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RESULTS OF THE WINTER BAT CENSUS IN TWO SITES OF THE CENTRAL PODOLIA (UKRAINE)

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Results of the Winter Bat Census in Two Bat Sites of the Central Podolia (Ukraine). Godlevska O. V., Ghazali M. A., Tyshchenko V. M., Drebet M. V., Martynjuk V. Ju. — In February 2009 a full bat census in GMN- and IVK-mines (Khmelnitsky Oblast) was done. In total, 4801 individuals of 10 species were counted: 2438 of 7 sp. in GMN-mines and 2364 of 9 sp. in IVK-mines. The carried work is the first experience of a full bat census in considerable by length underground systems (29 and 11 km correspondingly) in Ukraine. Examination of GMN-mines took 77,5 man-hours; IVK-mines, ca. 50 man-hours. The obtained results will be at a base of the further bat monitoring in these two sites.

Key words: bats, key sites, underground roosts, winter census, Ukraine.

Результаты зимнего учета рукокрылых в двух местонахождениях Центральной Подольи (Украина). Годлевская Е. В., Гхазали М. А., Тищенко В. М., Дребет В. Ю., Мартынюк М. В. — В феврале 2009 г. осуществлен полный учет рукокрылых в GMN- и IVK-каменоломнях (Хмельницкая обл.). В сумме учтено 4801 ос. 10 видов: в GMN-каменоломнях — 2438 ос. 7 видов, в IVK-каменоломнях — 2364 ос. 9 видов. Проведенная работа является первым опытом полного учета рукокрылых в протяженных системах (29 и 11 км соответственно) в Украине. Обследование GMN-каменоломен заняло 77,5, IVK-каменоломен — около 50 человеко-часов. Полученные результаты важны для дальнейшего мониторинга рукокрылых в этих двух подземельях.

Ключевые слова: рукокрылые, ключевые местонахождения, подземные убежища, зимний учет, Украина.

Introduction

Monitoring of important for bats underground sites is one of the goals in bat conservation. At that, counting bats in considerable by length hibernacula is a special task for bat workers in countries (including Ukraine) where a monitoring system was not established yet, bat volunteers are almost or completely absent, and key sites have been distinguished comparatively recently. Among few tens of recently determined important bat sites in Ukraine there are two extensive mine systems situated in the central part of Podolian Upland (Western Ukraine, in borders of Kmelnytsky Oblast).

The first partial census of bats in GMN-mines was carried out in winter and late summer of 2001. It was found that the site is a swarming place and a hibernation shelter for bats. In the subsequent years bats were counted in winter but, as previously, only small parts of the shelter were examined (Tyshchenko et al.,

2005). More detailed census was carried out in December 2006: 610 specimens of 6 species were accounted. By results of this winter census GMN-mines took the third place in the list of the most important bat underground roosts of Podolia and Central Dniester River region. Totally, 9 species were registered for the site (Godlevska et al., 2010).

IVK-mines were firstly discovered (as a bat place) by V. Tyshchenko in 2001; then, in late summer, swarming bats were mist-netted at one of the entrances (Tyshchenko, 2003). During the first winter census in February 2007 only a part of drifts was examined by the transect method (1013 bat ind. of 9 species were accounted). However, results of this partial census put the site at the first place in the rank of important underground bat hibernacula in the region. In 2007 it was revealed that a part of drifts was used by bats in summer as well; that includes a presence of the big maternity colony of *Rhinolophus hipposideros*. In total, 10 bat species were registered for IVK-site (Godlevska et al., 2010).

The preliminary results enabled to include these two mine systems into the national list of key bat sites of Ukraine and propose them for the Pan-European list. However, a full winter census was needed to establish a base for further bat monitoring in these two sites. A full census in big labyrinth systems in Ukraine had never been carried out before. Thus, in addition, our task was to estimate a capability of realisation of a detailed bat census in branchy underground labyrinths by efforts of few workers.

