

Distribution of bats (Chiroptera) in Montenegro

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Abstract. The first detailed review of the distribution of bats in Montenegro is presented. Altogether 28 species were confirmed to occur in the country: *Rhinolophus ferrumequinum* (55 records), *R. hipposideros* (54), *R. euryale* (12), *R. blasii* (5), *Myotis myotis* (7), *M. blythii* (37), *M. nattereri* (12), *M. emarginatus* (12), *M. mystacinus* (12), *M. alcaethoe* (1), *M. brandtii* (2), *M. daubentonii* (3), *M. capaccinii* (32), *Vespertilio murinus* (4), *Eptesicus serotinus* (7), *Hypsugo savii* (18), *Pipistrellus pipistrellus* (22), *P. pygmaeus* (19), *P. kuhlii* (38), *P. nathusii* (6), *Nyctalus noctula* (13), *N. leisleri* (4), *Plecotus auritus* (2), *P. macrobullaris* (3), *P. austriacus* (4), *Barbastella barbastellus* (1), *Miniopterus schreibersii* (39), and *Tadarida teniotis* (18). For the first time, evidence of the presence of *Myotis daubentonii* and *Barbastella barbastellus* in the country is provided. Majority of the data comes from the past 15 years, and was collected through our own field research, and gathered from nine museum collections and 51 literature sources. The bat observations are concentrated mainly along the Adriatic Sea coast and to the lowland areas around the Skadar lake. However, records of bats are also available from medium altitudes as well as from the high mountain environment. Many species are represented by just a few sightings, and large parts of the country are without any records of even the most frequently observed species. Only 33% of the 10×10 km UTM squares covering Montenegro contain at least one bat record. There are several important summer cave roosts and a few known roosts in buildings, but generally, very little data are available on maternity roosts or hibernacula. We observed several threats to bat populations, from roost disturbance to roost destruction, and incidents of bat road traffic casualties were also recorded. In general, further research on a more extensive scale needs to be completed to get an adequate picture of the distribution and important habitats of individual bat species in Montenegro, and also with the aim of maintaining their favourable conservation status and monitoring their populations.

Bats, distribution, roosts, Montenegro

Introduction

Due to historical reasons, the bat fauna of Montenegro has been poorly studied. Even in fairly recent reviews of the distribution of European bats (e.g. Mitchel-Jones et al. 1999, Dietz et al. 2009), there is a lack of data on many bat species from Montenegro, or their distribution maps have been based on scarce or very old data, often derived from single sources, or even produced using the best expert judgment possible, after taking into account bat records in neighbouring regions. In recent years, field research effort has increased to a certain degree, and it has highlighted the clear need of an overview publication on the bats of Montenegro. Our aim was to gather all available records of bats from Montenegro and to point out the gaps in biogeographical knowledge related to this highly endangered group of mammals.

History of bat research in Montenegro

Even though the first nature conservation laws were adopted in the last decade of the nineteenth century (Vizi 1984), for a long time there was no specific organization dealing with the country's biodiversity. Only in 1961, as a part of the then established Institute for the Protection of Nature, the so called "Collections", a predecessor of the Natural History Museum of Montenegro, was founded in city Titograd (now named Podgorica). It was even later, in 1974, that the predecessor of the present University of Montenegro was established, although the first students of the new Department of Biology were enrolled only in the 1991/1992 academic year. Therefore, for a long time, fauna and flora of the country were generally surveyed by foreign researchers and only a few interested local people.

Bat records before WW2 are very scarce in Montenegro and were collected more or less incidentally. To our knowledge, the oldest bat specimens are found in the Natural History Museum, "La Specola", of the University of Florence, Italy (*Eptesicus serotinus*, Kotor, September 1890) and in the Hungarian Natural History Museum, Budapest (*Myotis mystacinus*, *M. blythii*, *Pipistrellus pipistrellus*, Kotor, August 1906). Miller (1912) provided the first published data on bats of Montenegro; based on a few specimens collected by Ludwig von Führer, a hunter and ornithologist. Von Führer lived in Montenegro and Albania in 1894 and 1895, and his good connections with the Montenegrin king, King Nikola and Crown Prince Danilo, meant he was also allowed to stay in the rebellious border region around the Skadar lake between 1899 and 1901 (Gebhardt 2006). In this period, he collected approximately 800 specimens of different animals, among them also a few specimens of *Myotis blythii* and *Miniopterus schreibersii* from the vicinity of the present capital city of Podgorica, which were entered in the catalogue of the collections of the British Museum (the present Natural History Museum) in London, most probably in 1905.

During the interwar period, a Russian mammologist, Vladimir Martino, who at that time served as an assistant professor of zoology at the Russian University in Belgrade, collected some specimens of *Rhinolophus hipposideros*, *R. blasii*, *Myotis brandtii* (at that time referred to as *Myotis mystacinus*), and *Hypsugo savii* from a few places throughout the country in 1923 and 1939 and sent them to different museums around the world (Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia [ZIN]; National Museum of Natural History, Washington, USA). Another versatile biologist, Stanko Karaman, who was also, among other things, a founder of the Macedonian Museum of Natural History, provided reports on another two species, *Rhinolophus ferrumequinum* and *Myotis emarginatus*, from the Gulf of Kotor (Karaman 1929).

The first proper bat research in Montenegro was conducted by a prominent Serbian mammalogist, Đorđe Mirić, who in 1960 and 1961 investigated in detail bats in several caves and other

structures in the southernmost parts of the coastline (Mirić 1973a, b). There he collected, among other species, also *Rhinolophus euryale*, *Myotis capaccinii*, *M. mystacinus* and *Pipistrellus kuhlii*, for the Natural History Museum in Belgrade. Mirić (1987) also reported bats found during his general mammal survey in the mountainous area of Durmitor in the north of the country in 1960, where he added *Plecotus auritus* to the fauna of Montenegro. However, not all of these early accounts of species were published, nor were all of the species even determined right away. Therefore, Đulić & Mirić (1967) included only nine bat species in the first checklist for Montenegro (*Rhinolophus ferrumequinum*, *R. blasii*, *Myotis blythii*, *M. emarginatus*, *M. capaccinii*, *Pipistrellus pipistrellus*, *P. nathusii* (coll. ZIN), *Eptesicus serotinus*, and *Miniopterus schreibersii*). From then until the mid 1990s, a few incidental findings of bats were made, which were deposited mostly in the collection of the Natural History Museum in Belgrade. However, a French researcher Jean-François Noblet (1986) published data on three new species for Montenegro, which he found during his survey: *Myotis nattereri*, *M. mystacinus* and *Pipistrellus kuhlii*. Petrović et al. (1987) further reported a field observation of *Vespertilio murinus*. Then, Mirić & Paunović (1994), referred to 15 bat species occurring in Montenegro. In the next year, within a monograph on biodiversity of the Federal Republic of Yugoslavia, meaning Serbia and Montenegro, Savić et al. (1995) provided an overview of the diversity of mammals with a list of species for both constitutive parts of the state, as well as an analysis of the mammal diversity of different geographical-administrative regions and subregions. They listed 15 bat species for Montenegro, 13 of them for the mountain (continental) region and seven for the Mediterranean region.

Between 1996 and 1998, several joint field surveys were conducted by Milan Paunović (Natural History Museum, Belgrade) and Čeda Ivanović (Natural History Museum of Montenegro), who inspected some of the caves previously visited by Mirić in 1960, and some additional places as well. At that time, Mirić & Paunović (1997), and Paunović & Stamenković (1998), published accounts on some earlier collected specimens of *Nyctalus leisleri* and *Rhinolophus euryale*, and Benda & Tsytsulina (2000) in their revision of the *Myotis mystacinus* group, published an old record of *M. brandtii* collected by Martino in the 1930s. After forty years the Durmitor area was once again a target for mammal research, it was diligently investigated by student research camps organised by the Research Society “Vladimir Mandić – Manda” from Valjevo, Serbia (*Društvo mladih istraživača »Vladimir Mandić – Manda«, Valjevo*), and led by Branko Karapandža in 2000–2003. The research resulted in records of a few new species for the country (*Myotis myotis*, *Hypsugo savii*, *Plecotus austriacus*) which were reported by Stojić et al. (2004). With two additional species, *Myotis bechsteinii* and *Nyctalus noctula*, Paunović et al. (2004) reported 23 bat species to exist in Montenegro. However, a recent revision of museum collections (Paunović et al. 2010) discovered that a specimen assigned to *Myotis bechsteinii* had been mislabelled and the respective specimen did not originate from Montenegro.

After 2000, Montenegro was visited by many foreign chiropterologists, many of them just on their way to other locations. However, some researchers quickly recorded and published findings of new bat species for the country. Benda (2004a) published records of *Myotis aurascens*, *M. brandtii*, and a tentative record of *M. alcaethoe*; identification of the latter species was later confirmed by Benda et al. (2012). Polish and Czech authors reported on an ultrasound record of *Tadarida teniotis* (Ciechanowski et al. 2005), and Dietz (in Sachanowicz et al. 2006) first published a confirmed evidence of *Pipistrellus pygmaeus*. These records were important additions to the list of bat species of Montenegro, but related to just a few locations. Major additions to the knowledge on the distribution of some species came from data gathered by three Slovenian student research camps organised in the coastal areas of Montenegro in the springs of 2005, 2009, and 2013 (Jazbec 2006, Presetnik 2012, Presetnik in prep.). Even more important was the

involvement of Montenegrin students in bat research. Marina Đurović, Maša Ždralević, Branka Pestorić, Mihailo Jovičević and Miloš Pavičević, all got their grounding in chiropterologic skills at research camps in Slovenia and Serbia (Presetnik 2006, 2007), and through joint field work with Slovenian and Serbian colleagues in Montenegro. Paunović et al. (2010) examined a series of museum specimens, discovered *Plecotus macrobullaris* and reported on 25 bat species (not including *Myotis alcaethoe*).

Following the review by Paunović et al. (2010), the research in Montenegro intensified, a common database was created and regularly updated with new, unpublished field records. New data were collected within different various projects, e.g. bat surveys in the caves around the Skadar lake (the “Nature for the Future” project funded by the European Union, Đurović 2011), investigations of areas around the town of Nikšić (Đurović et al. 2012), or through incidental findings of bats. We also include some of the results of studies carried out by participants of a research camp of the Dutch Mammal Society in 2014 (Vercuise & Mostert in prep.). The summary of all these sources of data is presented below.

Geography of Montenegro

Montenegro is a small country (13,812 km²) in the south-eastern part of Europe with approximately 625,000 inhabitants. Montenegro is bordered by Croatia, Bosnia and Herzegovina, Serbia, Kosovo, Albania and the Adriatic Sea. The landscape relief ranges from high mountains in the northern part of the country (the highest peak is 2,534 m a. s. l.), through karst areas in the central and western parts, to the narrow coastal plain, 316 km long. The coastal plain disappears completely in the northern part of the coast, where mountain ranges plunge abruptly into the inlet of the Gulf of Kotor. Abrupt changes in terrain elevation within relatively short distances are very typical of Montenegro, with the mean elevation being approximately 1,050 m (Radojičić 2002). More than 3,000 caves have been recorded in Montenegro (Pretner 1961, Lješević 1980). The Nikšić karst plain (600–660 m a. s. l.) and the Bjelopavlička and Zeta plains with the town of Danilovgrad and the capital city of Podgorica (40–56 m a. s. l.) are the most densely populated areas of Montenegro. It is on these plains and in the coastal belt that 67% of the total number of inhabitants live. The surface water runoff of Montenegro in the north enters the Danube lowland via the Drina River of Bosnia and Herzegovina, while in the south, streams flow toward the Adriatic Sea. The largest lake (370 km²) of Montenegro, and also of south-eastern Europe, is the Skadar lake (Skadarsko jezero), which is shared with Albania. The lower areas of Montenegro have a warm Mediterranean climate that verges on being classified as humid subtropical, having hot though short, dry summers and cool, rainy winters. The distinguishable climate zones are: coastal (the towns of Kotor, Bar, and Ulcinj), with distinct Mediterranean characteristics; sub-Mediterranean, including the Podgorica-Skadar valley, the Bjelopavlička plain, and part of the Nikšić plain; mountain (the town of Žabljak), with extremely cold winters (the mean January temperature is below 0 °C), but with autumn and winter precipitation; and a moderately-continental climate in the north-eastern parts of Montenegro (the towns of Pljevlja and Mojkovac). Temperatures vary greatly with elevation. Podgorica, lying near sea level, is noted for having the hottest July temperatures in Montenegro, averaging 27 °C, and often reaching 40 °C. Cetinje, in the karst plain at an elevation of 670 m a. s. l., has a mean temperature of 22 °C. January temperatures range from 8 °C at Bar on the southern coast to –3 °C in the northern mountains. The annual precipitation at Crkvice, above the Gulf of Kotor, is 4,742 mm, in Podgorica it is around 1,600 mm. Snow cover is rare along the Montenegrin coast. It averages 10 days in low-lying karst areas and increases to 120 days in the higher mountains (Radojičić 2002).

Methods

Data were gathered from all available literature sources, museum collections and field observations. Through personally conducted inspections, interviews with museum curators, and searches through databases accessible via the internet, we tried to examine major international and regionally important museum collections. A detailed inspection of all Chiroptera specimens was conducted in the collection of the Natural History Museum in Belgrade, Serbia, which also houses the largest number of bat specimens from Montenegro. Field data were collected by means of visual observations of bats in their roosts, mist netting in front of the shelters and in foraging habitats, and the use of ultrasound detectors and consequent computer analyses of the recordings of bat calls. All these records were organised in a database and for each location, the geographical coordinates were determined as accurately as possible.

Data on the particular records are presented in the chapter *Results and Discussion* in the following order: general location or UTM square: – *Loc. no* (see Appendix for full information on the location), date, methods of observation: d – ultrasound

Table 1. Altitudinal distribution of bat records, locations and number of bat species in Montenegro (data only includes information where a species was determined, and at least the year of find was known)

altitude [m a. s. l.]	No. of records	No. of locations	No. of bat species
0–100	157	68	19
101–200	40	19	11
201–300	20	8	10
301–400	21	4	8
401–500	34	7	7
501–600	4	4	3
601–700	57	23	15
701–800	9	5	8
801–900	48	13	14
901–1000	11	3	8
1001–1100	3	1	3
1101–1200	10	3	5
1301–1400	4	4	2
1401–1500	2	1	2
1501–1600	6	6	2
1601–1700	4	2	3
1701–1800	10	1	7
1801–1900	1	1	1
1901–2000	1	1	1
total	442	174	28

Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia [ZIN]). Some of the contacted museums do not host any specimens of bats from Montenegro in their collections (National Museum of Bosnia and Herzegovina, Sarajevo, Bosnia and Herzegovina; Senckenberg Natural History Collections, Dresden, Germany) or at least in their so far digitalized catalogues (Natural History Museum, Vienna, Austria; Natural History Museum, Berlin, Germany and the National Museum of Natural History, Sofia, Bulgaria).

The recorded observations are unevenly spread across the country, since most of the researchers concentrated on the Adriatic coast (e.g. Jazbec 2006, Mirić 1973a, b, Presetnik 2012, Presetnik in prep.) and the lowland areas around the Skadar lake (Đurović 2011) (Fig. 1). Records of bats fall in 57 UTM 10×10 kilometre squares, which represent approximately 33% of the squares covering Montenegro (Fig. 1). Since some of the studies were carried out at medium or higher altitudes (e.g. Đurović et al. 2012, Stojić et al. 2004), the distribution of bat observations covers all the altitudes between 0–1,930 m a. s. l., although again, most records are related to lower or medium altitudes (Table 1). Most (74%) of the UTM squares with bat data contain less than 10 bat locations, and in 88% of the squares there were less than nine species recorded (Fig. 1).

