

**Abstrakty příspěvků přednesených na  
2. konferenci o netopírech Karpát,  
nezahrnutých do tohto zborníka**

**Abstracts of contributions presented in the  
2<sup>nd</sup> Conference on Carpathian Bats, not  
included in this volume**

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**The food of bat community in the Podyjí NP  
(SE Czech Republic)**

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We studied bats using netting and bat detecting in several seasons. The captured bats were kept in cloth bags and faecal pellets were collected after several hours. They were later analysed under stereomicroscope. The study has not been finished completely, and the underlying results concern only the period from March to June. *Eptesicus serotinus* feeds mostly on big beetles, especially Scarabaeidae, but the trophic niche of this species is not narrow. Diptera, Hymenoptera, Neuroptera and Heteroptera are frequently found. Even wingless arthropods as spiders and caterpillars were recorded in its diet. *Myotis nattereri*, *M. emarginatus* and *M. bechsteinii* are obviously gleaning species. Their food contains an important part of wingless items (Araneida, Lepidoptera lar.) and it is probable, that a lot of winged insects is also hunted on leaves and grass surface. *Myotis brandtii* and *M. mystacinus* feeds mainly on small Diptera (esp. Chironomidae), Araneida and moths. The main difference between these species inheres in a higher frequency of beetles in the diet of *M. brandtii*. This bigger species probably chew easily this hard-body prey. Wingless food items also represent an important part of their diets. *M. daubentonii* feeds mainly on small Diptera (esp. Chironomidae). A part of the prey is also gleaned. *Barbastella barbastellus* seems to be quite specialised species, with a narrow trophic niche, hunting predominantly moths. Neuroptera and Diptera are also consumed accidentally. *Plecotus auritus* eats especially moths. Dermoptera are an important part of the diet in spring, Diptera (Tipulidae) become an important prey in May. An important difference between the diets of *P. auritus* and *P. austriacus* is a higher frequency of beetles in the food of *P. austriacus*. We compared thoroughly two of the most abundant species – *P. auritus* and *M. daubentonii*.

The former one is more active at the locality during early spring, more successful in prey hunting, furthermore – the spring increase in weight becomes earlier. These results show that *P. auritus* is more flexible in foraging strategies and more successful in hunting than *M. daubentonii*, especially in early spring. Echolocation calls of *P. auritus* are at 15 kHz during early spring. There is an important change in May. *P. auritus* changes echolocation calls from 15 to 35 kHz and begin to hunt larger Diptera (Tipulidae) instead of moths. There are three hypotheses: (1) It is known that some moths are sensitive to echolocation calls in higher frequencies and try to escape. (2) *P. auritus* detects moths frequently by passive listening on a surface and this frequency is more suitable for this way of hunting. (3) *P. auritus* uses a frequency requiring less energy.

## **Results of preliminary research of bats in the Beskids (Ukrainian Carpathians Mts.) in 1997–1998**

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Until recently, serious investigations of bats on the territory of Beskids haven't been undertaken. Only individual observations of some species are known from this region. Our investigation began in the 1997 and took place in valleys of the Opir and the Striy Rivers. The inspection of two caves was carried out in two successive winter periods, and *Plecotus auritus*, *P. austriacus*, *Barbastella barbastellus*, *Myotis myotis*, *M. nattereri*, *Rhinolophus hipposideros* were recorded. Every year, we noted 12–18 individuals of all species in the caves. The most abundant one was *M. myotis*. In the summer period we inspected garrets of old houses, cellars, underground buildings etc. and *P. auritus*, *M. myotis*, *M. daubentoni*, *Eptesicus serotinus*, *Nyctalus noctula* were found. Besides two individuals of *M. daubentoni* were caught in a bird net. In the summer 1998 I used the detector and recorded additional species, *Eptesicus nilssoni*.

## **Results of a survey verifying the level of knowledge about bats among the visitors of Slovak caves open to public**

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The Administration of Slovak Show Caves (further on the Administration) is a professional organisation of nature conservation belonging under the Ministry of Environment of the Slovak Republic. Its quarter is in Liptovský Mikuláš and its activities are based on securing conservation and smooth management of 12 caves open to public in Slovakia. The question of species conservation of animals dwelling in caves was added to the responsibilities of the Administration in 1994. Then, bats became a priority as for a variety of bat species, some in

vast numbers, occupy caves open to public mainly during winter. Apart from providing conservation of these bat species, our attention's aimed to education. It is important to disprove superstitions people tend to have about these animals and spread true information about bats – their role, threats and conservation among the visitors of Slovak caves, whose number averages 600 000 annually. In order to gain new knowledge and make our educational efforts more effective, a survey verifying the level of knowledge about bats was spread out amongst the visitors of the Slovak caves in May and June. More than 300 questionnaires with 12 questions were distributed. Altogether, 183 participants of the survey sent back filled questionnaires, which were considered and evaluated. It is very positive, that 83% of them think that bats deserve special conservation although a lot of them find them ugly and have little knowledge about them.