Study sites and methods

Both sites represent mines for machine extraction of saw limestone. The mines are located at the distance of 50 km from each other. Mining in both cases was started in the late 1950s and carried out in 1960s.

GMN-site (Kam'yanets-Podilsky District) is a big mine with a total length of all drifts of ca. 29 km and a small isolated adit above with a length of ca. 0,5 km. The big system has three not blocked gallery entrances at the same altitude (closed with gates) and one vertical ventshaft; several previously existed entrances were blocked. The mine field has a shape of a stripe, about 2 km in length and 0,25 km in the broadest part. All gallery entrances are at one of the narrow edges of the mine, the ventshaft is in the first quarter. Mining was carried out both in one and few benches. The height of drifts is 2,5–3 to 12 m. In the mine there is a half-isolated lower subsystem conducted with the main part with two vertical shafts, one of which is closed from time to time. About 10 years ago the big system was rented and equipped for growing mushrooms. A mushroom farm is situated at the plot near entrances. For creating an appropriate for mushroom growing microclimate in periods of low winter temperatures outside drifts are shut with special screens and doors, isolating a main part of the mine from entrances. Thus, air circulation and temperature inside depend on human factor here.

IVK-site (Gorodotsky District) includes a big system with a general length of about 11 km and a small separate system of ca. 150 m. There are four gallery entrances in the big system, three of them are situated at the same level, the fourth one is higher at the same slope. Shape of the mine field is a roundish polygon — about 500 by 400 m. It includes three connected parts at different attitude; two of them are opened with entrances. Due to the original configuration, the biggest part of the system is cooled in the winter and works as a “cold sac” during all the year. E. g., in summer inside temperature near lower entrances was +4... +5°C (outside temperature was +25... +28°C). Mine exploitation was carried out in one bench mostly. The height of drifts is 2–3,5 m. After official closing of mine local people conducted an extraction of limestone illegally (for burning the lime) with explosive method (about two years ago it was stopped).

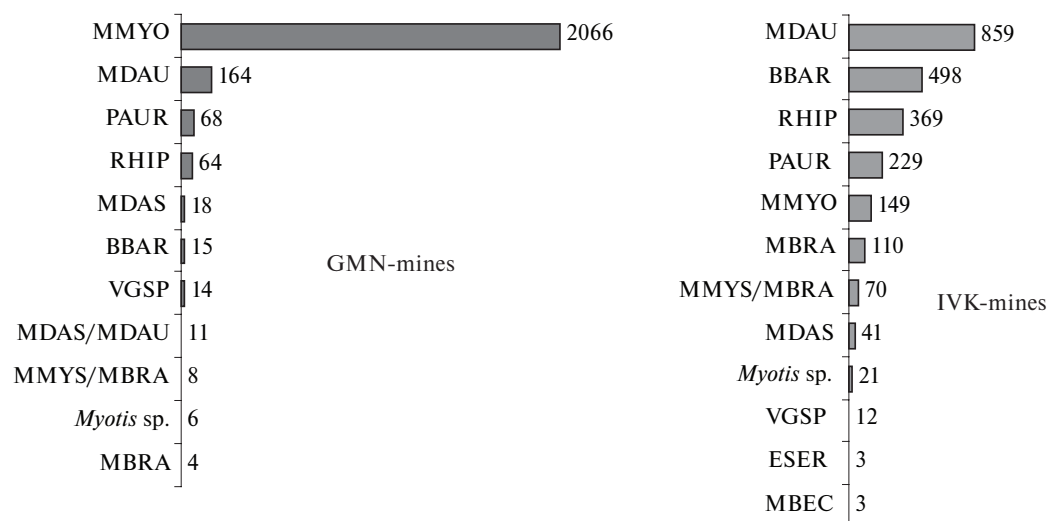
The mines were inspected on 20–22 February, 2009. Maps of the mines are absent, thus the work included systematic inspection of all passages “drift by drift”. For identifying bats on drifts' ceiling binoculars and zooming photo-cameras were used. For measuring air temperature inside digital thermometers with remote sensors (TFA Elektronisches Maxima-Minima-Thermometer) were used; metering was done at the height of 1 m from a floor.