Species Part

With the first confirmed records of *Myotis daubentonii* and *Barbastella barbastellus* presented in this paper, 28 bat species are now listed to exist in Montenegro. We provide details on the method used to collect the data, distribution of the particular species, and on the numbers, sex and reproductive status of the particular individuals. Short comments on general distribution, important roosts or interesting findings are added. The list of bat species cannot be regarded as final, considering the records of bats in the neighbouring countries (Tvrković et al. 2005, Tvrković 2006, Pavlinić

et al. 2010, Kovač et al. 2011, Bego & Théou 2014, Karapandža et al. 2014, Sachanowicz et al. 2014). The following species are expected to exist in the territory of Montenegro, but have yet to be confirmed: *Myotis bechsteinii* (confirmed in Croatia, Bosnia and Herzegovina, Serbia, and Albania) is probably present at least in old forest stands of *Fagus sylvatica* and *Quercus* spp. still preserved at some medium and higher altitudes; *Plecotus kolombatovici* (confirmed in Croatia, Bosnia and Herzegovina, and Albania) probably occurs along the Adriatic coast, where also *Nyctalus lasiopterus* could be expected (confirmed in Croatia and Albania). The presence of *Rhinolophus mehelyi* (confirmed in Albania) and *Eptesicus nilssonii* (reported in Croatia and tentatively in Albania) would be less expectable; considering the potential habitats, at least the latter species might be found in the higher mountains of northern Montenegro.

Although we have a fairly limited amount of data on bats from Montenegro, we can consider the number of bat species to be expectedly high when taking into consideration the geographical position of Montenegro and the abrupt changes in the elevation of the terrain. The bat fauna at lower altitudes is characterised by typical (sub-)Mediterranean species such as *Rhinolophus blasii*, *R. euryale*, *Myotis capaccinii*, *Miniopterus schreibersii*, and *Tadarida teniotis*, whereas in the Dinaric Mountains, forest habitats and/or higher altitudes, *Myotis alcathoe*, *M. brandtii*, *Nyctalus leisleri*, *Plecotus auritus*, *P. macrobullaris*, *Barbastella barbastellus*, and *Vespertilio murinus* are present.

***Rhinolophus ferrumequinum* (Schreber, 1774)**

Rhinolophus ferrumequinum is equally widespread as *R. hipposideros*, with a similar altitude distribution (Fig. 2). However, a smaller number of roost records is available, although they comprise more numerous bat aggregations; the biggest colony of up to 80 individuals was found in the Pećina kod Gorana cave (loc. 076), but it is not clear if it is a hibernaculum or a maternity roost, or possibly both. On the basis of museum specimens, it seems that a maternity colony was located in the Sumporna pećina cave (loc. 072) in the 1960s, and it was there where we observed 50 bats of an undetermined *Rhinolophus* species on 1 May 2013. Another maternity roost was reported to be found in the vicinity of Virpazar (loc. 055; Noblet 1986), but we were not able to locate the exact site in order to check for the colony existence. There are some other possible maternity roosts; one may be located in the only building with a roof that is close to the chapel within the Kotor fortress (loc. 007), and another in the Megara cave (loc. 165). However, both of these sites should be inspected during early summer. No evidence is available of larger hibernacula of this species in Montenegro.

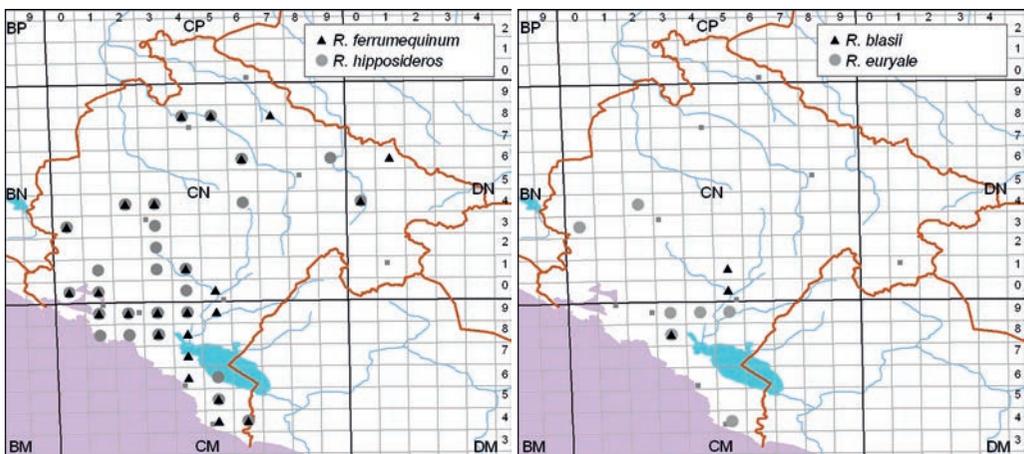
CM19: *Loc. 006:* 4 May 2013, o & m: 1 ex. & 1 ex *Rhinolophidae*, 1 ad ♂ [Mirko Silan, Aja Zamolo; Presetnik in prep.]; – *Loc. 007:* 25 June 2011, o: 40 ex. (determination questionable) [Richard Lemarie]; – *Loc. 010:* [Karaman 1929]; – *Loc. 012:* 18 March 2008, m: 1 ex. [coll. PMB]. – **CM29:** *Loc. 026:* 25 March 2006, o: 2 ex. [Boyan Petrov]. – **CM38:** *Loc. 031:* [Đurović 2011]; – *Loc. 031:* 10 May 2007, o: 1 ♂ [MĐ, Maša Ždralević], 27 April 2009, m: 1 ad ♀ [PP, MĐ, Miloš Pavićević, Maša Ždralević; Presetnik 2012]; – *Loc. 032:* [Đurović 2011], 17 April 2011, o: 2 ex. [MĐ, Marko Karaman, Miloš Pavićević, Zoran Popović, Marija Šokić]; – *Loc. 034:* 29 April 2013, o: 1 ad ♂ [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.], 14 September 2013, o & m: 1 ex., 1 ad ♂, 3 ad ♀♀ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – **CM39:** *Loc. 037:* [Đurović 2011], 16 April 2011, m: 2 ♀♀ [MĐ, Marko Karaman, Miloš Pavićević, Zoran Popović, Marija Šokić]; – *Loc. 038:* 28 April 2009, o: 1 ex. [PP, MĐ, Miloš Pavićević, Maša Ždralević; Presetnik 2012]; – *Loc. 039:* [Đurović 2011], 23 September 1960, m: 1 ♂, 1 ♀ [ĐM; coll. PMB]. – **CM46:** *Loc. 047:* 19 September 2001, o & m: 4 ex., 1 ad ♂ [Josef Hotový, coll. NMP], 7 April 2009, o: 1 ex. [Martin Antoš]. – **CM47:** *Loc. 049:* [Đurović 2011], 13 March 2011, o: 1 ex. [MĐ, ČI, Marko Karaman, Miloš Pavićević, Zoran Popović, Marija Šokić]. – **CM47:** *Loc. 055:* jun. 1985, o: 150 ad ♀♀ [Noblet 1986]. – **CM48:** *Loc. 057:* 7 September 1996, m: 1 ♂ [MP, ČI, coll. PMB]; – *Loc. 058:* [Đurović 2011], 11 May 2011, o: unknown number of animal present [Miloš Pavićević, Zoran Popović, Marija Šokić]; – *Loc. 064:* 20 August 2006, m: 1 ♂ [ČI, coll. PMP]. – **CM49:** *Loc. 065:* [Đurović 2011], 17 April 2011, m: 1 ♀ [MĐ, Marko Karaman, Miloš Pavićević, Zoran Popović, Marija Šokić]. – **CM54:** *Loc. 072:* 22 July 1960, m: 4 ♂♂, 5 ♀♀ [ĐM; coll. PMB], 30 July 1960, m: 2 ♀♀ [ĐM; coll. PMB]. – **CM55:** *Loc. 076:* 26 April 2009, o: 80 ex. [PP, Presetnik 2012],

1 May 2013, o: 30 ex. [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.]; – *Loc. 078*: 26 April 2009, d: several ex. [PP, Presetnik 2012]. – **CM59**: *Loc. 088*: 29 April 2013, o: 3 ex. & 50 ex *R. ferrumequinum/euryle* [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM64**: *Loc. 094*: 12 July 1969, o: 1 ex. [coll. PMS]. – **CN00**: *Loc. 097*: 11 July 2004, o: 1 ad [Christian Dietz]. – **CN03**: *Loc. 098*: 1 May 2012, o: 1 ex., 1 bone remains [PP, MD, TK, Jasmin Pašić]. – **CN10**: *Loc. 107*: 27 February 2011, o: few ex. [Anonymous]. – **CN24**: *Loc. 116*: [Mlakar & Jazbec 2005], 29 April 2005, o: 1 ex. [KJ, Jazbec 2006], 26 April 2011, m: 1 bone remains [PP, MD, TK], 28 April 2012, o & m: 6 ex., 2 ad ♂♂, 2 ad ♀♀ [PP, MD, TK, Jasmin Pašić], 13 September 2013, o: 1 ad ♀ [MD, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – **CN34**: *Loc. 134*: 28 April 2012, o: 1 ♀, 2 ad ♀♀, 3 subad ♀♀ [PP, MD, TK, Jasmin Pašić]. – **CN41**: *Loc. 141*: 6 March 2010, o: 2 ex. [MD, Jasmin Pašić, Miloš Pavičević]. – **CN48**: *Loc. 160*: 19 July 2001, o: 5 ex. [BK]; – *Loc. 162*: 1998, m: 1 bone remains [BK]. – **CN50**: *Loc. 165*: 29 April 2009, o & m: 1 ex. *Rhinolophus* sp., 1 ad ♂ [PP, MD, Miloš Pavičević, Maša Ždralović; Presetnik 2012]. – **CN58**: *Loc. 167*: 15 July 2001, m: 1 ex. [BK], 24 July 2002, m: 2 ad [BK]. – **CN66**: *Loc. 170*: 6 September 1960, m: 1 ad ♂ [DM; coll. PMB, Mirić 1987]. – **CN78**: *Loc. 172*: 29 September 2011, m: 2 ♀♀ [MD]. – **DN04**: *Loc. 186*: 30 September 2011, o: 1 ex. [MD, Mihailo Jovičević]. – **DN16**: *Loc. 189*: 16 August 1996, m: 1 ♂, 1 ♀ [coll. PMB]. – **General locations**: *Loc. 190* [Đulić & Mirić 1967, Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004]; – *Loc. 193*: 2012 [Đurović et al. 2012].

Rhinolophus hipposideros (Borkhausen, 1797)

Rhinolophus hipposideros most probably lives all over the country, it was found at all altitudes from sea level up to 1,700 m a. s. l. (Fig. 2). Only a few records of maternity roosts are available, from the altitudes of 10–900 m a. s. l. (loc.: 092, 015, 125, 163, and possibly at loc. 168), all of them being situated in buildings. The approximate number of adults in the colonies varied between 20 and 50 individuals. No maternity roosts in caves are known, but they are supposed to exist. Further surveys in winter will probably reveal important hibernacula with higher numbers of *R. hipposideros*, than are currently known.

CM18: *Loc. 002*: 24 April 2005, o: 1 ex. [KJ, Jazbec 2006]; – *Loc. 003*: [Jazbec 2006; *R. hipposideros* was not encountered there – editorial mistake] – **CM19**: *Loc. 005*: 3 May 2013, o: 4 ex., 2 ad ♀♀ [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM28**: *Loc. 013*: 27 April 2005, o: 1 ex. [KJ, Jazbec 2006]; – *Loc. 015*: 11 July 2004, o: 16 ad, 12 juv [Christian Dietz]; – *Loc. 017*: 24 April 2005, o: 1 ex. [KJ, Jazbec 2006]; – *Loc. 020*: 10 July 2004, d: 1 ex. [Christian Dietz]. – **CM29**: *Loc. 026*: 25 March 2006, o: 1 ex. [Boyan Petrov]; – *Loc. 026*: 26 June 2008, o: 1 ex. [PP, ČI, Andrej Vizi]; – *Loc. 027*: 25 August 1923, m: 1 ♀ [coll. ZIN]. – **CM38**: *Loc. 032*: [Đurović 2011], 17 April 2011, m: 4 ex. [MD,



Figs. 2, 3. Distribution of bats in Montenegro based on UTM squares. 2 – *Rhinolophus ferrumequinum* and *R. hipposideros*. 3 – *Rhinolophus euryle* and *R. blasii*.

Marko Karaman, Miloš Pavičević, Zoran Popović, Marija Šokić]. – **CM38**: *Loc. 034*: 29 April 2013, m: 2 subad ♀♀ [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.], 14 September 2013, o & m: 10 ex., 2 ad ♀♀, 3 juv ♀♀ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – **CM39**: *Loc. 036*: 3 May 2013 1 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]; – *Loc. 037*: [Đurović 2011], 16 April 2011, o: 1 ex. [MĐ, Marko Karaman, Miloš Pavičević, Zoran Popović, Marija Šokić], 29 April 2013, o: 1 ex. [Teo Delić, Miloš Pavičević; Presetnik in prep.]. – **CM49**: – *Loc. 065*: [Đurović (2011)], 17 April 2011, o: 1 ex. [MĐ, Marko Karaman, Miloš Pavičević, Zoran Popović, Marija Šokić]. – **CM55**: *Loc. 076*: 1 May 2013, o: 2 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM56**: – *Loc. 084*: [Đurović 2011], 10 March 2011, o: 7 ex. [MĐ, Miloš Pavičević, Zoran Popović, Marija Šokić]. – **CM64**: *Loc. 092*: 1 May 2013, o: 40 ad [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CN00**: *Loc. 097*: 11 July 2004, o: 1 ad [Christian Dietz]. – **CN03**: *Loc. 098*: 1 May 2012, o & m: 2 ex., 1 juv, 1 subad ♂, 2 bone remains [PP, MĐ, TK, Jasmin Pašić]. – **CN10**: *Loc. 107*: 27 February 2011, o: several ex. [Anonymous], 5 May 2012, o: several ex. [Nikola Brajović]. – **CN11**: *Loc. 110*: 27 March 2006, o: 1 ex. [Boyan Petrov]. – **CN24**: *Loc. 116*: [Mlakar & Jazbec 2005], 29 April 2005, m: 1 subad ♀ [KJ, Jazbec 2006], 28 April 2012, o & m: 9 ex., 2 subad ♂♂, 4 subad ♀♀ [PP, MĐ, TK, Jasmin Pašić], 13 September 2013, m: 1 ad ♂, 2 ad ♀♀ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – **CN31**: *Loc. 118*: 27 September 2013, m: 1 ad ♂ [Vuk Iković, Iković et al. 2014]. – **CN32**: *Loc. 120*: 30 August 2013, m: 1 ad ♂ [Vuk Iković, Iković et al. 2014]. – **CN33**: *Loc. 124*: 22 July 2012, m: 1 ad, 1 juv, 1 juv ♀ [MĐ]. – **CN34**: *Loc. 134*: 28 April 2012, m: 1 subad ♂ [PP, MĐ, TK, Jasmin Pašić]. – **CN40**: *Loc. 140*: 6 March 2013, m: 1 subad ♂ [Vuk Iković, Iković et al. 2014]. – **CN41**: *Loc. 141*: 6 March 2010, o: 5 ex. [MĐ, Jasmin Pašić, Miloš Pavičević]; – *Loc. 142*: 9 August 2013, m: 1 juv ♂ [Vuk Iković, Iković et al. 2014]. – **CN48**: *Loc. 160*: 19 July 2001, o: 4 ex. [BK]; – *Loc. 162*: 19 July 2000, o & m: 25 juv, 1 juv ♂, 20 ad ♀♀, 2 juv ♀♀ [BK, coll. PMB], 20 July 2000, m: 1 juv ♀ [BK, coll. PMB], 21 July 2002, m: 1 ad ♂, 1, 7 ad ♀♀, 1 juv ♀ [BK], 29 July 2002, m: 1 juv ♂ [BK], 20 June 2011, o: 8 ex., 2 ad [MĐ], 23 September 2011, o & m: 103 ex., 1 ♂ [MĐ]. – **CN48**: *Loc. 163*: 28 July 2002, m: 1 ad ♂ [BK]. – **CN58**: *Loc. 167*: 24 July 2000, m: 5 ad ♂♂ [BK], 24 July 2000, m: 5 ad ♂♂ [BK, coll. PMB], 25 July 2002, m: 1 ad ♂ [BK], 17 July 2003, m: 2 ad ♂ [BK]. – **CN64**: *Loc. 168*: 28 July 2010, m: 1 juv ♂ [MĐ]. – **CN66**: *Loc. 169*: 6 September 1960, m: 1 ad ♂ [ĐM; coll. PMB, Mirić 1987]; – *Loc. 170*: 6 September 1960, m: 2 ad ♂♂ [ĐM; coll. PMB, Mirić 1987]. – **CN96**: *Loc. 181*: 11 April 2011, o: 20 ex. [Željko Madzgjaj]. – **DN04**: *Loc. 186*: 30 September 2011, m: 1 ♂ [MĐ, Mihailo Jovičević]. – **General locations**: *Loc. 190* [Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004]; – *Loc. 193*: 2012 [Đurović et al. 2012].

