts (Gaisler 2001, Hutterer et al. 2005, Dietz et al. 2009a). Limited recovery data from the area of the Carpathians (Tables 4, 5) are based on records of individuals banded mostly in the period 1950–1970 (Topál 1962b, Gaisler et al. 2003) on the Slovak-Hungarian transition area. Anyway, following the general recommendations (cf. Dietz et al. 2006), marking of this species by metal rings has been recently limited to special purposes and projects only (Paunović 1998, Fulín & Matis 2007, Paulovics & Juhász 2008, Juhász et al. 2009).



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Figs. 11–14. Examples of *Rhinolophus euryale* individuals observed in various roost types in the Carpathians. 11 – reproduction colony of *R. euryale* in the Bradlo mine, Slovakia, July 2004 (photo by E. Hapl). 12 – aggregation of ca. 3000 inds. of *R. euryale* hibernating in the Baradla cave, Hungary, February 2012 (photo by S. Boldogh). 13 – nursery colony of *R. euryale* with ca. 700 inds. in an abandoned building at Csehi-hegy, Hungary, July 2012 (photo by S. Boldogh). 14 – part of the reproduction colony of *R. euryale* with ca. 300 inds. in church attic at Krásnohorské Podhradie, Slovakia, July 2003 (photo by S. Matis).

Table 4. Review of the number of *Rhinolophus euryale* individuals banded in the Carpathians, 1948–2012. Legend: n – number of banded individuals, nr – number of recaptured individuals

country	period	n	nr	%	reference
Hungary	1950–2012	760	49	6.45	Topál (1956, 1962b), Juhász et al (2009), this study
Serbia	1960–2012	516	44	8.53	Paunović (1998, 2001), this study
Slovakia	1948–2000	499	11	2.20	Gaisler et al. (2001)
	1996–1998	50	4	8.00	Fulín & Matis (2007), this study
total		1825	108	5.92	

Recovery rate observed in the Carpathian region is quite low (Table 4) and the recaptures are related to movements within a locally limited group of roosts, probably used by local populations as the sites with a certain tradition. The distances of the movements were small (0.5–16.7 km) and document the relations between the nursery colony roosts, hibernacula and/or transient roosts, see e.g. the Miskolc-tapolcai-tavas barlang and Vár-tetői-barlang caves; the Ardovská jaskyňa and Líščia diera caves; the Jasovská jaskyňa cave and the Jasov Monastery; the Hajdučka pečina and Lazareva pečina caves. In the core distribution range in the Mediterranean, the distances between a hibernaculum and a summer roost were found to be larger, with the maximum aerial distance of 58.8 km in Bulgaria (Dietz et al. 2009a). Only exceptionally, longer movements (up to 134 km) were observed in Italy and France (Heymer 1964, Dinale 1967).

The highest longevity in the Carpathian range, defined as the period between banding and recapture, was 4,959 days in males and 3,941 days in females with the average of 993 days for both sexes (Table 4). These maximum ages documented (13 years, 7 months for a male and 10 years, 9 months for a female) conform to the maximum longevity known so far, 13 years, see Crucitti (1976).

In each of the delineated sub-ranges (group of records) of the species within the Carpathian region (Fig. 1), *R. euryale* creates at least one abundant nursery colony in a traditional roost (e.g. the Ljubinkova pečina cave, the Bradlo mine, the Jasov monastery) and one abundant hibernaculum (e.g. the Baradla or Lazareva pečina caves), surrounded by satellite roosts of various types used in various seasons (e.g. roosts of transient pre- and/or post-hibernation aggregations or of single individuals; e.g. Gaura Burci cave, Mandina pečina cave, Domica cave). Thus, the particular



Fig. 15. Newborns of *Rhinolophus euryale* in the Peștera de la Tășad cave, Romania, July 2011 (photo by Sz. Bücs).

Table 5. Movements and longevity in *Rhinolophus euryale* recorded from banded individuals in the Carpathian region, 1948–2012. Legend: no. – ring number; p – period (days), km – distance of movement. * – exact site is not known, most likely identified a cave; dates are in the form dd/mm/yyyy; c. – cave;

no.	sex	banding site	banding date	recovery site	recovery date	p	km	reference
Hungary								
17555	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Miskolc	12/09/1954	57	?	Topál 1956, this study
17618	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Miskolc	12/09/1954	57	?	Topál 1956, this study
17401	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Miskolctapolcai tavasbarlang c.	06/07/1958	1450	0.0	Topál 1956, this study
17448	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Miskolctapolcai tavasbarlang c.	20/07/1958	1464	0.0	Topál 1956, this study
17511	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Miskolctapolcai tavasbarlang c.	06/07/1955	354	0.0	Topál 1956, this study
17535	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Miskolctapolcai tavasbarlang c.	06/07/1955	354	0.0	Topál 1956, this study
17540	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Miskolctapolcai tavasbarlang c.	03/08/1958	1478	0.0	Topál 1956, this study
17551	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Miskolctapolcai tavasbarlang c.	04/07/1955	352	0.0	Topál 1956, this study
17544	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Vár-tetői-barlang c.*	20/11/1955	491	5.8	Topál 1956, this study
17557	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Vár-tetői-barlang c.*	20/11/1955	491	5.8	Topál 1956, this study
17591	♀	Miskolctapolcai tavasbarlang c.	17/07/1954	Vár-tetői-barlang c.*	27/11/1955	498	5.8	Topál 1956, this study
20659	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Vár-tetői-barlang c.*	20/11/1955	491	5.8	Topál 1956, this study
20803	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Miskolctapolcai tavasbarlang c.	20/07/1956	382	0.0	Topál 1956, this study
20814	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Miskolctapolcai tavasbarlang c.	20/07/1958	1112	0.0	Topál 1956, this study
20890	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Miskolctapolcai tavasbarlang c.	20/07/1958	1112	0.0	Topál 1956, this study
20811	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Vár-tetői-barlang c.*	20/11/1955	139	5.8	Topál 1956, this study
20870	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Vár-tetői-barlang c.*	20/11/1955	139	5.8	Topál 1956, this study
20894	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Vár-tetői-barlang c.*	20/11/1955	139	5.8	Topál 1956, this study
20898	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Vár-tetői-barlang c.*	27/11/1955	146	5.8	Topál 1956, this study
20788	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Vár-tetői-barlang c.*	27/11/1955	146	5.8	Topál 1956, this study
20863	♀	Miskolctapolcai tavasbarlang c.	04/07/1955	Vár-tetői-barlang c.*	27/11/1955	146	5.8	Topál 1956, this study
20777	♀	Miskolctapolcai tavasbarlang c.	05/07/1955	Vár-tetői-barlang c.*	27/11/1955	138	5.8	Topál 1956, this study
20797	♀	Miskolctapolcai tavasbarlang c.	05/07/1955	Vár-tetői-barlang c.*	20/11/1955	138	5.8	Topál 1956, this study
20799	♀	Miskolctapolcai tavasbarlang c.	05/07/1955	Vár-tetői-barlang c.*	27/11/1955	145	5.8	Topál 1956, this study
20588	♀	Miskolctapolcai tavasbarlang c.	06/07/1955	Vár-tetői-barlang c.*	20/11/1955	138	5.8	Topál 1956, this study
20865	♀	Miskolctapolcai tavasbarlang c.	06/07/1955	Miskolctapolcai tavasbarlang c.	27/07/1958	1117	0.0	Topál 1956, this study
20883	♀	Miskolctapolcai tavasbarlang c.	06/07/1955	Vár-tetői-barlang c.*	20/11/1955	137	5.8	Topál 1956, this study
20884	♀	Miskolctapolcai tavasbarlang c.	06/07/1955	Vár-tetői-barlang c.*	20/11/1955	137	5.8	Topál 1956, this study
21127	♀	Miskolctapolcai tavasbarlang c.	06/07/1955	Vár-tetői-barlang c.*	27/11/1955	144	5.8	Topál 1956, this study

Table 5. (continued)

no.	sex	banding site	banding date	recovery site	recovery date	p	km	reference
21394	♂	Pisznice-barlang c.	24/07/1955	Pisznice-barlang c.	20/05/1956	301	0.0	Topál 1956; this study
24051	♀	Pisznice-barlang c.	04/08/1957	Pisznice-barlang c.	24/07/1958	354	0.0	Topál 1956; this study
24096	♀	Pisznice-barlang c.	04/08/1957	Pisznice-barlang c.	22/07/1958	352	0.0	Topál 1956; this study
24578	♀	Pisznice-barlang c.	04/08/1957	Pisznice-barlang c.	22/07/1958	352	0.0	Topál 1956; this study
24999	♀	Pisznice-barlang c.	05/08/1957	Pisznice-barlang c.	22/07/1958	351	0.0	Topál 1956; this study
25925	♀	Pisznice-barlang c.	22/07/1958	Pisznice-barlang c.	02/08/1959	376	0.0	Topál 1956; this study
26401	♀	Pisznice-barlang c.	31/07/1959	Pisznice-barlang c.	02/08/1959	2	0.0	Topál 1956; this study
26450	♀	Pisznice-barlang c.	31/07/1959	Pisznice-barlang c.	02/08/1959	2	0.0	Topál 1956; this study
Serbia								
B1463	♀	Lazareva pećina c.	18/11/1960	Lazareva pećina c.	03/11/1968	2907	0.0	Paunović 2001
B1532	♀	Lazareva pećina c.	18/11/1960	Lazareva pećina c.	03/11/1968	2907	0.0	Paunović 2001
B1719	♀	Lazareva pećina c.	18/11/1960	Lazareva pećina c.	03/11/1968	2907	0.0	Paunović 2001
B1788	♀	Lazareva pećina c.	10/03/1995	Lazareva pećina c.	12/05/1996	429	0.0	Paunović 2001
B1907	♀	Lazareva pećina c.	21/09/1995	Lazareva pećina c.	12/05/1996	234	0.0	Paunović 2001
B1973	♀	Lazareva pećina c.	10/05/1996	Lazareva pećina c.	02/07/1996	53	0.0	Paunović 2001
B1819	♀	Lazareva pećina c.	23/04/1995	Lazareva pećina c.	21/12/1996	608	0.0	Paunović 2001
B1832	♀	Lazareva pećina c.	25/04/1995	Lazareva pećina c.	21/12/1996	606	0.0	Paunović 2001
B1839	♀	Lazareva pećina c.	26/04/1995	Lazareva pećina c.	21/12/1996	605	0.0	Paunović 2001
B1841	♀	Lazareva pećina c.	26/04/1995	Lazareva pećina c.	21/12/1996	605	0.0	Paunović 2001
B1965	♀	Lazareva pećina c.	10/05/1996	Lazareva pećina c.	21/12/1996	225	0.0	Paunović 2001
B1966	♀	Lazareva pećina c.	10/05/1996	Lazareva pećina c.	21/12/1996	225	0.0	Paunović 2001
B1969	♀	Lazareva pećina c.	10/05/1996	Lazareva pećina c.	21/12/1996	225	0.0	Paunović 2001
B1974	♀	Lazareva pećina c.	10/05/1996	Lazareva pećina c.	21/12/1996	225	0.0	Paunović 2001
B1839	♀	Lazareva pećina c.	26/04/1995	Lazareva pećina c.	30/05/1997	765	0.0	Paunović 2001
B1824	♀	Lazareva pećina c.	23/04/1995	Hajdučka pećina c.	03/06/1997	772	4.0	Paunović 2001
B1816	♀	Lazareva pećina c.	23/04/1995	Lazareva pećina c.	02/12/1997	954	0.0	Paunović 2001
B1831	♀	Lazareva pećina c.	25/04/1995	Lazareva pećina c.	02/12/1997	952	0.0	Paunović 2001
B1832	♀	Lazareva pećina c.	25/04/1995	Lazareva pećina c.	02/12/1997	952	0.0	Paunović 2001
B1969	♀	Lazareva pećina c.	10/05/1996	Lazareva pećina c.	02/12/1997	571	0.0	Paunović 2001
B1970	♀	Lazareva pećina c.	10/05/1996	Lazareva pećina c.	02/12/1997	571	0.0	Paunović 2001
B1784	♀	Lazareva pećina c.	10/03/1995	Lazareva pećina c.	19/03/1998	1105	0.0	Paunović 2001
B1790	♀	Lazareva pećina c.	10/03/1995	Lazareva pećina c.	19/03/1998	1105	0.0	Paunović 2001
B1819	♀	Lazareva pećina c.	23/04/1995	Lazareva pećina c.	19/03/1998	1061	0.0	Paunović 2001

no.	sex	banding site	banding date	recovery site	recovery date	p	km	reference
B1838	♀	Lazareva pečina c.	26/04/1995	Lazareva pečina c.	19/03/1998	1058	0.0	Paunović 2001
B1940	♀	Lazareva pečina c.	22/09/1995	Lazareva pečina c.	19/03/1998	909	0.0	Paunović 2001
B1965	♀	Lazareva pečina c.	10/05/1996	Lazareva pečina c.	19/03/1998	678	0.0	Paunović 2001
B1954	♀	Lazareva pečina c.	22/09/1995	Lazareva pečina c.	02/11/1998	1137	0.0	Paunović 2001
B1969	♀	Lazareva pečina c.	10/05/1996	Lazareva pečina c.	02/11/1998	906	0.0	Paunović 2001
B1831	♂	Lazareva pečina c.	25/04/1995	Lazareva pečina c.	10/11/1999	1660	0.0	Paunović 2001
B1819	♂	Lazareva pečina c.	23/04/1995	Lazareva pečina c.	05/02/2000	1749	0.0	Paunović 2001
B1831	♂	Lazareva pečina c.	25/04/1995	Lazareva pečina c.	05/02/2000	1747	0.0	Paunović 2001
B1832	♂	Lazareva pečina c.	25/04/1995	Lazareva pečina c.	05/02/2000	1747	0.0	Paunović 2001
B1839	♂	Lazareva pečina c.	26/04/1995	Lazareva pečina c.	05/02/2000	1746	0.0	Paunović 2001
B1915	♂	Lazareva pečina c.	21/09/1995	Lazareva pečina c.	05/02/2000	1598	0.0	Paunović 2001
B1948	♂	Lazareva pečina c.	22/09/1995	Lazareva pečina c.	05/02/2000	1597	0.0	Paunović 2001
B1965	♂	Lazareva pečina c.	10/05/1996	Lazareva pečina c.	05/02/2000	1366	0.0	Paunović 2001
B1969	♂	Lazareva pečina c.	10/05/1996	Lazareva pečina c.	05/02/2000	1366	0.0	Paunović 2001
B1974	♂	Lazareva pečina c.	10/05/1996	Lazareva pečina c.	05/02/2000	1366	0.0	Paunović 2001
B1786	♂	Lazareva pečina c.	10/03/1995	Lazareva pečina c.	17/02/2001	2171	0.0	this study
B1965	♂	Lazareva pečina c.	10/05/1996	Lazareva pečina c.	17/02/2001	1744	0.0	this study
B2114	♂	Lazareva pečina c.	06/03/2000	Lazareva pečina c.	17/02/2001	348	0.0	this study
B1832	♂	Lazareva pečina c.	25/04/1995	Lazareva pečina c.	21/11/2008	4959	0.0	this study
B2114	♂	Lazareva pečina c.	06/03/2000	Lazareva pečina c.	21/11/2008	3182	0.0	this study
Slovakia								
V11402	♂	Arđovská jaskyňa c.	19/02/1968	Liščia diera c.	13/08/1970	906	5.0	Gaisler et al. 2003
V11404	♂	Arđovská jaskyňa c.	19/02/1968	Liščia diera c.	13/08/1970	906	5.0	Gaisler et al. 2003
X10900	♂	Čertova diera pri Domici c.	06/10/1993	Andrássy-bánya Mine (Hungary)	18/12/2001	2995	16.7	this study
X10710	♂	Čertova diera pri Domici c.	06/10/1993	Čertova diera pri Domici c.	02/10/2004	4014	0.0	this study
T745613	♂	Liščia diera c.	17/08/1995	Čertova diera pri Domici c.	19/08/1995	2	0.5	this study
X1397	?	Čertova diera pri Domici c.	17/08/1995	Čertova diera pri Domici c.	02/10/2004	3334	0.0	this study
X14316	♀	Jasovská jaskyňa c.	18/09/1996	Jasov monastery	04/07/2007	3941	1.0	Fulin & Matis 2007
X17899	♀	Jasovská jaskyňa c.	18/09/1996	Jasovská jaskyňa c.	04/10/1997	381	0.0	Fulin & Matis 2007, this study
T745667	?	Liščia diera c.	27/09/1996	Čertova diera pri Domici c.	21/08/2004	2885	0.5	this study
R150773	♀	Jasovská jaskyňa c.	08/09/1998	Jasovská jaskyňa c.	04/11/2004	2249	0.0	Fulin & Matis 2007, this study
R150780	♀	Jasovská jaskyňa c.	08/09/1998	Jasovská jaskyňa c.	04/11/2004	2249	0.0	Fulin & Matis 2007, this study