Results and discussion

In total, 4801 bat individuals of 10 species were accounted (fig. 1).

In GMK-mines 2438 bat individuals of 7 species were revealed. A clear dominant species is *Myotis myotis*. Specimens of *M. myotis* accommodated both individually and with clusters up to 25 specimens. Few tens of *M. myotis* with a white fungus (similar by expression to *Geomyces destructans* (e. g. Puechmaille et al., 2010)) at muzzles were registered. Such individuals were observed being placed separately and among «clean» individuals in clusters.

2364 individuals of 9 species were found in IVK-mines. The dominant species by number is *Myotis daubentonii*, the subdominant one is *Barbastella barbastellus*. For latter species one big cluster of 380 individuals was observed, other barbastelles placed individually or by rare groups in few specimens. IVK-mines are one of the most unique bat underground sites in Ukraine. Before its discovery, a maximal number of bar-



RHIP — *Rhinolophus hipposideros*, MBEC — *Myotis bechsteinii*, MMYO — *M. myotis*, MDAU — *M. daubentonii*, MDAS — *M. dasycneme*, MMYO — *M. mystacinus*, MBRA — *M. brandtii*, BBAR — *Barbastella barbastellus*, PAUR — *Plecotus auritus*, ESER — *Eptesicus serotinus*, VGSP — Vespertilionidae indetermined.

Fig. 1. Number of revealed bats by species.

Рис. 1. Количество учтенных особей рукокрылых по видам.

bastelles, registered in one shelter, was 50 individuals only (Golub, 1996); other records of the species in Ukraine were represented by single individuals. Besides, IVK-site is a hibernaculum for the biggest aggregations of *M. daubentonii*, long eared bats (in particularly, *Plecotus auritus*) and *Myotis brandtii* in Ukraine.

There is a considerable difference in a ratio of revealed bat numbers and mine lengths. Total bat numbers for each site are nearly similar but mines differ almost three times in the length (hence, there are ca. 82 ind. per 1 km in GMN-site; ca. 212 ind. per 1 km in IVK-site). Besides, there is a difference in distribution of individuals' number by species in two sites (fig. 1). The main cause of it is, evidently, a difference in temperature regimes inside. In fact, IVK-mine is one continuous zone of temperature gradient with a registered temperatures in winter from -4 to $+8.4...+10^{\circ}\text{C}$, with very expanded areas of low and middle temperatures. GMN-system has quite different temperature characteristics. At its biggest part the temperature is about $+10^{\circ}\text{C}$ with the exception of zones near gallery entrances, a ventshaft and a lower subsystem, in latter one a quite expanded zone of temperature gradient has a place (from $+4.9^{\circ}\text{C}$ to $+9.6^{\circ}\text{C}$ in Febr. 2009).

The full census of 2009 revealed more bats than the partial one in winter 2006/2007 (for GMN-mines, in 2.5 times more; in IVK-mines, in 4 times). Nevertheless, *M. myotis* was a dominant species in GMN-mines both during partial and full census. In IVK-mines number of species was the same (although *M. nattereri* and *M. bechsteinii* were "blinking": the first species was revealed in 2007, not in 2009; and *M. bechsteinii* was found in 2009 only). However, a ratio of the most mass species in IVK-mines revealed to be different during the full census: *M. daubentonii* was the most numerous (instead of *B. barbastellus* in 2007); significantly more individuals of *R. hipposideros* (in 6 times) and *M. myotis* (in 3 times) were accounted. Evidently, the difference is caused not by real changes in species quantity ratio but by fullness of inspection of the shelter.

The inspection of GMN-site took 77.5 man-hours; IVK-site, about 50 man-hours (with 5 persons participated). Our results demonstrate that a relatively quick full census is possible even by efforts of few skilled accounters.

The obtained results will be at a base of the further bat monitoring in these two sites.

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