Rhinolophus euryale Blasius, 1853

In Montenegro, *Rhinolophus euryale* was found along the Adriatic coast and its hinterland (Fig. 3), where it was observed at the altitudes of up to approximately 900 m a. s. l. (the record made at the highest elevation is possibly related to a hibernaculum). The only known maternity roost was reported from the sea side Sumporna pećina cave (loc. 072) in the 1960s, but unfortunately our visit to the cave in May 2013 only confirmed the existence of a group of 50 undetermined *Rhinolophus* bats. Recently, important roosts of *Rhinolophus euryale* have been confirmed in the Začirska pećina (loc. 034) and Jama Šjutovića caves (loc. 088), but both caves have to be inspected during winter and in summer to clarify whether they serve as hibernacula or maternity roosts. The Jošova pećina cave (loc. 071) was reported to have hosted a maternity colony in the past, but the current use of this important site remains to be confirmed.

CM38: *Loc. 034*: 6 October 2011, o: 40 ex. *Rhinolophus* sp. [MĐ, Marko Karaman, Miloš Pavičević, Zoran Popović, Marija Šokić], 29 April 2013, o & m: 52 ex., 9 ♂♂, 4 ♀♀ [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.], 14 September 2013, m: 65 ex. *Rhinolophus* spp., 8 ad ♂♂, 4 ad ♀♀ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – **CM39**: *Loc. 040*: 4 May 2013, m: 1 ex. in owl pellets [Mirko Silan, Aja Zamolo; Presetnik in prep.]; – *Loc. 065*: [Đurović 2011]; – *Loc. 065*: 25 May 2011, m: 1 ♀ [MĐ, Mihailo Jovičević]. – **CM54**: *Loc. 071*: m: [Paunović & Stamenković 1998]; – *Loc. 072*: [Paunović & Stamenković 1998], 22 July 1960, m: 2 ♀♀ [ĐM; coll. PMB], 30 July 1960, m: 2 ♂♂, 1 ♀ [ĐM; coll. PMB]. – **CM59**: *Loc. 088*: 29 April 2013, m: 1 ad ♂, 2 subad ♀♀ [PP, MĐ, Mirko Silan, Aja Zamolo, Presetnik in prep.]. – **CN03**: *Loc. 098*: 1 May 2012, m: 4 bone remains [PP, MĐ, TK, Jasmin Pašić]. – **CN24**: *Loc. 116*: 26 April 2011, m: 1 bone remain [PP, MĐ, TK]. – **General locations**: *Loc. 190* [Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 193*: 2012 [Đurović et al. 2012].

Rhinolophus blasii Peters, 1859

Rhinolophus blasii is the rarest horseshoe bat species of Montenegro (Fig. 3); however, this is a situation similar to that in other parts of the Adriatic coast. Neither mist netting surveys conducted in the spring and autumn periods of 2013, nor several visual inspections, confirmed current

presence of the species in the Začirska pećina cave (loc. 034), where several records were made in the past (although all other Montenegrin rhinolophids were found there). However, there were two new findings of *R. blasii* from the vicinities of Podgorica and Danilovgrad (both sites are situated below 100 m a. s. l.). In the surroundings of the latter town, a maternity roost is most probably located, since the recorded animal was a juvenile male.

CM38: *Loc. 034:* 1 ex. [Kryštufek & Petrov 1987, Paunović & Stamenković 1998, Kryštufek & Đulić 2001, Đurović 2011], 28 July 1923, m: 1 ex., 1 ♂, 1 ♀ [V. Martino, coll. ZIN], 23 September 1923, m: 1 ♀ [V. Martino, coll. ZIN]. – **CN50:** *Loc. 165:* 28 October 2006, 1 ad ♂ [MD; Maša Ždraljević, coll. PMP]. – **CN51:** *Loc. 166:* 9 August 2013, 1 juv ♂ [Vuk Iković, Iković et al. 2014]. – **General locations:** *Loc. 190* [Paunović et al. 2004, 2010]; – *Loc. 191* [Đulić & Mirić 1967].

***Myotis myotis* (Borkhausen, 1797)**

Myotis myotis is distributed in both the Mediterranean and Alpine zones, at the altitudes of up to 900 m a. s. l. (Fig. 4). According to the available evidence, it is much rarer than *M. blythii*. However, based on the author's data from the neighbouring Serbia and Bosnia and Herzegovina, it is expected to be widespread and common. Only one site which may be a maternity roost of *M. myotis* is known in Montenegro – the Golubija cave on the Vranjina Island in the Skadar lake. It is from this cave that some of the specimens of both sexes that are deposited in a number of museum collections originate.

CM29: *Loc. 027:* 1923, m: 1 ex. [coll. ZIN]. – **CM39:** *Loc. 039:* m: 1 ex. [Đurović 2011]. – **CM48:** *Loc. 057:* [Đurović 2011], 7 September 1996, m: 3 ♂♂, 2 ♀♀ [MP, ČI, coll. PMB & PMP]. – **CM64:** *Loc. 093:* 1 September 1960, m: 1 ex. [DM; coll. PMB]. – **CN58:** *Loc. 167:* 15 July 2001, m: 1 ad ♂ [BK, coll. PMB]. – **DN03:** *Loc. 185:* 22 September 1928, m: 1 ex. [coll. ZIN]. – **General locations:** *Loc. 190* [Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004].

***Myotis blythii* (Tomes, 1857)**

Myotis blythii is a widely distributed species in the country, it was recorded at the altitudes from sea level up to 1,700 m a. s. l. (Fig. 4). Formerly, a maternity colony was known to occupy the Jošova pećina cave (loc. 071). Several specimens that were caught were exclusively of *M. blythii*, which confirmed the presence of this species in the colonies attributed to *Myotis myotis* and/or *M. blythii* in the Obodska pećina cave (loc. 039). A huge aggregation, undoubtedly a maternity colony (based on one bat examined in June 2013), was observed in the Sumporna pećina cave (loc. 072); it lies close to the Jošova pećina cave. It is interesting that no evidence of the colony of this large *Myotis* species was recorded by researchers who visited the Sumporna pećina cave in 1960 and 1997. In the three mentioned caves, hundreds of large *Myotis* bats were hanging along with several thousands of *Myotis capaccinii*, and in some cases, there were also *Miniopterus schreibersii*. Perhaps the aggregations documented in the Jama Šjutovića (loc. 088) and Golubija caves (loc. 057) near the Skadar lake are maternity colonies. All these caves lie at the altitudes below 135 m a. s. l. An important site also worth mentioning is the Začirska pećina cave (loc. 034), where on several occasions, many *M. blythii* were netted, or groups of large *Myotis* bats were observed.

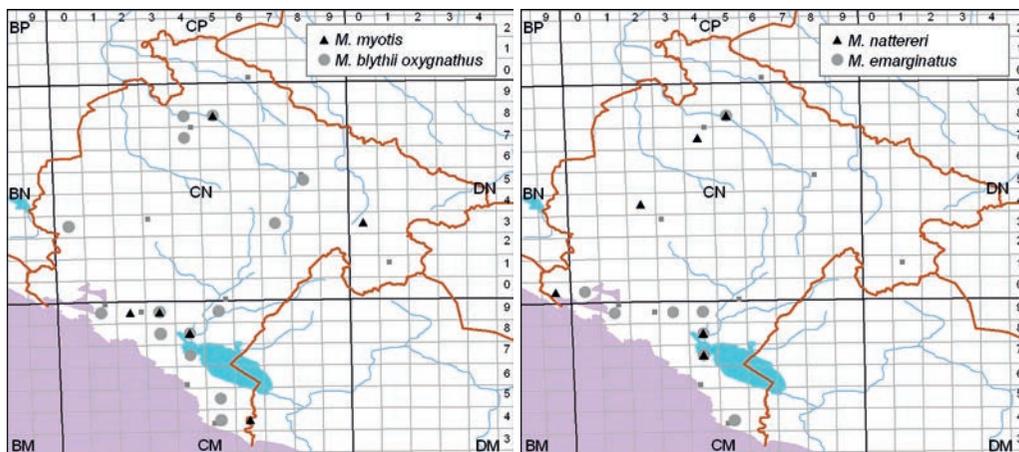
CM19: *Loc. 005:* 3 May 2013, m: 3 ad ♂♂ [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.]; – *Loc. 010:* 28 December 1906, m: 1 ex. [coll. HMNH]. – **CM38:** *Loc. 031:* [Đurović 2011]; – *Loc. 031:* 27 April 2009, m: 11 ad ♂♂, 1 ad ♀ [PP, MD, Miloš Pavičević, Maša Ždraljević; Presetnik 2012]; – *Loc. 033:* 1 bone remains [Đurović 2011]; – *Loc. 034:* 3 July 1922, m: 1 ex. [coll. ZIN], 6 October 2011, o: 65 ex. *M. myotis* and/or *M. blythii* [MD, Marko Karaman, Miloš Pavičević, Zoran Popović, Marija Šokić], 29 April 2013, m: 18 ♂♂ [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.], 14 September 2013, m: 5 ex. *M. myotis* and/or *M. blythii*, 18 ad ♂♂ [MD, Ivana Budinski, Maja Hodžić, Vukašin Josipović]; – *Loc. 035:* 28 April 2013, m: 1 ad ♂ [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM39:** *Loc. 036:* 3 May 2013, m: 1 ad ♂ [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.]; – *Loc. 039:* [Đurović 2011], 23 September 1960, m: 2 ♂♂ [DM; coll. PMB], 22 July 1986, m: 1 ex. [Boris Kryštufek, coll. PMS], 2 August 2002, o & m: 500 ex. *M. myotis* and/or *M. blythii*, 2 ad ♂♂, 1 ad ♀ [PB, coll. NMP], 30 April 2005, o & m: 300 ex. *M. myotis* and/or *M. blythii*, 1 ad ♂ [KJ, Jazbec 2006, Mlakar & Jazbec 2005], 30 April 2009, o & m: 450 ex. *M. myotis* and/or *M. blythii*, 1 ad ♀ [PP, Presetnik

2012], 28 April 2013, o & m: 300 ex. *M. myotis* and/or *M. blythii*, 2 ad ♂♂, 5 ad ♀♀ [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM47: Loc. 051:** m: 1 ex. [coll. PMS]. – **CM48: Loc. 057:** 2 May 2013, o & m: 1 ex *M. myotis* and/or *M. blythii* observed & more heard in a cave chimney, 1 ad ♂ [PP, MD, Aja Zamolo; Presetnik in prep.]. – **CM54: Loc. 071:** 17 July 1960, m: 1 ♂ [DM; coll. PMB], 19 July 1960, m: 2 ♂♂, 7 ♀♀ [DM; coll. PMB], 22 July 1960, m: 5 ♀♀ [DM; coll. PMB], 29 July 1960, m: 1 ♂, 3 ♀♀ [DM; coll. PMB], 20 July 1961, o: 2000 ex. [Mirić 1973b], 24 August 1997, m: 1 ex., 2 ♂♂, 1 ♀ [MP, ČI, coll. PMB]; – **Loc. 072:** 26 June 2013, m: 1 ex. [Ivana Budinski]. – **CM55: Loc. 076:** 26 April 2009, m: 1 ad ♂ [PP, Presetnik 2012]. – **CM59: Loc. 090:** m: 2 ♂♂, 2 ♀♀ [Ludwig von Führer, coll. BMNH, Miller 1912]. – **CN03: Loc. 098:** 1 May 2012, m: 1 bone remains [PP, MD, TK, Jasmin Pašić]. – **CN47: Loc. 157:** 23 July 2003, m: 1 ad ♂ [BK, coll. PMB]. – **CN48: Loc. 161:** 14 July 2003, m: 2 ad ♂♂ [BK, coll. PMB]. – **CN58: Loc. 167:** 24 July 2000, m: 1 ad ♂ [BK, coll. PMB], 15 July 2001, m: 2 ad ♂♂ [BK], 28 July 2001, m: 1 ad ♂ [BK]. – **CN73: Loc. 171:** m: 1, 1 in owl pellets [Ján Obuch]. – **CN85: Loc. 178:** 4 August 2014, m: 1 ad ♂ [MD, Jan Buys, Bart Noort, Odile Schmidt, Vercause & Mostert in prep.]. – **General locations: Loc. 190** [Karaman 1929, Đulić & Mirić 1967, Savić et al. 1995, Paunović et al. 2004, 2010]; – **Loc. 192** [Stojić et al. 2004]; – **Loc. 193:** 2012 [Đurović et al. 2012].

Records attributed to *Myotis myotis* and/or *M. blythii*: **CM47: Loc. 048:** 26 June 2011, o: 1 ex. [Richard Lemarie]; – **Loc. 050:** [Đurović 2011]; – **Loc. 053:** 26 June 2011, o: 1 ex. [Richard Lemarie]. – **CM54: Loc. 068:** 26 April 2009, d: 1 ex. [PP, Presetnik 2012]. – **CN03: Loc. 098:** 1 May 2012, m: 2 bone remains [PP, MD, TK, Jasmin Pašić]. – **CM59: Loc. 088:** 29 April 2013, o: 100 ex. [PP, MD, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CN20: Loc. 113:** 4 May 2013, o: 2 ex. [Teo Delić; Presetnik in prep.]. – **CN24: Loc. 116:** 26 April 2011, m: 1 bone remains [PP, MD, TK]. – **CN33: Loc. 133:** 30 April 2012, d: 1 ex. [PP, MD, TK, Jasmin Pašić]. – **CN44: Loc. 150:** 20 July 2011, d: 1 ex. [MD].

Myotis nattereri (Kuhl, 1817)

The rather rare observation records available indicate that *Myotis nattereri* is present across the whole country. Locations are spread at the altitudes between 5 and 1,750 m a. s. l. (Fig. 5). The only known maternity colony was found in the fortress ruins at Virpazar (loc. 053), where some 20 adult individuals were observed in 2009 and 2011; it is probably at this site that the 1985 observation record (loc. 056) was made. At the Skadar lake, several bats were netted in front of the Golubija cave (loc. 057) during the swarming period. Several other observations involve bats netted in front of cave entrances, or bone remains found in a cave; one individual was found hidden in a crevice of a stone bridge (loc. 001).



Figs. 4, 5. Distribution of bats in Montenegro based on UTM squares. 4 – *Myotis myotis* and *M. blythii*. 5 – *Myotis nattereri* and *M. emarginatus*.

