

ABSTRACTS

Monday, 26 August

Phylogeny and Systematics

Oral communications

EARLY *MYOTIS*: COMMENT ON FOSSIL RECORD

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Recent molecular studies on phylogeny of the genus *Myotis* (Ruedi & Mayer 2002) show a considerable discrepancy between the late divergence data predicted based on molecular evidence and a fact that most of the Miocene and Oligocene records of vespertilionid bats is identified just as *Myotis*. The present paper reports results of a revision of the Early Miocene and Oligocene material of these forms, and an extensive material of them obtained from the N-Bohemian MN3 site Ahníkov- Merkur -north. It is demonstrated that almost all European early *Myotis* actually do not belong to that genus but represent ancestral grades of the other vespertilionid clades. Two new genera (*Hanakia*, *Quinetia*) are described and their possible relations are discussed. The fossil forms which for sure can be identified as *Myotis* appear first in Vallesian, i.e. just in the period that is in quite a good agreement with predictions by molecular clock.

MEGA- AND MICROCHIROPTERA: OLD CLADES AND NEW VIEWS

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Extensive discussions on mutual relations of the two traditional suborders of Chiroptera, vivid in nineties, turned recently to another topics: monophyly of Microchiroptera and reality and actual content of Yungipterid and Yinochiroptera. The strong molecular evidence, recently published, suggests that Rhinolophoidea is a sister group of Pteropodidae. We try to reexamine this topic in details, particularly with considerable enlarging of a spectrum of rhinolophoid and pteropodid clades taken in account. Here we report results of a phylogenetic analysis based on cytochrome b sequence data both published and those we obtained from several critical taxa not yet investigated (including *Craseonycteris*, three *Rhinopoma* spp., *Megaderma*, *Nycteris*, *Emballonura* etc.) which we analysed with aid of several techniques of phylogenetic analysis (MP, ML, spectral analyses etc.).

The results mostly confirmed close relations between Pteropodidae and Rhinolophoidea (including Craseonycteridae) except for Nycteridae which was found a sister group of Emballonuridae. Within Rhinolophoidea, a close relation of Rhinolophidae and Megadermatidae is suggested, while Hipposideridae - a sister group of Craseonycteridae, appear to be not directly related to that clade similarly as Rhinopomatidae. Further phylogenetic inferences and their possible consequences in classification are also discussed.

NEUROMORPHOLOGICAL TRAITS AND PHYLOGENY OF BATS

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Neuromorphological traits constitute the main body of evidence supporting chiropteran diphyly hypothesis. Indeed, early Pettigrew's papers challenging the monophyletic origin of bats have been based almost entirely on the neural traits. However, the heat of the monophyly/diphyly controversy resulted in the comprehensive revision of their heuristic value for phylogenetic reconstruction. Virtually none of the strongest pieces of evidence supporting the diphyletic scenario can withstand the critical analysis in the light of more recent re-investigations. First, the megachiropteran retinotopic organization of the superior colliculus is not primate-like, but follows the general mammalian scheme (Thiele *et al.* 1991). Second, the megachiropteran lamination pattern in the lateral geniculate nucleus is distinctive and differs from that of primates (Kaas & Preuss 1993). Third, the microchiropteran visual system exhibits regressive features indicative of secondary reductions; a poorly differentiated visual system of insectivorous bats cannot therefore be considered a plesiomorphic state (own unpublished data). Fourth, gross morphology, cyto- and myeloarchitectonic organization of the spinal cord do not differ significantly between Mega- and

Microchiroptera; commonly discussed differences do not refer to any disparate quality or characters with discrete states but to continuous quantitative variables scaled by body size and the degree of the neocortex development (Nimec *et al.* 2000; unpublished data). Finally, quantitative brain characters, when analyzed using an appropriate statistical framework, do support the monophyletic origin of bats (Lapointe *et al.* 1999).

MOLECULAR SYSTEMATICS OF THE PISCIVOROUS BAT *MYOTIS (PIZONYX) VIVESI*

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Previous phylogenetic reconstructions based on molecular data showed recurrent morphological convergences during the evolution of the speciose genus *Myotis*. This illustrates that the evolution of species or groups of species with similar feeding strategies occurred independently several times, but led to remarkable similarities in their external morphology. In this context, we investigated the rather contested phylogenetic position of one of the only two piscivorous species of bat in the world, *Myotis vivesi* Menegaux, 1901, which was missing in the earlier study. This bat is endemic to the coasts and islands of the Gulf of California, Mexico. Because of its distinctive morphology, it was long classified in its own genus, *Pizonyx*. In order to reconstruct its phylogenetic origins relative to other *Myotis*, we sequenced the mitochondrial cytochrome-*b* of two *M. vivesi* and related vespertilionid bats. These outgroups included *Pipistrellus subflavus*, a member of the subgenus *Perimyotis*, sometimes classified within the genus *Myotis*. Unexpectedly, all reconstructions placed *vivesi* unambiguously within a strongly supported clade including more “conventional” Neotropical and Nearctic *Myotis*. This supports the existence of an endemic radiation of American *Myotis*. Other *Myotis* species with similar adaptations to gaffing preys from the water surface present no close phylogenetic relationships with *M. vivesi*, indicating that such adaptations result from morphological convergences. On the other hand, “*Pipistrellus*” *subflavus* is genetically as distant from the genus *Myotis*, as from other true “*Pipistrellus*”, suggesting separate, full generic rank to *Perimyotis*.

Phylogeny and Systematics

Poster

PHYLOGEOGRAPHY OF THE LONG FINGERED BAT *MYOTIS CAPACCINII* IN THE NORTH-MEDITERRANEAN AREA: TWO GENETIC STRUCTURES AND PROBABLY TWO HISTORIES

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The Long fingered bat *Myotis capaccinii* (Bonaparte, 1887) is a rare cave-dwelling bat which hunts above water of lakes and rivers. In Europe, it lives around Mediterranean sea with an extension in the low Danube basin. It also lives from near-east regions to the western margins of central Asia. In this study, we tried to reveal the genetic links between the groups of reproduction in the north part of the Mediterranean sea. The Long fingered bat is known as an phylogenetically “old” species.

The samples come from Eastern Spain with Balearic Islands, Southern France including Corsica, Northern Italia, Sardinia, Monte-Negro, Serbia, Central and Southern Bulgaria. Unfortunately, the samples from Algeria and Israel didn't give any results when extracting DNA. We sequenced parts of two mitochondrial genes: cytochrome *b* (420 bp) and control region (380 bp). Analysis give trees obtained by several methods as distance methods (NJ, MSN), parcimony.

The two genes show a clear bipartition of the Mediterranean basin with an eastern group composed by North Italia and Monte-Negro in a clade, and Serbia, Bulgaria and Greece (one *cyt b* sequence from Gene Bank) in a second one. The western group is composed by the other samples. The two groups differed by the genetic structuration. The eastern group is clearly structured with high bootstrapping values on nodes. The clades of this group are consistent with the geography of the region geographically separated by mountains. The western group is not as well clearly structured, and many clades are not well supported by bootstrapping values. The branching of the insular populations is frequently confused. Generally, all the individuals of a same colony are grouped together in trees. This is probably due to a phylopatric behaviour of the species. Compared with other bat species, the long fingered bat seem to be tied to an localised area where reproductive conditions are favourable. The females, studied by the mean of mitochondrial DNA, seems to be mostly sedentary and must return year after year in the same cave. These observations are important for the conservation strategy of this rare species in Europe.

THE GENUS *PLECOTUS* IN AUSTRIA**Friederike Spitzenberger¹, Elisabeth Haring¹ & Nikola Tvrkovic²**¹ *Natural History Museum in Vienna, P.O. Box 417, A-1014 Wien, Austria*² *Natural History Museum Zagreb, Demetrova 1, HR-10 000 Zagreb, Croatia*

Austria is inhabited by three species of the genus *Plecotus*: *P. austriacus*, *P. auritus* and *P. microdontus* (or *P. alpinus*). External and cranial characters as well as distribution maps are presented.

Plecotus austriacus is mainly confined to the extra-alpine lowlands where it lives in regions characterized by small-scaled agriculture dominated by arable land in low altitudes. It enters also cities. Maternity roosts are situated mainly in lofts, hibernacula in cellars of buildings.

Plecotus auritus is widely distributed in wooded areas of the Alps and in the Bohemian Massif, for hibernation it migrates also to low-lying planes east of the Alps. Maternity roosts are situated in trees as well as in lofts of buildings up to 1640m. a.s.l. For hibernation it prefers caves to buildings. The highest hibernaculum was found in 1960 m a.s.l. *Plecotus microdontus* (or *P. alpinus*) was found in some parts of the Alps in altitudes between 550 and 1220m a.s.l.. All maternity roosts were situated in lofts of churches.

Population Biology**Oral communications****DNA FROM FAECAL PELLETS USED TO ASSESS RELATIONSHIPS WITHIN AND BETWEEN COLONIES OF SEROTINE BAT *EPTESICUS SEROTINUS*****Anthony M. Hutson***Winkfield, Station Road, Plumpton Green BN7 3BU, East Sussex, England. hutson@pavilion.co.uk*

Bat DNA extracted from faecal pellets of colonies of Serotine bat (*Eptesicus serotinus*) in South-East England and Belgium was analysed to demonstrate the relatedness of bats within a colony and between colonies and hence likely levels of recruitment of individuals to non-natal colonies. Faecal pellets were collected by leaving sheets under maternity colony roost sites or outside under access points and the resultant faeces collected on subsequent days. The recovery rate of DNA was affected by the length of time between placement of the sheet and the collection of the faeces, and by the time between collection and extraction. In the best circumstances DNA could be retrieved from 80% of the faeces in a sample. The techniques used, some preliminary results and future plans will be discussed.

ESTIMATION OF DISPERSAL RATES IN BATS : DIFFERENCES BETWEEN MALES AND FEMALES**Eric Petit***UMR 6552 "Ethologie-Evolution-Ecologie", Campus de Beaulieu, Université de Rennes I, F-35042 Rennes cedex, France*

Male-biased dispersal characterises most mammalian species, and bats are no exception to this rule. However, this pattern covers different situations, and these differences have profound implications for the evolution and conservation of bat populations. Because dispersal mediates gene flow between populations, it is possible to estimate dispersal rates by using differences in allele frequencies between populations. If, moreover, the genetic markers that are typed have sexually contrasted inheritance, differences between male and female dispersal rates can be quantified. We analysed the maternally inherited mitochondrial DNA and biparentally inherited microsatellites to characterize the degree of sex-bias in dispersal in two European bat species. We find in both species, the noctule bat *Nyctalus noctula* and the Bechstein's bat *Myotis bechsteinii*, that the genetic data are compatible with complete male dispersal. By contrast, females are strictly philopatric in one species (the Bechstein's bat) whereas they disperse at a high rate in the other species (the noctule bat). In light of recent theoretical treatment of dispersal evolution, possible ultimate causes for these two different patterns will be discussed. This will help to understand some differences in conservation strategies that could be applied to the two species. Finally, weaknesses of the population genetic analysis of sex-biased dispersal in bats will be underlined and a comparison with recently published studies will show that our understanding of bat population biology is limited due to a lack of knowledge of bat mating systems.

EVOLUTION OF MIGRATION AND GENE FLOW IN *MYOTIS MYOTIS*: A MOLECULAR PERSPECTIVE**Manuel Ruedi¹ & Vincent Castella²**¹ *Muséum d'Histoire Naturelle de Genève, Case postale 6434, CH-1211 Geneva 6, Switzerland*² *Laboratoire de Génétique Forensique, C.H.U.V., CH-1005 Lausanne, Switzerland*

Analyses of mitochondrial (mtDNA) control region polymorphism and of variation at 10 nuclear microsatellite loci are used to investigate the mechanisms and genetic consequences of the postglacial

migration of *Myotis myotis* in Europe. Overall, the 24 European nurseries tested (= 480 bats analysed) show contrasted patterns of mtDNA and nuclear (nDNA) structure, with the former being 20 times more pronounced than the latter. Such discrepancy is in agreement with a strong male-bias dispersal, whereby females remain philopatric. Nevertheless, both markers indicate the existence of major genetic subdivisions across the continent. Accordingly, the phylogeography based on mtDNA sequences reveals the presence of contact zones between haplogroups that have probably diverged in separate glacial refugia. Such zones of secondary contact are found near the Alps and near the Rhodopes. Due to the mixing of divergent haplogroups in these mountain ranges, the predicted northward decline of genetic variation stemming from successive founder events is poorly supported by both mtDNA and nDNA data sets. Contrastingly, when analyses are restricted to a subset of 15 nurseries originating from a single Iberian refugium, a strong northward decrease of mtDNA polymorphism is evidenced, but nothing comparable has been found at nuclear markers. Thus movements of males over large areas have been sufficient to preclude the expected northward decrease of nDNA variation. Results from contrasting patterns of genetic differentiation at nuclear and mitochondrial markers are also used to infer possible modes of colony foundation during the recolonization process of Europe by *M. myotis*.

GENETICS AND CONSERVATION OF THE AZOREAN BAT *NYCTALUS AZOREUM*

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The Azorean bat *Nyctalus azoreum* is the only endemic mammal from the archipelago of Azores. It is thought to have evolved from a continental ancestor related to *N. leisleri* but it is morphologically distinct from the later (with a smaller size and darker pelage). This species is considered threatened due to its isolation and very limited geographic range.

To analyse genetic diversity and the colonisation history of *N. azoreum*, 21 breeding colonies from six islands of the Azores were sampled. Mitochondrial DNA variation was examined by amplification of D-loop sequences of 161 individuals. Within the Azores, 15 distinct haplotypes were identified, but only two were common to both central and eastern groups of islands. The largest and eastern island of S. Miguel showed the highest diversity with eight haplotypes, six of them were unique to this island. Four haplotypes from islands of the central group showed a unique insertion of 22 bp that was not found elsewhere. This pattern of haplotype distribution suggests very few current population exchanges between eastern and central island groups, although such exchanges seem to be more frequent among neighbouring islands within the central group.

These results allowed to estimate female gene flow between island populations, which will provide a solid framework for the future conservation of this endemic species.