## **Monitoring and conservation programmes for bats in the Aggtelek NP (Hungary)**

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The underground world in the Aggtelek National Park (ANP) includes more than 270 caves which were inscribed in the World Heritage List in 1995. More than 500 cave-dwelling and cave-visiting animal species (many of them endemic) can be found in the caves, so it is urgent to determine the capacity of sustainability of caves (the underground world of the ANP is annually visited by 200 000 visitors). Bats are very important endangered species in this biosphere reserve. The ANP Directorate organizes many programmes for their survival, monitoring and conservation. The paper presents the results of the cave-dwelling bat monitoring, describes the threats and actions for protection of bats, the plans of the automated bat monitoring system and the education strategy for the effective bat protection.

## **Results of the “House-dwelling Bats Monitoring Programme” in the administrative area of Aggtelek NP (Hungary) in 1996–1998**

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The paper discusses the results of bat-fauna monitoring investigation done in buildings within the administrative area of the Aggtelek National Park in 1996–1998 (the programme has started in 1988). The research was carried out in 100–120 buildings (church buildings, manor-houses, etc.). The paper presents the location, composition of species and size of house dwelling colonies living in the administrative area of ANP. It also describes the factors representing threats for bats and actions for protection.

## Bats of the Demänová valley (Lower Tatra Mts., Slovakia)

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The first winter bat census and collection of osteological remains of bats in the Demänová valley (Nízke Tatry Mts.) was performed in the Suchá cave. In successive seasons (1995/1996, 1996/1997 and 1997/1998) hibernating bats were recorded in 7 localities: Suchá cave, Okno cave, Barania cave, Veľký Sokol cave, Mieru cave, Eadová cave and Demänovská Slobody cave. Eleven bat species were determined: *Myotis myotis*, *M. nattereri*, *M. dasycneme*, *M. mystacinus*, *M. daubentoni*, *Eptesicus serotinus*, *E. nilssoni*, *Barbastella barbastellus*, *Plecotus austriacus*, *Rhinolophus hipposideros* and *R. ferrumequinum*. An analysis of the osteological samples from the Suchá cave (309 individuals) and from the Veľký Sokol cave (15 individuals) revealed 14 bat species. Besides the species mentioned above, *Pipistrellus pipistrellus*, *Plecotus auritus*, *Vespertilio murinus* and *Myotis bechsteini*, were determined. Osteological samples were collected from superficial parts, from fissures, from stone and clay deposits of the Demänovka cave stream. Only several fresh cadavers of bats (*M. nattereri*) were found in the caves. The Demänová valley represents an interesting type of winter hibernaculum from the point of view of the species composition. Despite of a relatively low total abundance of bats, this locality is very important for some species and e. g. in the case of *E. nilssoni*, it seems to be the most important hibernaculum in Slovakia. Occurrence of *E. nilssoni* was confirmed in 4 localities. The highest abundance (17 individuals) was recorded in February 1996 in Suchá cave. In this cave, solitary *E. nilssoni* hibernated on the cave walls in the height of 0.6–15 m. Several individuals were found hibernating in fissures.

## The Carpathian System and chiropteran biogeography

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The recent European bat fauna can be looked upon as an assemblage of (1) the elements of Palearctic arboreal, (2) the E-Mediterranean (and afro-eremial) elements and (3) those of the W-Mediterranean, eventually. The Carpathians, are just among few regions in Europe, where all these groups are not only equally well represented but do even contribute to a core of local bat communities. Moreover, in each mentioned group, there are more species which meet margins of their European distribution just in the Carpathians (viz. *Rhinolophidae*, *Miniopterus*, *Myotis myotis*, *M. blythii*, *M. dasycneme*, *Eptesicus nilssonii*, *Hypsugo savii*, *Pipistrellus kuhlii*, etc.). This fact can be well correlated with the available data on the Late Pleistocene and

Holocene faunal development. Not only in that period did the Carpathian System (Carpathian Mts. plus Carpathian Basin) represent one of the most significant knots for the European faunal dynamics that provided a greatly varied system of barriers delimiting the major migration routes and channelized them into just a few biogeographic patterns by which the European fauna was repeatedly constituted. Such a prominent position was even more pronounced during the earliest stages of the Late Cenozoic past. A comparison between the Late Miocene/Early Pliocene bat communities from the Carpathian Basin (then an archipelago in the Paratethys sea) and those coming from the northern Outer Carpathians is quite impressive. While the communities of almost a subtropical pattern survived for a long time in the former part, in the latter one, already in the period we meet the assemblages corresponding quite well to the modern European bat fauna including the hibernating colonies that first appeared just here (Podlešice). Hence, the story of Carpathian bat fauna provides in short a very complete view of all the major events by which the bat fauna of Europe has developed.