BN90: *Loc. 001:* 11 July 2004, m: 1 ad ♂ [Christian Dietz]. – **CM47:** *Loc. 053:* 28 April 2009, o & m: 15 ex., 5 ad ♀♀ [PP, MĐ, Miloš Pavičević, Maša Ždravević; Presetnik 2012]; – *Loc. 056:* 26 June 2011, o: 1 ex. [Richard Lemarie], 7 June 1985, m: 1 ad ♂ [Noblet 1986, Kryštufek & Červený 1984, Kryštufek 1998]. – **CM48:** *Loc. 057:* 7 September 1996, m: 3 ♂♂, 3 ♀♀ [MP, ČI, coll. PMB & PMP, Salgueiro et al. 2007, Đurović 2011, Salicini et al. 2011]. – **CN24:** *Loc. 116:* 29 April 2005, m: 1 bone remains [KJ, Jazbec 2006]. – **CN47:** *Loc. 157:* 23 July 2003, m: 1 ad ♂ [BK, coll. PMB], 24 July 2003, m: 2 ad ♂♂ [BK]. – **CN58:** *Loc. 167:* 15 July 2001, m: 1 ad ♂ [BK, coll. PMB], 16 July 2003, m: 1 ad ♂ [BK, coll. PMB], 17 July 2003, m: 1 ad ♂ [BK]. – **General locations:** *Loc. 190* [Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004]; – *Loc. 193* [Đurović et al. 2012].

***Myotis emarginatus* (Geoffroy, 1806)**

The majority of records of *Myotis emarginatus* in Montenegro are concentrated in areas close to the seashore (Fig. 5). However, since the known sites lie between sea level and 900 m a. s. l., we expect that *M. emarginatus* is widespread all over the country. Only one observation record of a small maternity colony comes from the vicinity of Virpazar (loc. 055), but unfortunately no exact location is available. Another possible maternity roost may be found in the Žrnjjevića pećina cave (loc. 065), where several adult females were caught.

CM19: *Loc. 008:* [Karaman 1929]. – **CM39:** *Loc. 041:* 1 August 2002, m: 2 ad ♂♂, 2 ad ♀♀ [PB, coll. NMP]. – **CM47:** *Loc. 055:* jun. 1985, o: 40 ad ♀♀ [Noblet 1986], 11 June 1985, m: 1 ad ♀ [Noblet 1986]. – **CM48:** *Loc. 057:* 7 September 1996, m: 1 ♂ [MP, ČI, coll. PMB]. – **CM49:** *Loc. 065:* 25 May 2011, m: 4 ♀♀, 4 ad ♀♀ [MĐ, Mihailo Jovičević]. – **CM54:** *Loc. 072:* 4 September 1997, m: 3 ex. [MP, ČI, coll. PMB]. – **CN00:** *Loc. 097:* 31 July 2002, m: 1 subad ♂, 1 subad ♀ [PB, coll. NMP]. – **CN58:** – *Loc. 167:* 24 July 2000, m: 1 ad ♂ [BK, coll. PMB], 15 July 2001, m: 1 ad ♂ [BK, coll. PMB], 28 July 2001, m: 3 ad ♀♀ [BK], 28 July 2001, m: 3 ad ♀♀ [BK, coll. PMB], 24 July 2002, m: 1 ad ♂ [BK]. – **General locations:** *Loc. 190* [Đulić & Mirić 1967, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004].

***Myotis mystacinus* (Kuhl, 1817)**

Based on skull morphology, Benda (2004a) attributed two specimens from two locations (loc. 097, 112) to *M. aurascens*. Jazbec (2006), based on external morphology, also tentatively assumed that she had netted this species (loc. 003). However, in accordance with the results of mtDNA analyses (Mayer & von Helversen 2001, Mayer et al. 2007), the morphotype *aurascens* is currently co-identified with the name *M. mystacinus bulgaricus*. Therefore, all records attributed to *M. mystacinus* s.l. are jointly presented in the paragraph below.

So far, *M. mystacinus* has been found to occur across the country from the Adriatic coast to the mountains of northern Montenegro, from sea level to 1,750 m a. s. l. (Fig. 6). The records are mostly related to individuals netted above streams or on the banks of lakes, but there is also a record from the front of a cave entrance.

CM18: *Loc. 003:* 27 April 2005, m: 1 ad ♀ [KJ, Jazbec 2006]. – **CM19:** *Loc. 010:* August 1906, m: 2 ex. [coll. HMNH]. – **CM47:** *Loc. 055:* 11 June 1985, m: 1 ad ♀ [Noblet 1986]. – **CM54:** *Loc. 071:* 19 July 1960, m: 1 ♂ [DM; coll. PMB]. – **CN00:** *Loc. 097:* 31 July 2002, m: 1 subad ♂ [PB, coll. NMP, Benda 2004a]. – **CN18:** *Loc. 112:* 8 August 2002, m: 1 ad ♂, 1 ad ♀ [PB, coll. NMP, Benda 2004a, b]. – **CN41:** *Loc. 147:* 26 September 2012, m: 1 ex. [Vuk Iković, Iković et al. 2014]. – **CN47:** *Loc. 157:* 23 July 2003, m: 2 ad ♂♂ [BK, coll. PMB]; – *Loc. 159:* 10 August 2004, m: 1 ♂ [Marija Stojić, coll. PMB]. – **CN84:** *Loc. 174:* 29 July 2014, m: 1 ad ♂ [MĐ, Jan Buys, Bart Noort, Odile Schmidt, Vercaise & Mostert in prep.]. – **CN85:** *Loc. 177:* 30 July 2014, m: 1 ad ♂ [MĐ, Jan Buys, Bart Noort, Odile Schmidt, Vercaise & Mostert in prep.]. – **CN85:** *Loc. 179:* 31 July 2014, m: 1 ad ♂ [MĐ, Jan Buys, Bart Noort, Odile Schmidt, Vercaise & Mostert in prep.]. – **General locations:** *Loc. 190* [Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004].

***Myotis brandtii* (Eversmann, 1845)**

Presence of this bat in Montenegro has been known for a long time, a specimen originating from the Čakor Mountains is preserved in the ZIN collection. The second finding of *Myotis brandtii* was made more than 60 years later, when an adult female was netted above the Vrbnica River. Since both sites are located in a rather Alpine/Dinaric environment (Fig. 6), further observations are expected to be made in similar forest habitats and areas of Montenegro.

CN18: *Loc. 112*: 8 August 2002, m: 1 ad ♀ [PB, coll. NMP, Benda 2004a, Benda & Karataş 2005]. – DN12: *Loc. 188*: 24 August 1939, m: 1 ad ♂ [Vladimir Martino, coll. ZIN, Petrov 1967, Strelkov 1983, Benda & Tsytsulina 2000, Benda 2004a, Benda & Karataş 2005, Tsytsulina et al. 2012]. – **General location**: *Loc. 190* [Paunović et al. 2004, 2010]].

Myotis alcaethoe von Helversen et Heller, 2001

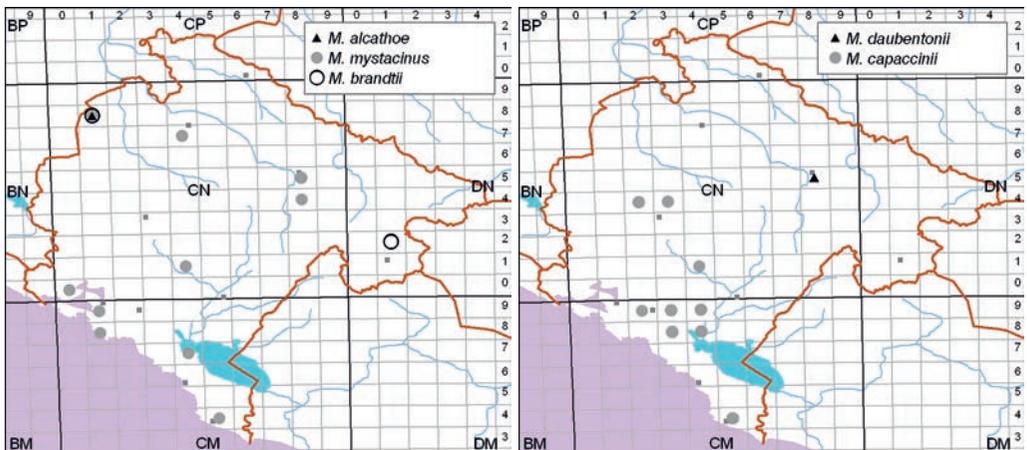
There is only one record of existence of *Myotis alcaethoe* in Montenegro (Fig. 6), an adult female that was netted above the Vrbnica River near Stabna, in a habitat typical for this species, and as a part of an interesting bat community. Two other species from the *Myotis mystacinus* morpho-group, *M. brandtii* and *M. mystacinus* were also caught at the same site and on the same night (Benda 2004a).

CN18: *Loc. 112*: 8 August 2002, m: 1 ad ♀ [PB, coll. NMP, Benda 2004a, Benda et al. 2012].

Myotis capaccinii (Bonaparte, 1837)

Myotis capaccinii is a fairly common species in Montenegro, it was found above water bodies and in caves in most of the Mediterranean areas, between sea level and 650 m a. s. l. (Fig. 7). Several maternity colonies are known in the country, all of them in cave roosts; they comprise several hundreds to several thousands of bats. Maternity colonies were documented in the Obodska pećina (loc. 039), Jošova pećina (loc. 071), and the Vilina pećina caves (loc. 116), in which the maximum counts were 4,000, 1,000 and 900 bats, respectively. It is expected that a hibernaculum exists in the Grbočica cave, with up to 400 bats observed (loc. 033). In the Žrnjčeva pećina cave (loc. 065), 150 bats were found during the spring transition period. We also believe that all ultrasound detections of bats, identified as *Myotis daubentonii* and/or *M. capaccinii*, belong rather to *M. capaccinii* than to the similar but slightly smaller trawling species.

CM29: *Loc. 027*: 7 January 1924, m: 1 ad ♂ [V. Martino, coll. ZIN]. – CM38: *Loc. 031*: [Đurović 2011]; – *Loc. 031*: 27 April 2009, m: 8 ad ♂♂, 7 ad ♀♀ [PP, MĐ, Miloš Pavićević, Maša Ždravević; Presetnik 2012]; – *Loc. 033*: [Đurović 2011], 14 March 2011, o: 400 ex. [MĐ, ČI, Marko Karaman, Miloš Pavićević, Zoran Popović, Marija Šokić], 11 May 2011, o: 400 ex. [Miloš Pavićević, Zoran Popović, Marija Šokić], 28 April 2013, o: 35 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – CM39: *Loc. 039*: [Đurović 2011], 22 July 1986, m: 1 ex. [Boris Kryštufek, PMS 5566,



Figs. 6, 7. Distribution of bats in Montenegro based on UTM squares. 6 – *Myotis alcaethoe*, *M. mystacinus* and *M. brandtii*. 7 – *Myotis daubentonii* and *M. capaccinii*.

coll. PMS], 2 August 2002, o: 1500 ex. [PB], 30 April 2009, o & m: 4000 ex., 1 ad ♂ [PP, Presetnik 2012], 28 April 2013, o & m: 1750 ex., 15 ad ♂♂, 1 subad ♂, 1 ad ♀ [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]; – *Loc. 041*: 1 August 2002, m: 1 ad ♂, 1 subad ♀ [PB, coll. NMP]. – **CM48**: *Loc. 057*: [Đurović 2011], 7 September 1996, m: 2 ♂♂, 2 ♀♀ [MP, ČI, coll. PMB], 14 January 1997, m: 7 ♂♂, 3 ♀♀ [MP, ČI, coll. PMB & PMP]. – **CM49**: *Loc. 065*: [Đurović 2011], 17 April 2011, o: 150 ex. [MĐ, Marko Karaman, Miloš Pavičević, Zoran Popović, Marija Šokić], 25 May 2011, m: 1 ♂ [MĐ, Mihailo Jovičević]. – **CM54**: *Loc. 071*: [Spitzenberger & von Helversen 2001], 17 July 1960, m: 3 ♂♂, 4 ♀♀, 2 juv ♂♂, 2 juv ♀♀ [DM; coll. PMB, Mirić 1973a], 19 July 1960, m: 1 ♂ [DM; coll. PMB, Mirić 1973a], 22 July 1960, m: 3 ♀♀, 1 juv ♂ [DM; coll. PMB, Mirić 1973a], 29 July 1960, m: 1 juv ♂ [DM; coll. PMB, Mirić 1973a], 20 July 1961, o: 1000 ex. [Mirić 1973b], 4 September 1997, m: 1 ex. [MP, ČI, coll. PMB]; – *Loc. 072*: 22 July 1960, m: 1 ♂ [DM; coll. PMB, Mirić 1973a], 4 September 1997, m: 1 ex. [MP, ČI, coll. PMB]. – **CN24**: *Loc. 116*: 28 April 2012, m: 1 ad ♂ [PP, MĐ, TK, Jasmin Pašić], 13 September 2013, o & m: 900 ex., 19 ad ♂♂, 7 juv ♂♂, 7 ad ♀♀, 7 subad ♀♀ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – **CN34**: *Loc. 135*: 15 September 2013, m: 3 ad ♂♂ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – **CN41**: *Loc. 144*: 20 September 2013, m: 1 ad [Vuk Iković, Iković et al. 2014]. – **General locations**: *Loc. 190* [Đulić & Mirić 1967, Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 193*: 2012 [Đurović et al. 2012].

Records attributed to *Myotis daubentonii* and/or *M. capaccinii*: **CM18**: *Loc. 003*: 24 April 2005, d: several ex. [KJ, Jazbec 2006]. – **CM39**: *Loc. 036*: 3 May 2013, d: 2 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM58**: *Loc. 086*: 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CN33**: *Loc. 123*: 30 April 2012, d: 3 ex. [PP, MĐ, TK, Jasmin Pašić].

Myotis daubentonii (Kuhl, 1817)

This is the first report on the presence of *Myotis daubentonii* in Montenegro. At first, there were tentative observations of foraging individuals and their ultrasound calls were detected; recently two individuals have been netted at the same Biogradsko jezero lake in the Alpine region of the country. The species is probably much more widely distributed across Montenegro than documented by the records (Fig. 7), and the scarcity of data is most likely due to the lack of extensive mist netting surveys conducted in the country, particularly in the northern forested areas.

CN85: *Loc. 176*: 8 September 2001, d: several ex. [Josef Hotový], 9 September 2001, d: several ex. [Josef Hotový]; – *Loc. 179*: 31 July 2014, m & d: several ex., 1 ad ♂, 1 ad ♀ [MĐ, Jan Buys, Bart Noort, Odile Schmidt, Vercaise & Mostert in prep.].

Nyctalus noctula (Schreber, 1774)

The presence of *Nyctalus noctula* was documented in all parts of the county; it was recorded from sea level to around 1,400 m a. s. l. (Fig. 8). Even though the majority of records were obtained by the use of an ultrasound detector combined with visual observations, the fact that the CF part of the calls was never lower than 19 kHz (Skiba 2009, Estók & Siemers 2009, Haquart et al. 2010), gave us sufficient confidence to report that we observed *N. noctula*, rather than its larger relative *N. lasiopterus*.