populations could be assumed to create the metapopulation structure in all respective regions. Koselj (2009) estimated that the whole population from south-eastern Slovenia represents a single large colony using one principal nursery and one hibernation roost, and several adjacent satellite shelters. Similar metapopulation structure is known in the congeneric species, *R. ferrumequinum* (Schreber, 1774), see Bihari (2001). This arrangement of intra-population relations could result in population fragmentation and furthermore, to the reduction of genetic variation. This state was already documented in an isolated population of another congener and the closest relative, *R. mehelyi* Matschie, 1901, in Romania (Dragu & Borissov 2011).

Considering the supposed metapopulation structure, a strong philopatry and sedentary characteristics of local populations, supported by the available banding evidence, it is possible to estimate total abundance of the particular populations (Table 2). In the Slovak-Hungarian transition area, where such estimation could be based on several simultaneous censuses, *R. euryale* abundance is estimated at 5,000 individuals at maximum in the Baradla-Domica cave system

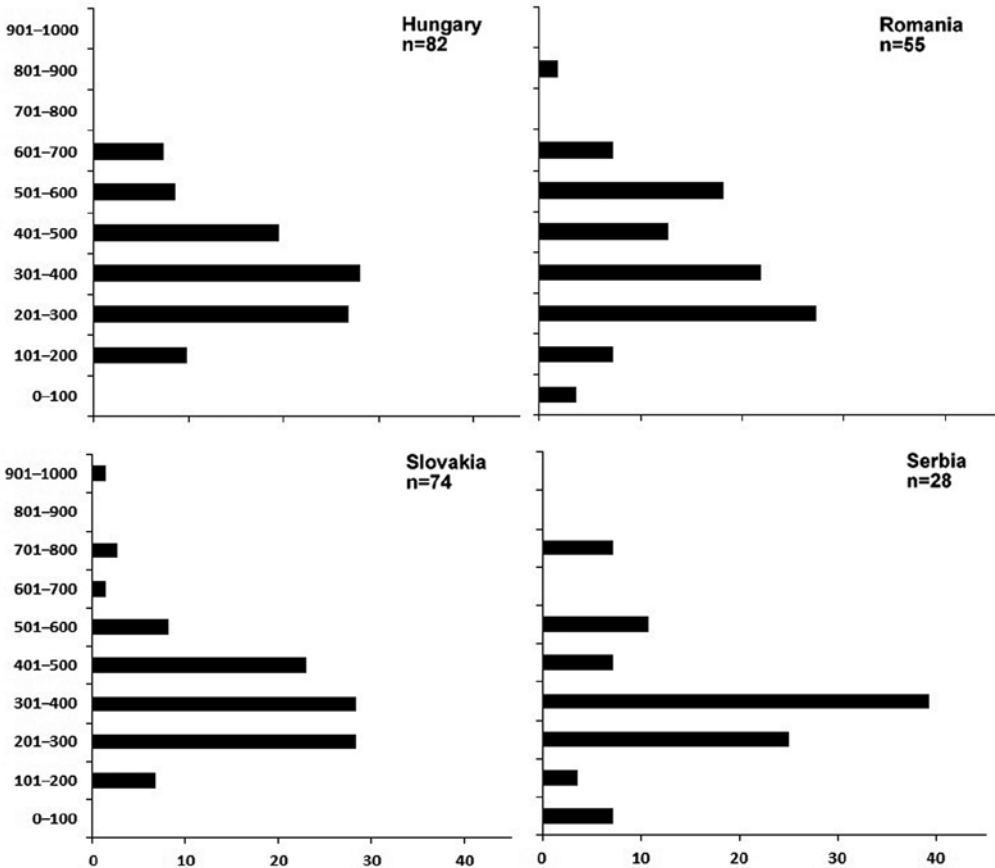


Fig. 16. Altitudinal distribution of the known localities with presence of *Rhinolophus euryale* in the Carpathian region expressed as percentage of localities (x axis) in a particular altitudinal range (y axis; m a. s. l.).

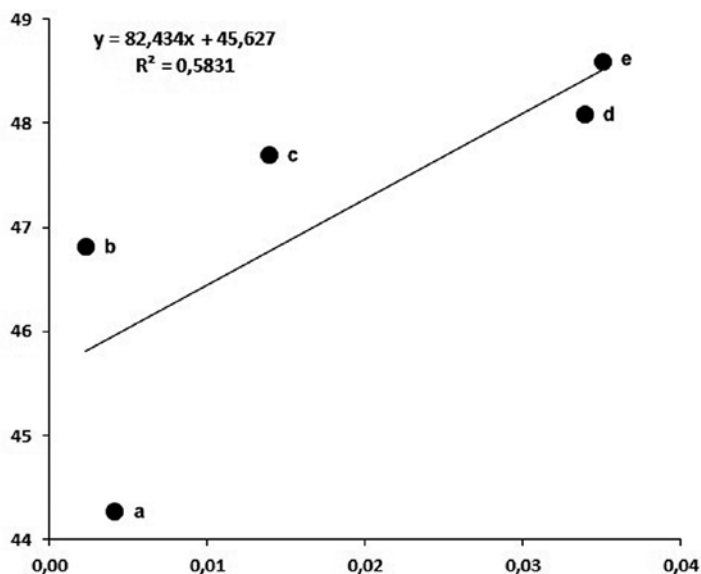


Fig. 17. Relationship between site densities (sites per km²; x axis) and latitude (y axis) in subpopulations of *Rhinolophus euryale* in the Carpathian region. a – Transylvania, b – Southern Carpathians, c – Dunazug-hegyvidék Region, d – Bükkvidék Region, e – Gemér-Turňa / Gömör-Torna Region (see Table 2 for exact density values).

(Miková et al. 2012). Thus, the abundance of *R. euryale* in the whole Carpathian system could be estimated at some 30,000 individuals only. Density of the documented roost sites varied little among the regional groups of localities (Fig. 1, Table 2) and generally, it increases along a cline from south to north (Fig. 17). This pattern could be interpreted as a function of geographically limited opportunities of roosts with suitable microclimatic conditions at the northern margin of the range. Thus, the species is concentrated there to a smaller territory compared to the situation in the Southern Carpathians or in the Mediterranean of the European peninsulas, where *R. euryale* is widespread. On the other hand, different levels of bat surveillance in the respective countries should also be considered.

In conclusion, the range of *Rhinolophus euryale* in the Carpathian region is limited to its warmest parts with the record sites divided into five separate regions. These regions are bounded by large river valleys, extensive lowlands and basins, and higher mountain ranges, which the species is probably unable to cross. The southern part of the range of *R. euryale* in the Carpathian region is directly connected with the core Mediterranean range and the species largely occurs there in sympatry / syntopy with *Rhinolophus blasii*. On the other hand, the northern part of the range of *R. euryale* in the Carpathian region is isolated and creates an island of the species occurrence separated by the vast area of Pannonia. Within the delineated range subdivisions, the species seems to be sedentary and perhaps shows the pattern of metapopulation structure organised around several and traditionally used unique and populated roosts (but further research on this topic is needed – see e.g. Dietz et al. 2009 vs. Bihari 2001). Compared to the situation in the core species range, *R. euryale* uses a more diversified roost strategy in the Carpathian region with a pronounced tendency to synanthropy in the reproduction period.

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Appendix

Review of records of *Rhinolophus euryale* from the Carpathian region

List of records of *Rhinolophus euryale* in the Carpathians is arranged alphabetically by countries and site names within geomorphological / geographical units (Marković 1980, Mazúr & Lukniš 1980, Marosi & Somogyi 1990, Mándruț 2006). After the site name, the district name, altitude [m a. s. l.] and coordinates [WGS84] are given in parentheses, followed by date and description of the record; published data are simplified as a site name along with the reference (see explanations below). Where not specified, the record represents an observation; when a collection abbreviation is given, the collected specimens are available.

Abbreviations. ind. – individual (sex indeterminate); f – female; m – male; a – adult; s – subadult; j – juvenile; L – female in lactation; G – pregnant female; C – nursery colony; det. – a bat call recorded using ultrasound detector; net. – bat individual/s netted; OW – owl pellets (*Sa* – *Strix aluco*, *Ta* – *Tyto alba*); OS – osteological record; S – summer record (period between 1 April – 31 October); W – winter record (period between 1 November – 31 March); *Mema* – *Myotis emarginatus*; *Mschr* – *Miniopterus schreibersii*; *Rbla* – *Rhinolophus blasii*; *Reur* – *R. euryale*; *Rfer* – *R. ferrumequinum*; *Rmeh* – *R. mehelyi*; RBPA – Romanian Bat Protection Association; GUC – Gödöllő University Collection (Gödöllő, Hungary); HNHM – Hungarian Natural History Museum (Budapest, Hungary); NHMB – National History Museum (Belgrad, Serbia); PMS – Slovenian Museum of Natural History (Ljubljana, Slovenia); ANPI – Aggtelek National Park Directorate (Hungary); GBTE – Gerecse Speleological and Nature Conservation Association (Hungary).

Hungary

Aggteleki-karszt Mts.: **Aggtelek** (340 m, 48.5° N, 20.5° E), 10 March 1967: 2 m (F. Mészáros). – **Baradla-barlang cave** (Aggtelek, 340 m, 48.5° N, 20.5° E), S, W (Dudich 1930, 1932, Topál 1954, 1956, 1962a, b, 1966, 1989, Murai 1976, Rác 1977, 1978, Boldogh 2006, 2007c, 2008); 1 July 1956: 3 ma (HNHM, leg. G. Topál); 29 May 1959: 2 ma (HNHM, G. Topál); 1 March 1963: 1 ind. (GUC, W (P. Székely); 26 January 1983: 1 f, HNHM, W (A. Demeter, G. Topál); 9 December 1997: 1 ind. in the Giant Hall (S. Boldogh); 11 February 2000: 1 ind. in the Morea Hill (S. Boldogh); 6 February 2007: 685 inds. in the Morea Hill (S. Boldogh); 11 January 2008: 1000–1200 inds. (S. Boldogh); 20 November 2009: 2820 inds. in the Morea Hill (S. Boldogh); 30 November 2009: 3 inds. (S. Boldogh, T. Burinda, E. Gáti); 31 December 2009: min. 2598 inds. (S. Boldogh); 18 February 2010: min. 2065 inds. in the Morea Hill (S. Boldogh); 18 February 2010: min. 100 inds. in the main tunnel (S. Boldogh); 30 December 2010: 2533 inds. (S. Boldogh, Š. Matis, M. Fulín); 28 November 2011: 3746 inds. in the Morea Hill (S. Boldogh); 3 January 2012: 3644 inds. in the Morea Hill (S. Boldogh); 3 January 2012: min. 1 ind. in the main tunnel (S. Boldogh); 14 January 2012: 1 ind. in the Vöröstó section (S. Boldogh); 3 February 2012: 2 inds. at the short tour route (S. Boldogh); 3 February 2012: 3241 inds. in the Morea Hill (S. Boldogh, D. Dobrosi); 23 February 2012: 1 m dead in a building near entrance (S. Boldogh); 27 February 2012: 1577 inds. in the Morea Hill (S. Boldogh, M. Juhász, E. Domina, Z. Hegyi); 27 February 2012: min. 100 inds. in the main tunnel (S. Boldogh, M. Juhász, E. Domina, Z. Hegyi); 19 March 2012: ca. 20 inds. in the Morea Hill (S. Boldogh, E. Miková); 19 March 2012: min. 10 inds. in the main tunnel (S. Boldogh, E. Miková); 5 September 2012: 1 f, 1 m (S. Boldogh); 24 September 2012: 20 inds. (S. Boldogh, K. Lear); 5 November 2012: 1801 inds. in the Morea Hill (S. Boldogh); 12 November 2012: 3563 inds. in the Morea Hill (S. Boldogh, T. Visnyovszky); 17 November 2012: 3558 inds. in the Morea Hill (S. Boldogh, E. Miková, M. Uhrin); 27 November 2012: 4651 inds. in the Morea Hill (S. Boldogh, E. Miková, M. Uhrin). – **Béke-barlang cave** (Aggtelek, 337 m, 48.5° N, 20.5° E), S, W (Boldogh 2006, 2007c); 7 February 2007: 6 inds. (S. Boldogh, Z. Bihari, O. Somogyvári); 23 September 2010: 8 inds., 5 m, 3 f (S. Boldogh); 9 February 2012: 1 ind. (S. Boldogh). – **Danca-barlang cave** (Égerszög, 320 m, 48.4° N, 20.6° E), 14 March 2012: 11 inds. (S. Boldogh, Á. Szabó); 3 October 2012: 1 m, 1 f (S. Boldogh). – **Jósvafő** (280 m, 48.5° N, 20.5° E), 20 September 2012: 1 f in ANPI apartments (S. Boldogh). – **Kossuth-barlang cave** (Jósvafő, 207 m, 48.5° N, 20.6° E), S (Boldogh 2006). – **Magas-tetői-barlang cave** (Szögliget, 430 m, 48.6° N, 20.7° E), S (Boldogh 2006, 2007b); 13 February 2004: 1 ind. OS (S. Boldogh, Š. Matis, T. Burinda, P. Pjenčák); 10 September 2007: 2 m net. (S. Boldogh); 9 September 2008: 1 m net. (S. Boldogh); 4 October 2011: 10 inds. (S. Boldogh, I. Mihalik, Á. Szabó). – **Meteor-barlang cave** (Bódvászilás, 415 m, 48.6° N, 20.7° E), W (Boldogh 2007b); 12 January 2012: 5 inds. (S. Boldogh). – **Szelce-puszta**, touristic cottage (Szin, 390 m, 48.5° N, 20.6° E), 5 July 2011: C 25–30 inds. (S. Boldogh); 9 August 2012: 3 inds. (S. Boldogh). – **Szinpetri, church** (180 m, 48.5° N, 20.6° E), 9 August 2012: 2 inds. (S. Boldogh).