Population Biology

Posters

METAPOPULATION STRUCTURE OF *RHINOLOPHUS FERRUMEQUINUM* IN THE CARPATHIAN BASIN

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Roost utilisation by *Rhinolophus ferrumequinum* (Schreber, 1774) was investigated between 1984 and 1998 in North-Eastern Hungary. Exploration of summer and winter roosts, monitoring and bat-banding were implemented to find movements between the colonies. Data on roost utilisation by this species in South-Eastern Slovakia, collected in a similar way, were included for comparison. Twenty two marked bats were recaptured. The studied bats created nursery colonies in Hungarian churches and moved to Slovakian mines and caves to hibernate in winter. The population used two main hibernacula, two large nursery roosts and one temporary-roost, but several other roosts were also visited. *R. ferrumequinum* living in SE Slovakia and NE Hungary formed probably a separate population on the northern edge of the species range. This population is a part of the metapopulation of the species existing in the Carpathian Basin. The study population inhabited a well determinable region. The study population now living in an area of 5180 km², consists of 350 individuals, but it increases up to 500 after the juveniles are able to fly. This indicates a bat density of 0.0005 specimens per ha. This low density is explained by the very few underground roost possibilities. This region is suboptimal from the point of view of winter roost availability. The fact that bats migrate from here to longer distances away (60-80 km) than in other regions (20-30 km) also indicate the suboptimality. This leads to the conclusion that greater horseshoe bats living in the investigated region should be treated as a homogeneous unit. Therefore, the efficient protection of the bats can be achieved only by the protection of all known roosts.

**POPULATION DEVELOPMENT AND PRESENT DISTRIBUTION OF THE MOST ENDANGERED BAT
- RHINOLOPHUS HIPPOSIDEROS - IN SOUTHERN BAVARIA, GERMANY**

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In Bavaria (Germany) the population of *Rhinolophus hipposideros* (Bechstein, 1800) declined dramatically after 1950. Between 1991 and 2000 only one reproducing colony was known. This colony, which settles in a castle on the island, Herrenchiemsee“ in Lake Chiemsee (Upper Bavaria) increased from 12 adults in 1991 to 56 in 2001.

In the year 2000 however, two further smaller maternity colonies of this species were discovered. Therefore a special conservation program was financed in the same year by the Bavarian State Office for Environmental Protection.

The program included systematic controls of potential roosts (e.g. churches and castles) in South-Eastern Bavaria and public relation work about this bat species. To favour the establishment of new colonies, suggestions were made to optimize roosts in the surrounding of the existing nurseries.

In 2000 and 2001 altogether 110 buildings in an area of about 2000 km² were controlled. New colonies could not be detected. In 6 roosts solitary individuals or fresh faeces were observed indicating that the population was not limited to the known colony sites. In 6 other buildings old faeces indicated former roosts. In 4 roosts, that were occupied before 1990, neither bats nor fresh faeces were found. In 2002 local batworkers shall participate the conservation work to optimize roosts nearby the 3 colonies.

**CONTROL REGION VARIABILITY OF THE MITOCHONDRIAL DNA OF NATHUSIUS PIPISTRELLE *PIPISTRELLUS NATHUSII*:
FIRST RESULTS OF POPULATION GENETIC STUDY**

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Distribution of wintering places and breeding areas of bat *Pipistrellus nathusii* in Europe may suggest that there are several different populations of this species with different migration routes and migration strategies. The aim of this project is to check if genetic variability between individuals from Baltic States and Northern Poland allows to divide these bats into different populations.

Study of population genetics of *Nathusius pipistrelle* was done using control region of mitochondrial DNA extracted from hair samples. They were collected on breeding areas of *P. nathusii*: Kuronian Split, Kaunas (Lithuania), Vistula Split, Sobieszewo Island and Darłubaska Forest (Poland). Comparison of the genetic structure was carried out with use of two techniques: amplification of mtDNA control region (PCR) and RLFP (Restriction Fragment Length Polymorphism) analysis of PCR product.

The size of PCR product varied from 1000 to 1070 bp. RsaI was used to digest a PCR product. The length of two restriction fragments varied from 190-250 to 690-750 bp. Comparison of amplified DNA fragment shows higher similarity among samples from Lithuania than between samples from Kuronian and Vistula Splits. On the other hand, analysis of RLFP of all samples allows to distinguish four genogroups: A (consisted of samples from Kuronian and Vistula Splits), B (consisted of individuals from Darłubaska Forest, Vistula Split, Sobieszewo Island and Kaunas region), C (consisted of individuals from Vistula split only), D (consisted of individuals from Kaunas region and Vistula split).

Species Status and Biology

Oral communications

ECTOPARASITE LOAD IN EUROPEAN VESPERTILIONID BATS

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Between 1998 and 2000, a study was conducted on the parasite load of eight European bat species (*Myotis daubentonii*, *Myotis emarginatus*, *Myotis myotis*, *Myotis mystacinus*, *Myotis nattereri*, *Nyctalus noctula*, *Pipistrellus pipistrellus*, *Plecotus auritus*) to compare the parasite densities of different bat populations, sexes and ages and to determine whether a relationship existed between high parasite load and poor physical condition. Considerable variations in load were observed according to host species, age and sex, and are attributable to roosting conditions and behavioural differences. Male bats, which roost relatively often alone, had the fewest parasites. Parasite population development was found to differ considerably according to year and site. There was no particular evidence of an increase in parasite load in relationship to deteriorating physical condition. High parasite numbers in weak bats did not appear to be a cause but rather a symptom of poor condition.

ECOMORPHOMETRY OF *MYOTIS DAUBENTONII* AND *MYOTIS LUCIFUGUS*: A COMPARISON

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The Palearctic Daubenton's and the Nearctic little brown bats are very similar in their ecology and morphology and have traditionally been included into the subgenus *Leuconoe*. Recent molecular genetic analysis by Ruedi & Mayer (2001), however, did not support this division of *Myotis* into subgenera and placed *M. daubentonii* into quite another cluster than *M. lucifugus*. The present paper is based on an analysis of eight external and 12 cranial characters in a sample of 158 *M. d. daubentonii* and 113 *M. l. lucifugus*. Significant sexual dimorphism was found in eight of the characters in *M. d. daubentonii* and in three in *M. l. lucifugus*, hence in further analyses, males were separated from females. The two species were compared by ANOVA. Significant differences were found in all but five characters in males and in all but four characters in females; of them, mastoid and maxillary widths were common to both sexes. PCA was performed separately for external and cranial characters. Only 48 and 52 % variability was found on the first two PC axes in external characters, probably due to differences in individual measurements (the values were adopted from specimens' labels). In cranial dimensions (taken invariably by the first author) the first three axes explained 70 % of variability in both sexes. The ANOVA test on the factor scores did not reveal differences in the first axis (influenced mainly by length variables) but did so in the further two. These two axes were influenced by breadth and height of braincase, and interorbital constriction respectively. We conclude that the two species differ in the shape of neurocranium but do not differ in the shaping of viscerocranium, namely the maxillary, mandibular and dental variables. This development could have resulted from adaptation to analogous foraging strategies and diets.

Species Status and Biology**Posters*****MYOTIS PUNICUS*, A NEW MEDITERRANEAN SPECIES IN CORSICA**

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The presence of the two sibling species *Myotis myotis* and *Myotis blythii* in Mediterranean islands has always been strongly debated. Arlettaz (1995) described these as belonging to the North African form of *Myotis myotis*. Nowadays, owing to recent works in genetics, a new Mediterranean species is identified: *Myotis punicus* (Felten, 1977). *Myotis punicus* is distributed in North Africa and in some Mediterranean islands (Corsica, Sardinia and Malta).

No easy morphological criteria is presently available to distinguish *Myotis punicus* from *Myotis myotis/blythii*. So genetic analysis is required.

The poster presents available information in Corsica concerning the distribution, status and ecology of *Myotis punicus*.

Myotis punicus is found throughout the island (0 to 1480m) but is weakly represented (ca. 3000 individuals). The presence of this species is recorded in 69 roosts and 29 different biotopes. Four maternity colonies are known (generally mixed colonies with *Miniopterus schreibersii*, *Myotis capaccinii* and *Rhinolophus euryale*) and concerns ca. 500 females of *Myotis punicus*. Two autumnal transit roosts have been identified. No winter roost is known in Corsica.

In Corsica, the life cycle of *Myotis punicus* is characterized by an early breeding season (the end of May to the end of June). As soon as the end of July, young can forage and disperse. Mating seems to take place at the beginning of August.

Myotis punicus prey on 8 distinct arthropod taxa. Open areas and hedgerows seem to be the most appropriate foraging habitat according to this diet.

THE ROLE OF VITAMIN C IN THE HAND REARING OF INSECTIVOROUS EUROPEAN BATS

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Authors describe clinical pathological signs observed in some hand reared European orphaned bats belonging mainly to the species *Pipistrellus pipistrellus*, *Pipistrellus kuhlii* and *Hypsugo savii*. These diseases appeared during artificial nursing, at different ages of the bats, and involved especially the skin, the cartilaginous joints and the digestive system. All symptoms observed in these bats led the authors to suspect an ascorbic acid deficiency. The diagnostic of scurvy was only based on clinical signs as laboratory tests and radiographic findings could not be used because of the small size of these patients. However, a positive response to treatment is often the bet of confirmation of the diagnostic. After addition of vitamin C

to the diet of the orphaned bats, the authors obtained the complete recovery from the diseases in those patients whereas the lesions did not compromise the ability to climb and fly. After collecting the observations described in this work, authors hypothesise that ascorbic acid is essential for the growth and the development of insectivorous bats.

THE OCCURRENCE OF THE PARTI-COLOURED BAT *VESPERTILIO MURINUS* IN THE NETHERLANDS, A CHANGE OF STATUS Eric Jansen

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In the Netherlands the parti-coloured bat was unrecorded from 1900 until 1976. From 1977 onwards, almost yearly, a few individuals were found. The number of records show a marked increase from 1991 onwards. In 1993, 1998, 2000 and 2001 more than 5 individuals were found. This increase in findings may have been explained by migrants from a growth in the bat population in Scandinavia and partly by larger numbers of Dutch bat workers.

Most parti-coloured bats were found in poor condition, often in the months September, October and November, close to high buildings and less than 25 km from the coastline. The species is easily recognizable and unlikely to have been overlooked before 1977. The Dutch-Bat-Survey 1986-1993 did produce only a few records of stranded bats, except one calling male along the coast. This led many others to the conclusion that, this species was in the Netherlands, a rare vagrant from the northeast of Europe.

Totally unexpectedly, a colony of 22 parti-coloured bats was found in 1998 in Maarssenbroek, close to Utrecht. The colony was at least present from 1996 onwards. The status as a nursery colony was confirmed in 1999 with the finding of two youngsters, 5-6 and 10-11 days old. The yearly maximum emergence counts gradually increased from 22 individuals in 1998 to 56 in 2002. The present status of this species in the Netherlands should now be regarded as a rare bat with a (very) small number of nursery colonies. It should be considered vulnerable because of the small number of individuals and the isolated location of the nursery roost.

FIRST DATA OF *PIPISTRELLUS PYGMAEUS/MEDITERRANEUS* IN BELGIUM

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The distribution and habitat use of *Pipistrellus pygmaeus/mediterraneus* (the 55 kHz phonic type Pipistrelle) are still unclear.

This species was discovered by chance for the first time in Belgium only four years ago. The very first time expansion recording came from a location in the Flemish Region, Ieper (May 1998) at the vicinity of trees on the bank of a large moat. The bat has only been identified in March 2000. Two other recordings were conducted in Flanders at a later date. In Moen (June 1999), *Pipistrellus pygmaeus/mediterraneus* was recorded from a bridge over a canal and in Beernem (May 2000), the bat was hunting around the tops of a castle ruin. Despite repeated survey sessions, Soprano Pipistrelles have never been observed twice in the same place. The last two records to date, have been from the Brussels' Region, in Boitsfort (April 2002). Both recordings were taken at exactly the same place, very near the pond's bank (Domaine des Silex). The animal's behaviour has been observed while hunting at very close range.

THE MEDITERRANEAN HORSESHOE BAT *RHINOLOPHUS EURYALE* IN SLOVENIA: STATUS, DISTRIBUTION AND CONSERVATION

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The Mediterranean horseshoe bat *Rhinolophus euryale* is the rarest of the three rhinolophid species currently living in Slovenia (*R. blasii* is considered extinct). The Slovenian population is also on the northern border of the distribution of the species. During the increased chiropterological work in the past few years a number of roosts has been discovered and additional ecological data have been gathered.

The Mediterranean horseshoe bat has been found exclusively in caves throughout the year. The species reproduces in Slovenia. The largest maternity colony composed of ca. 300 individuals was found in the cave Ajdovska jama pri Nemški vasi, where a number of Mediterranean horseshoe bats can be also found during the mating season. Another interesting maternity site was found in the water cave Spodnja

Klevevška jama, where thermal springs are present. The most important hibernaculum is in the tourist cave Kostanjeviška jama, which lies 12 km south of Ajdovska jama pri Nemški vasi, and harbours approximately the same number of bats. The colonies are most probably linked.

The Mediterranean horseshoe bat is a gregarious species, dependent on traditional underground roost sites. We found the species to be sensitive to disturbance. Due to specialized diet consisting mainly of moths, light pollution, intensive agriculture and destruction of woodland also present a threat to this species. A metal walkway, which has been constructed in Ajdovska jama pri Nemški vasi and the plans to build a presentation of archaeological findings are seriously threatening the existence of the maternity colony inhabiting this small cave.

ECTOPARASITE SPECIES OF CAVE DWELLING AND FOREST BATS

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The current work is the result of investigation on ectoparasites of dendrophilous and cave dwelling bats. The dendrophilous bats were studied in Talmaz forest during August, 2000; while cave dwelling - in the caves near village Bicok, during February, 2001.

Spare methods were used for material collection. Searching of the bats and their shelters in the forest was carried out with the bat detector. For bat catching, the mist net was used. Parasite collection from the cave dwelling bats was carried out preferably from slipping animals.

In Talmaz forest 86 specimens of *Nyctalus noctula* bat species were investigated from which 4 species of ectoparasites were collected: *Spinturnix vespertilionis* (occurrence frequency (OF) = 100%; infection intensity (II) = 4,4; abundance index (AI) = 4,4; *Argas vespertilionis* (OF) = 2%; (II) = 1,5; (AI) = 0,03, *Ichnopsyllus elongatus* (OF) = 5%; (II) = 1,3; (AI) = 1,5, *Cimex lectularius* (OF) = 2%; (II) = 1,5; (AI) = 0,03.