## Bats of loft spaces of the Carpathians Mts. in the Northeastern Slovakia

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A study of the bat fauna of the loft spaces was performed in 1995–1998 in the Carpathians in north-eastern Slovakia. This inventory research enters into relations with results of older chiropterological works from the studied territory and knowledge based on the collections of Šarišské Museum Bardejov (SMB). We have investigated 96 loft spaces, mainly were formed in churches. The bats were recorded in 62 (64.6%) of controlled buildings, traits of presence at other 19 (19.8%) loft spaces. Bats were not found in 15 (15.6%) lofts. By current research five species were found out of 15 species, known from studied area recently. The total number was at least 2178 bats. Eudominant and most frequent was *Myotis myotis*, followed by *Rhinolophus hipposideros*. The situation of usually well hidden *Eptesicus serotinus* is less clear and probably underestimated. Besides more typical *Plecotus auritus*, also *P. austriacus* occurs in valleys of the region. The Shannon-Wiener index of diversity of recorded bat community was  $H' = 0.885$ , the index of equitability  $E = 0.550$ . From the collections SMB *Myotis mystacinus* is known at this type of shelters, *M. brandti* was also found out at building. Occasional occurrence of *Nyctalus noctula* in this habitat was confirmed by a finding of a cadaver. Records of other two species, dispersing into the Carpathian mountains through biocorridors of river valleys – *Rhinolophus ferrumequinum* and *Myotis emarginatus* were reported from the immediate neighbouring area. We can also assume the presence of *M. blythi*. The influence of building adaptations on the species composition of the bat community was further evaluated. The occurrence of *M. myotis*, *Plecotus austriacus* and *R. hipposideros*, was observed at very light spaces, as well as that of *M. myotis* at a room without evident entrance opening. The ability of species to accept changed conditions has obvious conservancy implications.

## **Morphological investigations of bats in the Ukrainian Carpathians Mts.**

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Complex investigations of the body structure, individual organs as well as the systems of organs of Chiroptera species of the Carpathian fauna and other regions of Ukraine, have been carried out during the last 20 years. In particular, systems such as skeleton-muscle, cardiovascular, nervous (Kovtun); digestive (Zhukova); respiratory (Kovaljova); have been investigated. The representatives of the 16 Chiroptera families of the world fauna have been studied in the same way. The obtained materials led to a number of generalizations concerning the origin and evolution of chiropteran species, phylogenetic connection between Mega- and Microchiroptera, evolution of the wing and flight, etc. (Kovtun 1978, 1981, 1984, 1990); ways of trophic specialization regularities (Zhukova 1993). The microscopic investigation of the vestibular nucleus complex of Insectivora and Chiroptera brain has been carried out (Omelcovets 1993). The research of embryogenesis of the organs and systems of organs of Chiroptera started in the last decade. In particular the embryonic development of skull in the representatives of the genus *Nyctalus* were investigated (Kovtun & Lyhotop 1994) and embryonic development of organs of locomotion, in particular of pectoral extremities (Kovtun & Ledenjov 1998). The investigations concerning the development of organs of digestive as well as of respiratory system were carried out. The comparative anatomical investigations as well as the embryological ones gave more facts in favour of the conception of monophyletic origin of Mega- and Microchiroptera. The hypothesis (Kovtun 1994) about the parallel development of ancestors of lower primates and bats at an early stage of these lineages was caused by various directions of hand specialization. The investigations of the embryogenesis of skeletal components of pectoral and pelvic extremities proved the fact that for the achievement of a unique (among mammals) length of pectoral extremities of Chiroptera, nature did not invent any new unique mechanism of growth (histogenesis), but it managed with the modification of the well-known mechanism. Perhaps, the most important is the thing that the rate of growth of tubular bones increased at the end as well as during the first two weeks after the birth; the embryogenesis extremities increased in 1/4 concerning the definite length, 3/4— after the birth.