Budai-hegység Mts.: **Bátori-barlang cave** (Budapest, 439 m, 47.5° N, 19.0° E), S, W (Méhely 1900); 28 July 1919: 1 ind. a, 1 fa, 1 ma (HNHM). – **Farkas-völgy** (Budapest, 460 m, 47.5° N, 19.0° E), W (Czajlik 1986). – **Hárs-hegyi-barlang cave** (Budapest, 409 m, 47.6° N, 19.0° E) (Méhely 1900). – **Remete-barlang cave** (Budapest, 286 m, 47.6° N, 19.0° E), January 1900: 1 ad (HNHM, T. Kormos). – **Solymári ördöglyuk cave** (Solymár, 353 m, 47.6° N, 19.0° E), W (Méhely 1900, Topál, 1954, Paulovics & Juhász 2008).

Bükkalja Mts.: **Fecske-lyuk cave** (Miskolc, 164 m, 48.1° N, 20.7° E), S (Gombkötő et al. 2007). – **Herman Ottó-barlang cave** (Miskolc, 236 m, 48.1° N, 20.6° E), S (Vásárhelyi 1930, 1939, 1942; Dobrosi 1994, Gombkötő et al. 2007); 22 June 2007: C 2800 inds. (P. Gombkötő); 8 September 2009: 5 inds. (P. Gombkötő); 12 September 2012: 1 f (P. Estók). – **Miskolc** (250 m, 48.1° N, 20.7° E), 12 September 1954: 1 f, 1 fs (Anonymous). – **Miskolctapolcai tavasbarlang cave** (Miskolc, 130 m, 48.1° N, 20.7° E), S (Vásárhelyi 1939, Topál 1956, 1962, 1966, Beron 1965, Czajlik 1986); 17 July 1954: 1 ma, 10 fa, 12 mj, 15 fj, 1 m, 1 f (HNHM, G. Topál); 18 July 1954: 5 fa, 2 mj, 2 inds. a (HNHM, G. Topál); 4 July 1955: 1 ma, 1 mj, 2 fa, 1 fj, (HNHM, G. Topál); 6 July 1955: 4 fj, 2 ma, 2 fa (HNHM, G. Topál); 20 July 1956: 1 ind. j, 1 mj, 1 fa (HNHM, G. Topál); 23 July 1956: 3 fj, 1 ind. j (HNHM, G. Topál); 6 July 1958: 1 ma (cavers' data); 20 July 1958: 1 ma, 3 f (cavers' data); 27 July 1958: 1 fa (cavers' data); 6 August 1958: 1 ma (cavers' data). – **Nagykőmázsa-ol-dali-zsomboly cave** (Miskolc, 332 m, 48.1° N, 20.7° E), 9 September 1999: 150–200 inds. (P. Gombkötő, G. Ferenczy); 3 August 2003: 1 ind. (P. Gombkötő). – **Viktória-barlang cave** (Miskolc, 189 m, 48.1° N, 20.7° E), S (Gombkötő et al. 2007). – **Zsendice-barlang cave** (Kács, 366 m, 48.0° N, 20.6° E) (Dobrosi 1994).

Bükklába Mts.: **Bánhorvát, church** (180 m, 48.2° N, 20.5° E), 21 June 2006: C 30 inds.; 5 July 2007: C 80 inds.; 23 July 2008: C 80 inds.; 30 July 2009: C 200 inds.; 20 July 2010: C 300 inds.; 11 August 2011: mixed C 300 inds. of *Reur* and *Rfer*; 11 July 2012: C 400 inds. (all records P. Gombkötő).

Északi-Bakony Mts.: **Inotai karsztvíz-akna ürege cave** (Várpalota, 156 m, 47.2° N, 18.2° E), W (Paulovics & Juhász 2008).

Gerecsevidék Region: **Baits-barlang cave** (Bajót, 347 m, 47.7° N, 18.6° E), 26 April 2012: 4 inds. (M. Juhász, E. Domina). – **Bajóti Bűdös-lyuk cave** (Bajót, 234 m, 47.7° N, 18.6° E), W (Paulovics & Juhász 1998); 28 December 2011: 1 ind. (M. Juhász, B. Máté); 24 March 2012: 4 inds. (M. Juhász, Z. Polacsek); 26 April 2012: 10 inds. (M. Juhász, E. Domina); 31 May 2012: 10 inds. (M. Juhász, Z. Hegyi). – **Bajóti Bűdös-lyuk cave** (Bajót, 234 m, 47.7° N, 18.6° E), 1 June 1916: 1 m, 2 fa (HNHM, T. Kormos). – **Keselő-hegyi II. triászbanya tárója mine** (Tatabánya, 232 m, 47.6° N,

18.5° E), S, W (Paulovics & Juhász 2008). – **Öreg-kői 1. sz. zomboly cave** (Bajót, 306 m, 47.7° N, 18.6° E), W (Juhász 1994, Paulovics & Juhász 2008); 30 September 1951: 1 ma (HNHM, G. Scheuer); 17 February 2010: 5 inds. (GBTE); 28 December 2011: 5 inds. (B. Máté, M. Krkos). – **Pisznice-barlang cave** (Lábatlan, 472 m, 47.7° N, 18.5° E), S, W (Topál 1956, 1962, 1966, 1989, Beron 1965, Mészáros 1971, Murai 1976, Juhász 1994, 2007, Molnár 1997, Paulovics & Juhász 2008, Juhász et al. 2009); 24 July 1955: 1 fa, 1 mj (HNHM, G. Topál); 20 May 1956: 1 fa (HNHM, G. Topál); 4 August 1957: 1 fj, 2 ma (HNHM, G. Topál); 5 August 1957: 1 ind. (G. Topál); 24 July 1958: 4 fj, 1 fa, 2 mj, 1 ma (HNHM, G. Topál); 31 July 1959: 1 ind. a, 2 inds. j (G. Topál); 22 August 1959: 1 ma (G. Topál); 27 July 1962: 1 m, 1 f (HNHM, F. Mészáros); 27 December 2008: 18 inds. (M. Juhász); 31 January 2010: 17 inds. (M. Juhász); 28 February 2010: 3 inds. (M. Juhász, E. Domina); 28 March 2010: 13 inds. (M. Juhász, E. Domina); 1 October 2010: 4 inds. (M. Juhász, D. Kováts); 7 October 2010: 7 inds. (M. Juhász, E. Domina, Z. Hegyi); 8 October 2010: 18 inds., 10 transferred inds. (M. Juhász); 10 October 2010: 15 inds. (M. Juhász, E. Domina, D. Kováts); 15 October 2010: 20 inds. (M. Juhász, Z. Hegyi); 29 October 2010: 14 inds. (M. Juhász, Z. Hegyi); 27 November 2010: 23 inds. (M. Juhász, Z. Hegyi); 28 December 2010: 29 inds. (M. Juhász, E. Domina, C. Forrásy); 27 January 2011: 27 inds. (M. Juhász); 28 February 2011: 25 inds. (M. Juhász, Z. Hegyi); 29 March 2011: 25 inds. (M. Juhász, Z. Hegyi); 28 April 2011: 1 ind. (M. Juhász); 24 September 2011: 1 ind. (M. Juhász, Z. Hegyi); 12 October 2011: 22 inds. (M. Juhász, E. Domina, Z. Hegyi); 18 October 2011: 20 inds. (S. Boldogh, M. Juhász, E. Domina, Z. Hegyi); 20 October 2011: 35 inds., 10–12 transferred bats (M. Juhász, E. Domina); 27 October 2011: min. 23 inds. (M. Juhász, Z. Hegyi); 26 November 2011: 42 inds. (M. Juhász, Z. Hegyi, B. Máté, P. Paulovics); 27 December 2011: 43 inds. (M. Juhász, B. Máté); 27 January 2012: min. 43 inds., 13 transferred bats (M. Juhász, Z. Hegyi, B. Máté); 26 February 2012: ca. 40 inds. (M. Juhász, Z. Hegyi); 8 March 2012: 1 ind. (M. Juhász, E. Domina, F. Kundráth); 14 March 2012: 3 inds. (M. Juhász, E. Domina, F. Kundráth); 29 March 2012: 8 inds. (M. Juhász, Z. Hegyi, H. Mező); 31 May 2012: 9 inds. (M. Juhász, Z. Hegyi); 27 September 2012: 5 inds. (M. Juhász, Z. Hegyi, E. Domina); 30 September 2012: 5 f net., 3 f transferred from Rudabánya (M. Juhász, Z. Hegyi, D. Kováts); 14 October 2012: 8 inds. (M. Juhász, Z. Hegyi, E. Domina); 19 October 2012: 1 f, 1 ind. net., 1 f transferred from Rudabánya (M. Juhász, B. Máté, E. Domina); 27 October 2012: 1 f, 13 inds. net., 1 f transferred from Rudabánya (M. Juhász, Z. Hegyi, E. Domina); 3 November 2012: 12 inds., 2 f transferred from Rudabánya (M. Juhász, Z. Hegyi, E. Domina); 29 November 2012: 4 f, 23 inds., 4 f transferred from Rudabánya (M. Juhász, Z. Hegyi, E. Domina). – **Pisznicei Alsó-barlang cave** (Lábatlan, 437 m, 47.7° N, 18.5° E), 26 November 2011: 1 ind. (M. Juhász, Z. Hegyi, B. Máté, P. Paulovics). – **Pisznicei Határ-barlang cave** (Lábatlan, 485 m, 47.7° N, 18.5° E), S (Juhász 1994, Molnár 1997, Paulovics & Juhász 2008); 31 October 1997: 16 inds. (GBTE); 30 September 2006: 1 ind. (M. Juhász); 14 October 2012: min. 36 inds., 8–10 bats transferred from Rudabánya (M. Juhász, Z. Hegyi, E. Domina); 19 October 2012: 1 f, 19 inds., 1 f transferred from Rudabánya (M. Juhász, Z. Hegyi, E. Domina); 27 October 2012: 15 inds. (M. Juhász, Z. Hegyi, E. Domina); 3 November 2012: 3 f, 14 inds., 3 f transferred from Rudabánya (M. Juhász, Z. Hegyi, E. Domina). – **Pisznicei Átjáró cave** (Lábatlan, 448 m, 47.7° N, 18.5° E), 21 August 1997: 1 ind. (GBTE). – **Pisznicei Rókás-barlang cave** (Lábatlan, 454 m, 47.7° N, 18.5° E), S (Juhász 1994). – **Sárkány-lyuki kőfejtő 2. sz. barlangja cave** (Lábatlan, 314 m, 47.7° N, 18.5° E), 9 August 2011: 7 inds. (M. Juhász, Z. Hegyi, F. Keresztes); 31 August 2011: 9 inds. (M. Juhász, E. Domina, Z. Hegyi); 29 September 2011: 13 inds. (M. Juhász, E. Domina, Z. Hegyi); 31 May 2012: 2 inds. (M. Juhász, Z. Hegyi); 30 August 2012: 19 inds. (M. Juhász, Z. Hegyi, E. Domina); 27 September 2012: min. 9 inds. (M. Juhász, Z. Hegyi, E. Domina). – **Veres-hegyi-barlang cave** (Tatabánya, 278 m, 47.6° N, 18.4° E), S, W (Paulovics & Juhász 2008).
Központi-Bükk Mts.: Anna-barlang cave (Miskolc, 275 m, 48.1° N, 20.6° E) (Vásárhelyi 1942, Boldogh 2008). – **Balla-barlang cave** (Répáshuta, 566 m, 48.0° N, 20.5° E), (Topál 1954, 1996, Boldogh 2008); August 1915: 1 a (HNHM, T. Kormos). – **Bodzás-oldali 2. Zomboly cave** (Miskolc, 393 m, 48.1° N, 20.6° E), W (Dobrosi 1994). – **Borókás-tetri 2. sz. víznyelőbarlang cave** (Miskolc, 627 m, 48.1° N, 20.6° E), S (Gombkötő et al. 2007). – **Büdöspeszt-zomboly cave** (Miskolc, 307 m, 48.1° N, 20.6° E), S (Gombkötő et al. 2007). – **Csanyik-völgy** (Miskolc, 250 m, 48.1° N, 20.6° E) (Boldogh 2008). – **Csemetekerti-víznyelő cave** (Miskolc, 407 m, 48.1° N, 20.6° E), S (Gombkötő et al. 2007). – **Diósgyőr** (250 m, 48.1° N, 20.6° E), S (Vásárhelyi 1939, 1942). – **Fekete-barlang cave** (Miskolc, 565 m, 48.1° N, 20.6° E), S (Gombkötő et al. 2007); 14 August 2007: 1 ind. det. (P. Gombkötő); 14 September 2007: 1 m net. (P. Gombkötő); 13 July 2008: min. 1 ind. det. (P. Estók); 27 September 2008: 1 f net. (P. Gombkötő); 19.9. 2009: 1 m, 1 f net. (P. Gombkötő). – **Felső-forrási-barlang cave** (Miskolc, 372 m, 48.1° N, 20.6° E), S (Gombkötő et al. 2007). – **Felsőtárkány** (200 m, 48.0° N, 20.4° E), 2000–2003: min. 1 ind. (P. Estók). – **Garadna railway terminal** (Miskolc, 380 m, 48.1° N, 20.5° E) (Boldogh 2008). – **Garadna, Pisztrántelep** (Miskolc, 350 m, 48.1° N, 20.6° E) (Vásárhelyi 1939). – **Gyurkó-lápai-barlang cave** (**Lengyel-barlang cave**) (Varbó, 610 m, 48.1° N, 20.6° E), W (Dobrosi 1994, Gombkötő et al. 2007), 2 March 2010: 10 inds. (P. Gombkötő). – **Hajnóczy-barlang cave** (Cserépfalu, 457 m, 47.9° N, 20.5° E), S (Gombkötő et al. 2007); 16 August 2007: 2 m net. (P. Gombkötő); 31 August 2007: 1 f net. (P. Gombkötő); 13 September 2007: 4 m net. (P. Gombkötő); 25 September 2008: 1 m, 1 f net. (P. Gombkötő); 23 September 2009: 1 m, 1 f net. (P. Gombkötő); 24 September 2010: 1 m, 1 f net. (P. Gombkötő); 16 September 2011: 3 m, 2 f, 7 inds. net. (P. Estók); 30 August 1996: 10 inds. net. (P. Gombkötő). – **Hámor** (Miskolc, 280 m, 48.1° N, 20.6° E), S (Méhely 1900, Boldogh 2008). – **Három-kúti-barlang cave** (Miskolc, 618 m, 48.1° N, 20.5° E), 18 May 1991: 5 inds. (D. Dobrosi). – **Hillebrand Jenő-barlang cave** (Parasznya, 431 m, 48.1° N, 20.6° E), S, W (Dobrosi 1994, Gombkötő et al. 2007); 2 March 2010: 5 inds. (P.