Investigations on the ecology of cave dwelling bats in the caves near village Biciok revealed the following species of bats: *Plecotus austriacus*, *Eptesicus serotinus*, *Myotis daubentonii*, *Myotis mystacinus*, from which were collected 5 ectoparasites species: *Trombicula* sp., *Spinturnix vespertilionis*, *Argas vespertilionis*, *Ichnopsyllus petropolitanus*, *Ichnopsyllus hexactenus*. Most infected with ectoparasites was *Eptesicus serotinus* that was probably related to the formation of big colonies of this species during hibernation that could provide suitable conditions for ectoparasites.

It is important to mention the finding of *Argas vespertilionis* on dendrophilous bats. This species usually feed on cave dwelling and synantropic bats species. The results of investigations on cave dwelling bats did not reveal any specimens of *Ixodes vespertilionis*. However, some findings exist on the occurrence of this species on bat species from caves of vg. Bicioc.

SOME FAUNISTICAL ASPECTS OF THE ECTOPARASITE LOAD ON BAVARIAN BATS

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Bats serve as hosts for different ectoparasite families, but with the regression of the bats the existence of their parasites is endangered as well and some species are regarded as being threatened by extinction in Germany. To investigate the nearly unknown Bavarian bat ectoparasite fauna, 927 bats of 19 Bavarian bat species (*Barbastellus barbastellus*, *Eptesicus nilssonii*, *E. serotinus*, *Myotis bechsteinii*, *M. brandtii*, *M. daubentonii*, *M. emarginatus*, *M. myotis*, *M. mystacinus*, *M. nattereri*, *Nyctalus leisleri*, *N. noctula*, *Pipistrellus nathusii*, *P. pipistrellus*, *Plecotus auritus*, *P. austriacus*, *Rhinolophus ferrumequinum*, *R. hipposideros* and *Vespertilio murinus*) were investigated with regard to their ectoparasite load. Collected parasites were determined in the lab by light microscopy respectively scanning electron microscopy. Altogether, 9 flea species of the family Ichnopsyllidae, three bat-fly species (Nycteribiidae) and two bug species (Cimicidae) could be found. In the Acari 4 species of ticks (Ixodidae and Argasidae), 7 species of the family Spinturnicidae, 6 of the Macronyssidae and *Nycteridocoptes poppei* (Sarcoptidae) as well as *Trombicula russica* (Trombiculidae) were found parasitizing Bavarian bats. For some species it is the first record in Bavaria and for the mite *Steatonyssus noctulus* also the first record in Central Europe.

GEOGRAPHIC VARIATION IN *MYOTIS BLYTHII* IN WESTERN ZAGROS MTS., IRAN**Mozafar Sharifi & Zeinab Hemmati***Department of Biology, Faculty of Science, Razi University, Baghabrisham 67149, Kermanshah, Iran*

Information obtained from 74 specimens of *Myotis blythii* (Tomes, 1857) collected from 6 caves along Western Zagros Mts. (Western Iran) together with 22 specimens described from the same area in the literature has been used to demonstrate geographic variation in this species. Results of this investigation reveal that an overall clinal increase in size exists in this species from the north to the south across the Zagros Range. These differences in external features and cranial characters are best shown in two separated samples coming from the Zivieh and Kilasefid caves located at the north and the south of the western part of the Zagros Range in Iran respectively. Size differences appear to exist in these specimens as bigger (individuals with bigger forearms) specimens are reported from the southern parts of the range and smaller ones from the northern parts of the range. The specimens from northern part of the country appear to have more "reddish" coloration than those from the southern localities which are paler.

POSTNATAL GROWTH IN THE LESSER MOUSE-EARED BAT *MYOTIS BLYTHII* IN A MATERNITY ROOST IN WESTERN IRAN**Mozafar Sharifi¹, B. Kiabi² & K. Faizolahi²**¹ *Department of Biology, Faculty of Science, Razi University, Baghabrisham 67149, Kermanshah, Iran*² *Department of Biology, faculty of Science, Shahid Beheshti University, Tehran, Iran*

Length of forearm, body mass and length of total gap of the fourth metacarpal-phalangeal joint were measured in order to develop empirical growth curves for a free-ranging population of the lesser mouse-eared bat *Myotis blythii* in a maternity colony in Western Iran. Length of forearm and body mass followed a linear pattern of growth until day 14 and subsequently leveled off to reach to a stable condition. The length of the total gap of the metacarpal-phalangeal joint showed an increase up to 10 days and decreased when it closed at over 70 days. Initiation of flight occurred 3-4 weeks after birth. During the first two weeks of post-natal growth, the body mass and the length of forearm of pups increased linearly at mean rates of 0.43 g/day and 0.8 mm/day, respectively. A method of estimation of age was derived from values of length of forearm and the total gap of the four metacarpal-phalangeal joint during the preflight and post flight periods.

SURVEY OF HISTORIC DATA AND PRESENT STATUS OF *BARBASTELLA BARBASTELLUS* IN THE NORTHERN REGION OF BELGIUM (FLANDERS)**Bob Vandendriessche¹, Paul Voet¹, Joost Vandenberghes¹, Rudy Van Torre¹, Marc Van De Sijpe¹ & Els Martens²**¹ *Bat Working group Flanders, Natuurpunt vzw, Kardinaal Mercierplein 1, B-2800 Mechelen, Belgium*² *Ministry of the Flemish Community, Nature Division, Koning Albert II-laan 20, Bus 8, B-1000 Brussels, Belgium*

One of the species which status has been described in the Flemish Red Data List of Mammals as 'probably extinct' is the barbastelle (Criel *et al.* 1994). During the last two decades, several observations have proven the opposite, and it is not unlikely that the barbastelle is still present, probably in critically low numbers, in some forested areas of Flanders. At the Belgian level, the main distribution is presumed to be South of the rivers Samber and Meuse (Wallonia). Our survey presents a summary and some comment on historic and recent data. During the eighties, observations are limited to the finding of a skull at the fortress of Oudenaarde in 1981 (Minnaert *et al.* 1990) and two observations of hibernating animals, one near Brussels (winter '84-'85) and one in a fortress of the well-known 'Antwerp cluster of fortresses' for the consecutive winters from '87-'88 until '90-'91. Observations of at least 5 hibernating barbastelles were equally made between '81 and '94 at a site of ruins at the town of Sluis (The Netherlands), less than two miles from the Flemish border. September '92 a barbastelle was seen in a barn in that same area, this time at a stone's throw of the border. During the 1990-ies, apart from an unverifiable bat-detector observation in the 'Forêt des Soignes' near Brussels, observations in Flanders are limited to one site at the coastal province of Western Flanders, only fifteen miles away from the Dutch site: during the winter of '96-'97 one barbastelle was found hibernating in an ice-cellar at a private woodland at the city of beernem. At this site, sound recordings of hunting barbastelles were made and analysed for the first time in October '98. A first summer observation was made the 30th of may 1999. The last verifiable observation at that site was made on July 2000. Since then further intensive attempts to observe barbastelles at this site have failed. The following winter, a remarkable observation of a hibernating barbastelle was done at a well surveyed hibernation-site in the province of Eastern Flanders, less than seven miles away from the former site. It seems not unlikely that all or some of the animals of the small Dutch population in Sluis have migrated along canals that make a known migration route for at least nine other species of bats.

Criel D., Lefèvre A., Van Den Berge K., Van Gompel J. & Verhaegen R., 1994. *Rode lijst van de Zoogdieren in Vlaanderen (Red data list of mammals in Flanders)*. Ainal, 79p. Minnaert G., Lefèvre A., Jooris R. & Fairon J., 1990. De vleermuisenpopulaties in het keuzelfort te Oudenaard. *Doc. Trav. Inst.R.Sci.Nat.Belg*, 62, 5-30.

MINIOPTERUS SCHREIBERSII IN SLOVENIA - STATUS, DISTRIBUTION AND CONSERVATION**Maja Zagmajster**, Klemen Koselj, Primož Presetnik & Nataša Aupič*S.D.P.V.N. - Slovenian Association for Bat Research and Conservation, Prešernova 20, SI-1000 Ljubljana, Slovenia.
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In the past few years, intensive work has been carried out to assess the status and distribution of Schreiber's bat in Slovenia. Most of the fieldwork was done in 1999 and 2000, as a part of the international project Central European Miniopterus Protection Programme, but it continued also later. Caves and other potential roosting places were searched and monthly monitoring was introduced to the most important shelters.

Schreiber's bats or their bony remnants have been found on fifteen localities in Slovenia, but larger concentrations of bats occur on five localities only. Škocjanske jame cave (SW Slovenia) is a large cave system, used by Schreiber's bats throughout the year. In winter 1999/2000 about 10.000 bats were counted there. Predjama cave system (SW Slovenia) and Huda luknja cave (N Slovenia) are being used as hibernation and mating site for Schreiber's bats, though in Huda luknja a small summer colony could also be observed. Planinska jama (SW Slovenia) appears to be an autumn transitory roost. In the cellars of the castle Grad na Goriškem (NE Slovenia) about one hundred Schreiber's bats, including the young, were observed during the summer time.

Schreiber's bat has been classified Endangered in the Slovenian Red List of Animal and Plant species and is legally protected. Recommendations for the protection of some underground sites were given to the Conservation Authorities. Most of the roosts are tourist caves, so the tourism in some of them should be at least partly restricted. In the case of the castle Grad, besides human vandalism the collapsing of walls in the cellars presents an even bigger problem. Conservation of the species in Slovenia for now depends completely on the protection of roosts, since little is known about other threats.

Tuesday, 27 August
Inventoring**Oral communications**

**BAT DETECTOR WORKSHOPS IN EASTERN AND SOUTH EASTERN EUROPEAN COUNTRIES :
BUILDING A NETWORK FOR BAT CONSERVATION**

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In the framework of the 'European Bats Agreement a series of training workshops for bat experts and colleagues in eastern and south eastern European countries was initiated in 1999.

The project was made possible by the German Ministry of Environment - Federal Agency of Nature Conservation. The aims of the workshops were the introduction to and training of the use of bat detectors as an additional tool to the survey methods already established; providing equipment; assessment of the possibilities of a systematic approach to the assessment of distribution, and a round table discussion on the possibilities and needs for bat conservation in the countries.

Between 1999 and 2001 10 workshops could be held in Bulgaria, Croatia, Ukraine, Georgia, Slovenia, Romania, Moldova, Lithuania - Baltic Region, Slovakia, Yugoslavia. The workshops generated interest and participation from all corners of the countries, and where possible also participants from neighbouring countries were welcomed. The new survey technique revealed many new data, observations and experiences, including first species records, and first roost records of species. The workshops served as a strong impulse to the development of working groups addressing bat research and conservation and stimulated development of links and co-operation between individuals and organisations across Europe. They contributed to the building of a network for bat workers and bat conservation in Europe. The results on the biological as well as the organisational level demonstrate the effectiveness of the approach and call for new initiatives.

THE IMPROVED ROUTE COUNTING METHOD TO MONITOR BOREAL BATS**Matti Masing¹, Lauri Lutsar² & Kaja Lotman³**¹ *Sicista Development Centre, Box 111, Tartu 50002, Estonia. matti@ut.ee;*² *Estonian Fund for Nature, Box 245, Tartu 50002, Estonia. lauri@elfond.ee;*³ *Matsalu Nature Reserve, Penijõe 90305, Läänemaa, Estonia. kaja@matsalu.ee.*

In 2000-2001 the improved route counting method (RCM-2) was developed in Estonia to monitor foraging bats in boreal region. This is a modification of the route counting method (RCM) in which two counting methods, line counting (sub-method LC) and point counting (sub-method PC) are combined to make bat counting more powerful (Masing *et al.* 1998). In RCM-2 both sub-methods are separated, thus enabling to consider their results separately. RCM-2 includes the following aspects: 1) line counting (LC) and point counting (PC) are separated; 2) bats are recorded and their species identified using a sensitive heterodyne detector and visual observation; 3) bat counting starts 1-1.5 hours after sunset depending on light conditions; 4) only suitable weather conditions (temperature at least +10 C, no rain, no strong wind) are recommended for counting bats in the purpose of monitoring their populations; 5) in LC route length is between 3-5km, while bats (maximum number of every species heard or seen) are counted per 50m segments of the route; 6) in PC bats are counted in nine 5-min waiting points, situated either on or near the LC route, in three points in each main habitat type (at the edge of water-body, in forest or park, near houses with trees); 7) the counting is completed during 2.5-3 hours (including 45 min for nine PC waiting points); 8) the results of LC and PC are given in inds/10 km (or inds/100 km) and inds/100 points, respectively; 9) to characterize bat populations in a larger area the results of several routes are summarized.

Compared to LC, PC enables to record more effectively bat species which emit quiet sounds (e.g. *Plecotus* and small *Myotis*) while foraging close to vegetation, because the observer is not moving. The results of PC characterize certain habitat types while the results of LC apply to the whole landscape where the counting route passes. While testing RCM-2 on eight routes during 22 hours in midsummer 2001, ten species of bat were found out of eleven species known to occur in Estonia. If only one sub-method is used, some species may be missed.

FAUNA OF BATS IN NORTHERN URALS, RUSSIA**Oleg Orlov***Institute of Plant and Animal Ecology, 8 March street. 202, RU-620144 Ekaterinburg, Russia*

Northern Urals is known to be a part of Urals mountain chain between 64° n. l. in the north and 59° n. l. in south with the adjoining territories of Russian plain (Pre-Urals) in the west and West Siberian Plain (Trans-Urals) in the east. Analysis of literature data and our research indicate that most common species in the bats' fauna of Northern Urals are such species as *Myotis dasycneme*, *M. daubentonii*, *M. brandtii*, *Eptesicus nilsonii*. The presence of these species is determined mainly by the presence of numerous wintering places in caves of mountains and foothills parts of the region (the biggest groups of wintering animals were found in Divja cave - in total more than 1000 individuals) Considered species differ in their pattern of distribution in Northern Urals. The most northern records were made *E. nilsonii*. *M. brandtii* is the most common, often most abundant species in all parts of region, excluding the northern ones. *M. dasycneme* is much more rare, while *M. daubentonii* was found only in plains of western part of Northern Urals. Such species as *M. mystanicus* and *Plecotus auritus* also inhabit the territory of Northern Urals however they are much less common than the mentioned above species. The former was found in the south of western part of Northern Urals, while the latter inhabits both the eastern and western slope of Ural mountains in the southern part of region. All mentioned above species are non-migrating. Migrating bats in Northern Urals are presented by *Vespertilio murinus*. In the western part of Northern Urals species is distributed further to north than in the eastern part of it. Absence of other migrating species is determined by the lack of typical habitats, providing them with shelters (broadleaves forests) and the remoteness of Northern Urals from their places of wintering.