CM28: *Loc. 014*: 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM39**: *Loc. 036*: 3 May 2013, d: 1 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM58**: *Loc. 086*: 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CN10**: *Loc. 106*: 19 June 2007, d: 1 ex. [BK, ČI, MĐ, Maša Ždravević, Ivanović & Karapandža 2007]. – **CN23**: *Loc. 115*: 29 April 2012, d: 2 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN33**: *Loc. 127*: 30 April 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić]; – *Loc. 130*: 30 April 2012 1 ex. [PP]. – **CN34**: *Loc. 136*: 29 April 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN44**: *Loc. 150*: 20 July 2011, d: 1 ex. [MĐ]. – **CN84**: *Loc. 173*: 21 August 1994, m: 1 ♂ [coll. PMB]. – **CN85**: *Loc. 176*: 8 September 2001, d: several ex. [Josef Hotový], 9 September 2001, d: several ex. [Josef Hotový]; – *Loc. 178*: 4 August 2014, m: 1 ad ♂ [MĐ, Jan Buys, Bart Noort, Odile Schmidt, Vercaise & Mostert in prep.]. – **General locations**: *Loc. 190* [Savić et al. 1995, Paunović et al. 2004, 2010], – *Loc. 193*: 2012 [Đurović et al. 2012].

Nyctalus leisleri (Kuhl, 1817)

Nyctalus leisleri is known in Montenegro from a few records of single males found in the Alpine/Dinaric environments in the northern and eastern regions of the country (Fig. 8). The sites are located approximately between 700 and 950 m a. s. l.; further findings can be expected, particularly during the transient migration periods of the year.

CN18: *Loc. 112:* 8 August 2002, d: 1 ex. [PB]. – **CN85:** *Loc. 178:* 4 August 2014, m: 7 ad ♂♂ [MĐ, Jan Buys, Bart Noort, Odile Schnid, Verceuse & Mostert in prep.]. – **DN01:** *Loc. 182:* 5 August 2002, m: 1 ad ♂ [PB, coll. NMP, Salgueiro et al. 2007]. – **DN04:** *Loc. 187:* 25 June 1976, m: 1 ad ♂ [M. Šabotić, coll. PMB, Mirić & Paunović 1997]. – **General locations:** *Loc. 190:* [Savić et al. 1995, Paunović et al. 2004, 2010].

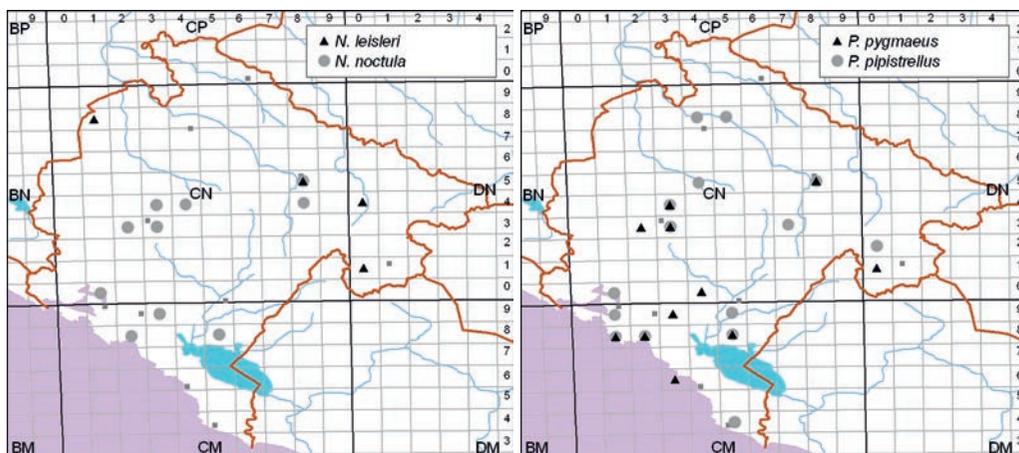
Pipistrellus pipistrellus (Schreber, 1774)

Pipistrellus pipistrellus is commonly found to forage in towns and villages, along banks of water bodies, and forest edges as well. It was recorded at the altitudes of up to 1,700 m a. s. l. (Fig. 9). Moreover, one old sighting of a maternity colony is known (loc. 067). A few males were netted in front of cave entrances high in the mountains at two sites (loc. 061, 068).

CM18: *Loc. 003:* 24 April 2005, d: 1 ex. [KJ, Jazbec 2006]. – **CM19:** *Loc. 011:* 28 April 2005, d: 1 ex. [KJ, Jazbec 2006]. – **CM28:** *Loc. 019:* August 1906, d: 1 ex. [coll. HMNH]; – *Loc. 021:* 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM54:** *Loc. 067:* 20 July 1960, m: 4 ♂♂, 2 ♀♀ [ĐM; coll. PMB]. – **CM54:** *Loc. 067:* 28 July 1960, m: 1 ♀ [ĐM; coll. PMB]; – *Loc. 073:* 27 July 1960, m: 1 ♀ [ĐM; coll. PMB]. – **CM58:** *Loc. 086:* 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM59:** *Loc. 087:* 25 June 2008, d: 3 ex. [PP, ČI, Andrej Vizi]. – **CN10:** *Loc. 106:* 19 June 2007, d: 1 ex. [BK, ČI, MĐ, Maša Ždraljević, Ivanović & Karapandža 2007]; – *Loc. 109:* 16 October 2004, d: 1 ex. [BK]. – **CN33:** *Loc. 123:* 30 April 2012, d: 3 ex. [PP, MĐ, TK, Jasmin Pašić]; – *Loc. 129:* 30 April 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN34:** *Loc. 136:* 29 April 2012, d: 3 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN45:** *Loc. 156:* 20 July 1958, d: 1 ex. [coll. PMS]. – **CN48:** *Loc. 160:* 19 July 2001, m: 2 ad ♂♂ [BK, coll. PMB]. – **CN58:** *Loc. 167:* 15 July 2001, m: 1 ad ♂♂ [BK, coll. PMB]; – *Loc. 167:* 28 July 2001, m: 4 ad ♂♂ [BK]. – **CN73:** *Loc. 171:* aug. 2002, m: 1 in owl pellets [Ján Obuch]. – **CN85:** *Loc. 176:* 8 September 2001, d [Josef Hotový]; – *Loc. 176:* 9 September 2001, d [Josef Hotový]. – **DN02:** *Loc. 183:* 27 October 2011, d: 1 ex. [MĐ; Marija Šoškicić]. – **General locations:** *Loc. 190* [Đulić & Mirić 1967, Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004]; – *Loc. 193:* 2012 [Đurović et al. 2012].

Pipistrellus pygmaeus (Leach, 1825)

Pipistrellus pygmaeus is a common species in Montenegro, usually recorded to forage along the banks of rivers, streams and other water bodies, but sometimes also around street lights in towns and villages. We recorded it at the altitudes between sea level and 1,100 m a. s. l. (Fig. 9). Only one known site is suspected to be a maternity roost (loc. 028).



Figs. 8, 9. Distribution of bats in Montenegro based on UTM squares. 8 – *Nyctalus leisleri* and *N. noctula*. 9 – *Pipistrellus pipistrellus* and *P. pygmaeus*.

CM18: *Loc. 003:* 24 April 2005, d: 1 ex. [KJ, Jazbec 2006], 1 May 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM28:** *Loc. 020:* 10 July 2004, d: 1 ex. [Christian Dietz, Sachanowicz et al. 2004]; – *Loc. 024:* 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM36:** *Loc. 028:* 21 September 2001, o & m: c. 30 ex. in mixed colony with *P. kuhlii*, 1 subad ♀ [Josef Hotový, coll. NMP]. – **CM39:** *Loc. 036:* 3 May 2013, m: 1 ad ♂ [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM58:** *Loc. 086:* 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CN23:** *Loc. 115:* 29 April 2012, d: 3 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN33:** *Loc. 121:* 25 April 2011, d: 1 ex. [PP, MĐ, TK]; – *Loc. 122:* 25 April 2011, d: 1 ex. [PP, MĐ, TK]. – **CN34:** *Loc. 135:* 15 September 2013, d & m: several ex., 1 ad ♀ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]; – *Loc. 136:* 29 April 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN40:** *Loc. 138:* 5 September 2012, m: 1 ♂ [Vuk Iković, Iković et al. 2014]. – **CN85:** *Loc. 176:* 8 September 2001, d: several ex. [Josef Hotový], 9 September 2001, d: several ex. [Josef Hotový]. – **CN85:** *Loc. 179:* 31 July 2014, m: 1 ad ♂ [MĐ, Jan Buys, Bart Noort, Odile Schmidt, Vercaise & Mostert in prep.]. – **DN01:** *Loc. 182:* 5 August 2002, d: 3 ex. [PB]. – **General locations:** *Loc. 190:* [Paunović et al. 2010]; – *Loc. 193:* 2012 [Đurović et al. 2012].

Pipistrellus kuhlii (Kuhl, 1817)

Pipistrellus kuhlii is a very common species in Montenegro, and has been observed in all types of environments, especially in urban or suburban areas. However, it has been recorded only at the altitudes below 700 m a. s. l. (Fig. 10). The apparent lack of distribution data on *P. kuhlii* in the Alpine/Dinaric areas of northern Montenegro could be linked with the fact that the species is rarer in such habitats, and also that almost no studies using ultrasound bat detectors were conducted in those parts of the country. We attribute the majority of ultrasound detections identified as *Pipistrellus kuhlii* and/or *P. nathusii* (see below), to the former species. Maternity colonies numbering several hundreds of individuals were recorded in crevices of buildings (loc. 101, 103–105); unfortunately, all these known nursery roosts have been destroyed.

CM19: *Loc. 009:* 4 May 2013, m: 2 ad ♂♂, 3 ad ♀♀ [Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM28:** *Loc. 020:* 10 July 2004, d: several ex. [Christian Dietz]; – *Loc. 025:* 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM36:** *Loc. 028:* 21 September 2001, o & m: c. 30 ex. in mixed colony with *P. pygmaeus*, 2 ad ♂♂, 1 subad ♀ [Josef Hotový, coll. NMP]. – **CM37:** *Loc. 029:* 2 May 2013, d: 1 ex. [PP, MĐ, Aja Zamolo; Presetnik in prep.]. – **CM45:** *Loc. 043:* 26 April 2009, m: 1 ad ♀ [PP, Presetnik 2012]. – **CM46:** *Loc. 046:* 2 August 2002, d: 2 ex. [PB]. – **CM47:** *Loc. 055:* 11 June 1985, m: 1 ad ♂ [Noblet 1986, Paunović & Marinković 1998]. – **CM48:** *Loc. 063:* 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM54:** *Loc. 067:* 24 July 1960, d: 1 ex. [ĐM; coll. PMB]. – **CM54:** *Loc. 073:* 17 July 1960, m: 1 ♂ [ĐM; coll. PMB, Paunović & Marinković 1998]. – **CM55:** *Loc. 080:* 26 April 2009, d: 1 ex. [PP, Presetnik 2012]; – *Loc. 083:* 26 April 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM56:** *Loc. 085:* 3 August 2002, d: 1 ex. [PB]. – **CM58:** *Loc. 086:* 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM59:** *Loc. 089:* 10 March 2006, m: 1 ad ♀ [MĐ, Maša Ždravlević, coll. PMP]. – **CN10:** *Loc. 099:* 17 June 2007, d: few ex. [Ivanović & Karapandža 2007]; – *Loc. 100:* 17 June 2007, d: few ex. [Ivanović & Karapandža 2007]; – *Loc. 101:* 17 June 2007, o & m: 300 ex., 1 ad ♂ [Ivanović & Karapandža 2007]; – *Loc. 102:* 17 June 2007, d: few ex. [Ivanović & Karapandža 2007]; – *Loc. 103:* 17 June 2007, o: 175 ex. [Ivanović & Karapandža 2007]; – *Loc. 104:* 17 June 2007, o: 150 ex. [Ivanović & Karapandža 2007]; – *Loc. 105:* 17 June 2007, o: 250 ex. [Ivanović & Karapandža 2007]; – *Loc. 106:* 19 June 2007, d: several ex. [BK, ČI, MĐ, Maša Ždravlević, Ivanović & Karapandža 2007]; – *Loc. 108:* 26 April 2005, m: 1 ad ♂ [KJ, Jazbec 2006]; – *Loc. 109:* 16 October 2004, d: 1 ex. [BK]. – **CN31:** *Loc. 119:* 4 June 2013, m: 1 ex. [Vuk Iković, Iković et al. 2014]. – **CN33:** *Loc. 122:* 25 April 2011, d: 1 ex. [PP, MĐ, TK]; – *Loc. 125:* 21 September 1996, m: 1 ♂ [MP, ČI, coll. PMP]; – *Loc. 126:* 25 April 2011, d: 1 ex. [PP, MĐ, TK]; – *Loc. 130:* 30 April 2012, d: 1 ex. [PP]. – **CN34:** *Loc. 135:* 15 September 2013, m: 1 ad ♂ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – **CN40:** *Loc. 139:* 10 August 2012, m: 1 ex. [Vuk Iković, Iković et al. 2014]. – **CN41:** *Loc. 143:* 4 June 2013, m: 1 ex. [Vuk Iković, Iković et al. 2014]; – *Loc. 144:* 10 October 2013, m: 1 ex. [Vuk Iković, Iković et al. 2014]; – *Loc. 145:* 27 May 2013, m: 1 ex. [Vuk Iković, Iković et al. 2014]; – *Loc. 146:* 20 September 2013, m: 1 ex. [Vuk Iković, Iković et al. 2014]. – **CN50:** *Loc. 164:* 22 March 2013, m: 1 ♀ [MĐ]. – **General locations:** *Loc. 190* [Mirić & Paunović 1994, Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 193:* 2012 [Đurović et al. 2012].

Records attributed to *Pipistrellus kuhlii* and/or *P. nathusii*: **CM18:** *Loc. 003:* 24 April 2005, d: several ex. [KJ, Jazbec 2006]. – **CM19:** *Loc. 010:* 28 April 2005, d: 1 ex. [KJ, Jazbec 2006, Mlakar & Jazbec 2005]; – *Loc. 011:* 28 April 2005, d: several ex. [KJ, Jazbec 2006]. – **CM28:** *Loc. 014:* 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – *Loc. 018:* 24 April 2005, d: several ex. [KJ, Jazbec 2006]; – *Loc. 021:* 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]; – *Loc. 023:* 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM44:** *Loc. 042:* 30 April 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM48:** *Loc. 060:* 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]; – *Loc. 062:* 28 April 2013, d: 1 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM49:** *Loc. 066:* 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM54:** *Loc. 068:* 26 April 2009, d: 1 ex. [PP, Presetnik

2012]; – *Loc. 069*: 30 April 2009, d: 1 ex. [PP, Presetnik 2012]; – *Loc. 070*: 30 April 2009, d: 1 ex. [PP, Presetnik 2012]; – *Loc. 075*: 26 April 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM59**: *Loc. 087*: 25 June 2008, d: 3 ex. [PP, ČI, Andrej Vizi]; – *Loc. 091*: 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CN23**: *Loc. 115*: 29 April 2012, d: 3 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN24**: *Loc. 117*: 28 April 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN33**: *Loc. 121*: 25 April 2011, d: 1 ex. [PP, MĐ, TK]; – *Loc. 123*: 30 April 2012, d: 3 ex. [PP, MĐ, TK, Jasmin Pašić]; – *Loc. 125*: 25 April 2011, d: 1 ex. [PP, MĐ, TK]; – *Loc. 127*: 30 April 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić]; – *Loc. 128*: 25 April 2011, d: 1 ex. [PP, MĐ, TK]; – *Loc. 130*: 30 April 2012, d: 2 ex. [PP]; – *Loc. 131*: 25 April 2011, d: 1 ex. [PP, MĐ, TK]; – *Loc. 132*: 25 April 2011, d: 1 ex. [PP, MĐ, TK]. – **CN34**: *Loc. 136*: 29 April 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić].