Gombkötő). – **István-lápai-barlang cave** (Miskolc, 545 m, 48.1° N, 20.6° E), 15 August 2007: 1 f; 26 September 2008: 3 m, 7 f; 1 October 2009: 3 m, 5 f; 29 September 2010: 1 m; 27 September 2012: 4 inds. net. (all records P. Gombkötő). – **Jáspis-barlang cave** (Miskolc, 588 m, 48.1° N, 20.6° E), S (Gombkötő et al 2007); 19 September 2009: 2 m net. (P. Estók); 17 September 2012: 1 m net. (P. Estók); 27 September 2012: 4 m net. (P. Gombkötő, P. Estók). – **Jávorkúti 5. sz. víznyelőlóbarlang cave** (Miskolc, 662 m, 48.1° N, 20.3° E), S (Vásárhelyi 1942, Boldogh 2008). – **Kecske-lyuk cave** (Miskolc, 256 m, 48.1° N, 20.6° E), S, W (Paszlavszyk 1918, Vásárhelyi 1939, Czajlik 1986, Dobrosi 1994, Gombkötő et al. 2007, Boldogh 2008); 16 September 2007: C 40 inds.; 25 June 2008: C 1200 inds.; 18 September 2008: C 2500 inds.; 11 June 2009: C 4500 inds.; 8 September 2009: C min. 200 inds.; 11 June 2010: C 1100 inds. (all records P. Gombkötő). – **Király-kúti zomboly cave** (Miskolc, 275 m, 48.1° N, 20.6° E) (Vásárhelyi 1942, Boldogh 2008); 13 February 1937: 1 m (HNHM, I. Vásárhelyi). – **Kőlyuk-barlang cave** (Parasznya, 441 m, 48.1° N, 20.6° E), S/W (Gyulai 1979, Dobrosi 1994, Topál 1996, Gombkötő et al. 2007); 20 March 1993: 30 inds. (D. Dobrosi); 27 April 1993: 3 inds. (D. Dobrosi); 20 September 2007: 1 f (P. Gombkötő); 21 February 2008: 1 ind. (P. Gombkötő); 13 March 2009: 4 inds. (P. Gombkötő); 18 March 2011: 2 inds. (P. Gombkötő). – **Létrási-vizesbarlang cave** (Miskolc, 575 m, 48.1° N, 20.6° E), W (Dobrosi 1994). – **Lillafüred (320 m, 48.1° N, 20.6° E) (Vásárhelyi 1939)**. – **Lök-völgyi-barlang cave** (Felsőártárány, 389 m, 48.0° N, 20.5° E), S/W (Gombkötő et al. 2007); 23 September 2006: more inds.; 15 November 2006: min. 1 ind.; 27 August 2007: min. 10 inds.; S; 13 September 2007: 30 inds.; 31 March 2009: min. 1 ind.; 15 July 2009: min. 60 inds.; 4 August 2009: min. 1 ind.; 25 March 2010: min. 1 ind.; 15 September 2010: min. 1 ind.; 31 August 2012: 1 f, 1 m net.; 12 September 2012: 2 f, 2 m, 2 inds. net.; 4 October 2012: 1 m net. (all records P. Estók). – **Mexikó-völgyi-víznyelőlóbarlang cave** (Miskolc, 303 m, 48.1° N, 20.7° E), S (Gombkötő et al. 2007). – **Odorvári-barlang cave** (Cserépfalu, 460 m, 48.0° N, 20.5° E), S (Gombkötő et al. 2007). – **Ómassa (200 m, 48.1° N, 20.5° E) (Vásárhelyi 1942, Boldogh 2008)**. – **Speizi-barlang cave** (Miskolc, 550 m, 48.1° N, 20.6° E), S (Gombkötő et al. 2007). – **Szeleta-barlang cave** (Miskolc, 347 m, 48.1° N, 20.6° E), S (Vásárhelyi 1939, Czajlik 1986, Gombkötő et al. 2007, Boldogh 2008). – **Szent István-barlang cave** (Miskolc, 352 m, 48.1° N, 20.6° E), S (Vásárhelyi 1942, Topál 1962, Beron 1965, Boldogh 2008); 1960: 1 ma (HNHM, E. Schmidt); 31 January 2002: 2 inds. (P. Gombkötő); 15 February 2008: 1 ind. (P. Gombkötő). – **Szivárvány-Sebes-barlang cave** (Miskolc, 640 m, 48.1° N, 20.6° E), 14 September 2012: 6 m, 1 ind. net. (P. Estók). – **Tatár-árki-barlang cave** (Miskolc, 296 m, 48.1° N, 20.7° E), W (Dobrosi 1994). – **Vár-tetői-barlang cave** (Miskolc, 317 m, 48.1° N, 20.7° E), S, W (Dobrosi 1994, Gombkötő et al. 2007); 20 November 1955: 4 fa, 6 f, 3 ma (O. Láner); 27 November 1955: 1 fa, 3 f, 2 ma, 1 m (O. Láner, G. Topál). – **Pénc-pataki-víznyelőlóbarlang cave** (Bükkszentkereszt, 531 m, 48.0° N, 20.5° E), 13 June 2003: 3 inds. (P. Gombkötő). – **Tölgyes-oromi-barlang cave** (Szilvásvárad, 685 m, 48.1° N, 20.4° E), 12 September 2011: 3 m, 1 f net. (P. Estók).

Mátraalja Mts.: Antal-táró mine (Recsk, 250 m, 47.9° N, 20.1° E), S, W (Gombkötő et al. 2007).

Rudabánya-Szalonnai-hegység Mts.: Andrássy-bánya mine (Rudabánya, 290 m, 48.4° N, 20.6° E), S, W (Boldogh 2006, 2007b; Juhász et al. 2009); 18 December 2001: 3 inds. (S. Boldogh); 28 August 2002: C, 10 m, 23 f, 3 inds. net. (S. Boldogh); 14 September 2004: 3 f, 5 inds. (S. Boldogh); 24 August 2007: C 1840 inds. (S. Boldogh); 20 November 2009: 7 inds. (S. Boldogh); 4 August 2010: C max. 120 inds. (S. Boldogh); 7 October 2010: C ca. 300 inds., 10 inds. transferred to the Pisznice-barlang cave (S. Boldogh, T. Burinda, Á. Szabó); 2 September 2011: C min. 1000 inds., 2 m net. (S. Boldogh); 17 October 2011: 136 inds., 36 inds. net., 20 inds. transferred to the Pisznice-barlang cave (S. Boldogh, Á. Szabó); 11 July 2012: C 1357 inds. (S. Boldogh); 8 August 2012: C min. 1500 inds. (S. Boldogh); 4 September 2012: C min. 1500 inds. (S. Boldogh); 3 October 2012: min. 40 inds. (S. Boldogh); 5 November 2012: 1 m, 6 inds. (S. Boldogh, T. Visnyovszky, P. Estók); 7 November 2012: 1 m, 6 inds. (S. Boldogh, B. Váczi). – **Csehi-hegy, building** (Szalonna, 320 m, 48.4° N, 20.7° E), 11 July 2012: C 730 inds. in a store (S. Boldogh). – **Esztramos-hegy mine** (Bódvarákó, 280 m, 48.5° N, 20.7° E), S (Boldogh 2007b); 26 July 2007: C 40–50 inds.; 10 July 2009: C ca. 60 inds.; 22 June 2010: 12 inds.; 14 July 2011: C ca. 250 inds.; 11 July 2012: C ca. 250 inds. (all records S. Boldogh); 25 September 2012: C 700–1000 inds. (S. Boldogh, K. Lear). – **Perkupa, church** (160 m, 48.5° N, 20.7° E) 5 July 2011: C 10–15 inds. (S. Boldogh). – **Vizsló, church** (210 m, 48.5° N, 20.5° E), 22 June 2010: 1 ind. (S. Boldogh).

Tokaj-Hegyalja Mts.: Bomboly-bánya mine (Mád, 217 m, 48.2° N, 21.3° E), W (Bihari et al. 2000, Bihari 2007).

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Munții Almăjului Mts.: Orșova (Miller 1912). – **Peștera Gura Ponicevei cave** (Dubova, 154 m, 44.6° N, 22.3° E), S, W, OW (Sa (Murariu et al. 2004, Barti 2005, Nagy & Postawa 2010, Obuch 2011); 29 October 2003: 25 inds. (RBPA); 3 March 2010: 1 ind. (RBPA); 22 July 2010: 1 faL net. (M. Uhrin); 19 February 2012: 1 ind. (M. Uhrin, E. Míková, M. Rendőš). **Munții Aninei Mts.: Nera Gorge** (Sasca Română, 259 m, 44.9° N, 21.8° E), 12 August 2010: 2 inds. (RBPA). – **Peștera Buhui cave** (Anina, 675 m, 45.1° N, 21.9° E), 15 March 2010: 3 inds. (RBPA); 27 July 2010: 1 ind. (RBPA). – **Peștera cu Apă din Cheile Gârliștei cave** (Gârliște, 345 m, 45.2° N, 21.9° E), 15 March 2010: 3 inds. (RBPA). – **Peștera de după Cârșă cave** (Carașova, 244 m, 45.2° N, 21.9° E), 6 August 2011: 1 active ind. (M. Uhrin). – **Peștera Simion cave** (Cuclova Montană, 380 m, 45.0° N, 21.7° E), 15 March 2010: 1 ind. (RBPA).

Munții Bihor Mts.: Peștera de la Fănațe cave (Fănațe, 565 m, 46.5° N, 22.6° E), 24 June 2010: 5 inds. (cf. Bücs et al. 2012). – **Peștera din Dealul Cornii cave** (Sighiștel, 520 m, 46.5° N, 22.6° E), 28 June 2010: 1 ind., S (RBPA). – **Peștera Măgura cave** (Sighiștel, 526 m, 46.5° N, 22.6° E), 10 June 2006: 5 inds. (RBPA); 25 June 2010: 4 inds. (cf. Bücs et al.

2012). – **Peștera Poarta lui Ionele cave** (Gârda de Sus, 848 m, 46.5° N, 22.8° E), 3 February 2009: 1 ind. (RBPA). – **Site unspecified exactly** (Dobrosi & Gulyás 1999).

Munții Cernei Mts.: **Avenul lui Adam cave** (Băile Herculane, 295 m, 44.9° N, 22.4° E), S, W (Nagy & Postawa 2010); 2 June 1998: 100 inds. (L. Barti); 11 August 2010: 1000 inds. (RBPA); 28 October 2011: 25 inds. (RBPA). – **Peștera Despăcătura cave** (Băile Herculane, 164 m, 44.9° N, 22.4° E), S (Nagy & Postawa 2010); 25 April 2002: 7 inds. (L. Barti); 9 May 2003: 1 ind. (L. Barti); 3 March 2010: 6 inds. (RBPA). – **Peștera Grota Haiducilor cave** (Băile Herculane, 196 m, 44.9° N, 22.4° E), S (Nagy & Postawa 2010).

Munții Domanului Mts.: **Peștera Gaura Turcului cave** (Cuptoare, 472 m, 45.2° N, 21.9° E) (Kolenati 1860).

Munții Locvei Mts.: **Peștera Alibeg cave** (Sfânta Elena, 174 m, 44.7° N, 21.7° E), 1 March 2010: 1 ind. (RBPA). – **Peștera din Valea Ceuca cave** (Sighiștel, 315 m, 44.7° N, 21.7° E), 2 March 2010: 13 inds. (RBPA). – **Peștera Gaura cu Muscă cave** (Coronini, 83 m, 44.7° N, 21.7° E), S, W (Kolenati 1860, Méhely 1900, Nagy & Postawa 2010); 5 June 2001: 1 ind. (RBPA); 1 March 2010: 13 inds. (RBPA); 12 June 2010: 80 inds. (RBPA); 12 August 2010: 2 inds. (RBPA); 4 August 2011: min. 1 ind. det. (M. Uhrin). – **Peștera Gaura Haiducească cave** (Moldova Nouă, 478 m, 44.7° N, 21.7° E), 2 March 2010: 6 inds. (RBPA). – **Peștera Padina Matei cave** (Padina Matei, 580 m, 45.5° N, 21.8° E), 2 March 2010: 2 inds. (RBPA); 17 July 2010: 1 fa net. (M. Uhrin); 27 July 2010: 400 inds. (RBPA); 25 April 2011: 70 inds., W (RBPA); 19 February 2012: 7 inds. (M. Uhrin, E. Miková, M. Rendoš); 28 July 2012: 10 inds. (M. Uhrin, E. Miková, M. Rendoš).

Munții Mehedinții Mts.: **Epuran cave, stagnant water near entrance** (Jupânești, 421 m, 44.8° N, 22.6° E), 21 July 2010: 1 ind. det. (M. Uhrin). – **Peștera Bulba cave** (Baia de Aramă, 324 m, 45.0° N, 22.8° E), 10 August 2010: 15 inds. (RBPA). – **Peștera Gaura Ungurului de la Pecenișca cave** (Pecenișca, 295 m, 44.8° N, 22.4° E), S (Méhely 1900, Barti 2002); 25 April 2002: 2 inds. (L. Barti); 1 June 2004: 8 inds. (F. Szodoray-Parádi et al.), 3 March 2010: 2 inds. (RBPA). – **Peștera Izverna cave** (Izverna, 480 m, 45.0° N, 22.6° E), 28 October 2001: 150 inds. (RBPA).

Munții Metaliferi Mts.: **Peștera Liliecilor din Cheile Ampoitei cave** (Lunca Ampoitei, 608 m, 46.1° N, 23.4° E), S, W (Dumitrescu et al. 1963, Barti 2005, Borda et al. 2006); 4 April 2004: 2 inds., OS (L. Barti); 31 May 2010: 20 inds. (cf. Bücs et al. 2012); 1 July 2010: 15 inds. (cf. Bücs et al. 2012).