## **Results of ten-year investigations of underground bat hibernation shelters in the Ukrainian Carpathians Mts.**

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We began regular investigations of underground hibernation shelters of bats in the winter season 1988–1989 and continued the study annually from the middle of February till the beginning of March. Every year our investigations included three galleries, one tectonic and at

least ten karst caves (maximum 28) in the eastern and central part of the southern slopes of the Ukrainian Carpathians (Transcarpathian Region). Within 10 years of investigations the composition of species of bat cave communities and their abundance dynamics was determined. In general, 14 bat species belonging to two families were found hibernating in the underground shelters (*Rhinolophus ferrumequinum*, *R. hipposideros*, *Miniopterus schreibersi*, *Myotis blythii*, *M. myotis*, *M. bechsteini*, *M. nattereri*, *M. mystacinus*, *M. emarginatus*, *M. daubentoni*, *Plecotus auritus*, *Barbastella barbastellus*, *Eptesicus serotinus*). An additional species – *Vespertilio murinus*, was discovered hibernating only in a burrow type underground shelters. nine rare species included in the Ukrainian Red Data Book (1994) and the European Red List (1991) were recorded among the hibernating bats. The number of bats, which hibernate in underground cavities was greatly variable over the last 10 years. A population increase in certain species was recorded. More notable was the increase in the number of the following species – *M. myotis* and (to a smaller extent) *M. blythii*. In separate shelters, their number has increased tenfold within this period. This increasing trend of population was also recorded in *R. hipposideros* and *R. ferrumequinum*. Populations of other species remained practically constant. *M. schreibersi* was the most common species in the caves of Transcarpathia not too long time ago, but it has not been recorded there since 1993.

## Bats of the proposed Protected Landscape Area of the Drienčanský karst (Slovakia)

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Evaluation of published and original data on bats from a small karstic (appr. 75 km<sup>2</sup>) area named Drienčanský kras (central Slovakia) is presented. Original data were collected during mammal research mainly in 1993–1998 with the use of various research methods: winter census, summer attic mapping, mist-netting, observation of flying bats and analysis of owl's pellets and cave osteological deposits. Altogether, 18 bat species were recorded in this region: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. euryale*, *Myotis blythii*, *M. myotis*, *M. nattereri*, *M. emarginatus*, *M. bechsteini*, *M. daubentoni*, *M. mystacinus*, *Eptesicus serotinus*, *E. nilssonii*, *Pipistrellus pipistrellus*, *Nyctalus noctula*, *Barbastella barbastellus*, *Plecotus auritus*, *P. austriacus* and *Miniopterus schreibersi*. In nine species, breeding (nursing colonies) was confirmed (*R. ferrumequinum*, *R. hipposideros*, *R. euryale*, *M. blythii*, *M. myotis*, *M. emarginatus*, *M. mystacinus*, *E. serotinus*, *P. austriacus*). The region under study is zoogeographically important because of the occurrence of Mediterranean or termophilous forms (e. g. *R. ferrumequinum*, *R. euryale*, *M. emarginatus*, *M. schreibersi*) and it is similar to the Slovak karst (south-eastern Slovakia). Relationships to mountain fauna of the Central Carpathians are evidenced by the occurrence of several forest and/or mountain bat species (e. g. *M. bechsteini*, *M. mystacinus*, *E. nilssonii*, *P. auritus*).

## The bat fauna of the Polish part of the International Biosphere Reserve Bieszczady Mts.

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Bat research in the Bieszczady Mountains has been carried out since 1992, using netting, detector monitoring and bat roosts controls (summer and winter). In general 16 bat species were recorded, including 9 species reported for the first time: *Myotis daubentoni*, *M. nattereri*, *M. mystacinus*, *M. brandti*, *M. bechsteini*, *M. emarginatus*, *Eptesicus nilssoni*, *Barbastella barbastellus*, *Vespertilio murinus*. The occurrence of seven species was recorded: *Rhinolophus hipposideros*, *Myotis myotis*, *Pipistrellus pipistrellus*, *Nyctalus noctula*, *Eptesicus serotinus*, *Plecotus auritus*, *P. austriacus*. Altogether, 16 new bat sites were found (total: 45). The most interesting results are the findings of breeding colonies of *E. nilssoni*, *V. murinus*, *M. brandti* and a summer colony of *R. hipposideros*. The results evidence species-specific habitat preferences: in river valleys the dominating species are *N. noctula* and *E. serotinus*, along streams – *M. daubentoni*, in forests – *E. serotinus*. Little information was obtained concerning hibernation period, because there are only a few known natural hibernaculi in this area. In 2 known caves, the dominant species was *Myotis myotis*, in cellars – *P. auritus*, *P. austriacus* and *B. barbastellus*. The remaining bat species were recorded less often.