Pipistrellus nathusii (Keyserling et Blasius, 1839)

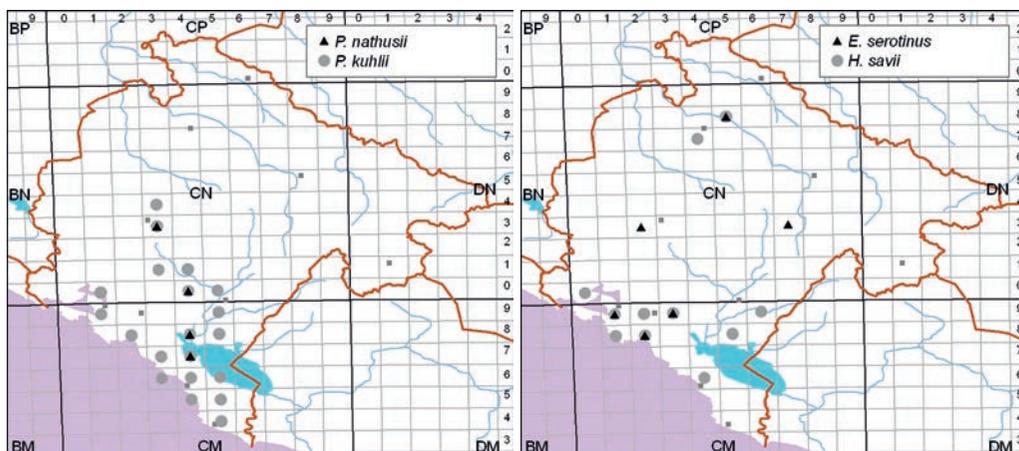
Although only few findings of *Pipistrellus nathusii* are available from Montenegro (at the altitude range of 0–640 m a. s. l.), considering its migratory behaviour one can assume it could be widespread all over the country (Fig. 10).

CM47: *Loc. 054*: 21 September 1991, m: 1 ex. [Georg Džukić, coll. PMS]. – **CM47**: *Loc. 056*: 1 January 1996, m: 1 ♂ [coll. PMB]. – **CM48**: *Loc. 059*: 20 September 2001, m: 1 ad ♂, 1 ad ♀ [Josef Hotový, coll. NMP]; – *Loc. 061*: 27 March 1947, m: 1 ex. [coll. ZIN]. – **CN33**: *Loc. 121*: 25 April 2011, d (social calls): 1 ex. [PP, MĐ, TK]. – **CN40**: *Loc. 137*: 3 May 2013, m: 1 ♂ [Vuk Ikočić, Ikočić et al. 2014]. – **General locations**: *Loc. 190* [Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 191* [Đulić & Mirić 1967]; – *Loc. 193* [Đurović et al. 2012].

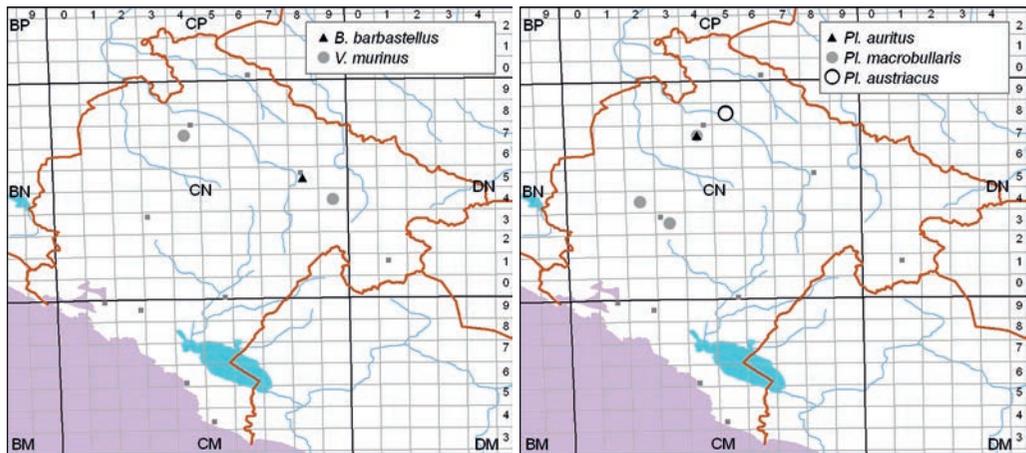
Hypsugo savii (Bonaparte, 1837)

Hypsugo savii is probably widespread across the country. Records are available from the coast of the Adriatic Sea up to the high mountains (1,750 m a. s. l.) in northern Montenegro (Fig. 11). It is quite a numerous bat, which forages in coastal towns and villages, and also along banks of water bodies.

CM18: *Loc. 003*: 24 April 2005, d: 1 ex. [KJ, Jazbec 2006], 1 May 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM19**: *Loc. 011*: 28 April 2005, d: several ex. [KJ, Jazbec 2006]. – **CM28**: *Loc. 023*: 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM29**: *Loc. 027*: 1923, m: 1 ex. [Vladimir Martino, coll. USNM], 14 August 1923, m: 3 ex. [Vladimir Martino, coll. ZIN, Horáček & Benda 2004]. – **CM39**: *Loc. 036*: 3 May 2013, d: 1 ex. [PP, MĐ, Mirko Silan, Aja Zamolo, Presetnik in prep.]. – **CM46**: *Loc. 047*: 11 January 1997, m: 1 ♂ [MP, ČI, coll. PMB]. – **CM58**: *Loc. 086*: 25 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM69**: *Loc. 095*: 4 August 2002, m: 3 ad ♂♂, 1 ad ♀ [PB, coll. NMP]. – **CN00**: *Loc. 097*: 31 July



Figs. 10, 11. Distribution of bats in Montenegro based on UTM squares. 10 – *Pipistrellus kuhlii* and *P. nathusii*. 11 – *Hypsugo savii* and *Eptesicus serotinus*.



Figs. 12, 13. Distribution of bats in Montenegro based on UTM squares. 12 – *Vespertilio murinus* and *Barbastella barbastellus*. 13 – *Plecotus auritus*, *P. macrobullaris* and *P. austriacus*.

2002, m: 1 ad ♂, 1 subad ♀ [PB, coll. NMP]. – **CN47:** *Loc. 157:* 23 July 2003, m: 1 ad ♂ [BK], 24 July 2003, m: 1 ad ♂ [BK, coll. PMB]. – **CN58:** *Loc. 167:* 24 July 2000, m: 5 ad ♂♂, 1 ad ♀ [BK, coll. PMB], 28 July 2001, m: 1 ad ♂ [BK], 24 July 2002, m: 2 ad ♂♂ [BK], 25 July 2002, m: 2 ad ♂♂ [BK], 16 July 2003, m: 2 ad ♂♂ [BK]. – **General locations:** *Loc. 190* [Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004].

Eptesicus serotinus (Schreber, 1774)

Not many confirmed locations are known, but *Eptesicus serotinus* seems to be present from the sea coast up to the higher altitudes of mountains in northern Montenegro (1,000 m a. s. l.; Fig. 11).

CM19: *Loc. 010:* sep. 1880, m: 1 ♀ [coll. MZUF]. – **CM28:** *Loc. 014:* 26 June 2008, d: 1 ex. [PP, ČI, Andrej Vizi]. – **CM39:** *Loc. 036:* 3 May 2013, d: 1 ex. [PP, MD, Mirko Silan, Aja Zamolo, Presetnik in prep.]. – **CN23:** *Loc. 114:* 7 August 2002, d: 1 ex. [PB]. – **CN58:** *Loc. 167:* 24 July 2000, m: 1 ad ♂ [BK, coll. PMB], 15 July 2001, m: 1 ad ♂ [BK]. – **CN73:** *Loc. 171:* m: 2 in owl pellets [Ján Obuch]. – **General locations:** *Loc. 190* [Đulić & Mirić 1967, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004].

Vespertilio murinus Linnaeus, 1758

Exclusively male individuals of *Vespertilio murinus* were found at higher altitudes in northern Montenegro (1,430–1,930 m a. s. l.; Fig. 12). With additional autumn bat detector surveys (October–November), targeting the species-specific male advertisement calls (e.g. Presetnik et al. 2014), we expect an increase in the number of recorded observations in various parts of the country.

CN47: *Loc. 157:* 23 July 2003, m: 1 ad ♂ [BK, coll. PMB], 24 July 2003, m: 2 ad ♂♂ [BK, coll. PMB]; – *Loc. 158:* 28 August 1984, m: 1 ♂ [Petrović et al. 1987]. – **CN94:** *Loc. 180:* 2 August 2014, m: 1 ad ♂ [MĐ, Jan Buys, Bart Noort, Odile Schnidt, Vercaise & Mostert in prep.]. – **General locations:** *Loc. 190* [Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004].

Barbastella barbastellus (Schreber, 1774)

This is the first report on presence of *Barbastella barbastellus* in Montenegro. It was long assumed that this bat could be found in forests at higher altitudes around the Biogradsko jezero lake (Fig. 12). This hypothesis was confirmed as soon as bat detectors were used there for the first time, and the typical calls of *B. barbastellus* were recorded; the bats were observed to forage along forest edges.

CN85: *Loc. 175*: 2 August 2014, d: 1 ex. [MĐ, Jan Buys, Bart Noort, Odile Schnidt; Vercaise & Mostert in prep.].

***Plecotus auritus* (Linnaeus, 1758)**

Only two records of *Plecotus auritus* are available from Montenegro, both originating from higher altitudes of closely situated sites (1,430 m and 1,745 m a. s. l.; Fig. 13). However, considering the records in neighbouring Bosnia and Herzegovina (own unpublished data), we expect future findings of this bat also from forest environments at lower altitudes.

CN47: *Loc. 157*: 23 July 2003, m: 2 ad ♂♂ [BK, coll. PMB]; – *Loc. 158*: 17 September 1960, m: 1 ad ♂ [ĐM; coll. PMB, Mirić 1987]. – **General locations**: *Loc. 190* [Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004].

***Plecotus macrobullaris* Kuzâkin, 1965**

One male *Plecotus macrobullaris* was netted in front of the Jelovačka pećina cave (loc. 157), where two male *P. auritus* were also caught (Fig. 13). So far, the sites where *P. macrobullaris* are located are spread out in the northwest of Montenegro, at the altitudes from 650 to 1,700 m a. s. l.

CN24: *Loc. 117*: 28 April 2012, m: 1 ad ♂ [PP, MĐ, TK, Jasmin Pašić]. – CN33: *Loc. 133*: 30 April 2012, m: 1 ad ♂ [PP, MĐ, TK, Jasmin Pašić]. – CN47: *Loc. 157*: 23 July 2003, m: 1 ad ♂ [BK, coll. PMB]. – **General locations**: *Loc. 190* [Paunović et al. 2010]; – *Loc. 193*: 2012 [Đurović et al. 2012].

***Plecotus austriacus* (Fischer, 1829)**

Currently, only one site of repeated observations of *Plecotus austriacus* is known in Montenegro (Fig. 13). On several occasions, several males were netted at Tmuša cave (loc. 167; 850 m a. s. l.) over a span of three years (2001–2003). We expect the species to be more common in northern Montenegro.

CN58: *Loc. 167*: 15 July 2001, m: 1 ad ♂ [BK, coll. PMB], 28 July 2001, m: 1 ad ♂ [BK, coll. PMB], 24 July 2002, m: 1 ad ♂ [BK], 17 July 2003, m: 1 ad ♂ [BK, coll. PMB]. – **General locations**: *Loc. 190* [Paunović et al. 2004, 2010]; – *Loc. 192* [Stojić et al. 2004].

***Miniopterus schreibersii* (Schreber, 1774)**

Miniopterus schreibersii is a common bat in coastal areas, and is also present at medium altitudes up to 800 m a. s. l. (Fig. 14). All known roosts were found in caves. Some of the roost sites are possibly hibernacula; the Grbočica cave (loc. 033) and the Pećina kod Gorana cave (loc. 076), where some 550 and 1,000 individuals were observed, respectively. In the Jošova pećina cave (loc. 071), a maternity colony of up to 2,000 bats was reported; however, in the last decade this site was not surveyed, and the status of the colony remains unclear. The first parturitions in the Jošova pećina cave were observed in mid-May 1998. It is not clear whether the following caves are used as maternity or transient roosts, or as hibernacula, but they are likely to be important shelters for this species (Babatuša – loc. 031, Začirska pećina – loc. 034, Obodska pećina – loc. 039, Jama Šjutovića – loc. 088, and possibly also Sumporna pećina – loc. 116). *M. schreibersii* was also observed in its foraging areas, sometimes close to water bodies, but the majority of ultrasound detections were made in settlements where the bats were observed to search for their prey around streets lights.

CM28: *Loc. 020*: 10 July 2004, d: 1 ex. [Christian Dietz]. – CM38: *Loc. 031*: [Đurović 2011], 27 April 2009, m: 17 ex. [PP, MĐ, Miloš Pavićević, Maša Ždravlević, Đurović 2011, Presetnik 2012]. – CM38: *Loc. 033*: [Đurović 2011], 14 March 2011, o: 550 ex. [MĐ, ČI, Marko Karaman, Miloš Pavićević, Zoran Popović, Marija Šokić], 28 April 2013, o & m: 44 ex., 1 ad ♂ [PP, MĐ, Mirko Silan, Aja Zamolo, Presetnik in prep.]; – *Loc. 034*: 6 October 2011, o: 10 ex. [MĐ, Marko Karaman, Miloš Pavićević, Zoran Popović, Marija Šokić], 29 April 2013, m: 9 ad ♂♂, 2 subad ♀♀ [PP, MĐ, Mirko Silan, Aja Zamolo, Presetnik in prep.], 14 September 2013, m: 12 ad ♂♂, 8 ad ♀♀, 1 subad ♀ [MĐ, Ivana Budinski, Maja Hodžić, Vukašin Josipović]. – CM39: *Loc. 039*: 28 August 2006, o: 100 ex. [Radomir Jaskaŭa], 30 October 2011, o: 35 ex. [MĐ];

Miloš Pavićević], 28 January 2012, o: 2 ex. [MĐ; Jasmin Pašić, Mihailo Jovičević]. – **CM44:** *Loc. 042:* 30 April 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM45:** *Loc. 044:* 26 April 2009, d: 1 ex. [PP, Presetnik 2012]; – *Loc. 045:* 26 April 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM47:** *Loc. 050:* [Đurović 2011]. – **CM48:** *Loc. 062:* 28 April 2013, d: 1 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM54:** *Loc. 069:* 30 April 2009, d: 1 ex. [PP, Presetnik 2012]; – *Loc. 071:* 17 July 1960, m: 1 ♂, 7 ♀♀ [DM; coll. PMB], 29 July 1960, m: 4 ♂♂, 6 ♀♀ [DM; coll. PMB], 20 July 1961, o: 2000 ex. [Mirić 1973b], 24 August 1997, m: 1 ex., 4 ♀♀ [MP, ČI, coll. PMB], 4 September 1997, m: 1 ex., 6 ♂♂, 1 ♀ [MP, ČI, coll. PMB], mid-May 1998; o [MP], – *Loc. 072:* 1 May 2013, m: 1 bone remains [MĐ, Aja Zamolo; Presetnik in prep.]; – *Loc. 074:* 30 April 2009, d: 2 ex. [PP, Presetnik 2012]. – **CM55:** *Loc. 076:* 26 April 2009, o & m: 1000 ex. (cf. *M. schreibersii*), 1 ad ♂ [PP, Presetnik 2012], 1 May 2013, o: 190 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]; – *Loc. 077:* 26 April 2009, d: 1 ex. [PP, Presetnik 2012]; – *Loc. 078:* 26 April 2009, d: several ex. [PP, Presetnik 2012]; – *Loc. 079:* 26 April 2009, d: several ex. [PP, Presetnik 2012]; – *Loc. 081:* 26 April 2009, d: 1 ex. [PP, Presetnik 2012]; – *Loc. 082:* 26 April 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM59:** *Loc. 088:* 29 April 2013, o & m: 50 ex., 1 ad ♂ [PP, MĐ, Mirko Silan, Aja Zamolo, Presetnik in prep.]; – *Loc. 090:* m: 1 ♀ [Ludwig von Führer, coll. BMNH, Miller 1912]. – **CM69:** *Loc. 095:* 4 August 2002, m: 1 ad ♀ [PB, coll. NMP]. – **CN13:** *Loc. III:* 1 May 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić]. – **CN24:** *Loc. 116:* 29 April 2005, m: 1 bone remains [KJ, Jazbec 2006]. – **CN33:** *Loc. 130:* 30 April 2012, d: 1 ex. [PP]. – **CN34:** *Loc. 136:* 29 April 2012, d: 1 ex. [PP, MĐ, TK, Jasmin Pašić]. – **General locations:** *Loc. 190* [Karaman 1929, Đulić & Mirić 1967, Savić et al. 1995, Paunović et al. 2004, 2010]; – *Loc. 193:* 2012 [Đurović et al. 2012]. – **Undetermined location:** *Loc. 194:* m: 1 ♀ [Ludwig von Führer, coll. BMNH, Miller 1912].

