

The presence of Mehely's horseshoe bat *Rhinolophus mehelyi* in South-Western Romania

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Abstract. Mehely's horseshoe bat (*Rhinolophus mehelyi*) is classified as vulnerable by the IUCN. It has a single known colony in Romania with less than 100 adult bats. In 2013 and 2014, we surveyed 24 caves in South-Western Romanian, and regularly identified the bat species outside its currently accepted distribution range, in two caves located on the lower course of the Cerna River. Four methods were used in these surveys: direct observation, mist-netting, harp-trapping, and ultrasound recording. We identified *R. mehelyi* in Gaura Ungurului de la Pecinișca and at Avenul lui Adam, 60 km north of the currently known distribution point of the species. Through these findings we have updated the European distribution of *R. mehelyi*, and we are able to take steps for the protection of these sites.

Key words: updated distribution, caves, horseshoe bats, vulnerable, conservation.

Mehely's Horseshoe bat (*Rhinolophus mehelyi* Matschie, 1901) is discontinuously distributed in the Iberian Peninsula, the Balkans, Bulgaria, Turkey, as well as in the narrow band around the Mediterranean Sea (Gaisler 2001). The presence of *R. mehelyi* in the Balkan Peninsula and along the Croatian Adriatic coast is not clearly known (Dietz et al. 2009b). However, it was recently rediscovered in Peninsular Italy (Dondini et al. 2014) (Fig 1.A.) and also indicated to be present in Serbia (Grubač & Milovanović 2012).

R. mehelyi is an exclusive cave-dwelling species, preferring warm caves located below 700 m asl and extensive karstic areas. Colonies typically include up to 200 bats, but significantly larger colonies of over 5000 bats were documented in Bulgaria (Dietz et al. 2009b) and Romania (Dumitrescu et al. 1963, 1965). Mehely's Horseshoe bat often forms mixed colonies with other medium sized horseshoe bat species, and other cave-dwelling species. Their foraging areas are located in open areas, steppes and pastures (Dietz et al. 2009b), where its diet predominantly (in over 94%) consists of moths (Valenciuc 1971, Salsamendi et al. 2012). Although sedentary in nature, *R. mehelyi* can migrate at distances of up to 94-100 km (Huttrer et al. 2005, Dietz et al. 2009a).

R. mehelyi is classified as vulnerable (Hutson et al. 2008), due to its fragmented distribution and significant population declines. With declines in most of the European countries (Hutson et al. 2008, Dietz et al. 2009b), populations at the northern border of occurrence are close to extinction

(Rodrigues & Palmeirim 1999). The Romanian population of the species are significantly affected by the loss of roosting sites, the modification of feeding areas, as well as the high frequency and uncontrolled nature of cave tourism. In 1950 the *R. mehelyi* population from the Dobrogea Region was estimated to be around 3,000-5,000 bats (Dumitrescu et al. 1963, 1965). In the 1960s agricultural activities were intensified in this region which simultaneously increased cave disturbances that resulted in the constant decline of the *R. mehelyi* population (Hermanns et al. 2002). Currently, the Dobrogea population of *R. mehelyi* is only around 100 adult bats (Nagy & Postawa 2011, Pocora & Pocora 2011). The drastic decrease of colony size combined with low genetic variability (Dragu & Borissov 2011) can lead to the extinction of the Dobrogea population from Romania.

R. mehelyi was also identified over 50 years ago in three caves of South Western Romania, namely Gaura Pârșului de la Capul Bacifului, Gaura lui Schimpfin, and Peștera de la Vălee. The identification was based on cranial materials (Negrea & Negrea 1967) collected by Emil Racoviță Speleological Institute. Unfortunately, this bone material has disappeared from the museum collections (Dragu, Bucharest, pers. comm. 2013). The only specimen left is a single wet-preserved individual collected from Grota Haiducilor (leg. Dumitrescu 1954, Dragu, Bucharest, pers. comm. 2013). Since the last 60 years, this is the only confirmed data regarding the presence of *R. mehelyi* in the Banat Region.