Munții Pădurea Craiului Mts.: **Avenul de la Betfia cave** (Betfia, 290 m, 47.0° N, 22.0° E), 16 May 2008: 10 inds. net. (M. Uhrin, P. Kaňuch). – **Biserica Ortodoxă Lazuri de Roșia** (Lazuri de Roșia Orthodox Church) (Lazuri de Roșia, 242 m, 46.4° N, 22.2° E), S (Willemsen & Thomassen 2008). – **Peștera Bătrânului cave** (Tomnatic, 596 m, 46.9° N, 22.5° E), 3 September 2010: 25 inds. (RBPA); 1 September 2012: 10 inds. (RBPA). – **Peștera Calului cave** (Meziad, 277 m, 46.7° N, 22.5° E), S (Nagy & Postawa 2010); 2 July 2002: 1 ind. (RBPA); 1 March 2011: 1 ind. (cf. Bücs et al. 2012); 13 July 2011: 70 inds. (cf. Bücs et al. 2012); 1 August 2012: 15 inds. (cf. Bücs et al. 2012). – **Peștera Ciur Ponor cave** (Roșia, 520 m, 46.9° N, 22.4° E), 2 August 2012: 2 inds. (RBPA). – **Peștera cu Apă de la Bulz cave** (Bulz, 289 m, 46.9° N, 22.7° E), (Szodoray-Parádi 1998); 17 June 2006: 1 ind. (RBPA). – **Peștera cu Apă din Valea Leșului cave** (Remeti, 652 m, 46.8° N, 22.6° E), 18 November 2011: 40 inds. (cf. Bücs et al. 2012). – **Peștera de la Gălășeni cave** (Gălășeni, 400 m, 47.0° N, 22.4° E), S (Nagy & Postawa 2010); 26 February 2009: 33 inds. (RBPA); 2 July 2009: 30 inds. (RBPA); 10 July 2010: 4 inds.; 12 January 2011: 106 inds. of *Rbla* and *Reur*; 17 February 2011: 130 inds. of *Rbla* and *Reur*; 12 July 2011: 20 inds. of *Rbla* and *Reur*; 25 January 2012: 64 inds. of *Rbla* and *Reur*; 15 February 2012: 120 inds. of *Rbla* and *Reur*; 23 March 2012: 100–110 inds. of *Rbla* and *Reur*; 8 June 2012: 60 inds. of *Rbla* and *Reur* (all records cf. Bücs et al. 2012); 4 August 2012: C 50 inds. of *Rbla* and *Reur*, several emerging inds. det. (M. Uhrin, E. Miková, M. Rendoš); 3 October 2012: 4 inds. (cf. Bücs et al. 2012). – **Peștera de la Stracoș cave** (Stracoș, 269 m, 46.9° N, 22.1° E), 13 January 2011: 2 inds.; 26 January 2012: 13 inds.; 22.3. 2012: 300 inds.; 1 August 2012: 50–60 inds. (all records cf. Bücs et al. 2012). – **Peștera de la Tășad cave** (Tășad, 230 m, 46.9° N, 22.1° E), S (Nagy & Postawa 2010); 20 June 2000: 90 inds.; 18 August 2001: 200 inds.; 11 July 2003: 400 inds.; 13 July 2007: 90 inds.; 16 June 2008: 344 inds.; 3 July 2009: 429 inds. (all records by RBPA); 15 July 2010: 400 inds.; 14 July 2011: 250 inds.; 7 June 2012: 400 inds.; 1 August 2012: 500–600 inds. (all records cf. Bücs et al. 2012). – **Peștera de la Vadu Crișului cave** (Vadu Crișului, 322 m, 47.0° N, 22.5° E), S (Nagy & Postawa 2010). – **Peștera Gruiețului cave** (Roșia, 318 m, 46.8° N, 22.4° E), 1 October 2012: 20–30 inds., S (RBPA). – **Peștera Igrîța cave** (Peștere, 336 m, 47.0° N, 22.4° E), S (Topál 1954, Borda 2002); 5 November 1997: 2 inds. (RBPA). – **Peștera Meziad cave** (Meziad, 463 m, 46.8° N, 22.5° E), S, W (Nagy & Postawa 2010); 19 August 2001: 1 ind.; 19 January 2002: 2 inds.; 12 December 2003: 1 ind.; 7 January 2005: 5 inds.; 19 February 2008: 1 ind.; 19 December 2008: 6 inds.; 18 January 2009: 3 inds.; 28 December 2009: 1 ind. (all records by RBPA); 24 June 2010: 6 inds.; 15 December 2010: 2 inds.; 1 March 2011: 1 ind.; 12 January 2012: 3 inds.; 7 March 2012: 4 inds.; 1 August 2012: 5 inds. (all records cf. Bücs et al. 2012). – **Peștera Țicului cave** (Țiclu-Stan System) (Vârciorog, 385 m, 46.9° N, 22.3° E), 17 June 2008: 46 inds. (RBPA); 16 June 2010: 20 inds. (cf. Bücs et al. 2012). – **Peștera Viduța nr 1. cave** (Dobrești, 384 m, 46.9° N, 22.4° E), 2 October 2012: 4 inds. (RBPA). – **Site unspecified exactly** (Dobrosi & Gulyás 1999).

Munții Poiana Ruscă Mts.: **Peștera de la Românești cave** (Românești, 334 m, 45.8° N, 22.4° E), 17 March 2010: 21 inds. (RBPA).

Munții Semenic Mts.: **Peștera cu Apă din Cheile Gârliștei cave** (Gârliște, 345 m, 45.2° N, 21.9° E) (Negrea et al. 1967); 13 June 2010: 40 inds. (RBPA). – **Peștera de după Cârșă cave** (Carașova, 244 m, 45.2° N, 21.9° E), 16 March 2010: 2 inds. (RBPA). – **Peștera de la Tunelul I cave** (Carașova, 235 m, 45.2° N, 21.9° E), 15 March 2010: 1 ind. (RBPA). –

Peștera Găurile lui Miloi cave (Valea Minișului, 475 m, 45.0° N, 21.9° E), 14 March 2010: 3 inds. (RBPA). – **Peștera Lilieciilor din Cheile Carașului cave** (Carașova, 233 m, 45.2° N, 21.9° E), S, W (Nagy & Postawa 2010); 16 March 2010: 8 inds. (RBPA); 13 August 2010: 6 inds. (RBPA). – **Site unspecified exactly** (Murariu 2002).

Munții Trascău Mts.: Biserica Unitariană din Moldovenești (Unitarian church of Moldovenești) (Moldovenești, 421 m, 46.5° N, 23.6° E) 10 August 2012: 207 inds. (RBPA). – **Peștera Cetățuia Mare cave** (Petreștii de Jos, 503 m, 46.6° N, 23.7° E), S (Nagy & Postawa 2010); 3 July 2002: 1 cadaver (R. K. Lučan); 12 June 2003: 1 ind. (R. K. Lučan); 10 June 2005: 2 inds. (L. Barti, A. Dóczy, C. Jéré); 23 September 2006: 3 inds. (I. Urák); 4 August 2012: min. 1 ind. det. (M. Uhrin, E. Miková, M. Rendoš). – **Peștera Cetățuia Mică cave** (Petreștii de Jos, 503 m, 46.6° N, 23.7° E), 3 July 2002: 2 fa/ net. (R. K. Lučan); 5 July 2002: 1 fs net. (R. K. Lučan, I. Horáček). – **Peștera Huda lui Papară cave** (Sub Piatră, 575 m, 46.4° N, 23.5° E), W (Nagy et al. 2005); 27 January 2012: 1 ind., W (RBPA). – **Peștera Puculea cave** (Vălișoara, 561 m, 46.4° N, 23.6° E), 2 August 2012: 1 ind., S (M. Uhrin, E. Miková, M. Rendoš). – **Peștera Ungurească din Cheile Turzii cave** (Petreștii de Jos, 603 m, 46.7° N, 23.7° E), 8 April 2005: 2 ind., OW *Sa* (L. Barti).

Munții Vâlcanului Mts.: Peștera Fușteica cave (Izvarna, 223 m, 45.0° N, 22.9° E), W (Nagy & Postawa 2010). – **Peștera Lazului cave** (Motru Sec, 293 m, 45.1° N, 22.8° E), S (Nagy & Postawa 2010).

Munții Zărandului Mts.: Peștera lui Duflu cave (Căprioara, 305 m, 46.0° N, 22.3° E), 17 March 2010: 1 ind. (RBPA). – **Peștera Furdulăul după Piatră cave** (Boiul de Sus, 495 m, 46.0° N, 22.6° E) (Dumitrescu et al. 1963).

Records not exactly located: **Oltenia Region** (Bazilescu 1983).

Serbia

Beljanica Mts.: Suva pećina cave, Klisura Suvi Do Gorge (Žagubica, 295 m, 44.2° N, 21.7° E), S (Paunović & Stamenković 1998, Paunović 2001); 5 July 1983: 3 ma (NHMB, Đ. Mirić).

Delji Jovan Mts.: Canetova pećina cave (Plavna, 300 m, 44.3° N, 22.3° E), S (Paunović 2001); 21 April 1988: 7 inds. (PMS, B. Kryštufek); 11 February 2004: C min. 200 inds. of *Reur* and *Rbla* (M. Paunović).

Homoljske planine Mts.: Kučevo, a bunker in front of tunnel (Kučajna, 350 m, 44.4° N, 21.6° E), S/W (Paunović 2001). – **Kučevo, tunnel** (Kučajna, 350 m, 44.4° N, 21.6° E), S/W (Paunović 2001).

Kučajske planine Mts.: Gaura Burći cave (Zlot, 280 m, 44.1° N, 21.9° E), W (Paunović & Stamenković 1998, Paunović 2001). – **Hajdučka pećina cave** (Zlot, 320 m, 44.0° N, 21.9° E), S (Paunović & Stamenković 1998, Paunović 2001); 3 June 1997: C min. 100 inds. of *Reur* and *Rbla*: 1 fa *Reur* examined (M. Paunović). – **Kozja pećina cave** (Krivi Vir, 558 m, 43.9° N, 21.7° E), 14 October 2006: 1 ma net. (M. Paunović, B. Karapandža). – **Lazareva pećina cave** (Zlot, 303 m, 44.0° N, 22.0° E), S, W (Paunović & Stamenković 1998, Paunović 2001); 18 November 1960: C 400 inds. of *Reur*, *Rbla* and *Rmeh*: 181 fa, 130 ma examined (12 fa, 19 ma, NHMB, Đ. Mirić); 29 June 1965: C 100 inds. of *Reur*, *Rbla* and *Rmeh* (3 fa, 1 ma, NHMB, Đ. Mirić); 3 November 1968: C 1500 inds. of *Reur* and *Rbla*, 4 fa, 5 ma examined (3 fa, 3 ma, NHMB, Đ. Mirić); 14 May 1970: 3 inds. (PMS, B. Kryštufek); 21 December 1993: C 800 inds. of *Reur* and *Rbla* (2 fa, 3 ma, 2 inds., NHMB, M. Paunović); 10 June 1994: 1 fa, 3 ma, 1 ind. a (NHMB, M. Paunović); 12 June 1994: C 200 inds. of *Reur* and *Rbla* (M. Paunović); 10 July 1994: 2 inds. (M. Paunović); 18 August 1994: 3 fa (NHMB, M. Paunović); 10 March 1995: C 1200 inds. of *Reur* and *Rbla*, 5 fa, 3 ma examined (2 ma, NHMB, M. Paunović); 11 March 1995: 3 fa, 4 ma net. (M. Paunović); 23 April 1995: C 1500 inds. of *Reur* and *Rbla*, 3 fa, 5 ma net. (M. Paunović); 25 April 1995: 1 fa, 2 ma net. (M. Paunović); 26 April 1995: 1 fa net. (M. Paunović); 9 July 1995: 1 ma (NHMB, M. Paunović); 21 July 1995: 2 fs (NHMB, M. Paunović); 21 September 1995: C 400 inds. of *Reur* and *Rbla*, 1 fa, 3 fs, 4 ma, 5 ms examined (1 fa, 1 fs, 2 ms, NHMB, M. Paunović); 22 September 1995: 2 fa, 1 ms net. (M. Paunović); 10 May 1996: C 600 inds. of *Reur* and *Rbla*, 1 f, 1 fa, 1 fs, 1 m, 1 ma, 5 ms examined (2 fa, 3 ma, 2a, NHMB, M. Paunović); 11 May 1996: 2 ma net. (M. Paunović); 12 May 1996: 1 f, 1 fa, 5 ma net. (M. Paunović); 2 July 1996: 1 f net. (M. Paunović); 20 December 1996: 1 fa (NHMB, M. Paunović); 21 December 1996: C 1000 inds. of *Reur* and *Rbla*, 2 fa, 1 m, 4 ma, 1 ms net. (M. Paunović); 30 May 1997: C 200 inds. of *Reur* and *Rbla*, 1 ma examined (M. Paunović); 1 June 1997: 1 fa, 1 a (NHMB, M. Paunović); 2 December 1997: C 1100 inds. of *Reur* and *Rbla*, 4 ma examined (M. Paunović); 19 March 1998: C 1000 inds. of *Reur* and *Rbla* (M. Paunović); 2 November 1998: C 800 inds. of *Reur* and *Rbla*, 1 fa, 1 ma examined (M. Paunović, B. Karapandža); 10 November 1999: C 900 inds. of *Reur* and *Rbla* (M. Paunović, B. Karapandža); 5 February 2000: C 1000 inds. of *Reur* and *Rbla*, 9 ma examined (M. Paunović, B. Karapandža); 6 March 2000: 2 ma, 1 fj net. (M. Paunović, B. Karapandža); 17 February 2001: 3 ma net. (M. Paunović, B. Karapandža); 29 May 2001: C 160 inds. of *Reur* and *Rbla*, 2 ma net. (M. Paunović, B. Karapandža); 23 May 2003: C 50 inds. of *Reur* and *Rbla* (M. Paunović, B. Karapandža); 1 November 2003: 1 fa (NHMB, M. Paunović, B. Karapandža); 22 May 2004: C 60 inds. of *Reur* and *Rbla* (M. Paunović, B. Karapandža); 21 November 2008: C 1350 inds. of *Reur* and *Rbla*: 2 inds. recaptured (M. Paunović, B. Karapandža); 11 January 2010: C 1000 inds. of *Reur* and *Rbla* (M. Paunović, B. Karapandža); 23 February 2011: C 800 inds. of *Reur* and *Rbla* (M. Paunović); 24 March 2012: 1 ma net. (M. Paunović, B. Karapandža); 15 October 2012: 1 ma net. (I. Budinski); 16 October 2012: 2 ma net. (I. Budinski); 17 October 2012: 1 fa, 1 ma net. (I. Budinski). – **Lazareva reka River**, foraging area (Zlot, 295 m, 44.0° N, 22.0° E), S (Paunović 2001). – **Ljubinkova pećina cave** (Zlot, 800 m, 44.0° N, 22.0° E), S (Paunović & Stamenković 1998, Paunović 2001); 23 July 1995: 1 ind. a (NHMB, M. Paunović); 23 July 1996: C ca. 1000 inds. of *Reur*, *Rbla* and *Rmeh*, 2 fa, 1 fj, 8 ma, 2 mj examined (NHMB, M. Paunović); 21 July 2003: C ca. 1000 inds. of *Reur*, *Rbla* and *Rmeh* (M. Paunović). – **Mandina pećina cave** (Zlot, 350 m, 44.1° N, 22.0° E), W (Paunović & Stamenković