Tadarida teniotis (Rafinesque, 1814)

Although only records using ultrasound detectors are available for *Tadarida teniotis* in Montenegro, with its qCF type of echolocation calls reaching 10–12 kHz and its large body, its records are quite unmistakable. This bat was heard in various areas, at the altitudes from shore level at the Adriatic Sea up to 1,550 m a. s. l. (Fig. 14). It usually hunts high above the ground, but several times it was also observed to forage above street lights (loc. 022).

CM18: *Loc. 003:* 24 April 2005, d: 1 ex. [KJ, Jazbec 2006], 1 May 2009, d: 1 ex. [PP, Presetnik 2012]. – **CM19:** *Loc. 011:* 28 April 2005, d: several ex. [KJ, Jazbec 2006, Mlakar & Jazbec 2005]. – **CM28:** *Loc. 020:* 10 July 2004, d: 1 ex. [Christian Dietz]; – *Loc. 022:* 29 April 2013, d: 3 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM37:** *Loc. 029:* 2 May 2013, d: 1 ex. [PP, MĐ, Aja Zamolo; Presetnik in prep.]. – **CM47:** *Loc. 052:* 28 April 2013, d: 1 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM48:** *Loc. 062:* 28 April 2013, d: 1 ex. [PP, MĐ, Mirko Silan, Aja Zamolo; Presetnik in prep.]. – **CM69:** *Loc. 095:* 4 August 2002, d: 1 ex. [PB, Ciechanowski et al. 2005]; – *Loc. 096:* 17 August 2003, d: 1 ex. [Ciechanowski et al. 2005]. – **CN44:** *Loc. 148:* 21 July 2011, d: 1 ex. [MĐ]; – *Loc. 149:*

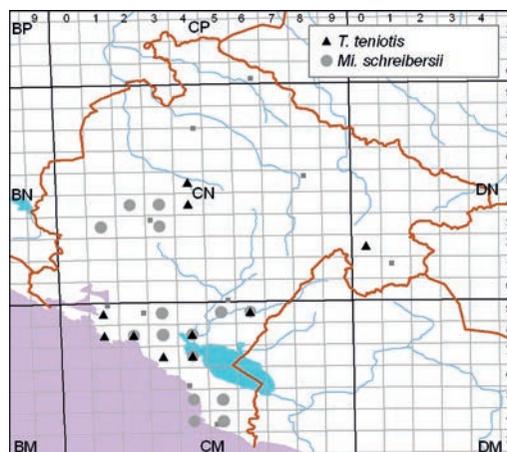


Fig. 14. Distribution of *Miniopertus schreibersii* and *Tadarida teniotis* in Montenegro based on UTM squares.

21 July 2011, d: 1 ex. [MĐ]; – *Loc. 151*: 21 July 2011, d: 1 ex. [MĐ]. – **CN45**: *Loc. 152*: 22 July 2011, d: 1 ex. [MĐ]; – *Loc. 153*: 22 January 2011, d: 1 ex. [MĐ]; – *Loc. 154*: 22 July 2011, d: several ex. [MĐ]; – *Loc. 155*: 22 July 2011, d: several ex. [MĐ]. – **DN02**: *Loc. 184*: 27 October 2011, d: 1 ex. [MĐ; Marija Šoškić]. – **General location**: *Loc. 190* [Paunović et al. 2010].

Conclusions

In this review, we tried to collect all the available data on the distribution of bats in Montenegro. Although some old records could be hidden in various collections, and perhaps are not yet labelled as coming from contemporary Montenegro (e.g. Dalmatia, Cattaro/Kotor, etc.), and it is certain that some researchers have made additional recent observations, based on the data presented, we can make certain conclusions.

(a) Much more research effort is needed to record all bat species occurring in Montenegro, to assess their distribution status, and to identify their important habitats.

(b) The currently identified important bat roosts, with maternity or winter groups of bats are: Go-ražda fortress (Trojica, loc. 005), Kotor fortress (Kotor, loc. 007), Mogren fortress (Budva, loc. 015), Babatuša cave (Trnovo, loc. 031), Grbocica cave (Trnovo, loc. 033), Začirska pećina cave (Cetinje, loc. 034), Obodska pećina cave (Rijeka Crnojevića, loc. 039), Besac fortress (Virpazar, loc. 053), Golubija cave (Skadar lake, loc. 057), Žmrljevica pećina cave (Pavlova strana, loc. 065), Jošova pećina cave (Ulcinj, loc. 071), Sumporna pećina cave (Ulcinj, loc. 072), Pećina kod Gorana cave (Metanovići, Bar, loc. 076), Jama Šjutovića cave (Grbavci, loc. 088), abandoned hotel on the shore of the Šaško jezero lake (Šaš, loc. 092), Vilina pećina cave (Nikšić, loc. 116), the school building in Tepca village (Žabljak, loc. 162), and Megara cave (Podgorica, loc. 165). We advise and recommend that all of these sites should receive special status and legal protection as a part of local conservation areas of natural habitats, and/or in the framework of the Natura 2000 network.

(c) Although for some caves (e.g., Obodska, Jošova and Sumporna pećina caves), data from the 1960s and 1990s are available, along with records from the first decade of the third millennium, we cannot even try to estimate population trends of the roosting bat species. Firstly, the earlier data that are available were mainly qualitative in nature, while quantitative data were only rarely provided. Secondly, the recent surveys were conducted mostly in spring, when the bats might be still migrating to their summer roosts, and consequently the number of bats in the particular roosts could differ from the numbers that would exist there in early summer, when more stable maternity colonies are formed. The latter period (usually before parturition) is the preferable time to make monitoring counts, since it is the easiest way to count the numbers of adult animals, which is the most suitable number for the calculation of population trends. Clearly, there is a need for research focused specifically on certain bat species in order to identify their distribution status and population trends. The research could subsequently be used as a basis for long-term monitoring of the respective populations (of species or communities).

(d) During field studies, we recorded some threats to bats and their habitats. Some cave entrances are completely blocked by doors (e.g. Lipska pećina cave), or the entrances were heavily modified for tourist utilities (e.g. Megara cave). There are plans of exploitation of some other important bat roosts for the benefit of tourists, which could lead to increased disturbance of the extremely sensitive maternity and/or wintering aggregations. Iković et al. (2014) also report on bats as road traffic casualties, and stress that bats should be included in environmental impact assessments. Additional fast growing sources of threat to bats are wind power plants which are being planned in the increased number.

(e) Since 1982, all species of bats have been protected by law in Montenegro (Vizi 1984), and are currently protected under provisions of the Decision on the Protection of Certain Plant and Animal Species (*Rješenje o stavljanju pod zaštitu pojedinih biljnih i životinjskih vrsta*; Official Gazette RCG 76/06). Among other things, it is also prohibited by law to disturb, catch or kill bats without a special permit from the Environmental Protection Agency of Montenegro (Agencija za zaštitu životne sredine Crne Gore). This also applies to bat researchers, who are warmly welcomed in Montenegro, providing they also follow the Guidelines on Ethics for Research and Field Work Practices (EUROBATS 2010).

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Appendix

Locations of bat observations in Montenegro

Data arrangement: **UTM square**: No. of the location: description of the location (larger settlement nearby) [latitude in ° N, longitude in ° E / altitude in metres a. s. l.]

BN90: *Loc. 001:* small bridge W of Herceg Novi (Herceg Novi) [42.4550, 18.4988 / 5]. – **CM18:** *Loc. 002:* abandoned house cellar in Glavati, 3 km WNW from Lastva Grbaljska (Budva) [42.3095, 18.7894 / 16]; – *Loc. 003:* artificial lake at Mrčevo polje, 1 km W of Lastva Grbaljska (Budva) [42.2953, 18.7946 / 6]. – **CM19:** *Loc. 004:* Golubija peč cave (Kotor) [42.4220, 18.7989 / 920]; – *Loc. 005:* Goražda fortress (Trojica) [42.3957, 18.7632 / 435]; – *Loc. 006:* Vrmac fortress (Kotor) [42.4211, 18.7491 / 480]; – *Loc. 007:* high building with roof close to a chapel in the Kotor fortress (Kotor) [42.4238, 18.7749 / 185]; – *Loc. 008:* Kotor bay (Kotor) [42.4188, 18.7675 / 0]; – *Loc. 009:* N branch of the Škudra river at the uppermost bridge (Kotor) [42.4270, 18.7722 / 5]; – *Loc. 010:* Kotor (Kotor) [42.4188, 18.7675 / 10]; – *Loc. 011:* Kotor, from the coast to the fortress walls (Kotor) [42.4207, 18.7682 / 7]; – *Loc. 012:* Trojica (Kotor) [42.4019, 18.7653 / 260]. – **CM28:** *Loc. 013:* barrow above the Vrela spring, 8 km S of Cetinje (Cetinje) [42.3191, 18.9276 / 870]; – *Loc. 014:* Cetinje, city park (Cetinje) [42.3386, 18.9282 / 650]; – *Loc. 015:* Mogren fortress (Budva) [42.2754, 18.8266 / 80]; – *Loc. 016:* at a gas station on the road Budva–Cetinje (Cetinje) [42.3424, 18.9344 / 730]; – *Loc. 017:* Podmaine monastery (Budva) [42.2938, 18.8496 / 30]; – *Loc. 018:* promenade in Budva (Budva) [42.2842, 18.8423 / 2]; – *Loc. 019:* Budva (Budva) [42.2881, 18.8425 / 10]; – *Loc. 020:* vicinity of the Mogren fortress (Budva) [42.2759, 18.8267 / 80]; – *Loc. 021:* Duletići (Budva) [42.3168, 18.8533 / 545]; – *Loc. 022:* Lapčići (Budva) [42.3141, 18.8584 / 525]; – *Loc. 023:* Markovići (Budva) [42.3075, 18.8546 / 320]; – *Loc. 024:* Obzovica (Budva) [42.3144, 18.9358 / 830]; – *Loc. 025:* Pržno (Miločer) [42.2667, 18.8935 / 28]. – **CM29:** *Loc. 026:* Cetinska pećina cave (Cetinje) [42.3858, 18.9226 / 650]; – *Loc. 027:* Cetinje (Cetinje) [42.3928, 18.9186 / 660]. – **CM36:** *Loc. 028:* bus station in Sutomore (Ulcinj) [42.1416, 19.0477 / 145]. – **CM37:** *Loc. 029:* agricultural area SE of Buljarica (Budva) [42.1934, 18.9756 / 3]; – *Loc. 030:* camp in Buljarica (Budva) [42.1957, 18.9763 / 10]. – **CM38:** *Loc. 031:* Babatuša cave (Trnovo) [42.2894, 19.0398 / 330]; – *Loc. 032:* Dujevska pećina cave (Dujevo) [42.3419, 19.0506 / 100]; – *Loc. 033:* Grbocica cave (Trnovo) [42.2874, 19.0353 / 415]; – *Loc. 034:* Začirska pećina cave (Cetinje) [42.3434, 18.9912 / 450]; – *Loc. 035:* upper karst pond at Trnovo (Virpazar) [42.2897, 19.0362 / 337]. – **CM39:** – *Loc. 036:* Pijavice artificial lake (Strugari) [42.3672, 18.9820 / 277]; – *Loc. 037:* Duruk pećina cave (Jankovića krši) [42.3720, 19.0239 / 490]; – *Loc. 038:* Lipska pećina cave (Cetinje) [42.3741, 18.9534 / 500]; – *Loc. 039:* Obodska pećina cave (Rijeka Crnojevića) [42.3520, 19.0048 / 135]; – *Loc. 040:* Strugarska pećina cave (Strugovci) [42.3692, 18.9859 / 280]; – *Loc. 041:* a river 2 km NW of Rijeka Crnojevića (Cetinje) [42.3571, 19.0132 / 190]. – **CM44:** *Loc. 042:* Kruta (Ulcinj) [41.9660, 19.1894 / 175]. – **CM45:** *Loc. 043:* Utjeha bay, Masline, a house in the President bungalow lodgement (Bar) [42.0103, 19.1524 / 5]; – *Loc. 044:* Pečurice, at the streetlights on the road to Bar (Bar) [42.0567, 19.1398 / 200]; – *Loc. 045:* Pečurice, at the streetlights on the SW (Bar) [42.0317, 19.1739 / 200]. – **CM46:** *Loc. 046:* vicinity of a spring in Zupci (Bar) [42.1281, 19.1225 / 126]; – *Loc. 047:* Bar, ruins of a medieval city and fortress (Bar) [42.0921, 19.1330 / 650]. – **CM47:** *Loc. 048:* bridge in Virpazar (Skadar lake) [42.2462, 19.0914 / 10]; – *Loc. 049:* Golubinja pećina cave (Gornje Seoce) [42.2085, 19.1306 / 430]; – *Loc. 050:* Ivanina pećina cave (Donje Seoce) [42.2200, 19.1430 / 130]; – *Loc. 051:* Vilina pećina acve – Feengrotte (Dolnja Seoca) [42.2218, 19.1410 / 190]; – *Loc. 052:* Orahovsko polje, N of Virpazar (Podgorica) [42.2485, 19.0897 / 5]; – *Loc. 053:* Besac fortress (Virpazar) [42.2445, 19.0926 / 33]; – *Loc. 054:* Grmožur island (Skadar lake, Virpazar) [42.2364, 19.1319 / 1]; – *Loc. 055:* vicinity of Virpazar (Skadar lake) [42.2389, 19.0899 / 10]; – *Loc. 056:* Virpazar (Virpazar) [42.2457, 19.0924 / 40]. – **CM48:** *Loc. 057:* Golubija cave on the Vranjina island (Skadar lake) [42.2690, 19.1308 / 33]; – *Loc. 058:* Milačka pećina cave (Poseljani) [42.3078, 19.0664 / 10]; – *Loc. 059:* Lesenovo fortress at the Skadarsko jezero lake (Skadar lake) [42.2715, 19.1197 / 3]; – *Loc. 060:* main road to Zeta (Podgorica) [42.2951, 19.1158 / 6]; – *Loc. 061:* Dodoši (Skadar lake) [42.3281, 19.1353 / 13]; – *Loc. 062:* Kruševica (Virpazar) [42.2674, 19.0853 / 220]; – *Loc. 063:* Vranjina (Podgorica) [42.2796, 19.1344 / 30]; – *Loc. 064:* Žabljak Crnojevića (Skadar lake) [42.3171, 19.1592 / 10]. – **CM49:** *Loc. 065:* Žmrljevića cave (Pavlova strana) [42.3708, 19.0642 / 330]; – *Loc. 066:* petrol station at Kamenica, along the main road Cetinje–Podgorica (Podgorica) [42.3957, 19.1605 / 180]. – **CM54:** *Loc. 067:* ambulance barrack (Ulcinj) [41.9202, 19.2102 / 10]; – *Loc. 068:* at a pond in Metanovići (Bar) [41.9854, 19.2293 / 250]; – *Loc. 069:* at a bridge over the Bratica II river, N part of Ulcinj (Ulcinj) [41.9364, 19.2200 / 35]; – *Loc. 070:* a bridge over the Milena river, N of Velika plaža (Ulcinj) [41.9134, 19.2397 / 2]; – *Loc. 071:* Jošova pećina cave (Ulcinj) [41.9223, 19.1981 / 0]; – *Loc. 072:* Sumporna pećina cave (Ulcinj) [41.9200, 19.2130 / 0]; – *Loc. 073:* Ulcinj (Ulcinj) [41.9297, 19.2243 / 10]; – *Loc. 074:* Kolonza, at the streetlights (Ulcinj) [41.9398, 19.2419 / 15]; – *Loc. 075:* Metanovići (Bar) [41.9854, 19.2293 / 250]. – **CM55:** *Loc. 076:* Pećina kod Gorana cave (Metanovići, Bar) [41.9925, 19.2365 / 225]; – *Loc. 077:* Kamenički bridge, at the streetlights (Bar) [42.0229, 19.2197 / 215]; – *Loc. 078:* a road in vicinity of the Pećina kod Gorana cave (Bar) [41.9912, 19.2354 / 230]; – *Loc. 079:* a road W of Metanovići (Bar) [41.9929, 19.2265 / 240]; – *Loc. 080:* Gornja Klezna, at the street lights (Bar) [41.9985, 19.2640 / 110]; – *Loc. 081:* Krute, street lights at the intersection (Bar) [42.0139, 19.2626 / 115]; – *Loc. 082:* Krute, street lights at the W part of the village (Bar) [42.0151, 19.2254 / 145]; – *Loc. 083:* Vladimir, at the street lights (Bar) [42.0163, 19.2442 / 170]. – **CM56:** *Loc. 084:* Cave Špela (Donji Murići) [42.1590, 19.2157 / 45]; – *Loc. 085:* S bank of the Skadarsko jezero lake at Murići (Skadar lake) [42.1634, 19.2215 / 30]. – **CM58:** *Loc. 086:* Plavnica (Skadar lake) [42.2731, 19.2201 / 6]. – **CM59:** *Loc. 087:* Cijevna river canyon, at a waterfall (Podgorica) [42.3836, 19.2788 / 40]; – *Loc. 088:* Jama Šjutovića cave (Grbavci) [42.3687, 19.1839 / 40]; – *Loc. 089:* Technical Faculty campus (Podgorica) [42.4380, 19.2459 / 45]; – *Loc. 090:* Berić (Podgorica) [42.4329, 19.1845 / 30]; – *Loc. 091:* Rakića kuće (Cijevna, Podgorica)