THE UK'S NATIONAL BAT MONITORING PROGRAMME (NBMP)**Colin Catto***The Bat Conservation Trust, 15 Cloisters house, 8 Battersea Park Road, SW8 4BG London, England*

The UK Bat Monitoring programme began in 1997 and is run by the Bat Conservation Trust with the Joint Nature Conservancy Council the main governmental funder. Summer colony, field and hibernation surveys form the main monitoring methods. Heterodyne/frequency division detectors were introduced onto field surveys in 2002 allowing a more objective assessment of species identification. Power statistics demonstrate a 90% confidence in meeting RUCN 'Alert' targets for population declines based on present

annual data collection levels for most species/surveys. Population indices are constructed for each species/survey.

The programme delivers c. 11 000 hours of volunteer effort throughout the UK annually and volunteer management is identified as critical to the success of the programme. Volunteer turnover requires constant recruitment to maintain present survey levels. In 2002 the pilot 'Sunrise Survey', requiring no equipment/previous bat experience for participation, opened the programme to novice surveyors. Workshops are run throughout the UK to increase existing surveyor effectiveness, especially on detector-based field surveys.

Inventoring

Posters

STATUS OF *MYOTIS EMARGINATUS* IN BOHEMIA, CZECH REPUBLIC: DISTRIBUTION AND POPULATION TRENDS

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At the present time, *Myotis emarginatus* reaches in the territory of Bohemia its northernmost regular occurrence in Central Europe (up to 50°50' N). However, this occurrence was considered rare on a margin of distributional range of species, unlike the situation in Moravia and Austria, where *M. emarginatus* is relatively common species. In the last decade, this species was recorded in Bohemia on 43 localities (from these are 27 new, i.e. 56% of all up-to-date known Bohemian localities). During last 20 years, *M. emarginatus* became regularly recorded bat in Bohemia in hibernacula; within last 10 years, it was regularly recorded also in summer shelters and by netting; in 2000, it was for the first time found a nursery colony. In the last quarter of XXth century, *M. emarginatus* was probably spread (1) to Eastern, North-Eastern and Central Bohemia from Northern and Central Moravia, and (2) to southern and South-Western Bohemia from Upper Austria or from Bavaria. Two of winter shelters of *M. emarginatus* in Bohemia (one cave and one artificial space) we can consider as mass hibernacula of the species (highest numbers of hibernated bats was 38 and 70 individuals, respectively); in these hibernacula, numbers of hibernating bats have increased since 1980s and in 1990s. In Bohemia, *M. emarginatus* is inhabitant of middle elevations, with average locality altitude ca. 460m a.s.l. (of winter record ca. 480m a.s.l.; of summer record ca. 430m a.s.l.). As in more to south situated regions of continuous occurrence of *M. emarginatus*, in Bohemia is its distribution in relation to distribution of karst and pseudo-karst phenomena, and it is in positive correlation with the occurrence of relatively commonly distributed *Rhinolophus hipposideros*.

RECORD OF *HYPUSUGO ARABICUS* FROM BALUCHISTAN, IRAN, WITH REMARKS TO ITS ECOLOGY AND SYSTEMATICAL STATUS

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Up to now, *Hypsugo arabicus* is a bat species known only from mountains of the North-Eastern Oman, Arabian Peninsula. In the course of a recent expedition to Iran, twelve individuals were netted in Southern Baluchistan; it represents the first record of the species from Iran and from the mainland Asia, respectively. The bats were caught above a rest pool of periodical river, that was surrounded by lowland desert and semi-desert habitats (ca. 130m a.s.l.). Similarly as in other species of eptesicini-pipistrellini clade, *H. arabicus* is an aerial hawker: as the diet analysis has shown, diet of this species consist mostly of Auchenorrhyncha and small representatives of Coleoptera; additionally the diet is composed by Hymenoptera, Blattoidea and some others insect groups. The species *H. arabicus* is considered as a member of the *H. savii* group; together with Saharo-Sindian species *H. bodenheimeri* and *H. ariel*, it is included into *ariel*-subgroup. All three species of this subgroup are considered as possibly conspecific (senior synonym is the name *H. ariel*). Although among these three species significant differences in colouration, external and/or cranial dimensions and dentary constitution are not present, the distinctness has been found in penial anatomy. The validity of species status of *H. arabicus* has been confirmed; however, *H. bodenheimeri* is suitable to consider conspecific with *H. ariel*.

THE STATUS OF FOREST BATS IN THE BÜKK MOUNTAINS, N.E. HUNGARY

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The Bükk mountains, situated in North-East of Hungary are one of the richest regions in bat species in the country. The poster is reporting on the results of a bat research programme, that has been running here since 1994 aiming mostly at forest bats. 23 of the 27 Hungarian bat species were mist netted during nearly 200 nights. The observations took place in different habitats: Aegopodio-Alnetum, Aconito-Fagetum, Melittio-Fagetum, Querco-petrae-Carpinetum, Quercetum petraeae-cerris, and in an urban environment, a 14 hectare park in the city of Eger. The most common species were: *Nyctalus leisleri*, *Myotis myotis*, *M. bechsteinii*. Substantial numbers of *Barbastella barbastellus*, *Plecotus auritus*, *Pipistrellus pipistrellus*, *Myotis brandtii*, *M. mystacinus* and the recently described *Myotis alcathoe* were mist netted at different sites. Several faunistic rarities were observed like *Hypsugo savii*, *Pipistrellus kuhlii*, *Nyctalus lasiopterus* and *Vespertilio murinus*. Specific seasonal changes in the sex ratio of *Myotis daubentonii* and *M. dasycneme* were found. Several species showed a conspecific occurrence arising from similar habitat preference. Data obtained from research help us to establish the effective strategies of bat protection.

THE BAT POPULATION OF THE MEERDAAL FOREST, FLANDERS, BELGIUM

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During 2001, a full scale project was launched on the occurrence of bats in small and large scale forest areas throughout the Region of Flanders, Belgium. The project is co-ordinated by the Flemish Forest and Green Areas Division; the field work is carried out by the Bat Working Group within Natuurpunt vzw. One of the pilot study areas is the Forest of Meerdaal, in the Province of Vlaams-Brabant, covering a total area of ± 1300 ha. As a first step, a species inventory list is; a second phase aims to identify foraging habitats, flight paths and roosting sites. Activities are recorded using Pettersson D240 bat-detectors and Batbox-3s, connected to a Sony Minidisc recorder. Surveys were undertaken during early evening or at night; some surveys were carried out early mornings in order to better locate flight paths as well as colonies. All sound recordings were analysed using the BatSound Pro programme.

The first results indicate that the Meerdaal Forest is an important habitat for a considerable number of bat species: Daubenton's bat *Myotis daubentonii*, pipistrelle *Pipistrellus pipistrellus*, Nathusius' bat *Pipistrellus nathusii* (first observation in the larger area surrounding the study site), serotine *Eptesicus serotinus*, noctule *Nyctalus noctula* and long-eared bats *Plecotus sp.* A flight path was discovered with at least 13 *Myotis* species, most probably whiskered bats *Myotis mystacinus/brandtii*. Surprisingly, 2 encounters were recorded for Leisler's bat *Nyctalus leisleri*, being the 2nd and 3rd confirmed and recent observations in Flanders. A single encounter only was recorded of a hunting pond bat *Myotis dasycneme*; first record for this part of Belgium since 1945.

THE EAST LIMITS OF DISTRIBUTION OF MIGRATORY BAT SPECIES IN THE SOUTH URALS

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The territory of the South Urals and Preduralye, within limit 50-56°N and 52-60°E. is inhabited by 15 bat species. Migratory species from this to group are: *Nyctalus lasiopterus*, *N. noctula*, *N. leisleri*, *Pipistrellus pipistrellus*, *P. nathusii* and *Vespertilio murinus*. In this region they meet only in warm period of a year. As an exception single individuals of *V. murinus* can remain here and stay for the winter (Kirykov 1954). The South Urals are the east limit of distribution of such species: *P. nathusii*, *N. lasiopterus* and *N. leisleri*. The extreme points of detection of *P. nathusii* are fixed in flood - lands of river Large Cumak, near of settlements Udarnik (51°20'N, 58°48'E) and Novoorsk (51°22'N, 58°55'E) (Orenburg provise). A find of this species to the north are known from reserve "Ilmensky" (55°00'N, 60°11'E) (Snitko 2001). The *N. leisleri* is caught by us in the village Spasskoe by Orenburg province (52°01'N, 56°35'E). Earlier it inhabitation in the Orenburg steppes mentioned by E. Eversmann (1850). Also single specimen known from Bashkir reserve (53°02'N, 57°03'E) (Tkachenko 1971). About east boundary *N. lasiopterus* it is known thanks to unique find, made in the beginning XXth century in the Busulucsky forest (52°56'N, 52°03'E) (Ognev 1925). The territory of South Urals is a northeast limit of distribution european subspecies *N. noctula* and *P. pipistrellus*. The extreme east points of find *N. n. noctula* known near of settlements Idyash in Bashkir (51°47'N, 57°06'E). The *P. p. pipistrellus* marked in average current river White (52°55'N., 55°55'E) (Marvin 1969).

THE WINTERING BATS IN SELECTED HISTORICAL MONUMENTS OF THE GDAŃSK REGION, NORTHERN POLANDAleksandra Benedycka¹, Anna Biala¹ & Krzysztof Kniec²¹ Department of Cytology and Genetics, University of Gdańsk, PL-83-110 Gdańsk, Poland² Department of Animal Physiology, University of Gdańsk, PL-83-110 Gdańsk, Poland

The aim of the study was to determine the species composition of wintering bats in Pomeranian region (Poland) and to evaluate the importance of particular shelters for bat populations. The census was done during winters 1989-2002. We checked up 32 potential hibernacula (forts, bunkers, cellars and a natural cave). In the present paper we analysed data from 5 historical monuments of the Gdansk region according to the historical and cultural meaning: forts of Reduta Napoleonska (census since 1989), Wisloujście Fortress (census since 1994), cellar of the presbytery in Frombork (census since 1995), Bastion of St. Gertruda (census since 1998) and Teutonic Castle in Malbork (census since 2001). We recorded the presence of the 8 following species: *Myotis myotis*, *M. nattereri*, *M. daubentonii*, *M. dasycneme*, *Eptesicus serotinus*, *Pipistrellus pipistrellus* sensu lato, *Plecotus auritus*, *Barbastella barbastellus*. The highest number of hibernating bats during the study period was recorded in Malbork Castle (maximally 191 individuals, 6 species) and in Wisloujście Fortress (maximally 115 individuals, 4 species). These objects are the most important bat winter roosts in the Gdansk region. The population trends are different in particular localities, however the total number of bats in all localities is increasing. The protection of the above mentioned objects has to be a compromise, taking into account their natural and historical values.

BATS DISTRIBUTION AND PHENOLOGICAL DATA IN MATZEIKIAI DISTRICT IN 1999-2002

Deividas Makavicius & Nomedra Velaviciene

Lithuanian Society for Bat Conservation Renavas Palace, Renavas Kaimas, 5500 Mazeikiai District, Lithuania

Mazeikiai district is in the Northwest part of the Lithuania. It takes 1220 km² area. Episodic researches are carrying out in this territory from 1995, but detailed studies of bats fauna are organized from 1999. Then was the beginning of collecting detailed information about bats distribution in this area, abundance of individuals and populations, phonological data.

Totally there are 12 bat species founded in Mazeikiai district: *Myotis daubentonii*, *M. dasycneme*, *M. brandtii*, *M. nattereri*, *Plecotus auritus*, *Nyctalus noctula*, *N. leisleri*, *Pipistrellus nathusii*, *P. pipistrellus*, *Eptesicus nilsonii*, *E. serotinus*, *Vespertilio murinus*.

Renavas park is very important as a breeding territory of *N. noctula* (35-50 ind.), *P. nathusii* (40-60 ind.), *E. nilsonii* (till 30 ind.). In breeding period there are observed several *M. brandtii* (usually observe them in Lithuania only during wintering time) and *M. dasycneme*. Totally there are detected 11 bat species during breeding period.

There are big breeding colonies of *M. daubentonii* (about 80 ind.) and single individuals of *N. leisleri* in Plinkšiai park. 10 bat species are observed in Plinkšiai surroundings during breeding period. Numerous breeding colonies of *P. nathusii* (total 200 ind.) and *P. pipistrellus* (100-150 ind.) are in the Seda, Vieksniai and Krakiai settlements. *E. nilsonii* is common species and several individuals of *V. murinus* are usual in these towns. Totally there are living 7 bat species.

The most abundant species are: *M. daubentonii*, *P. auritus*, *P. nathusii*, *E. nilsonii*. *N. leisleri*, *M. dasycneme* and *V. murinus* is a rare or very rare species in Mazeikiai district.

THE RESULTS OF TESTING THE ROUTE COUNTING MÉTHODE TO MONITOR BOREAL BATSMatti Masing¹ & Kaja Lotman²¹ Siciasta Development Centre, Box 111, Tartu 50002, Estonia. matti@ut.ee;² Matsalu Nature Reserve, Penijõe 90305, Läänemaa, Estonia. kaja@matsalu.ee.