1998, Paunović 2001); 12 July 1994: 4 inds. (M. Paunović). – **Pečina Bela Sala cave** (Despotovac, 550 m, 44.1° N, 21.6° E), 3 August 1996: C 40 males: 11 ma (NHMB, B. Karapandža); 19 July 1997: C 50 males: 2 ma (NHMB, B. Karapandža); 20 July 1997: 5 ma (NHMB, B. Karapandža); 23 July 1997: 2 ma (NHMB, B. Karapandža); 2 July 1998: C 75 males.; 12 ma examined (NHMB, B. Karapandža); 3 July 1998: 8 ma net. (B. Karapandža); 6 July 1998: 8 ma (NHMB, B. Karapandža); 11 July 1998: 4 ma (3 ma, NHMB, B. Karapandža); 18 July 2004: C 120 males: 37 ma (5 ma, NHMB, B. Karapandža, I. Budinski); 21 July 2004: 16 ma (7 ma, NHMB, B. Karapandža, I. Budinski); 23 July 2004: 1 ma (NHMB, B. Karapandža, I. Budinski); 25 July 2004: 3 ma net. (B. Karapandža, I. Budinski); 18 June 2012: C 120 males of *Reur* and *Rbla*, 14 ma net. (I. Budinski); 19 June 2012: 7 ma net. (I. Budinski). – **Pečina Hajdučica cave** (Zlot, 800 m, 44.0° N, 21.9° E), S (Paunović & Stamenković 1998, Paunović 2001); 23 July 1996: C min. 200 inds. of *Reur* and *Rbla* (M. Paunović). – **Pečina u selu Lukovo cave** (Lukovo, 350 m, 43.8° N, 21.8° E), S (Paunović 2001). – **Pečina u selu Krivi Vir cave** (Krivi Vir, 375 m, 43.8° N, 21.7° E), W, S (Paunović & Stamenković 1998, Paunović 2001); 6 July 1998: 4 inds. (M. Paunović, B. Karapandža); 6 May 2000: 8 inds. (M. Paunović). – **Pečina u Sisevcu cave** (Sisevac, 400 m, 44.0° N, 21.6° E), W, S (Paunović & Stamenković 1998, Paunović 2001); 23 April 1972: 1 fa, 2 ma (NHMB, Đ. Mirić). – **Potkapina u klisuri reke Crnice Pothole** (Senje, 250 m, 43.9° N, 21.5° E), S (Paunović 2001). – **Ravanička pečina cave** (Senje, 235 m, 44.0° N, 21.5° E), W, S (Paunović 2001); 15 November 1960: C 35 inds.: 4 fa, 13 ma (NHMB, Đ. Mirić); 11 July 1969: 1 ind. (NHMB, Đ. Mirić); 18 November 1978: C 90 inds., 1 fa, 3 ma (NHMB, Đ. Mirić); 3 June 1994: C 100 inds. (M. Paunović); 16 May 1998: C 150 inds. (M. Paunović, B. Karapandža).

Liškovac Mts.: **Rajkova pečina cave** (Majdanpek, 470 m, 44.4° N, 22.0° E), 15 October 1960: 10 inds. (Đ. Mirić).

Mali krš Mts.: **Pešćera Mare cave** (Vlaole, 600 m, 44.3° N, 22.0° E), W, S/W (Paunović & Stamenković 1998, Paunović 2001); 10 October 1960: 1 fa (NHMB, Đ. Mirić).

Miroč Mts.: **Gradašnička pečina cave** (Donji Milanovac, 380 m, 44.5° N, 22.2° E), S, W (Paunović & Stamenković 1998, Paunović 2001); 23 April 1968: 2 fa (NHMB, Đ. Mirić); 21 October 1969: C 250 inds., 2 ma (NHMB, Đ. Mirić); 6 June 1998: C 30 inds. (M. Paunović); 28 October 1998: C 100 inds. (M. Paunović); 24 July 2005: 8 inds. (B. Karapandža, I. Budinski). – **Pečina Šupljajka cave** (Donji Milanovac, 370 m, 44.5° N, 22.2° E), 17 July 2005: C 50 inds.: 1 fa net. (NHMB, B. Karapandža, I. Budinski); 18 July 2005: 3 fa net. (B. Karapandža, I. Budinski); 20 July 2005: 1 fa net. (B. Karapandža, I. Budinski). – **Pečina između I i II prerasta, Vratna cave** (Jakubovac, 200 m, 44.4° N, 22.3° E), S (Paunović 2001).

Rtanj Mts.: **Pečina Pećurski kamen cave** (Skorica, 470 m, 43.8° N, 21.7° E), S (Paunović 2001); 7 July 2003: C 450 inds.: 51 fa, 13 ma net. (M. Paunović, B. Karapandža); 19 July 2006: C 400 inds. (M. Paunović); 14 July 2009: C 500 inds., 1 ma net. (M. Paunović, B. Karapandža).

Šomrda Mts.: **Dubočka pečina cave** (Kučevo, 360 m, 44.6° N, 21.8° E), 20 September 1968: 1 fa (NHMB, Đ. Mirić). – **Golubačka tvrđava castle** (Golubac, 80 m, 44.7° N, 21.7° E), 26 June 1958: C 50 inds. (Đ. Mirić). – **Pečina cave**, downstream from the castle (Golubac, 76 m, 44.6° N, 21.7° E), S (Paunović & Stamenković 1998, Paunović 2001).

Topuznica Mts.: **Pečina na Lenovačkom vrelu cave** (Zaječar, 230 m, 43.8° N, 22.2° E), 1 August 1978: 1 mj (NHMB, Đ. Mirić).

Slovakia

Košická kotlina Basin: **Mnichova diera cave** (Drienovec, 226 m, 48.6° N, 20.9° E), S (Matis & Fulín 2002).

Muránska planina Mts.: **Dielik tunnel** (Muráň, 500 m, 48.7° N, 19.9° E), 27 January 1996: 1 ind. (M. Uhrin, P. Benda). – **Kostolík cave** (Tisovec, 479 m, 48.6° N, 19.9° E), S, W (Vachold 1955, 1956, 2003, Horáček et al. 1979, Hanák & Anděra 1980); 4 February 2002: 3 inds. (M. Uhrin, P. Benda, J. Hotový); 6 February 2007: 1 ind. (P. Benda). – **Šarkanica cave** (Muráň, 925 m, 48.7° N, 19.9° E), 6 February 2008: 1 ind., OW *Sa* (J. Obuch).

Revúcka vrchovina Mts.: **Betliar manor house** (341 m, 48.7° N, 20.5° E), 12 July 2001: C 45 inds. (M. Fulín); 22 August 2007: C 50 inds., S (M. Ceľuch, M. Uhrin); 19 May 2009: 1 ind. (M. Ceľuch); 18 May 2011: C 10 inds. (M. Uhrin, E. Miková). – **Bradlo mine** (Nandraž, 770 m, 48.6° N, 20.2° E), S, W, OW *Sa* (Uhrin et al. 2002a); 1 August 2005: C min. 1000 inds., 1 ind. dead (M. Uhrin, P. Benda); 7 April 2006: 2 inds., OW *Sa* (J. Obuch); 8 July 2006: C 1800 inds. (M. Ceľuch, P. Kaňuch, P. Bryndza); 5 February 2008: 1 ind., OW *Sa* (J. Obuch); 12 August 2008: C 2500 inds. (M. Ceľuch); 4 February 2009: 1 ind., OW *Sa* (J. Obuch); 15 May 2009: 1 ma net. (M. Ševčík, P. Hohti); 12 June 2009: 13 faG, 4 ma net. (M. Ševčík, P. Hohti); 20 June 2009: 7 faL, 6 ma, 4 faG net. (M. Ševčík, P. Hohti); 11 July 2009: 4 mj, 4 fj, 14 faL net. (M. Ševčík, P. Hohti); 6 August 2009: 3 mj, 1 ms, 9 fa, 4 fj, 3 fs net. (M. Ševčík, L. Naďo); 8 August 2009: 1 ms, 1 fj net. (M. Ševčík, L. Naďo); 24 August 2009: 4 mj, 1 ms, 3 fj, 1 fs net. (M. Ševčík); 9 February 2010: 1 ind. obs., 1 ind., OW *Sa* (P. Bačkor, J. Obuch); 3 July 2010: 8 ma, 9 fa net. (M. Ševčík, L. Naďo); 28 July 2010: 6 inds., 2 ma, 2 fa net. (M. Ševčík, E. Miková); 23 May 2012: C hundreds inds. (M. Uhrin, E. Miková). – **Burda, cave** (Rovné, 380 m, 48.5° N, 20.0° E), W (Gulička 1975); 9 February 2004: 2 inds. (L. Bobáková, P. Bryndza). – **Chvalovská jaskyňa cave** (Chvalová, 263 m, 48.5° N, 20.1° E), S (Horáček et al. 1995; Uhrin & Benda 1995; Uhrin et al. 1996a, 2002); 5 February 2006: 1 dead ind. (M. Uhrin, P. Benda, J. Hotový); 20 July 2009: C 20 inds., 2 ma, 1 ms, 1 mj, 2 faL, 3 fs, 1 fj net. (M. Uhrin, P. Benda); 31 July 2009: C 20 inds., 1 ma, 3 mj, 2 ms, 4 fa, 2 fs net. (M. Uhrin, M. Ševčík); 6 September 2010: 3 fa, 2 fj, 2 fs, 6 ma, 1 mj, 3 ms net. (M. Uhrin, E. Miková); 18 May 2011: C 70 inds. (E. Miková); 3 September 2011: C 200 inds. (M. Uhrin, E. Miková); 23 May 2012: C of 200 inds. (M. Uhrin, E. Miková). – **Drienocká jaskyňa cave** (Rybník, 312 m, 48.5° N,

20.0° E), W (Uhrin et al. 2002a); 8 February 2002: 1 ind. (E. Hapl, P. Benda, A. Reiter); 7 February 2003: 1 ind. (P. Benda, A. Reiter, M. Andreas). – **Lipovec, evangetic church** (528 m, 48.5° N, 20.0° E), OW *Ta* (Obuch 2000). – **Podbanište cave** (Slizké, 352 m, 48.5° N, 20.0° E), S (Uhrin & Benda 1995, Uhrin et al. 1996a, 2002); 6 February 2006: 2 inds. (E. Hapl, P. Benda). – **Pokoradz, mine** (Nižná Pokoradz, 410 m, 48.4° N, 20.0° E), 25 March 2007: 1 ind. OW *Sa* (J. Obuch); 4 February 2009: 1 ind. OW *Sa* (J. Obuch). – **Praslen, cave** (Rybník, 333 m, 48.5° N, 20.1° E), 8 February 2010: 1 ind. (M. Uhrin, M. Andreas). – **Rákoš, evangetic church** (275, 48.6° N, 20.1° E), 7 August 2006: C 10 inds. (M. Ševčík); 20 August 2007: 1 ind. (M. Cefuch); 18 May 2009: 2 inds. (M. Cefuch). – **Rákoš Baňa, mine no. 1** (Rákoš, 550 m, 48.6° N, 20.2° E), 5 February 2006: 3 inds., C acoustically recorded (E. Hapl, P. Bryndza); 7 July 2006: 2 faL, 2 f, 2 m net. (M. Cefuch, M. Ševčík); 14 July 2007: 6 faL, 3 ma, 2 f net. (P. Kaňuch); 21 April 2009: 13 fa, 13 ma net. (M. Ševčík, P. Hohti); 16 May 2009: 3 faG, 7 ma net. (M. Ševčík, P. Hohti); 21 June 2009: 4 ma net. (M. Ševčík, P. Hohti); 4 July 2010: 1 ma, 1 fa net. (M. Ševčík, L. Naďo); 29 July 2010: 1 ma, 1 fa net. (M. Ševčík, P. Kaňuch). – **Rákoš Baňa, mine no. 2** (Rákoš, 550 m, 48.6° N, 20.2° E), 7 July 2006: 6 fa, 8 faL, 10 m net. (P. Kaňuch); 14 July 2007: 10 faL, 5 f, 8 m net. (P. Kaňuch); 21 April 2009: 1 ma net. (M. Ševčík, P. Hohti); 24 August 2009: 1 fa net. (M. Ševčík); 25 August 2009: 1 f j net. (M. Ševčík, L. Naďo); 29 July 2010: 1 fa, 1 ma net. (M. Ševčík, E. Miková, M. Rendoš). – **Rákoš Baňa, mines 1 & 2** (Rákoš, 550 m, 48.6° N, 20.2° E), 23 May 2012: 14 m, 5 fs, 2 faG net. (M. Uhrin, E. Miková, E. Hapl). – **Rákoš Baňa, mine 3** (Rákoš, 430 m, 48.6° N, 20.1° E), 7 July 2006: 9 m net. (P. Pjenčák); 14 July 2007: 1 m net. (P. Bačkor); 17 July 2007: 1 f, 7 faL, 9 ma net. (M. Cefuch, P. Bačkor, P. Bryndza). – **Rimavské Brezovo, church** (275 m, 48.5° N, 19.9° E), S (Uhrin et al. 2002a). – **Špaňopofská jaskyňa cave** (Španie Pole, 301 m, 48.5° N, 20.1° E), 10 February 2004: 2 inds. (P. Bryndza, J. Hotový); 1 February 2009: 3 inds. (M. Uhrin, P. Benda). – **Veľká drienčanská jaskyňa cave** (Drienčany, 246 m, 48.4° N, 20.0° E), S, W, OS (Zima 1983, Horáček & Červený 1985, Horáček et al. 1995, Obuch 1995, Uhrin & Benda 1995, Uhrin et al. 1996a, 2002, Bačkor et al. 2008); 5 June 1996: 3 faG net. (M. Uhrin, P. Benda); 24 October 1996: 7 inds., OS (J. Obuch); 26 January 2005: 1 ind. (E. Hapl, A. Reiter, P. Bryndza); 22 June 2009: 3 ma, 3 fa, 2 faG, 6 faL net. (M. Ševčík, P. Hohti); 19 July 2009: mixed C 200 inds. of *Reur* and *Mschr*, 1 ms, 3 mj, 2 fs, 2 faL net. (M. Uhrin, P. Benda); 18 May 2011: 2 inds. (M. Uhrin, E. Miková); 3 September 2011: C 100 inds. (M. Uhrin, E. Miková). **Rimavská kotlina Basin: Horná maňianska jaskyňa cave** (Bretka, 218 m, 48.4° N, 20.3° E), W (Uhrin 1993, Uhrin & Hapl 2002); 14 February 2004: 1 ind. (M. Uhrin, P. Benda, A. Reiter). – **Licince mine** (220 m, 48.5° N, 20.2° E), W (Uhrin & Hapl 2002); 4 February 2003: 1 ind. (M. Uhrin, P. Benda, E. Cepáková). – **Malé Teriakovce, evangetic church** (247 m, 48.4° N, 20.0° E), S (Horáček & Červený 1984, Horáček et al. 1995). – **Peškó cave** (Bretka, 200 m, 48.4° N, 20.3° E), OS (Ložek et al. 1989); 3 January 1989: 2 inds., OW *Sa* (J. Obuch). – **Pivničná diera cave** (Plešivec, 220 m, 48.5° N, 20.3° E), S (Matis et al. 2002).