The presence of *R. mehelyi* was also indicated in Peștera Gura Ponicevei (Danube Gorges, Almăjului Mountains), forming a nursery colony of 60 bats and a hibernation aggregation of 162 bats (Murariu et al. 2004). These colonies were reported to occupy the main hall of the cave, at 10-15m height, where accurate species identification is impossible to achieve. However, two other medium-sized horseshoe bat species are also reported from this site; the mediterranean horseshoe bat (*R. euryale* Blasius, 1853) and Blasius's horseshoe bat (*R. blasii* Peters, 1866) (Jéré et al. 2013). The presence of all three medium-sized horseshoe bat species within a site can complicate species determination without detailed measurements (Dietz et al. 2009b). Furthermore, the presence of *R. mehelyi* in Peștera Gura Ponicevei is not supported by bone material, ultrasound recording or mist-netting data, for the last 10 years of bat research (unpublished data, the Romanian Bat Protection Association). In addition, Murariu et al. (2004) does not provide any follow-up data in the time period of 2004-2014. In spite of these aspects, when considering roost and habitat characteristics, we cannot exclude the possible presence of *R. mehelyi* in Peștera Gura Ponicevei and its surrounding habitats.

The surveys undertaken during the LIFE+ project LIFE07 NAT RO 000680, in the Semenic - Cheile Carașului National Park did not find *R. mehelyi* in target caves (Bădescu & Vlaicu 2011), not even in the caves previously reported by Negrea & Negrea (1967). Therefore, there is no recent and proven evidence of the existence of *R. mehelyi* outside Dobrogea. However, in the period of 2013-2014 we demonstrated the permanent presence of *R. mehelyi* in South Western Romania, in the Banat Region, specifically on the lower course of the Cerna River, at two caves of the Cernei and Mehedinți Mountains.

The larger part of the Banat Region (18,945 km²) is located in South Western Romania, with a North Western part of lowlands, and a South Eastern part of extensive karst landscape that includes the Semenic, Almăjului, Locvei, Cernei and Orșovei Mountains. These calcareous mountains are home to several hundred caves (Bleahu et al. 1976). High habitat diversity is characterized by rivers, streams and lakes, untouched deciduous forests, limestone scrubland, alluvial hedgerows, and hillsides used as pastures. The bat fauna of this region is diverse, with a total of 28 reported species (Méhely 1900, Topál 1959, Dumitrescu et al. 1963, Negrea et al. 1967, Nagy et al. 2003, and

unpublished data of the Romanian Bat Protection Association).

At the end of August 2013 and mid-September 2014 we conducted mist-nettings at the entrance of nine caves located in the Banat Region, South Western Romania (Fig. 1.B.). The nine caves were the following (Romanian name, cadastre number from the database of the Emil Racoviță Speleological Institute, mountain region): Peștera Buhui (4/2237, Aninei Mts.), Peștera de la Despicătură (5/2146, Cernei Mts.), Avenul lui Adam (3/2146, Cernei Mts.), Grota Haiducilor (6/2146, Cernei Mts.), Gaura cu Muscă (3/2222, Locvei Mts.), Gaura Haiducească (3/2228, Locvei Mts.), Gaura Ungurului de la Pecinișca (9/2147, Mehedinți Mts.), Peștera Cloșani (34/2120, Mehedinți Mts.), Peștera lui Dușu (2/3022, Zarandului Mts.) (Fig. 1.B.). We used monofilament, 9m black mist-nets (Ecotone), and harp traps. Captured bats were morphologically identified according to the field-key of Dietz et al. (2009b) and Jéré et al. (2010). After standard measurements and genetic sampling (Worthington Wilmer & Barratt 1996) bats were released immediately. In July 2014, we performed standard bat surveys in a total of 22 caves in South-Western Romania (Fig. 1.B.), identified the bat species and estimated the size of nursery colonies. In addition to the previously mentioned caves, the survey included: Peștera 2 Mai (30/2238, Aninei Mts.), Peștera Bulba (7/2130, Mehedinți Mts.), Peștera Comarnic (3/2243, Domanului Mts.), Peștera cu Apă din Cheile Gârliștei (5/2236, Aninei Mts.), Peștera cu Gheață (4/2243, Domanului Mts.), Peștera Fusteica (8/2117, Vâlcăni Mts.), Gaura de la Capu Baciului (9/2246, Domanului Mts.), Gaura Pârșului de la Capu Baciului (10/2246, Domanului Mts.), Gaura Turcului (11/2246, Domanului Mts.), Găurile lui Miloi (8-9/2233, Aninei Mts.), Gura Ponicevei (3/2211, Almăjului Mts.), Peștera Izverna (6/2125, Mehedinți Mts.), Peștera Lazului (29/2121, Mehedinți Mts.), Peștera de la Padina Matei (2/2223, Locvei Mts.), Peștera Porcariului (13/2227, Locvei Mts.). Medium-sized horseshoe bat species that could not be identified on site were photographed and identified on computer, based on Dietz et al. (2009b), and Jéré et al. (2010). In these cases we also detected ultrasound calls with a Pettersson D240X (Pettersson Elektronik AB), and recorded them with an Edirol R09 (Roland). Echolocation pulses were analyzed with BatSound 3.3 (Pettersson Elektronik AB). Peak frequencies of *R. mehelyi* CF ultrasounds are within the 104-111 kHz range (Salsamendi et al. 2005, Dietz et al. 2009b, Pocora & Pocora 2012). The survey including capture and sampling was done according to permit nr. 97/2013 and 171/2014 issued by the Speleological Heritage Committee.