Using the route counting method (RCM, Masing *et al.* 1998) and the Skye SBR-1200 heterodyne detectors bat counts were carried out on the same routes during one summer. On two routes situated in different parts of Estonia two observers counted bats (K. Lotman at Matsalu and M. Masing at Värskä) during three nights in similar weather conditions in June, July and August 1998. Analysis of these data shows that significant differences in bat numbers occur between months, not between the dates of a short observation period within a certain month. This result supports the hypothesis that in Estonia bat counting can be carried out in the second half of June without a big difference in the number of bats counted on the same routes on different dates. This means that the counting work carried out under the national bat monitoring programme in Estonia since 1994 is reliable for population estimates, however, depending on the number of routes/counts and the quality of the counting work.

Masing M., Lutsar L. & Lotman K. 1998. Monitoring bats with bat detectors in Estonia. *Myotis*, 36: 167-176.

BAT-FAUNA EXAMINATION IN NORTH-WEST HUNGARY (FERTŐ-HANSAG NATIONAL PARK) 1995-2001**Károly Papp***Hungarian Bat Research Society, RaDI U. 4, H-2600 Vac, Hungary*

Records of 18 species of bats representing two families from Nord-West Hungary (NWH), included the territory of the Fertő-Hanság National Park (FHNP), are listed. The distribution and status of each species is also given.

In respect of the bat fauna in Nord-West Hungary is less investigated and for this reason relatively few data is available in the literature. The main reason for the lack of information is that though diverse habitats occur within the borders of the NWH there are just few old forests and caves providing daily shelters and hibernacula for bats and the territory itself was not interesting enough for bat researchers. The first data were listed by Méhely (1900) and subsequent works were made by Paszlavszky (1918), Éhik (1924) and Vásárhelyi (1939). Among others, these works were summarized and completed with his own records by Topál (1954). It was only in 1988 when newer data were published by Dobrosi (1988) and in the 1990's Miklós Szatyor conducted field work on the territory of the FHNP.

The recent records published in this paper are partly based on the yearly survey of house-dwelling bats organized by the Hungarian Bat Research Society and partly on my own data gathered between 1994 and 2001 by means of direct observation, mist-netting and ultrasound recording. The records of a particular species from the same locality are listed by time order and the month of the observation(s) is given at the end of each species text.

Due to the protected status of the species and since the identification in most cases were verified by hand-held individuals no voucher specimens were taken.

BAT SPELEOFAUNA OF AZERBAIJAN**Irina Rakhmatulina***Institute of Zoology Azerbaijan Academy of Sciences, Passage 1128, Block 504, AZ-370073 Baku, Azerbaijan*

Fifteen bat species of Azerbaijan (from 26 registered) have been revealed in different natural and artificial underground habitats. The degree of their speleophycity significantly varies. Exceptionally in caves, tunnels, qanats *Rhinolophus euryale*, *R. blasius*, *R. mehelyi*, *Miniopterus schreibersii* have been revealed. About 80% of *Barbastella leucomelas* findings were done in different underground places. Other 10 species were found in such roosts rarely: *R. ferrumequinum* a few more than 40% (in hibernating period 100%), *Myotis blythii* and *Eptesicus serotinus* nearly 30%, *R. hipposideros* and *Plecotus auritus* 20%, *M. emarginatus* and *Hypsugo savii* 10%. Minimum findings (1-4%) in subterranean places (in crevices of front sections) are characteristic for *M. mystacinus*, *Pipistrellus pipistrellus* and *E. serotinus*.

The most numerous aggregations were discovered mainly in karst caves of the Lesser Caucasus (8-10 thousand individuals of *M. schreibersii*, up to 2,000 *R. mehelyi* and *M. blythii* separately, to 200 *R. ferrumequinum*). In loamy caves *M. emarginatus* and *Eptesicus bottae* formed groups of some hundreds specimens. Number of other 9 species was not more than tens.

Microclimate of the different bat underground habitats varies by seasons. In the cold period air was highest in the roosts of *R. mehelyi* (12.2-15°C), it was lower in quarters of *R. hipposideros* and *R. ferrumequinum* (5-14°). In the places of *M. schreibersii* it was 3-9.7°. *B. leucomelas*, *P. pipistrellus*, and *H. savii* chose for hibernation coldest shelters of the caves, being hidden within chinks and fissures, where temperature was between 2-9°. In warm seasons males usually live in the cool sections of underground spaces, but females, on the contrary, prefer the warm places, where temperature vary in wide limits.

STUDIES ON BAT BIODIVERSITY AT THE ABRUZZO, LAZIO AND MOLISE NATIONAL PARK, CENTRAL ITALY**Danilo Russo**

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The 'Progetto Biodiversità' (Biodiversity Project) is a long-term research plan promoted by the Abruzzo, Lazio and Molise National Park. It aims to produce inventories of all plant and animal species occurring in this protected area of the Central Italy Apennine. In 2000-2001 I carried out research on the Park bat fauna in order to obtain an exhaustive check-list and to map bat distribution. The methods employed included roost search, mist-netting at foraging and drinking sites and acoustic surveys with time expansion bat detectors. Twenty-one bat species (about two-thirds of those known for Europe) - 20 of which observed in this study - currently occur at the park. Two of them (*Pipistrellus pygmaeus* and *Myotis blythii*) are new records for the area. The commonest species are *Pipistrellus pipistrellus*, *Pipistrellus kuhlii* and *Myotis daubentonii*. The occurrence of mature beech woodlands favour the presence of tree-dwelling

species such as *Nyctalus leisleri* and *Barbastella barbastellus*, both uncommon in Italy. A breeding population of the latter occurs at the Park over 1200 m a.s.l. Both *Plecotus auritus* and *P. austriacus* occur in sympatry. Recent records by other authors include breeding *Myotis brandtii* and a *Myotis capaccinii* skull. The occurrence of *Myotis bechsteinii* and *Rhinolophus blasii*, mentioned in old studies, has not been confirmed.

THE BATS OF FOREST AND FOREST-STEPPE ZONES IN CHELYABINSK REGION, RUSSIA

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The Chelyabinsk region occupies the largest part of Southern Urals. It is situated on the border of Europe and Asia, which runs along Urals ranges. There are four geographical zones are presented on this territory: southern taiga, broadleaf forest, forest-steppe and steppe. This zones combines with altitudinal differences. Because of this, the Chelyabinsk region characterizes by combination of different faunistical complexes. The region is very rich in rivers and lakes. Western part includes spacious carst landscapes.

The data were collected in forest and forest-steppe zones of Chelyabinsk region by inspection of hibernation places in caves in 1997, 1989, 2000 and March, 2002 in western part of region (from 54°45' to 55°40' N, from 57°50' to 59°10' E, Satkinsky, Katav-Ivanovsky, Ust-Katavsky districts), during expeditions in April, 2000 and August, 2001 in southern part and during stationary observations in 1997-2001 in Ilmensky reserve (from 54°50' to 55°20' N, from 60°07' to 60°25' E).

It was established, that the bats communities of forest and forest-steppe zones in Chelyabinsk region are represented by 10 typically European species (*Myotis dasycneme*, *M. daubentonii*, *M. brandtii*, *M. mystacinus*, *M. nattereri*, *Vespertilio murinus*, *Eptesicus nilssonii*, *Plecotus auritus*, *Pipistrellus nathusii*, *Nyctalus noctula*).

Three bat species are the most widespread in summer - *Myotis dasycneme* (50%, n=273), *Vespertilio murinus* (29,7%, n=162), *Pipistrellus nathusii* (8,2%, n=45). *Eptesicus nilssonii* (68,6%, n=45), *Myotis dasycneme* (12,4%, n=13), are usually were recorded on hibernation places. *Myotis daubentonii*, *M. brandtii*, *M. mystacinus*, are not numerous, *Plecotus auritus*, *Nyctalus noctula*, *Myotis nattereri*, are rare species.

RESULTS OF BAT RINGING IN SOUTH-HUNGARY

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More than ten years' results explored numerous interesting connections with the aid of bat ringing. Our main fields of research are Mecsek-, and Villány mountains, where we marked more than 4000 bats. These investigations alluded four stressed species: *R. ferrumequinum*, *M. myotis/blythii* (grate-*Myotis*), *M. daubentonii*, *M. dasycneme*. We succeeded in proving the connection between Mecsek mountains and Danubes's flood, where the migration of *M. daubentonii* and *M. dasycneme* is regularly observable in breeding time. Occurrence of ringed specimens of *R. ferrumequinum* and large-*Myotis* shows the connection between Mecsek-, and Villány mountains. Ringed specimens of these two species came up in the neighbouring Croatia too.

THE BATS OF THE MURÁNSKA PLANINA NATIONAL PARK, CENTRAL SLOVAKIA

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Landscape of the Muránska planina Mts. is characterized by a well-developed karstic plateau relief with a lot of sites suitable for bats. The Muránska planina National Park (altitude in the range of approximately 400-1439m a.s.l.) covers 420.2km² (including the buffer zone of 217.0km²). In the presentation, patterns of bat's distribution (with some ecological and biological notes) in the region based on all the data available (in the period 1950-2002) are presented. A total of 22 bat species occur in the region under study, which represents 88% of all bat species of Slovakia (25 species). Referring to the findings of nursery colonies, 5 bat species (*Rhinolophus hipposideros*, *Myotis myotis*, *M. blythii*, *M. mystacinus*, *Plecotus auritus*) regularly breed in the region. Occurrence of 17 other species was recorded in summer, transient and/or winter period (*R. ferrumequinum*, *R. euryale*, *Miniopterus schreibersii*, *M. bechsteinii*, *M. nattereri*, *M. emarginatus*, *M. brandtii*, *M. daubentonii*, *M. dasycneme*, *Vespertilio murinus*, *Eptesicus serotinus*, *E. nilssonii*, *Pipistrellus pipistrellus*, *Nyctalus noctula*, *N. leisleri*, *B. barbastellus*, *P. austriacus*).

Having evaluated the results of winter censuses (more than 50 shelters), nettings, owl pellet analysis and surveys of buildings and their lofts, the basic knowledge of the state of bat populations was obtained. This is together with examples of long-term changes of abundance of bats in selected hibernation sites and habitats presented in the presentation.

THE CATALOGUE OF THE BAT HIBERNACULA IN SLOVAKIA

Marcel Uhrin

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A summary of the project "The catalogue of the bat hibernacula in Slovakia", completed in 2001 is compiled in the presentation. Project was conducted by members of the Slovak Bat Protection Group and financed by the authorities of the Slovak State Nature Conservation organisations. The catalogue compiles all the data from winter censuses of more than 350 sites in the period 1950-2001. Totally 22 bat species (*Rhinolophus hipposideros*, *R. ferrumequinum*, *R. euryale*, *Miniopterus schreibersii*, *Myotis myotis*, *M. blythii*, *M. bechsteini*, *M. nattereri*, *M. emarginatus*, *M. mystacinus*, *M. brandtii*, *M. daubentonii*, *M. dasycneme*, *Vespertilio murinus*, *Eptesicus serotinus*, *E. nilssonii*, *Pipistrellus pipistrellus*, *Nyctalus noctula*, *N. leisleri*, *Barbastella barbastellus*, *Plecotus auritus*, *P. austriacus*) were recorded in the studied shelters during this period. Patterns of geographical and altitudinal distribution and cenological data are given. All the data are evaluated from the perspective of species and/or habitat conservation with respect to both, national and European (Natura 2000) legislation rules. List of the most important hibernacula is given.

DATA ABOUT THE DISTRIBUTION OF RHINOLOPHIDAE IN ROMANIA

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The poster presents data about the distribution of Rhinolophidae in Romania and recently data about winter and summer roosts of these species. As a result of our researches important winter and summer roosts of 5 species: *Rhinolophus ferrumequinum*, *Rhinolophus hipposideros*, *Rhinolophus euryale*, *Rhinolophus mehelyi*, *Rhinolophus blasii* have been localised. Our recent data are compared with data from literature.

BAT FAUNA OF THE REGIONAL PARK OF DELTA DEL PO (EMILIA-ROMAGNA REGION; N.E. ITALY) Edoardo Vernier

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The regional Park of Delta del Po (Emilia Romagna region; N.E. Italy) is placed along the low and sandy coasts of Emilia Romagna region, in the provinces of Ferrara and Ravenna, and include about 50.000 hectares. It covers a long tract of the Adriatic coast (more than 70 Km), and presents a series of habitats, greatly different from ecological and vegetational point of view. The valleys of Comacchio (the most important Italian complex of salt marsh), marsh forests of fresh water (Val Campotto and Punte Alberete), coastal dunes, mediterranean coastal forests (Bosco della Mesola; with prevalent vegetation of *Quercus ilex*) and great Pine forests (with *Pinus pinea* and *Pinus pinaster*). The natural areas are spaced out by urban areas (recent settlements), lands and great estates. A long series of monitoring with bat detector carried out in the last 10 years, together with data collected by mist nets, and a study of 6 years with bat-box stations (mostly in pine forest) have given new data and a more detailed catalog of the bat fauna of this great area. These bat species were recorded for the park area: *Rhinolophus ferrumequinum*, *Myotis daubentonii*, *Myotis myotis/blythii*, *Pipistrellus kuhlii*, *Pipistrellus pipistrellus*, *Pipistrellus nathusii*, *Hypsugo savii*, *Eptesicus serotinus*, *Nyctalus noctula*, *Plecotus auritus/austriacus*, *Barbastella barbastellus*.

The natural and semi-natural forests (Bosco della Mesola, to the North; Punte Alberete; Pineta di Cervia, at the extreme South) presents *Nyctalus noctula* as typical species, also with nursery colonies (with hundreds of individuals); *Pipistrellus kuhlii*, *P. nathusii*, *P. pipistrellus*, *Hypsugo savii* and *Eptesicus serotinus* are also present. Urbanized areas, with new buildings for turistic use, present regularly *P. kuhlii*, *H. savii* and *E. serotinus*, but also *Barbastella barbastellus*. The *Barbastella* was first recorded for the region Emilia-Romagna in 1994; in the park it was recorded in several localities, also in urban parks in new settlements. In Italy this (rare) species was usually recorded in mountain areas.

NEW RECORDINGS OF THE LESSER NOCTULE *NYCTALUS LEISLERI* IN BELGIUM

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Nyctalus leisleri is a fairly uncommon species, in Belgium as in other parts of its distribution range. Fairon (1982) listed two specimens found on 4 August 1873 at Overijse; one skull was found in a barn owl pellet collected in 1981 at La Hulpe. Both data are from the surroundings of Brussels. Two other authors report the observation of 3 captured individuals at Villers-la-Ville in 1947 (Lebrun, 1970) and one observation in 1941 in Brussels (Nerincx 1943).