Slovenský kras Mts.: Ardovská jaskyňa cave (Ardovo, 314 m, 48.5° N, 20.4° E), S, W (Vachold 1955, 1956, 2003, Mituch 1963, 1964, Hürka 1964, Mituch 1964, Gaisler & Hanák 1972, Horáček et al. 1979, Mošanský 1981, Uhrin et al. 1996a); 20 January 1996: 6 inds. (M. Uhrin); 26 January 1996: 13 inds. (M. Uhrin); 29 January 1998: 1 ind. (A. Reiter, M. Andreas); 3 February 1999: 5 inds.; 3 February 2000: 1 ind. (P. Benda, A. Reiter, M. Andreas); 6 February 2002: 20 inds., 2 active inds. (P. Benda, M. Andreas, J. Hotový); 6 February 2003: 19 inds. (A. Reiter, E. Cepáková); 12 February 2004: 1 ind. (P. Benda, P. Bryndza, A. Reiter); 15 March 2006: 109 inds. (E. Hapl, P. Bryndza); 4 February 2007: 5 inds. (M. Uhrin, P. Benda); 5 February 2008: 3 inds. (M. Uhrin, P. Benda, R. Lučan); 3 February 2009: 130 inds. (M. Uhrin, P. Benda); 2 June 2009: several inds. (L. Kováč); 22 October 2010: 100 inds. (E. Kováč); 6 April 2011: several inds. (L. Kováč); 3 November 2011: 40 inds. (M. Uhrin, E. Miková); 10 November 2012: 160 inds. (M. Uhrin, E. Miková). – **Brázda cave** (Silica, 598 m, 48.5° N, 20.4° E), 23 February 2009: 1 ind. (Š. Matis, Z. Jerg). – **Čertova diera na Hornom vrchu cave** (Bôrka, 767 m, 48.6° N, 20.7° E), W (Matis 2002b); 8 December 2001: 9 inds. (Š. Matis, P. Pjenčák, T. Máté, M. Horčík); 18 March 2006: 13 inds. (Š. Matis, P. Pjenčák, Z. Jerg); 2 March 2009: 27 inds. (Š. Matis, Z. Jerg); 2 March 2010: 33 inds. (Š. Matis, Z. Jerg). – **Čertova diera pri Domici cave** (Kečovo, 339 m, 48.4° N, 20.4° E), S, W, OS (Grulich & Povolný 1955, Vachold 1955, Gaisler & Hanák 1972, Horáček 1976, Horáček et al. 1979, 1995, Uhrin et al. 1996a, b, Matoušek 1998, Matis et al. 2002); 24 January 1997: 1 ind.; 3 February 1999: 7 inds.; 8 September 1999: 17 inds. net.; 7 February 2002: 9 active inds. (E. Hapl, A. Reiter, E. Cepáková); 5 February 2003: 4 inds. (L. Bobáková, J. Hotový); 22 August 2007: 2 inds. det. (M. Uhrin, M. Cefuch); 5 February 2008: 6 inds. (M. Uhrin, P. Bryndza); 4 February 2009: 6 inds. (P. Bryndza); 16 March 2010: 8 inds. (Š. Matis); 16 November 2012: many inds. det. (M. Uhrin). – **Domica cave** (Kečovo, 340 m, 48.4° N, 20.4° E), S, W (Kettner 1932; Staněk 1932, Štěpánek 1936, 1938, Rosický 1950, Jurík 1955, Grulich & Povolný 1955, Šebek 1955, Vachold 1955, 1956, Hürka 1963, Uhrin 1994, 1997, Horáček et al. 1995, Obuch 1995, Uhrin et al. 1996a, b, Bobáková 2004); 24 January 1988: 4 inds.; 21 November 1988: 800–1000 inds.; 9 December 1988: 300–400 inds.; 24 January 1989: 4 inds.; 26 January 1995: 5 inds. (M. Uhrin); 16 February 1995: 1632 inds. (M. Uhrin); 8 June 1995: 400 inds. (M. Uhrin); 22 October 1996: 600 inds. (M. Uhrin); 12 November 1996: 1000 inds. (M. Uhrin, F. Bernardovič); 24 January 1997: 7 inds. (M. Uhrin, P. Benda); 30 January 1998: 7 inds. (M. Uhrin, A. Reiter, b); 3 February 1999: 30 inds. (L. Bobáková, E. Hapl); 14 March 1999: 124 inds. (L. Bobáková); 13 November 1999: 1902 inds. (L. Bobáková); 12 December 1999: 12 inds. (L. Bobáková); 14 January 2000: 22 inds. (L. Bobáková); 3 February 2000: 40 inds. (L. Bobáková, Š. Matis, M. Fulín); 11 March 2000: 458 inds. (L. Bobáková); 11 November 2000: 2004 inds.; 13 December 2000: 12 inds. (M. Olekšák); 10 January 2001: 24 inds. (E. Hapl); 31 Ja-

uary 2001: 19 inds. (L. Bobáková); 3 April 2001: 1136 inds.; 4 May 2001: 803 inds.; 3 June 2001: 500 inds. (M. Fulín); 7 February 2002: 309 inds. (L. Bobáková, E. Hapl); 10 March 2002: 828 inds. (L. Bobáková); 16 April 2002: 1811 inds.; 5 May 2002: 1 ind. (E. Hapl); 5 May 2002: 585 inds. (M. Babnič); 7 June 2002: 635 inds.; 11 July 2002: 543 inds.; 7 August 2002: 3 inds.; 22.9. 2002: 1022 inds. (E. Hapl); 11 October 2002: 1016 inds.; 14 November 2002: 2502 inds.; 8 December 2002: 2 inds.; 5 February 2003: 621 inds. (L. Bobáková, J. Hotový); 7 February 2006: C + 12 inds. (E. Hapl, P. Bryndza, P. Bačkor); 5 February 2008: 102 inds. (J. Obuch); 4 February 2009: 1 ind. (M. Uhrin, P. Benda); 9 February 2010: 15 inds. (R. Lučan, M. Andreas); 7 December 2010: 118 inds. (M. Uhrin, E. Miková); 3 November 2011: 2658 inds. (M. Uhrin, E. Miková); 10 November 2012: 2266 inds. (M. Uhrin, E. Miková); 16 November 2012: ca. 200 inds. (M. Uhrin, E. Miková); 17 November 2012: ca. 5 inds. (M. Uhrin, E. Miková). – **Drienovec, manor house** (400, 190 m, 20.9°, 48.6°), 4 October 2006: 1 ind. det. (Š. Matis). – **Drienovecká mokrad' wetland** (Drienovec, 190 m, 48.6° N, 20.9° E), 7 April 2004: 1 ind. net. (P. Pjenčák, Š. Matis, M. Olekšák); 17 October 2009: 4 inds. net. (P. Pjenčák). – **Drienovská jaskyňa cave** (Drienovec, 245 m, 48.6° N, 20.9° E), S, W (Vachold 1956, 1957, 2003, Dusbábek 1964, Húrka 1964, Gaisler & Hanák 1972, Danko & Mihók 1989, Horáček et al. 1995, Uhrin et al. 1996a, Matis 2000, 2002a); 8 February 1997: 343 inds. (Š. Matis, E. Hapl, M. Fulín), 1 ind., OS (J. Obuch); 24 January 1998: 352 inds. (Š. Matis, P. Pjenčák, E. Hapl); 1 March 1998: 122 inds. (Š. Matis); 29 January 1999: 400 inds. (Š. Matis, M. Olekšák); 18 January 2000: 385 inds. (Š. Matis, M. Fulín); 9 February 2001: 310 inds. (Š. Matis, P. Pjenčák); 20 January 2002: 268 inds. (Š. Matis, P. Pjenčák); 30 July 2002: 1 ind. (Š. Matis, M. Olekšák); 26 January 2003: 340–360 inds. (Š. Matis, P. Pjenčák); 3 October 2003: 1 m net. (Š. Matis, P. Pjenčák, M. Cefluch); 25 January 2004: 380 inds. (Š. Matis, P. Pjenčák, S. Boldogh); 24 February 2004: several inds. (Š. Matis); 24 March 2004: several inds. (Š. Matis, M. Fulín); 24 February 2005: 170 inds. (Š. Matis, P. Pjenčák); 27 January 2006: 400 inds. (Š. Matis, P. Pjenčák); 28 January 2006: 400 inds. (Š. Matis, P. Pjenčák); 8 May 2006: 3 f, 6 m net. (M. Uhrin); 12 November 2006: 400 inds. (Š. Matis); 18 November 2006: 1 ind. (Š. Matis, M. Fulín); 29 January 2007: 380 inds. (Š. Matis, M. Fulín, M. Uhrin); 28 March 2007: 2 f net. (M. Uhrin, P. Kaňuch, M. Fulín); 13 August 2007: 1 ind. net. (M. Uhrin, M. Fulín); 21 August 2007: several inds. net. (M. Uhrin, M. Fulín, M. Cefluch); 9 October 2007: 1 f, 2 m net. (M. Uhrin, M. Fulín, M. Noga); 30 November 2007: several inds. (Š. Matis, M. Fulín); 27 January 2008: 15 inds.; 25 May 2008: 1 f net. (M. Uhrin, M. Fulín); 20 October 2009: 250 inds. (Š. Matis, Z. Višňovský); 8 February 2009: 176 inds. (Š. Matis); 25 February 2010: 56 inds. (Š. Matis); 9 May 2010: 1 faG net. (M. Ševčík, M. Uhrin); 14 June 2011: 1 ma net. (M. Uhrin, E. Miková); 8 November 2011: 693 inds. (M. Uhrin, E. Miková); 3 May 2012: 2 inds. net. (M. Uhrin, E. Miková). – **Drnava, manor house** (382, 48.6° N, 20.6° E), S (Matis et al. 2007); 6 August 2007: C 20 inds. (Š. Matis, M. Olekšák); 2 August 2008: C 40 inds. (Š. Matis); 18 July 2009: mixed C ca. 400 inds. of *Reur*, *Rfer* and *Mema*, 2 fa, 7 ma, 3 ms examined (M. Uhrin, P. Benda). – **Erňa cave** (Zádiel, 410 m, 48.6° N, 20.8° E), S (Uhrin et al. 1996a). – **Gemerskoteplická jaskyňa cave** (Jelšavská Teplica, 242 m, 48.6° N, 20.3° E), S (Uhrin et al. 1996a, 2002); 28 June 2003: 4 fa, 1 faL, 1 faG, 5 ma net. (M. Uhrin). – **Geofyzikálne štôlne mines** (Hrhov, 350 m, 48.6° N, 20.7° E), 29 February 2004: 1 ind. (Š. Matis, P. Pjenčák); 21 December 2006: 1 ind. (Š. Matis, M. Boďová); 25 January 2008: 1 ind. (Š. Matis, P. Pjenčák); 20 February 2009: 8 inds. (Š. Matis); 16 December 2009: 1 ind. (Š. Matis); 1 February 2010: 20 inds. (Š. Matis). – **Hámorská jaskyňa cave** (Plešivec, 260 m, 48.5° N, 20.4° E), OS (Horáček & Ložek 1993); 4 January 1993: 1 ind., OW *Sa* (J. Obuch). – **Hrhov, road** (200 m, 48.6° N, 20.7° E), S (Matis et al. 2002). – **Hrušovská jaskyňa cave** (Hrušov, 295, 48.6° N, 20.6° E), W (Matis 2002b); 2 February 2003: 8 inds. (Š. Matis, P. Pjenčák); 20 March 2006: 7 inds. (Š. Matis); 26 February 2009: 44 inds. (Š. Matis). – **Hucínska jaskyňa cave** (Hucin, 280 m, 48.5° N, 20.3° E), 9 March 2010: 1 ind. (Š. Matis). – **Jaskyňa nad vinicami cave** (Hrušov, 420 m, 20.6°, 48.6°), 20.3. 2006: 1 ind. (Š. Matis). – **Jasov, manor house** (280 m, 48.7° N, 20.9° E), S (Horáček et al. 1995, Matis 1998, Matis et al. 2002, 2007, Fulín & Matis 2007); 7 September 1998: C 20 inds.; 1 June 2001: C tens inds. (M. Fulín, H. Limpens); 12 August 2002: mixed C 350 inds. of *Reur*, *Rfer* and *Mema* (Š. Matis, M. Olekšák); 25 June 2003: mixed C 350 inds. of *Reur*, *Rfer* and *Mema* (Š. Matis, M. Fulín); 13 July 2004: mixed C 400 inds. of *Reur*, *Rfer* and *Mema* (Š. Matis); 8 July 2005: mixed C 400 inds. of *Reur*, *Rfer* and *Mema* (Š. Matis, S. Boldogh); 15 July 2008: C 400 ind. (Š. Matis); 10 July 2009: C 600 inds. (Š. Matis); 18 July 2009: mixed C hundreds inds. of *Reur* and *Mema*, 1 faL, 3 fs, 2 fj, 6 ma, 1 mj, 7 ms net. (M. Uhrin, P. Benda); 8 May 2010: C 20 inds., 1 fs net. (M. Andreas, P. Benda, M. Uhrin); 9 May 2010: 3 m, 2 fa net. (M. Andreas, P. Benda, M. Uhrin); 10 May 2010: 3 ma net. (M. Andreas, P. Bačkor, M. Uhrin); 5 July 2010: 9 m, 15 fa, 2 f net. (M. Andreas, P. Bačkor); 6 July 2010: 5 faL net. (M. Andreas); 9 July 2010: C 250 inds. (M. Uhrin); 13 July 2010: C 300 inds. (incl. juveniles) (M. Uhrin); 10 July 2011: 1 fa, 8 faL, 5 ma net. (M. Uhrin, E. Miková); 5 September 2011: C 200 inds. (M. Uhrin, E. Miková); 4 May 2012: C 40 inds. (M. Uhrin, E. Miková); 19 May 2012: several inds. (M. Uhrin, E. Miková); 23 May 2012: C 150 inds. (M. Uhrin, E. Miková); 27 May 2012: 2 faG, 1 ms net. (M. Uhrin, E. Miková); 31 May 2012: 3 m, 7 faG net. (M. Uhrin, E. Miková). – **Jasovská jaskyňa cave** (Jasov, 257 m, 48.6° N, 20.9° E), S, W, OS (Kormos 1917, Rosický 1948, Vachold 1955, 1956, 2003, Mituch 1964, Gaisler & Hanák 1972, Horáček et al. 1979, 1995, Mošanský 1981, Horáček & Červený 1985, Danko & Mihók 1989, Fulín 1995, Matoušek 1998, Fulín & Matis 2002, 2006, 2007, Matis et al. 2002, Obuch 2002); 28 January 1994: 132 inds. (M. Fulín); 27 November 1994: 3 inds. (M. Fulín); 12 February 1995: 2 inds. (M. Fulín, M. Ševčík); 16 March 1995: 14 inds. (M. Fulín); 25 June 1995: 7 inds. (M. Fulín); 21 October 1995: 1 inds. (M. Fulín); 1 November 1995: 8 inds. (M. Fulín); 30 December 1995: 11 inds. (M. Fulín); 7 January 1996: 1 ind. (M. Fulín); 20 January 1996: 2 inds. (M. Fulín); 28 Janu-