During the study, *R. mehelyi* was identified at two out of the 24 investigated caves. In August 2013, we caught a total of 144 bats at these two sites: 120 individuals at Gaura Ungurului de la Pecinișca and another 24 individuals at Avenul lui Adam (Table 1., Fig. 2.). Out of these 144 bats, two were identified as *R. mehelyi*, one individual at each

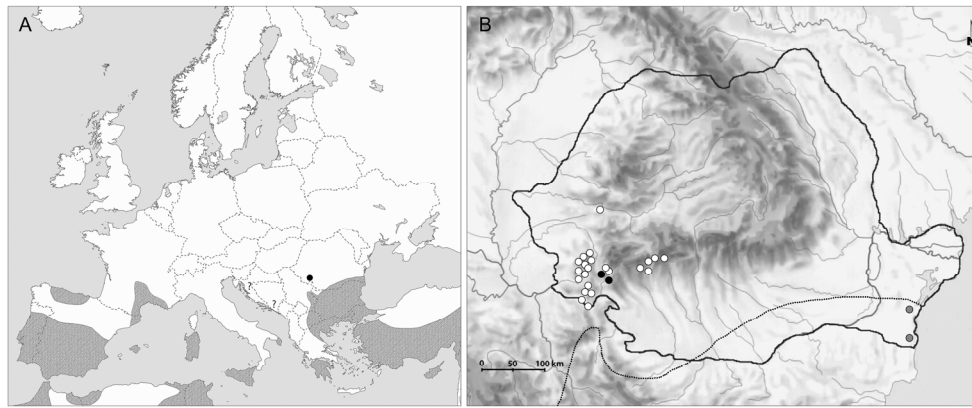


Figure 1. A. European distribution of *R. mehelyi* (Gaisler 2001, Dietz et al. 2009b, Dondini et al. 2014, Grubač & Milovanović 2012). The black dot represents the location of new sites regarding *R. mehelyi* identification in Romania, discussed in the present study. B. Map of Romania, with two known locations of *R. mehelyi* in Dobrogea (gray circles), as well as all surveyed sites of the current study (white and black circles). The two black circles represent Gaura Ungurului de la Pecinișca and Avenul lui Adam. The dotted line represents currently known northern distribution limit of *R. mehelyi*.

Table 1. Location name, capture and visual observation details, as well as ultrasound parameters in case of the *R. mehelyi* specimens identified in the period of 2013-2014 on the lower course of the Cerna River, South Western Romania. Time is given in hh: mm format, forearm length (FA) is given in mm. Bat species captured or observed during the events are given in the last column (Other species). Abbreviations: F = female, A = adult, *Rfer* = *R. ferrumequinum*, *Rbla* = *R. blasii*, *Reur* = *R. euryale*, *Rhip* = *R. hipposideros*, *Mmyo* = *Myotis myotis*, *Mbly* = *M. blythii*, *Mcap* = *M. capaccinii*, *Mdau* = *M. daubentonii*, *Ppip* = *Pipistrellus pipistrellus*, *Ppyg* = *P. pygmaeus*, *Hsav* = *Hypsugo savii*, *Bbar* = *Barbastella barbastellus*, *Msch* = *Miniopterus schreibersii*, *Paus* = *Plecotus austriacus*, medium sized *Rhinolophus* sp. = *R. mehelyi/euryale/blasii*.