By using the D240 and D980 bat-detector *Nyctalus leisleri* could be identified at 9 new locations. The majority of the locations lie close to the Forest of Zoniën, which is mainly a beech-wood. Since it is known that the species prefers tree holes and bat boxes, these observations are not so surprising.

From every observation, recordings were made, and after analyzing the different spectrograms and power spectrums we found a maximum frequency around 24 kHz for the QCF. For *Nyctalus noctula* these values lie in between 19 and 20 kHz.

We are absolutely convinced that in the near future new observations will appear, following the idea that 8 out of 9 new locations have been found during the last two years only.

THE ABC (ATLAS OF BATS OF THE CARPATHIANS) PROJECT

Bronisław W. Wołoszyn

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Carpathians territory is of considerable significance to analyse ranges of bats in Europe. Several bat species are restricted to different parts of the mountains and, as the ranges of these species have not been thoroughly studied, the boundaries of their distribution in Europe have been freely interpolated.

Changes in the geopolitical situation stimulated the development of new ideas and plans of international co-operation in this area. A proposal for conducting joint research aimed to recognize the present state of the bat fauna of the Carpathians was presented as the ABC Project (Atlas of Bats of the Carpathians) during the 1st International Conference on the Carpathians Bats, organized by the Chiropterological Information Center in Kraków (Poland) on 14-15 December 1996.

The main goals of the ABC Project are: 1- obtaining the most accurate knowledge of species and their distribution over the Carpathian Region; 2- recording the status of the bat fauna in a definite time interval, as a starting point for tracing further evolution and as an indicator of environmental changes; 3- filling the gaps in our knowledge of ranges of bats in the Carpathian Region.

The final form of the atlas will be divided into two main parts. The first part will gather descriptions of each region as independent chapters prepared by teams from respective countries appointed by national coordinators. The second part will contain maps of the distribution of all bat species currently occurring in the Carpathians as well as biogeographical analyses. Additional maps in different scale will present the regional distribution of certain species.

The ABC Team is managed by a Project Coordinator - Bronisław W. Wołoszyn, and National Coordinators: Czech Republic - Zdenek Rehak, Hungary - Zoltan Bihari, Romania - Dumitru Murariu & Zoltan Nagy, Slovakia - Marcel Uhrin, Ukraine - Andrij Taras Bashta & Vasyl Pokynchereda, Poland - Tomasz Postawa & Krzysztof Piksa.

Foraging Habitats and Diet

Oral communications

TUNNELS AS A POSSIBILITY TO CONNECT BAT HABITATS

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Fragmentation of landscape is one of the biggest problems for animals with large home ranges and/or different functional habitats within a landscape, such as red deer, wolves but also bats. Even in the case of undisturbed quality in hunting habitats and roosts, disconnection of flight paths could lead to decline of populations of bats. Tunnels allowing for connection of both sides of a barrier, can be used to minimize the impact of e.g. motorways. Results of studies in different parts of Germany show, that nine bat species do use tunnels. Data are analysed with respect to different types of tunnels. The results support the role of tunnels in effective de-fragmentation of landscapes.

MOUSE EARED BATS *MYOTIS MYOTIS* AND ORCHARDS. WAYS TO COEXISTANCE ?

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Mouse eared bats are at the same time reliant on man (for shelters) and adversely affected by him (e.g. landscape destruction). This is a common situation for most of the Central-european bat species. In South Tyrol however large maternity colonies of mouse eared bats are often situated amidst zones of intensive apple growing and they are usually thriving well. A telemetry study conducted in the months of July and August of the last two years shows strong foraging activity in the orchards. Beside this, the greater mouse eared bats also used deciduous shrub forests, a more traditional habitat. Mature forests, meadows and pastures were scarcely used. Arlettaz (1995) showed that greater mouse-eared bats prefer intensive to traditional orchards. But intensification in apple growing is an ongoing process. So it is crucial to know if the bats can keep pace with it.

At present, we have only hints, which suggest that mouse eared bats use more often orchard plots with high grown apple trees (more traditional) than ones with small trees (intensive orchards). Should this hints become proofs, it should be necessary to convince farmers that hunting bats in their orchards are beneficial to them. This should be based on the following two arguments: a) bats (in general) are beneficial organisms; b) bats sell: growing apples bat-friendly can be a valuable selling argument.

Arlettaz R., 1995. Ecology of the sibling mouse-eared bats (*Myotis myotis* and *Myotis blythii*). Horus Publ. Martigny, 223p.

HABITAT CHANGES: THE MEDITERRANEAN HORSESHOE BAT *RHINOLOPHUS EURYALE* IN PERIL**Urtzi Goiti, Jose Ramon Aihartza & Inazio Garin***Department of Zoology and Animal Cell Dynamics, University of the Basque Country, 644 p.k., E-48080 Bilbao, Spain*

In order to ascertain whether human-related habitat changes could be involved in the current decline of the Mediterranean horseshoe bat *Rhinolophus euryale*, we carried out two radio-tracking experiments in contrasting colonies of the Basque Country. During May 2000 nine bats of a spring colony located in a highly afforested area, where exotic plantations of pine and eucalyptus predominated, were radiotracked. Likewise, during May 2001 fourteen bats of the largest known breeding colony of the Northern Iberian Peninsula were tracked. This colony inhabited an Atlantic seminatural landscape. Results showed that the spatial foraging pattern and the habitat selection differed between both colonies. The maximum distance a bat travelled from the roost to its feeding grounds more than doubled in the first colony (10 vs. 4.8 km), mean distance being 4 times longer (5.5 vs. 1.4 km). Mean surface of foraging areas of the first colony also two-fold that of the second (94.9 vs 41.2 ha). Overlap between foraging bats was negligible in the first colony whereas it was extensive in the second. Additionally, most of bat foraging activity in the first colony occurred in exotic plantations, while this habitat was avoided in the second one, where foraging concentrated in native deciduous woodland. We think that the differences in landscape composition were responsible for the different spatial foraging behaviour found in the two colonies. The larger distances travelled to large foraging areas in the first colony suggest that it offers poorer feeding opportunities and is probably a suboptimal habitat for *R. euryale*. The spreading of the exotic plantations occurred in recent decades in the Basque Country may explain the disappearance of the species from a number of caves.

ASPECTS OF THE ECOLOGY OF SEROTINE BATS *EPTESICUS SEROTINUS* IN CONTRASTING LANDSCAPES**Christine Harbusch^{1,2} & Paul A. Racey²**¹ Orscholzerstrasse 15, 66706 Perl-Kesslingen, Germany² Department of Zoology, University of Aberdeen, Aberdeen AB24 2TZ, Scotland

Two maternity colonies of serotine bats were studied in contrasting landscapes in Saarland, Southwest Germany, and in the Grand Duchy of Luxembourg. The surroundings of the first colony were characterized by mixed woodlands, the second by fields and grassland. Part of the study aimed to assess possible differences in habitat use and selection of both colonies, as well as the diet and prey selection of one colony. The main methods used for studying the activity of bats were radio-tracking of adult female and juvenile serotine bats and ultrasound detector survey in foraging habitats. The average individual home range sizes and maximum distances traveled were similar for both colonies. There was a tendency for juvenile serotines to have larger home ranges than adult females, but early volant juveniles used foraging sites significantly closer to the maternity roost than older juveniles. Radio-tracked bats of both colonies spent on average 90 % of their foraging time at distances below 1.7 km from their maternity roost. Habitat use and selection were similar for both colonies, although habitat availability was different. Habitat selection ranks as follows for the main habitat types: settlement area > woodland edges > grassland. Arable land was significantly avoided.

During five years of study, faecal pellets were collected in one maternity roost and analysed.

Although 18 insect families were identified, three insect orders form the key prey taxa: Coleoptera: Scarabaeidae: *Aphodius*, *Amphimallon*, *Melolontha*; Diptera: Tipulidae; Hemiptera: Pentatomidae: *Pentatoma*. During two subsequent years, detailed insect studies were carried out in the colonial home range of the studied colony. The comparison between available arthropods in the field and those identified from faecal analyses resulted in a consistent prey selection during both years. The following prey taxa were preferred: Scarabaeidae, Carabidae, Tipulidae, Pentatomidae and Ophioninae. Lepidoptera were always avoided.

BATS IN THE FOREST AREAS OF DIFFERENT LEVEL OF AIR POLLUTION

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These studies concern the comparison of bat occurrence between the five mixed coniferous forest areas, of the different impact of air pollutions. Forest age at every study plot were 70-100 years old. The main census method were the detecting of ultrasounds along line transects. There were found a significant difference in bats diversity and activity between these areas. Median flight activity varied between 21 flights/1 control (Biebrza Valley) and 1 flight/1 control (Upper Silesia). The largest bats diversity was found in the less disturbed and polluted forests in Bia³owie¿a Primeval Forest and Biebrza Valley. The lowest bat diversity was found in the Upper Silesia region, South-West Poland, the area of highest impact of heavy industry. The possible reasons of these results are analyzed and discussed.

THE ROLE OF FRUIT BATS IN MAINTAINING BIODIVERSITY IN MALAGASY FORESTS

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The objectives of this project were : 1. To survey the roosts of the three Malagasy Megachiroptera *Pteropus rufus*, *Eidolon dupreanum* and *Rousettus madagascariensis* all of which are endemic; 2. To study their feeding ecology by analysis of faeces and ejection; 3. To evaluate the effects of hunting; 4. To produce a National Action Plan for their conservation.

Pteropus roosts are found mainly on the coastal lowlands. Twenty six of the hundred and thirty three *Pteropus* roosts surveyed have become deserted within the last ten years, often as a result of hunting with guns and there were only two examples of *Pteropus* establishing new roosts. *Eidolon* roosts in clefts in rock faces and although little forest remains on the central high plateau, it still roosts there. Eighteen out of the forty one *Eidolon* roosts surveyed have become deserted because of hunting.

There were thirty five plants species in the diet of *Eidolon* and thirty eight in the diet of *Pteropus* and a total of fifty different plant species in all, only twenty three of which were consumed by both bat species. Approximately two thirds of the plant species in the diet were fruit and one third was pollen or parts of flowers. Over half the species in *Eidolon*'s diet were endemics.

The germination rate of seeds passing through bats differed little from that of seeds taken from ripe fruit but is significantly greater than that recovered from the faeces of frugivorous birds. *Eidolon* visits the rare baobab *Adansonia suarezensis* and is likely to be its main pollinator.

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HABITAT SELECTION BY THE MEDITERRANEAN HORSESHOE BAT *RHINOLOPHUS EURYALE* IN A RURAL AREA OF SOUTHERN ITALY

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We studied habitat selection by *Rhinolophus euryale* in a rural area of Southern Italy in 1998-2000 by radio-tracking. Eighteen adult bats (14 females, 4 males) were tagged. Data from 16 bats were used to determine habitat selection. Two comparisons were carried out, one between habitat occurrence within individual home ranges and within the study area, the other between time spent in each foraging habitat and

habitat occurrence within the home range. Both comparisons were carried out using Compositional Analysis. The first analysis showed that olive groves and conifer plantations were respectively the most and the least important habitats. The second analysis highlighted the importance of woodland for *R. euryale*; a negative selection emerged for urban sites, open areas and conifer plantations. This analysis provided a more effective picture of habitat selection. The elevation values where roosts and foraging sites were located confirm the tendency of *R. euryale* to roost and hunt at a low altitude. The bats often followed linear landscape elements (stretches of riparian vegetation, large hedgerows and woodland strips). We recommend that clearing of continuous, large areas of woodland for tree harvesting should be avoided. Urbanisation should be limited in the areas of greatest importance for the species, and linear landscape features should be maintained. Reforestation with broadleaved trees of areas close to built-up sites might be a viable strategy to contrast the negative effect of urbanisation. Conifers should not be used for reforestation, particularly at low altitude.

GLEANING BEHAVIOUR IN TWO EUROPEAN BAT SPECIES, *MYOTIS NATERERI* AND *PLECOTUS AURITUS*

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Two species which glean prey directly from plant surfaces, Natterer's bat, *Myotis nattereri* and the Brown long-eared bat, *Plecotus auritus*, are sympatric in Scotland. However, they eat different arthropods, possibly due to differences in prey perception.

In a study carried out in a flight room, aimed to elucidate these methods of prey perception, *M. nattereri* continued to emit echolocation calls throughout gleaning attacks both on mealworms and on arthropods found in their natural diet, and made little use of prey-generated sound as a cue to locate them. Feeding buzzes were recorded in most attacks. In contrast, *P. auritus* in similar experiments stopped echolocating during the hovering phase of gleaning attacks, did not emit feeding buzzes and used prey-generated sound as a cue to find food. In uncluttered foraging situations, *M. nattereri* were able to locate prey by echolocation alone, but in clutter they may have combined it with associative learning, and may also have gleaned prey after being attracted to food sources by feeding buzzes of conspecifics. Both species used a sequence of low searching flight and hovering, Natterer's bats used the tail membrane for most aerial captures, and both were able to land and pursue prey by quadrupedal locomotion. In an area where both species had summer roosts, moths constituted 31.8% of the diet of *P. auritus* in the wild, but only 4.2% of that of *M. nattereri*. It is suggested that Natterer's bats do not hunt moths selectively because they cannot switch off echolocation during gleaning and cannot therefore avoid alerting tympanate moths to their presence.

HEDGEROW ARCHITECTURE AND ITS USE BY BATS

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Anecdotal evidence suggests that bats often associate with linear features. However, relatively few studies have looked at how the architecture of these linear features affects the distribution of bats. A study to investigate this was undertaken in 1998 and 1999 in Wales. Twenty-six transects along linear features in agricultural land were walked and bats identified using time-expanded recordings. The association of each bat with different features of the hedges was recorded. Hedges were categorised into one of three height categories and into one of three density categories. The latter were dense hedge, thin hedge, and gappy hedge. Hard landscape features such as fences, gates and walls were also recorded and transects took in areas of open field as a control. In total, 48.6 kilometres were surveyed with 486 bats recorded. Chi-squared analysis in combination with Bonferroni confidence intervals were used to investigate habitat preference. All species of bat selected against open fields and hard landscaping features but selected for at least one hedge type. In general, bats selected for taller, denser hedges.