ary 1996: 3 inds. (M. Fulín); 3 March 1996: 2 inds. (M. Fulín); 31 March 1996: 3 inds. (M. Fulín); 19 May 1996: 7 inds. (M. Fulín); 25 May 1996: 3 inds. (M. Fulín); 26 May 1996: 7 inds. (M. Fulín); 19 September 1996: 27 inds. (M. Fulín); 12 November 1996: 1 inds. (M. Fulín); 14 March 1997: 2 inds. (M. Fulín); 15 October 1997: 68 inds. (M. Fulín); 4 November 1997: 26 inds. (M. Fulín); 14 November 1997: 26 inds. (M. Fulín); 3 March 1998: 5 inds. (M. Fulín, Š. Matis); 12 October 1998: 307 inds. (M. Fulín); 8 November 1998: 4 inds. (M. Fulín, Š. Matis); 22 November 1998: 9 inds. (M. Fulín); 6 December 1998: 10 inds. (M. Fulín, Š. Matis); 27 December 1998: 10 inds. (M. Fulín, Š. Matis); 10 January 1999: 10 inds. (M. Fulín, Š. Matis); 12 February 1999: 8 inds. (M. Fulín, Š. Matis); 8 April 1999: 1 inds. (M. Fulín); 6 October 1999: 206 inds. (M. Fulín); 20 October 1999: 1 inds. (M. Fulín); 22 October 1999: 1 ind. (M. Fulín); 9 November 1999: 2 inds. (M. Fulín, Š. Matis); 28 November 1999: 5 inds. (M. Fulín, Š. Matis); 13 December 1999: 2 inds. (M. Fulín, Š. Matis, P. Pjenčák); 27 December 1999: 4 inds. (M. Fulín, Š. Matis); 14 January 2000: 5 inds. (M. Fulín, Š. Matis, M. Olekšák); 28 January 2000: 3 inds. (M. Fulín, Š. Matis); 2 March 2000: 8 inds. (M. Fulín, Š. Matis); 23 March 2000: 10 inds. (M. Fulín, Š. Matis); 13 October 2000: 42 inds. (M. Fulín, Š. Matis); 3 June 2001: tens inds. (M. Fulín); 25 October 2001: 177 inds. (M. Fulín); 15 November 2001: 23 inds. (M. Fulín); 1 December 2001: 2 inds. (M. Fulín, Š. Matis); 13 December 2001: 7 inds., OS (J. Obuch); 14 December 2001: 2 inds. (M. Fulín), 35 inds., OS (J. Obuch); 12 January 2002: 6 inds. (M. Fulín, Š. Matis); 25 January 2002: 6 inds. (M. Fulín, Š. Matis); 7 February 2002: 1 ind., OS (J. Obuch); 9 February 2002: 8 inds. (M. Fulín); 20 March 2002: 2 inds. (M. Fulín); 14 April 2002: 13 inds. (M. Fulín); 25 October 2002: 98 inds. (M. Fulín); 11 November 2002: 17 inds. (M. Fulín, Š. Matis); 1 December 2002: 14 inds. (M. Fulín, Š. Matis); 12 December 2002: 12 inds. (M. Fulín, Š. Matis, P. Pjenčák); 11 February 2003: 3 inds. (M. Fulín); 4 April 2003: 20 inds. (M. Fulín, Š. Matis); 24 April 2003: 35 inds. (M. Fulín); 29 April 2003: 40 inds. (M. Fulín); 22 July 2003: 45 inds. (M. Fulín, Š. Matis); 5 September 2003: 68 inds. (Š. Matis, P. Pjenčák); 30 September 2003: 8 inds. (Š. Matis, P. Pjenčák); 29 October 2003: 6 inds. (M. Fulín); 16 November 2003: 18 inds. (M. Fulín); 30 November 2003: 23 inds. (M. Fulín, Š. Matis, P. Pjenčák); 14 December 2003: 24 inds. (M. Fulín); 31 December 2003: 24 inds. (M. Fulín); 4 February 2004: 19 inds. (M. Fulín, Š. Matis); 18 February 2004: 18 inds. (M. Fulín, Š. Matis); 14 March 2004: 3 inds. (M. Fulín, Š. Matis); 12 September 2004: 6 inds. (M. Fulín); 14 September 2004: 2 inds. (M. Fulín); 20 October 2004: 251 inds. (M. Fulín); 4 November 2004: 109 inds. (M. Fulín); 14 December 2004: 1 ind. (M. Fulín, Š. Matis); 28 December 2004: 6 inds. (M. Fulín, Š. Matis); 7 January 2005: 3 inds. (M. Fulín); 26 January 2005: 13 inds. (M. Fulín); 4 February 2005: 19 inds. (M. Fulín, Š. Matis); 11 February 2005: 7 inds. (M. Fulín); 6 March 2005: 2 inds. (M. Fulín); 20 September 2005: 423 inds. (M. Fulín); 13 October 2005: 351 inds. (M. Fulín); 27 October 2005: 400 inds. (M. Fulín); 10 November 2005: 1 inds. (M. Fulín); 2 January 2006: 3 inds. (M. Fulín); 13 January 2006: 9 inds. (M. Fulín); 11 February 2006: 13 inds. (M. Fulín); 7 March 2006: 12 inds. (M. Fulín); 11 June 2006: 13 inds. (M. Fulín, Š. Matis); 31 December 2006: 19 inds. (M. Fulín); 17 January 2007: 23 inds. (M. Fulín); 2 February 2007: 23 inds. (M. Fulín); 23 February 2007: 19 inds. (M. Fulín); 9 March 2007: 71 inds. (M. Fulín); 22 August 2007: 6 f, 2 m net. (M. Ceľuch); 18 October 2007: 350 inds. (M. Fulín); 31 October 2007: 326 inds. (M. Fulín); 15 November 2007: 11 inds. (M. Fulín); 28 November 2007: 6 inds. (M. Fulín); 12 December 2007: 9 inds. (M. Fulín); 31 December 2007: 11 inds. (M. Fulín); 10 January 2008: 11 inds. (M. Fulín); 25 January 2008: 14 inds. (M. Fulín); 26 February 2008: 45 inds. (M. Fulín); 18 March 2008: 7 inds. (M. Fulín); 13 August 2008: 7 fA, 3 ma net. (M. Ceľuch); 28 October 2008: 8 inds. (M. Fulín); 30 December 2008: 1 inds. (M. Fulín); 13 January 2009: 1 inds. (M. Fulín); 4 February 2009: 4 inds. (M. Fulín); 22 April 2009: 1 fa net. (M. Ševčík, P. Hohti); 14 May 2009: 2 fa, 4 ma net. (M. Ševčík, P. Hohti); 13 June 2009: 15 faG net. (M. Ševčík, P. Hohti); 9 February 2010: 2 inds. (M. Fulín, Š. Matis); 1 September 2010: 750 inds. (M. Fulín, M. Ševčík, E. Miková); 1 September 2010: 4 ms, 2 fs, 11 ma, 1 mj, 5 fa net. (M. Fulín, M. Ševčík, E. Miková); 2 September 2010: 4 ma, 2 fa, 7 mj, 7 fj net. (M. Fulín, M. Ševčík, E. Miková); 25 November 2010: 10 inds. (M. Fulín); 13 June 2011: 2 fs, 8 m, 4 ms, 11 ma net. (M. Uhrin, E. Miková); 8 July 2011: 1 fa, 1 ms net. (M. Uhrin, E. Miková); 11 July 2011: 10 fa, 2 m net. (M. Uhrin, E. Miková); 12 July 2011: 5 fa, 1 fs net. (M. Uhrin, E. Miková); 10 August 2011: 3 ma, 3 ms net. (M. Uhrin, E. Miková); 2 September 2011: 2 fs net. (M. Uhrin, E. Miková); 3 September 2011: 2 fs, 1 ms, 4 ma net. (M. Uhrin, E. Miková); 4 September 2011: 1 fs, 1 ma, 2 ms net. (M. Uhrin, E. Miková); 21 September 2011: 1 fs net. (M. Uhrin, E. Miková); 6 April 2012: 2 fs, 2 m, 2 ma, 2 ms net. (M. Uhrin, E. Miková); 4 May 2012: 20 inds. (M. Uhrin, E. Miková); 20 May 2012: 1 fs net. (M. Uhrin, E. Miková); 13 June 2012: 1 fs, 1 fa, 1 ma, 1 ms net. (M. Uhrin, E. Miková); 13 July 2012: 1 ms net. (M. Uhrin, E. Miková); 21 August 2012: 1 fa, 1 fs, 5 fj, 3 ms net. (M. Uhrin, E. Miková). – **Krásnohorská Dlhá Lúka, church and school** (315 m, 48.6° N, 20.6° E), S (Horáček et al. 1979, 1995, Horáček & Červený 1984). – **Krásnohorská jaskyňa cave** (Krásnohorská Dlhá Lúka, 316 m, 48.6° N, 20.5° E), W (Kováč et al. 2005). – **Liščia diera cave** (Kečovo, 373 m, 48.4° N, 20.4° E), S, W (Grulich & Povolný 1955, Vachold 1955, Hárka 1963, Gaisler & Hanák 1972, Horáček et al. 1979, 1995, Mošanský 1981, Zima 1983, Horáček & Červený 1985, Uhrin et al. 1996a, b, 2002b); 14 July 1996: 2 inds. (M. Uhrin); 24 January 1997: 2 inds., OW *Sa* (J. Obuch); 29 January 1998: 1 inds., OW *Sa* (J. Obuch); 7 February 2002: 1 ind. (E. Hapl); 5 February 2003: 3 inds., OW *Sa* (J. Obuch); 20 February 2004: 1 ind. (L. Bobáková); 17 March 2006: 3 inds., OW *Sa* (J. Obuch); 9 August 2006: C 10–20 inds. (M. Uhrin, P. Kaňuch); 4 February 2007: 2 inds., OW *Sa* (J. Obuch); 22 August 2007: C 10 inds. (M. Uhrin, M. Ceľuch); 4 February 2009: 4 inds., OW *Sa* (J. Obuch); 18 July 2009: min. 5 active inds. obs., 19 ma, 2 ms net. (M. Uhrin, P. Benda); 9 February 2010: 3 inds., OW *Sa* (J. Obuch); 26 April 2011: 1 ma, 2 faG net. (M. Uhrin, E. Miková); 17 May 2011: 1 ma net. (M. Uhrin, E. Miko-

vá); 27 July 2012: 3 ms net. (M. Uhrin, E. Miková). – **Ľudmila cave** (Slavec, 245 m, 48.6° N, 20.5° E), S, W (Grulich & Povolný 1955, Vachold 2003). – **Majkova jaskyňa cave** (Silica, 494 m, 48.5° N, 20.5° E), 6 February 2002: 2 inds. (M. Uhrin, A. Reiter, J. Obuch). – **Maštaľná cave** (Slavec, 594 m, 48.6° N, 20.5° E), 3 January 1988: 1 ind., *OW Sa* (J. Obuch). – **Milada cave** (Silická Brezová, 420 m, 48.5° N, 20.4° E), S, W (Horáček et al. 1995, Uhrin & Benda 1995, Uhrin et al. 1996a, Uhrin 1997, Hapl et al. 2002); 3 February 1999: 39 inds. (M. Andreas, P. Benda, M. Uhrin); 6 February 2002: 3 inds. (M. Andreas, P. Benda, J. Hotový). – **Plešivec** (218 m, 48.5° N, 20.4° E) (Topál 1954); OS (Horáček 1976). – **Rezervovaná jaskyňa cave** (Háj, 480 m, 48.6° N, 20.8° E), 28 August 1999: 1 ind. (Š. Matis). – **Silická Jablonica, barracks** (256 m, 48.5° N, 20.6° E), S (Horáček et al. 1995). – **Silická Jablonica, reform church** (256 m, 48.5° N, 20.6° E), S (Horáček et al. 1979, 1995, Matis et al. 2007); 20 July 2007: C 50 inds. (Š. Matis, M. Fulín); 9 July 2008: C 50 inds. (Š. Matis, S. Boldogh); 3 July 2009: C 150 inds. (Š. Matis, M. Fulín); 21 July 2009: C 150 inds. (Š. Matis, S. Boldogh); 27 July 2010: C 300 inds. (Š. Matis); 3 September 2011: 1 ind. (M. Uhrin, E. Miková); 23 May 2012: C 50 inds. (M. Uhrin, E. Miková). – **Silická Padnica cave** (Silica, 495 m, 48.5° N, 20.5° E), S (Vachold 2003). – **Stará Domicia cave** (Kečovo, 339 m, 48.4° N, 20.4° E), S, OS (Vachold 1955, Gaisler & Hanák 1972, Horáček 1976, Horáček et al. 1979, Matoušek 1998). – **Teplica** (Jasov, 300 m, 48.7° N, 21.0° E), OS *Sa* (Obuch 1985, 1992). – **Vápenná jaskyňa cave** (Hrušov, 454 m, 48.5° N, 20.6° E), 2 February 2003: 1 ind. (Š. Matis, P. Pjenčák). – **Zbojnická jaskyňa cave** (Silická Jablonica, 380 m, 48.5° N, 20.6° E), OS *Sa* (Uhrin et al. 1996a). – **Zvonica cave** (Plešivec, 657 m, 48.6° N, 20.4° E), S (Horáček et al. 1995).

Stolické vrchy Mts.: **Hrlica church** (435 m, 48.6° N, 20.1° E), 10 June 2002: C 15–20 inds. (K. Petrželková). – **Kokavka, mine** (Kokava nad Rimavicou, 415 m, 48.6° N, 19.8° E), W (Fulín & Hapl 2002); 3 March 2002: 6 inds. (M. Fulín); 26 February 2004: 3 inds. (M. Fulín); 1 March 2005: 5 inds. (M. Fulín); 18 February 2007: 13 inds. (M. Fulín); 3 March 2007: 3 inds. (M. Fulín). – **Kutacia štôľňa mine** (Kokava nad Rimavicou, 450 m, 48.5° N, 19.8° E), S (Fulín & Hapl 2002).

Volovské vrchy Mts.: **Adam mine** (Jasov, 400 m, 48.7° N, 20.9° E), S (Matis 2002c); 27 February 2006: 1 ind. (Š. Matis, J. Popovics). – **Krásna Hôrka, castle cellar** (500 m, 48.7° N, 20.6° E), S, OS (Horáček et al. 1979, Horáček & Zima 1979). – **Krásnohorské Podhradie, catholic church** (369 m, 48.6° N, 20.6° E), S (Matis et al. 2002, 2007); 14 August 2002: C 250 inds. (Š. Matis, M. Olekšák); 13 July 2003: C 250 inds. (Š. Matis); 20 July 2004: C 400 inds. (Š. Matis, M. Olekšák); 14 July 2005: C 600 inds. (Š. Matis); 9 August 2006: C (M. Uhrin, P. Kaňuch); 20 July 2007: C 700 inds. (Š. Matis, M. Fulín); 13 July 2009: C 300 inds. (Š. Matis); 27 July 2010: C 70 inds. (Š. Matis). – **Samueli, mine** (Rožňava, 430 m, 48.6° N, 20.5° E), 19 February 2002: 1 ind. (Š. Matis, P. Pjenčák, M. Olekšák). – **Veľká pivnica cave** (Krásnohorské Podhradie, 385 m, 48.6° N, 20.6° E), 13 July 2003: 1 ind. (Š. Matis).