Cave	Date	Method	<i>Rhinolophus mehelyi</i>				Other bat species
			Time	Sex	Age	FA	
Avenul lui Adam	2013.08.22	mist-net	22:41	F	A	50.6	<i>Rbla</i> , <i>Reur</i>
Gaura Ungurului de la Pecinișca	2013.08.21	mist-net, harp-trap	20:42	F	A	52.8	<i>Rfer</i> , <i>Rhip</i> , <i>Rbla</i> , <i>Reur</i> , <i>Mmyo</i> , <i>Mbly</i> , <i>Mcap</i> , <i>Mmys</i> , <i>Mdau</i> , <i>Ppip</i> , <i>Ppyg</i> , <i>Hsav</i> , <i>Bbar</i> , <i>Msch</i>
			23:43	F	A	48.2	<i>Rbla</i> , <i>Rhip</i> , <i>Reur</i> , <i>Mcap</i> , <i>Mmyo</i> , <i>Mbly</i> , <i>Ppip</i> , <i>Paus</i> , <i>Bbar</i> , <i>Msch</i>
	00:45	F	A	51.9			
	06:20	F	A	47.4			
	06:40	F	A	48.0			
	2014.07.18	ultrasound recording	sound length: 21,4 - 36 msec peak frequencies: 104,7 - 105,2 kHz				<i>Rbla</i> , <i>Msch</i> , <i>Mmyo</i> , <i>Mbly</i> , medium sized <i>Rhinolophus</i> sp.
		visual observation	20-25 bats				
Avenul lui Adam	2014.07.17	visual observation	2-3 bats				<i>Rfer</i> , <i>Mmyo</i> , <i>Mbly</i> , <i>Msch</i> , <i>Mcap</i> , medium sized <i>Rhinolophus</i> sp.

cave. Captured *R. mehelyi* individuals were in both cases adult females (Table 1.). Gaura Ungurului de la Pecinișca has a remarkable species diversity, considering the capture of a single night. All five *Rhinolophus* species from Romania were captured during the night, with the total number of captured species reaching 15 (Table 1.). During the summer survey of 2014, we found a colony of *R. mehelyi* in Gaura Ungurului de la Pecinișca num-

bering 20-25 bats. In this case we also used ultrasound recordings to identify the species (Table 1., Fig. 2.C.). In Avenul lui Adam we observed 2-3 individuals of *R. mehelyi*. During the autumn survey in 2014, we conducted another mist-netting at Gaura Ungurului de la Pecinișca, capturing a total of 43 bats, four of which were *R. mehelyi* (Table 1.). In all surveys from 2013 and 2014, we also captured and observed species that typically roost

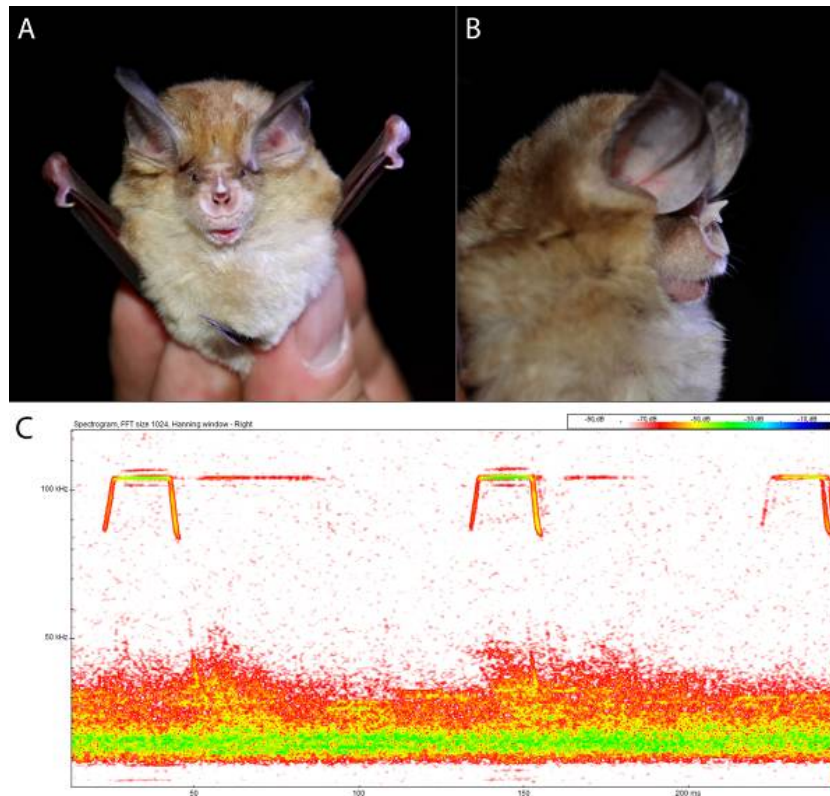


Figure 2. Frontal (A) and lateral (B) profile of *R. mehelyi* specimen caught at Avenul lui Adam, in the Autumn of 2013 (photos: Romanian Bat Protection Association). C: sonogram of *R. mehelyi* in the Gaura Ungurului de la Pecinișca, in July 2014 (see also Table 1. for sound analysis results).