RADIOTELEMETRIC STUDY OF THE LESSER HORSESHOE BAT *RHINOLOPHUS HIPPOSIDEROS* IN SOUTHERN BAVARIA, GERMANY

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Seven adult *Rhinolophus hipposideros* females were the subject of a radiotelemetric study made in 2000 and 2001. Six came from a colony at Herreninsel, a 230 ha island on Lake Chiemsee (Upper Bavaria), and the other from a smaller colony near Aschau, about twelve km northwest of the lake. The animals were

tracked for up to six nights in a row. This monitoring revealed that between 44% and 71% of the nights were spent flying, and that a minimum of two and a maximum of seven different foraging areas were used. The maximum distance from the respective roosts to the hunting areas was 1.3 km (Herreninsel) and 3.6 km (Aschau). The bats foraged in all available forest types, varying from young mainly deciduous woods to mature, semi-natural beech-spruce-fir woodlands and spruce-dominated monocultures. The Aschau individual visited night roosts to take a rest, whereas the island bats always returned to their main roost to rest and presumably feed their young. Two bats surprisingly left the island, returning either later the same night or not returning until the following night. These bats did not choose the closest distance to the shore to cross the lake but flew for at least 1.5 km above the open water.

Foraging Habitats and Diet

Posters

DIET SELECTION OF *RHINOLOPHUS EURYALE* IN SPRING

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During May 2001 we collected faeces from 25 bats of a colony located in a seminatural Atlantic landscape in the Basque Country. Simultaneously we used Malaise traps to determine differential prey availability in the available habitats and radiotracked 13 bats to ascertain habitat use. Prey availability was recalculated weighing it according to the registered habitat use. Main consumed prey were by far small size lepidopterans (5-11 mm long), followed by scarabaeid beetles (genus *Rhizotrogus*) and Tipulidae. The selection analysis showed that bats foraged selectively precisely on lepidopterans and scarabaeids. Longterm diet studies, however, should be implemented to assess possible temporal variability.

FEEDING ECOLOGY OF THE CENTRAL EUROPEAN BAT COMMUNITY

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Trophic ecology of 16 bat species living sympatrically in SE Czech Republic was studied by means of faecal analysis of netted animals. Food supply was studied using a light trap, sweeping and beating. The collected material enabled to assess main foraging strategies of bats, detailed seasonal dynamics of trophic niches and their overlaps in sympatry, foraging success of particular species etc. *E. serotinus*, *E. nilssonii*, *M. brandtii*, *M. mystacinus*, *M. daubentonii*, *N. leisleri*, *N. noctula* and *P. pipistrellus* s.l. can be classified as aerial hawkers, while *M. myotis* is a ground gleaner. Some food items (Odonata and Ephemeroptera larvae) in the diet of *M. daubentonii* indicate the use of water-surface gleaning. *M. nattereri*, *M. emarginatus*, *M. bechsteinii*, *P. auritus* and *P. austriacus* are foliage gleaners. Two species do not fit well in any of these groups and their strategies can be called slow hawking (*B. barbastellus*) or slow hawking/hovering/gleaning (*R. hipposideros*). Comparing food supply and the diets of bats, we can state opportunistic foraging of most species in the frame of their morphological and echolocation constraints. On the other hand, a trend of selectivity was found in several species which preferred hunting of relatively big species of *Lepidoptera* in summer, although small species distinctly prevailed in the food supply. Considerable differences were recorded in the foraging success rate, flying activity and weight changes between *P. auritus* and *M. daubentonii* - representatives of the groups applying different foraging strategies - foliage gleaning and aerial hawking. Compared to *M. daubentonii*, *P. auritus* is able to forage more effectively very early in the spring and late in the autumn, it shows higher flying activity during these periods and its weight grows earlier in spring.

COMPARATIVE STUDY OF THE DIET OF TWO PIPISTRELLE SPECIES *PIPISTRELLUS PYGMAEUS/MEDITERRANEUS* AND *P. PIPISTRELLUS* IN SOUTHWEST GERMANY

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Food composition and ecological parameters as niche width and niche overlap of the sibling species *P. pygmaeus/mediterraneus* and *P. pipistrellus* were investigated by analysis of bat droppings. The study area is situated outside the riparian zone in deciduous forests of hills and slopes adjacent to the Neckar Valley in the vicinity of Heidelberg, Southwest Germany. Throughout the season bat boxes were used by both species with different distributional patterns. The population of *P. pygmaeus/mediterraneus* is dominant in numbers and comprises, according to roost data, spring transient colonies, resident males, and mating

groups. However, the numbers of *P. pipistrellus* occurring in the forest are lower and only single bats or small groups could be found.

Despite some differences in seasonal variation the food composition was considerably equal. By far the most important prey for both bat species consisted of dipteran suborders Brachycera (incl. Cyclorrhapha) and Nematocera, followed by Hymenoptera, Planipennia and Homoptera. Values for standardized niche width showed a relatively high degree of specialisation, due to the fact that the bats preferred small prey organisms over larger ones.

Niche overlap was tending to high values indicating a strong competition concerning the resource "food" on common foraging grounds. According to the results obtained, conclusions were made regarding the food composition and the hunting strategy of *P. pygmaeus/mediterraneus* and *P. pipistrellus* in the area under investigation.

FLIGHT ACTIVITY AND HABITAT USE OF *PIPISTRELLUS PYGMAEUS* / *MEDITERRANEUS* IN THE FLOODPLAIN FOREST

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Seasonal and overnight changes of flying activity were studied in the floodplain area in South Moravia (Czech Republic) during the season 2001 by bat-detectors. The night was divided into thirds, during each one bat activity was recorded in the particular habitats - ecotones, water bodies, meadows and closed forest. The highest activity was recorded at the beginning of the night (first period). During the second period, the flying activity was very low throughout the whole season. An increase in the level of activity after the parturition during the 3th period was found. The seasonal changes of activity had a bimodal character along edges, in forest and over forest paths with the first peak in the spring (May) and the second in the end of the summer (August). On the contrary, foraging activity at the water bodies very varied on a relatively high level. Over the meadows very low activity throughout season was registered. A decline in flying activity was found during late pregnancy.

The peak in activity of *Pipistrellus pygmaeus* was found 40 minutes after the sunset. The decrease in activity after this peak was statistically significant. Pipistrelles in the floodplain forest can suddenly forage under the protection of canopies, after their emergence, reducing the predation risk. At the beginning of the night bats preferred the edges of the growths (ecotones). Foraging activity decreased at the ecotones towards midnight. The level of flying activity was recorded well-balanced in the closed forest and over the forest paths. But it was very low, in contrast to stable high activity over the water. The research was supported by the Grant Agency of the Czech Republic No. 206/02/0961.

DIET OF A MOTORWAY BRIDGE INDWELLING COLONY OF GREATER MOUSE EARED BATS *MYOTIS MYOTIS*

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The observed colony of Greater mouse eared bats *Myotis myotis* count about 250 individuals. The bats use a motorway bridge near Mellingen, 7 km SO of Weimar (Germany) as a nursery roost and for reproduction. To determine the diet of the colony 180 faecal pellets were collected between the end of March and the middle of November 1997. The seasonal differences in the composition of diet were established by a frequency analysis. For this analysis only the discovering of a taxon in a pellet was counted, but not its volume. Carabids were the main taxon found. Large Carabids of the order *Carabus* were mainly eaten in spring and autumn. The middle-sized taxon Pterostichinae showed a peak in summer. Especially from July until September Scarabeids and Tipulids became an important element of diet. Considering the habits of the prey species, the bats probably hunted in forests but also on meadows. Their use of foraging habitats changed through the season. The hunting of arthropods that live primarily on the soil surface, and the general prey size confirmed a size-selective and ground-gleaning foraging strategy of Greater mouse eared bats as already known and accepted. However, the discovering of numbers of the small beetle *Aphodius fimentarius* in August suggested that abundance and availability of prey items are more important than the prey size at certain times. It seems that Greater mouse eared bats use Carabids as a basic prey resource which is available the whole summer season. The bats may react quickly on high abundances of other prey taxons and change their hunting habitats and strategies individually.

**A STUDY OF THE ECOLOGY OF THE LESSER HORSESHOE COLONY AT THE SUMMER ROOST IN DROMORE,
CO. CLARE, IRELAND**

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The Lesser horseshoe bat *Rhinolophus hipposideros* is the only member of the Rhinolophidae to occur in Ireland. It is confined to the western side of the country where it is considered relatively common. This study is based at a maternity roost at Dromore, Co. Clare. The building is an old stables which has been used by the bats for many years. At least three hundred bats occupy the roost during the summer making it internationally important. In 1998 the Heritage Council purchased the building in order to protect the colony. The bats occupy the hayloft portion of the stables, which date back to the 1900's.

The colony has been investigated since the 1980s by the zoology department, NUI Galway. The diet and foraging behaviour are currently being studied using faecal analysis and radio-tracking. Eleven females were radio-tracked during the summer of 2001. The radio-tracking revealed the most commonly used commuting routes. Foraging took place in Dromore wood, a predominantly broadleaved woodland adjacent to the roost. Certain areas within the wood were selected over other areas. Two buildings were identified as night roosts and satellite roosts. The results show that the bats use linear landscape features such as stone walls, hedgerows and trees in order to commute to their foraging areas. The radio-tracking is continuing during 2002. The diet consists mainly of Nematoceran Diptera, Lepidoptera, Trichoptera, Coleoptera and Neuroptera.

The results will form the basis of a management plan for the conservation of this important roost.

**SPATIAL STRUCTURE OF BAT COMMUNITY AND DYNAMICS OF BAT ACTIVITY
IN A FOREST-AGRICULTURAL LANDSCAPE OF RED A VALLEY, NORTHERN POLAND**

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The aim of this study is to describe changes in community structure, feeding ground preferences and activity of co-occurring bat species, all the year round, except the hibernation period. Bat calls (echolocation and social) were recorded with an ultrasound detector (Pettersson D-230) and a tape recorder, once per decade from April to October. We made recordings in three, closely located water bodies every night. We also captured bats in mist nets, measured water and air temperature, wind speed and (using the sticky traps) insect abundance. Ten bat species were recorded in the study area. Over the river in a forest ecotone *Myotis daubentonii* and *Nyctalus noctula* dominated, over the pond in an open pasture - *N. noctula* and *Pipistrellus nathusii* (with a significant share of *Eptesicus serotinus*), while over the pond in an alder tree stand - *P. pipistrellus* and *M. daubentonii*. Three co-occurring species of pipistrelles preferred different feeding grounds (*P. nathusii* - the pasture pond, *P. pipistrellus* and *P. pygmaeus* - the forest pond and the river). In the autumn and early spring, when migratory *P. nathusii* left the area, *P. pipistrellus* utilized also the pasture pond. We found a significant correlation between air temperature and bat activity, however it differed in particular species. *N. noctula* was the most thermophilous (Spearman rank correlation, $r = 0.50$, $p = 0.002$), *M. daubentonii* was the least thermophilous ($r = 0.35$, $p = 0.05$; it foraged also in sub-zero temperatures in early spring). We recorded a distinct increase of *M. daubentonii* activity in September, what could be associated with pre-hibernation fat accumulation. The similar autumn peaks of activity of *P. pipistrellus* and *P. pygmaeus* were connected with their mating period. The long-distance migrant *N. noctula* showed the distinct decrease of activity in August, probably associated with its departure. Night dynamics of particular species' activity varied between localities and changed during the season. *M. daubentonii* was captured in mist nets mainly less than 1 meter above the water surface, while *Pipistrellus* spp. - more than 1 meter above it ($\chi^2 = 25,11$, $p < 0,0001$). The insect abundance was significantly higher near the water surface than 4 meters above (Mann-Whitney test, $U = 11.5$, $p < 0.02$).

FORAGING ACTIVITY OF SEROTINE BATS *EPTESICUS SEROTINUS* IN DIFFERENT FORAGING SITES

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The poster presents results of a study of the foraging activity of serotine bats. All-night recordings of echolocation activity were taken and insect samples were collected at sites located in different habitat types within 3 km from a known maternity roost of the species. Each site was visited 8 times, i.e. once every two weeks between 15 May and 15 September. The amount of time spent by bats at different foraging sites and the number of feeding buzzes were compared, and their dependence upon the abundance of prey, time of

night and time of the season was examined. Differences were found between habitat types, between different sites in the same habitat type, and also between different visits to the same site.

FIRST RESULTS IN RADIO-TRACKING GEOFFROY'S BATS *MYOTIS EMARGINATUS* IN CENTRE REGION, FRANCE

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The study concerns a colony of 80 bats located 15 km from Bourges in the Cher department, central France. The landscape around the roost is mostly constituted by monocultural fields. Nine females were captured and fitted with transmitters from summer 2000 to summer 2002: six were not-lactating, two were lactating and one was post-lactating.

Twenty-two hunting zones were identified. For the six non-lactating females, hunting zones were inside woods and wood borders with dense undergrowth, forest allees and along tree lines near a river. For the lactating and the post-lactating females, the hunting areas were mostly hedges with big trees bordering meadows. Just after take off, the no-lactating females first hunted in woody zones near the roost. Then they flew to nearby woods and then to a further forest, located between 7 and 12.5 km from the roost, where they spent most of the night. While returning back to the roost they usually foraged shortly over one or two area already visited in the beginning of the night. For one lactating female, which did not return in the roost during the night, and for the post-lactating, the principal hunting areas were also far from the roost. For the second lactating female, hunting zones were closer, only 3 km from the roost, the bat returned to the roost in the middle of the night to suckle her young. Transit trails between each hunting zone usually follow linear structural landscapes but *Myotis emarginatus* is able to cross large monocultural fields pointing directly to a distant wood. In this case, the flight is fast. In some cases they may forage shortly in a wooded area. The average speed was around 20 and 25 km/h in open field zone, and 8 km/h when wooded area exists. Hunting periods are long (around 6 hours each night); when the weather was good, bats only paused for a few minutes.

Other data collected during this study will be published later on. (infrared video monitoring inside the roost, solitary male hunting zones...).