[42.3883, 19.2836 / 52]. – **CM64:** *Loc. 092:* abandoned hotel building on the Šaško jezero lake bank (Šas) [41.9799, 19.3380 / 10]; – *Loc. 093:* Pečina Sarandža cave (Rožaj) [41.9624, 19.3112 / 100]; – *Loc. 094:* a cave with church at the Šaško jezero lake (Šas) [41.9770, 19.3464 / 8]. – **CM69:** *Loc. 095:* Cijevna river canyon, between Gurec and Lovka (Podgorica) [42.3909, 19.3998 / 170]; – *Loc. 096:* Donji Mileš, near a rocky gorge of the parched Cijevna river (Podgorica) [42.4067, 19.3535 / 156]. – **CN00:** *Loc. 097:* large cave at the sea shore 200 m SW of Vitoglav (2 km SW of Risan) (Kotor) [42.5136, 18.6817 / 10]. – **CN03:** *Loc. 098:* Špilja Muškovića cave (Spile Grahovačke) [42.7230, 18.6444 / 915]. – **CN10:** *Loc. 099:* arsenal building 16 in Tivat (Kotor) [42.4294, 18.6983 / 4]; – *Loc. 100:* arsenal building 2 in Tivat (Kotor) [42.4294, 18.6983 / 4]; – *Loc. 101:* arsenal building 20 in Tivat (Kotor) [42.4294, 18.6983 / 4]; – *Loc. 102:* arsenal building 31 in Tivat (Kotor) [42.4294, 18.6983 / 4]; – *Loc. 103:* arsenal building 4a in Tivat (Kotor) [42.4294, 18.6983 / 4]; – *Loc. 104:* arsenal building 8 in Tivat (Kotor) [42.4294, 18.6983 / 4]; – *Loc. 105:* arsenal building 8a/8b in Tivat (Kotor) [42.4294, 18.6983 / 4]; – *Loc. 106:* arsenal building in Tivat (Tivat) [42.4294, 18.6983 / 5]; – *Loc. 107:* Pečina Tamnica cave (Perast) [42.4873, 18.7007 / 70]; – *Loc. 108:* Ljuta, 9 km S of Kotor (Kotor) [42.4786, 18.7642 / 15]; – *Loc. 109:* vicinity of the Palma hotel (Tivat) [42.4319, 18.7113 / 50]. – **CN11:** *Loc. 110:* Pokljuka gornja cave (Krivošije) [42.5421, 18.6949 / 580]. – **CN13:** *Loc. 111:* small pond on the right side of the road Nikšić–Grahovac at Brestice (Nikšić) [42.7390, 18.7632 / 785]. – **CN18:** *Loc. 112:* Vrbnica river, 3 km SE of Stabna (5 km W of Plužine) [43.1620, 18.7795 / 770]. – **CN20:** *Loc. 113:* Njegoševe pećine cave (Njeguši) [42.4331, 18.8316 / 870]. – **CN23:** *Loc. 114:* blind arm of the Zeta river, 5 km SE of Orlina (Nikšić) [42.7456, 18.8719 / 660]; – *Loc. 115:* Krupačko jezero lake dam (Nikšić) [42.7928, 18.8999 / 615]. – **CN24:** *Loc. 116:* Vilina pećina cave (Nikšić) [42.8123, 18.9007 / 650]; – *Loc. 117:* vicinity of the Vilina pećina cave (Nikšić) [42.8123, 18.9007 / 670]. – **CN31:** *Loc. 118:* Danilovgrad–Podgorica road, 1.3 km NW of Frutak (Danilovgrad) [42.5832, 19.0487 / 115]; – *Loc. 119:* Danilovgrad–Podgorica road, 1.4 km SW of Kujava (Danilovgrad) [42.5952, 19.0404 / 145]. – **CN32:** *Loc. 120:* Danilovgrad–Podgorica road, 800 m WSW of Zagorak (Danilovgrad) [42.6175, 19.0218 / 200]. – **CN33:** *Loc. 121:* Bedem fortress (Nikšić) [42.7740, 18.9426 / 640]; – *Loc. 122:* at street lights close to Bedem fortress (Nikšić) [42.7736, 18.9437 / 640]; – *Loc. 123:* at water accumulation of hydropower plant (Ozrinici) [42.7202, 18.9986 / 600]; – *Loc. 124:* Petrovići house behind the Nikšić mill (Nikšić) [42.7783, 18.9377 / 630]; – *Loc. 125:* vicinity of the King Nikola mansion (Nikšić) [42.7695, 18.9513 / 630]; – *Loc. 126:* vicinity of a railway station (Nikšić) [42.7707, 18.9448 / 650]; – *Loc. 127:* vicinity of an underground fortification above Slivje (Nikšić) [42.7219, 19.0082 / 645]; – *Loc. 128:* main boulevard in Nikšić (Nikšić) [42.7733, 18.9442 / 645]; – *Loc. 129:* path E of the water accumulation for hydropower plant (Ozrinici) [42.7204, 19.0011 / 615]; – *Loc. 130:* 6. crnogorske brigade street (Nikšić) [42.7745, 18.9567 / 640]; – *Loc. 131:* a street at the Bedem fortress (Nikšić) [42.7750, 18.9448 / 640]; – *Loc. 132:* Karadžordževa ulica street (Nikšić) [42.7748, 18.9524 / 650]; – *Loc. 133:* underground fortification above Slivje (Nikšić) [42.7219, 19.0082 / 645]. – **CN34:** *Loc. 134:* Vidrovanska pećina cave (Vidrovan) [42.8584, 18.9368 / 670]; – *Loc. 135:* Vidrovanska reka river, a smaller bridge in Vidrovan (Nikšić) [42.8537, 18.9397 / 651]; – *Loc. 136:* Vidrovanski potok stream valley, Vidrovanska pećina cave (Vidrovan) [42.8581, 18.9396 / 660]. – **CN40:** *Loc. 137:* Danilovgrad–Podgorica road, Sušica river 1.1 km SE of Begovina (Danilovgrad) [42.5070, 19.1363 / 45]; – *Loc. 138:* Danilovgrad–Podgorica road, Sušica river 1.15 km SE of Begovina (Danilovgrad) [42.5050, 19.1401 / 52]; – *Loc. 139:* Danilovgrad–Podgorica road, Sušica river 1.4 km SW of Pitome Loze (Danilovgrad) [42.5045, 19.1410 / 50]; – *Loc. 140:* Danilovgrad–Podgorica road, Zagaračke livade at Gruda (Danilovgrad) [42.5197, 19.1221 / 47]. – **CN41:** *Loc. 141:* Gukoska pećina cave (Slap) [42.6005, 19.0680 / 50]; – *Loc. 142:* Danilovgrad–Podgorica road, 1.3 km S of Čurilac (Danilovgrad) [42.5277, 19.1175 / 50]; – *Loc. 143:* Danilovgrad–Podgorica road, 200 m ENE of Orja Luka (Danilovgrad) [42.5644, 19.0828 / 50]; – *Loc. 144:* Danilovgrad–Podgorica road, 500 m S of Frutak (Danilovgrad) [42.5733, 19.0661 / 95]; – *Loc. 145:* Danilovgrad–Podgorica road, 700 m SSE of Frutak (Danilovgrad) [42.5734, 19.0619 / 95]; – *Loc. 146:* Danilovgrad–Podgorica road, 950 m NW of Orja Luka (Danilovgrad) [42.5700, 19.0722 / 60]; – *Loc. 147:* Danilovgrad–Podgorica road, at a roundabout in Danilovgrad (Danilovgrad) [42.5456, 19.1031 / 49]. – **CN44:** *Loc. 148:* high mountain plateau between Krnovo and Glavica (Šavnik) [42.8747, 19.1113 / 1560]; – *Loc. 149:* vicinity of Krnovo (Šavnik) [42.8802, 19.0916 / 1430]; – *Loc. 150:* vicinity of Vučje (Šavnik) [42.8296, 19.0710 / 1380]; – *Loc. 151:* a small forest at Krnovo (Šavnik) [42.8747, 19.0960 / 1450]. – **CN45:** *Loc. 152:* agricultural land in Jarceva trava near Krnovo (Šavnik) [42.8921, 19.0960 / 1510]; – *Loc. 153:* at a spring in Krnovo (Šavnik) [42.8969, 19.1031 / 1510]; – *Loc. 154:* vicinity of Ostrvica / Krnovo (Šavnik) [42.8927, 19.1177 / 1550]; – *Loc. 155:* at a pond in Krnovo (Šavnik) [42.8954, 19.1100 / 1515]; – *Loc. 156:* Šavnik (Šavnik) [42.9578, 19.0943 / 830]. – **CN47:** *Loc. 157:* Jelovačka pećina cave (Crepulj polje, Ališnica) [43.1533, 19.0525 / 1745]; – *Loc. 158:* Durmirot hotel (Žabljak) [43.1507, 19.1114 / 1430]; – *Loc. 159:* Virak (Žabljak) [43.1183, 19.1077 / 1540]. – **CN48:** *Loc. 160:* Kaluderovača cave in the Tara river canyon (Tepca) [43.1936, 19.0606 / 1615]; – *Loc. 161:* plum orchards in Tepca (Žabljak) [43.2067, 19.0770 / 880]; – *Loc. 162:* school building in Tepca (Žabljak) [43.2061, 19.0802 / 890]; – *Loc. 163:* a small cave in Tepca (Žabljak) [43.1848, 19.0845 / 1625]. – **CN50:** *Loc. 164:* Grbe (Spuž) [42.4949, 19.2077 / 48]; – *Loc. 165:* Megara cave (Mareza, Podgorica) [42.4578, 19.2059 / 75]. – **CN51:** *Loc. 166:* road at Rimanić stream near Martinići (Danilovgrad) [42.5326, 19.1878 / 63]. – **CN58:** *Loc. 167:* Tmuša cave at Kruškovi vrt in the Tara river canyon (Žabljak) [43.2130, 19.2124 / 850]. – **CN64:** *Loc. 168:* school building in Moračke planine (Dragovica polje) [42.8669, 19.3049 / 830]. – **CN66:** *Loc. 169:* Čorbudžak I. cave in the Tara river canyon (Donja Dobrilovina) [43.0595, 19.3837 / 650]; – *Loc. 170:* Čorbudžak II. cave in the Tara river canyon (Donja Dobrilovina) [43.0595,

19.3837 / 740]. – **CN73:** *Loc. 171:* Tara river valley (Kolašin) [42.7892, 19.5324 / 980]. – **CN78:** *Loc. 172:* a cave near Vrbnica, Čehotina river [43.2336, 19.4655 / 850]. – **CN84:** *Loc. 173:* Biogradska Gora Mts. (Mojkovac) [42.8791, 19.6311 / 1380]; – *Loc. 174:* SE bank of the Biogradsko jezero lake (NP Biogradska gora) [42.5831, 19.0487 / 1135]. – **CN85:** *Loc. 175:* at an abandoned building in Kraljevo kolo at the entrance of the Biogradska gora NP (Mojkovac) [42.9179, 19.5794 / 900]; – *Loc. 176:* Biogradsko jezero lake (Mojkovac) [42.8982, 19.6003 / 1110]; – *Loc. 177:* NW bank of the Biogradsko jezero lake (Biogradska gora NP) [42.9011, 19.6000 / 1105]; – *Loc. 178:* Štitarska reka river at the bridge in Donja Štitatica (Mojkovac) [42.9249, 19.5446 / 943]; – *Loc. 179:* W bank of the Biogradsko jezero lake (Biogradska gora NP) [42.9000, 19.5956 / 1094]. – **CN94:** *Loc. 180:* a karst pond on the Jelenak Mt. (Biogradska gora NP) [42.8892, 19.6598 / 1931]. – **CN96:** *Loc. 181:* Novakovića pećina cave (Vranštica) [43.0377, 19.7479 / 605]. – **DN01:** *Loc. 182:* Grnčar river, 1 km W of Gusinje (Plav) [42.5612, 19.8479 / 920]. – **DN02:** *Loc. 183:* a church in Ulotina (Andrijevića) [42.6836, 19.8446 / 860]; – *Loc. 184:* Šoškića Andrijevića (Ulotina) [42.6838, 19.8426 / 870]. – **DN03:** *Loc. 185:* Sućeska (Andrijevića) [42.7317, 19.8191 / 780]. – **DN04:** *Loc. 186:* a cave in the Bistrica river canyon (Berane) [42.8450, 19.8744 / 670]; – *Loc. 187:* Dobrodole (Berane) [42.8383, 19.8487 / 730]. – **DN12:** *Loc. 188:* Čakor Mt. (Plav) [42.6686, 20.0078 / 1840]. – **DN16:** *Loc. 189:* Pećina cave above Vražjim Firovima-Đalovića pećina cave (Bijelo Polje) [43.0756, 19.9224 / 855]. – **General locations:** *Loc. 190:* Montenegro; – *Loc. 191:* Montenegro, southern part; – *Loc. 192:* Durmitor NP and the Tara river canyon (northern Montenegro); – *Loc. 193:* Nikšić field and its vicinity. – **Undetermined location:** *Loc. 194:* Velgi (Czolo).