together with *R. mehelyi* (Dietz et al. 2009b), these being cave-dweller species like the greater mouse-eared bat (*M. myotis*), long-fingered bat (*M. capaccinii*) and Schreibers's bat (*M. schreibersii*) (Table 1.). Based on the newly gathered data, we updated the current Romanian distribution of the species, by adding these two sites from the Cernei and Mehedinți Mountains to the distribution map (Fig. 1.B).

Our observations demonstrate the permanent presence of *R. mehelyi* in the Cernei and Mehedinți Mountains, and hence, the Banat Region of Romania. The closest proven records of *R. mehelyi* from all its European distribution range comes from the Republic of Serbia, just outside the limits of Djerdap National Park, in the Canetova Pećina Cave (Grubač & Milovanović 2012). The site is located 60 km south from the two caves of the present study. The closest records of *R. mehelyi* from Bulgaria are located in the Kalna Matrica Cave (Benda

et al. 2003), some 200 km south-east from the two caves of the present study. Although located approx. 25 km north of our location, Gaura Pârșului de la Capul Baciului and Gaura lui Schimpfin (Negrea & Negrea 1967) has no recent and confirmed presence of *R. mehelyi* (Bădescu & Vlaicu 2011). The fact that the two caves where we identified *R. mehelyi* are located approximately 60 km north from the currently proven northernmost point (Canetova Pećina Cave, Republic of Serbia), has significantly modified the current distribution range of the species.

Based on our current findings, we assume that the Cernei and Mehedinți Mountains (especially the caves on the lower course of the Cerna River) are breeding areas of *R. mehelyi* nursery colonies that are currently unknown. The fact that previous surveys did not identify *R. mehelyi* in the area (ex. Nagy et al. 2003, and unpublished data by the Romanian Bat Protection Association) does not ex-

clude the possibility that the species was already present in these caves. The historical presence of the species in these caves is also suggested by the fact that one of the confirmed *R. mehelyi* from the Banat Region (leg. Dumitrescu, 1954; Dragu, Bucharest, pers. comm. 2013) was collected from Peștera Grota Haiducilor, which is located in the immediate vicinity of Avenul lui Adam (<1 km aerial distance). The longest distance between the presently studied two caves and Peștera Grota Haiducilor is below six km. This fact, and also the known migration distances of the species which is below 100 km (Hutterer et al. 2005, Dietz et al. 2009a) makes the historical presence of *R. mehelyi* in the lower course of the Cerna River (between the Cernei and Mehedinți Mountains) more likely, even though additional data is needed to confirm this assumption.

The lower course of the Cerna River, running between the Cerna and Mehedinți Mountains, is a karstic area with a high number of warm caves, streams, large deciduous forests, limestone scrubland and hillsides used as pastures. The area is part of the Domogled - Valea Cernei National Park, overlapping with the Natura 2000 site RO-SCI0069. Legal protection of caves and habitats is available but is poorly applied. High anthropic pressure exists in the caves located in frequently visited areas such as Gaura Ungurului de la Pecinișca (unpublished data of the authors). Habitats are threatened with deforestation and expansion of anthropogenic habitats (e.g. fisheries, private buildings). Efficient management measures are needed to assure the durable protection of the local bat fauna and their habitats, including the population of *R. mehelyi*.

Taking into account the low genetic diversity and isolation of the *R. mehelyi* population in Dobrogea (Dragu & Borissov 2011), as well as the general decreasing trend in European populations (Hutson et al. 2008, Dietz et al. 2009b), it is important that future surveys continue to clarify the real distribution of the species in Romania and surrounding countries (ex. the Republic of Serbia), as well as its conservation status. Regarding the long-term presence of *R. mehelyi* in Romania, it is promising that the species was demonstrated to be permanently present in the Banat Region. In this way, we can further hypothesize if the colony from Gaura Ungurului de la Pecinișca and adjacent areas is part of an isolated population in the Banat Region, or is genetically linked to the Bulgarian/Serbian core populations.

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