IMPLEMENTATION OF THE POINT COUNTING METHOD TO MONITOR FORAGING BATS IN SOUTHERN TARTUMAA, ESTONIA

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From August till September 2001 and from April till July 2002 the point counting method (PC) was used to count foraging bats in a countryside landscape at Melliste and Poka in Southern Tartumaa. The Pettersson D-200 heterodyne detector was used to record bats. The task was to identify bats, estimate their numbers and compare the results of 5- and 10-minute counting periods. Two main habitats (edges of lakes with trees; and forest edges, sometimes in the vicinity of buildings) were chosen for the counts, six points in each habitat. The counts were carried out twice a month, always with suitable weather. Counting results are presented as maximum number of animals of each species recorded during either 5- or 10-minute periods in the chosen points, computed per 100 points (Masing *et al.* 2002, 5th European Bat Detector Workshop Abstracts, Tronçais, France).

By September 2001 the following preliminary results were received. First, considerably more animals and more species were foraging near water (four species and 111 animals per 100 points) compared to the sites away from water (one species and 14 animals per 100 points). Second, the 10-minute counting period gave a slightly larger number of animals (n=72) per 100 points, but the same number of species (four) as compared to the 5-minute counting period (n=60 animals).

FORAGING PATTERNS OF THE EUROPEAN FREE-TAILED BAT *TADARIDA TENIOTIS* STUDIED BY RADIO TRACKING

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Autumnal foraging behaviour of *Tadarida teniotis* was studied in Southern Portugal from September to November 2001. Four females and 6 males were successfully followed over multiple nights by radio

tracking, from fixed and mobile stations. On most nights the bats left the roosts about one hour after sunset, but the time of return to the roosts varied greatly. They only made one foraging trip in each night. In the early evening almost all the bats were foraging, but their numbers declined steadily through the night; one hour before sunrise over 80% of the animals were back in the roost. Bats kept flying even during rain, but there was an apparent decline in activity on colder nights.

Most animals flew straight to a previously identified foraging site, but some made slower indirect flights, suggesting that they were searching for profitable foraging areas. Upon arriving to a foraging site most bats remained there for the rest of the foraging trip. The median size of these foraging sites was just over 100 ha. The range of the colony had a radius of over 30 km, but this area was not used uniformly; most foraging sites were concentrated in a mountain region located about 5 km north of the roost. *T. teniotis* proved to be a strong flyer, reaching speeds of over 50 km/h, and flying for up to 10 hours without any obvious resting periods.

Forested areas, such as pine plantations, cork oak woodlands, and olive groves, were used more than expected from availability. They foraged both on alluvial plains and in a mountainous area, but in the later clearly concentrated their activity along the valleys.

THE IMPORTANCE OF WOODLAND FOR LESSER HORSESHOE BATS *RHINOLOPHUS HIPPOSIDEROS* IN AUSTRIA

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Earlier radio tracking studies have shown that woodlands are key foraging habitats for lesser horseshoe bats. Hence, the location of maternity roosts should be influenced by the availability of woodland. I studied the distribution of maternity roosts in Austria with respect to the availability of woodland measured at different scales. Based on digital maps I compared the percentages of woodland cover within a radius of 0.5 and 2.5 km around maternity roosts with those of randomly selected churches and castles. I also measured the distance from maternity roosts to the nearest patch of woodland.

Comparing different provinces of Austria, the number of maternity roosts was greater in provinces with greater cover by woodland. Woodland was more abundant around existing maternity roosts than around randomly selected churches and castles. These patterns were found within 0.5 km in both, Carinthia and Salzburg, and within 2.5 km only in Salzburg. Furthermore, the distance to the nearest patch of woodland was shorter at existing maternity roosts than at randomly sampled churches and castles in Salzburg. The colony size was positively correlated with the proportion of surrounding woodland: small areas of woodland only made for small colonies, bigger colonies were only possible in the vicinity of larger proportions of woodland.

I conclude that woodlands are an important factor explaining the distribution and selection of maternity roosts and should therefore strongly be considered when conservation measures for this species are required, designed and put into action.

IMPLEMENTATION OF THE IMPROVED ROUTE COUNTING METHOD TO MONITOR FORAGING BATS IN TARTU, ESTONIA

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From June till August 2001 and from April till July 2002 a new modification of the route counting method (RCM-2) was implemented to count foraging bats on two routes (3.6 km and 4.7 km) at Raadi in Tartu. The Pettersson D-200 heterodyne detector was used. The task was to identify bats, estimate their numbers and determine the value of different habitats for foraging bats. Two sub-methods of RCM-2, including line counting (LC) and point counting (PC), were used simultaneously (Masing *et al.* 2002, 5th European Bat Detector Workshop. Abstracts. Tronçais, France).

By the end of August 2001 the following preliminary results were received. First, LC and PC gave similar results: 7 species and 131 ind., and 7 species and 227 ind., respectively (total result of eight counts). Second, 6 species of bat were observed foraging at River Emajõgi, 5 species were recorded in the streets and around houses, and 4 species were recorded in parks. Third, a total of eight species were recorded on the routes in Tartu, incl. *M. dasycneme*, *M. daubentonii*, *P. auritus*, *P. nathusii*, *P. pipistrellus*, *E. nilssonii*, *V. murinus* and *N. noctula*. Fourth, the largest numbers of foraging bats were found either near or over River Emajõgi, especially in the vicinity of old trees.

Wednesday, 28 August**Echolocation****Oral communications****THE USE OF ECHOLOCATION SOUNDS IN SOUTHERN AFRICA****Pieter Blondé & Paul Van Daele***Vleermuzienwerkgroep Natuurpuntvzw, Natuurpunt Oost Vlaanderen, Kortrijksepoortstraat,
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The IUCN (International Union for Conservation of Nature and Natural Resources) Red List recognises that lack of data is a major problem for the development of conservation plans (Fenton & Rautenbach 1998). The use of echolocation sounds can provide a lot of these data. Recent technology now permits the direct identification of bats by analysing echolocation signals; meaning that capture is not always necessary. In many cases, the analysis of bat calls makes identification easier and often may be the only means available to identify some species.

Scientific experiments using bat calls in Southern Africa are scarce and data on echolocation calls of local species is largely lacking (Taylor 1999). The first recordings of African bats came from a study by Fenton & Bell in 1981, in which 23 Zimbabwean bats were analysed. Up to now, just six international articles have been written on identification of Southern African bats, based on time expansion signals. In 1999, Taylor compiled all the available data on the echolocation of 37 Southern African bat species. In 2001, we made the first time expansion recordings of 14 bat species in Zambia, in order to develop field studies on bats without catching them systematically. To make it possible to compare our data with others, we tried to record sounds in as many different situations as possible: from handheld bats, bats emerging from roosts and from bats flying in a tent or room or in the open environment.

**FIRST ELEMENTS FOR FIELD IDENTIFICATION OF NEOTROPICAL BATS IN FRENCH GUIANA
USING HETERODYNE AND TIME EXPANSION DETECTORS****Frédéric Leblanc¹ & Ronan Kirsh²**¹ *SFEPM / GMHL, 33 rue Christophe Duverger, F-87100 Limoges, France*² *Muséum National d'Histoire Naturelle, Laboratoire Mammifères et Oiseaux, 55 rue Buffon, F-75005 Paris, France*

During our stay in French Guiana in Autumn 2001, we caught and recorded 44 species of bats which originated from families *Emballonuridae*, *Phyllostomidae* and *Vespertilionidae*. Out of 465 recordings (that is 6 hours 30 minutes), only 80 or 90 have turned out to be usable for research on the identification criteria of recorded species. Thus out of 44 captured species, we only characterized 31 species or groups of species.

The first elements which have been collected permit to differentiate some species or to characterize some families in a conclusive way; a number of acoustic convergences with the European species permit to make hypothesis of the hunting habitats or on the nutrition specificities.

After these encouraging results, complementary campaigns are thus necessary to go on with the researches or the acoustic identification of the 105 species of Chiroptera reported from French Guiana (or even more widely in American Neotropical Rainforest).

**VARIABILITY IN ECHOLOCATION CALL DESIGN OF SWISS BAT SPECIES: CONSEQUENCES FOR AUTOMATED FIELD
IDENTIFICATION WITH A SYNERGETIC PATTERN RECOGNITION APPROACH****Martin K. Obrist, Peter. F. Flückiger & Ruedi Boesch***Swiss Federal Research Institute W.S.L., Zurcherstrasse 111, CH-8903 Birmensdorf, Switzerland*

Pattern recognition algorithms offer a promising approach to recognizing bat species by their echolocation calls. Automated systems like synergetic classifiers may contribute significantly to expert-independent species identification in the field. However, it necessitates the assembling of an appropriate database of reference calls, a task far from trivial. We present data on species specific flexibility in call parameters of all Swiss bat species (except *Nyctalus lasiopterus*). The selection of 'learn-calls' for the classifier significantly influences species identification success. We discuss this in the context of echolocation call variability differing between species and its consequences for the implementation of an automated, species specific bat activity monitoring system.

**ECHOLOCATION PERFORMANCE AND CALL STRUCTURE IN THE MEGACHIROPTERAN FRUIT-BAT
*ROUSETTUS AEGYPTIACUS***

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The call structure of the echolocating fruit bat *Rousettus aegyptiacus* was investigated. Calls are impulsive clicks with an exponential decay lasting 250 μ s, with most energy occurring during the first 100 μ s, much shorter in duration than previously recorded. Calls closely resemble Gabor functions and are similar in structure to those used by dolphins. The ability of *R. aegyptiacus* to detect and avoid obstacles was tested in both the light and total darkness. Bats were able to detect and avoid 6 mm diameter wires significantly more often than 1.3 mm diameter wires when tested in the light. In the dark, the same relationship held, with no decrease in the ability to detect and avoid the obstacles. Bats used echolocation in both the light and the dark conditions. The simple impulsive clicks used in echolocation by this species are thus able to detect wires of at least 6 mm in diameter, providing confirmation that this species may have a more sophisticated echolocation system than previously thought. The detection problems associated with very short duration signals is discussed. The possession of both a good visual system, and a good echolocation system has implications for the evolution of echolocation in bats.

Echolocation

Poster

**RECOGNIZING *MYOTIS* SPECIES BY THEIR ECHOLOCATION CALLS: LIMITS AND OPTIONS
FOR VISUAL PATTERN RECOGNITION**

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In the bat genus *Myotis*, today, recognition of species by their echolocation calls is virtually impossible in the field. Spectral and temporal offline-analysis of recordings and subsequent statistical treatment may allow to separate some species by the frequency content or temporal characteristics of their orientation calls. However, in some species, spectrographic analysis reveals 'signatures' in the course of the frequency-time-sweeps, which are not discernible by simple parametric measurements, but which could be species specific, and in some cases even individually specific. We test the hypotheses of individuality and species specificity by comparing identification success rate of a synergetic pattern recognition algorithm with the results from discriminant component analysis.

Activity

Oral communications

**ULTRASOUND CALLS MADE BY GREATER HORSESHOE BATS *RHINOLOPHUS FERRUMEQUINUM*
DURING THEIR EXIT FROM A NURSERY ROOST**

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Ultrasound calls of greater horseshoe bats *Rhinolophus ferrumequinum* were recorded during the emergence from a nursery roost in the pre and postnatal periods by using a time expansion detector with a microphone extension in the roost. The time expanded calls were recorded on tape for later analysis using the BatSound program. Recordings showed that in addition to the usual echolocation calls there was social interaction between the bats. The time and direction of travel of each bat passing through the roost exit was recorded on a computer when the bat interrupted infra-red beams in an array crossing the exit hole. The relation between the frequency of social calls and simultaneous bat activity during emergence is analysed.

**COMPARISON OF ROOST EMERGENCE AND RETURN ACTIVITY IN MATERNITY COLONIES OF PIPISTRELLE BATS
PIPISTRELLUS PIPISTRELLUS AND *P. PYGMAEUS***

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Bats are thought to be more vulnerable to predation during evening roost emergence and morning return. A great deal of research has been carried out on emergence behaviour, but less attention has been focused on a period of morning return. Early emergence increases exposure to raptorial birds, but emerging late results in missing of peak abundance of aerial insect. We studied both emergence and return activity in

six maternity colonies of pipistrelle bats (*Pipistrellus pipistrellus* and *P. pygmaeus*) in N.E. Scotland, focusing on light conditions and time parameters (with respect to sunset/sunrise).

Return activity generally occurred at lower light intensities than emergence. Therefore the time between dawn return and sunrise was generally longer than that between sunset and dusk emergence. However this trend was not clear at all colonies. These differences could be explained by variety of factors such as surroundings of the roosts, foraging opportunities and different risk of predation among colonies. Bats seem sometimes prolonged their activity and exploited a morning peak of insect abundance. Nevertheless, the general trend during morning return is rather to reduce the risk of predation and came back to the roost earlier.

THE INFLUENCE OF ARTIFICIAL LIGHT ON THE EMERGING TIME OF GEOFFROY'S BAT, *MYOTIS EMARGINATUS*

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In Flanders Geoffroy's bats roost in church attics. For architectural and estetic reasons a major part of the churches are illuminated during night with spotlights. We investigated the effect of this light on the emerging behaviour of the bats at 4 roosts. In 3 cases the number of bats and their behaviour was observed during 2 days in absence of spotlights (normal conditions), the following 2 days a spotlight was installed, and finally we observed again 2 days in absence of lights. At one roost the reverse was done: normally there was a spotlight, and it was switched off for two days and then turned on again. Furthermore we investigated the light intensity around the roost and compared this with the flightpath.

In normal conditions the bats flightpath was in close relation with the light intensity around the roost with an obvious preference for the darkest places.

The results of the experiment revealed that the first day when spotlights were installed bats showed an obvious change in behaviour (changing flightpath, using other exits, flying back into the roost) and emergence was delayed ($36,7 \pm 3,34$ minutes). The second day behaviour was less disturbed but bats even remained longer in the roost (extra $8,62 \pm 1,45$ minutes). At the roost were the experiment was reversed, the bats showed exactly the opposite behaviour. During the experiment we also gained evidence that the installation of spotlights actually increases the predation pressure on emerging bats by birds of prey.

Activity

Posters

BAT MIGRATION IN SOUTHERN SWEDEN

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Visible bat migration was discovered and studied at 14 sites along the Swedish south coast in 1993-1996 (Ahlén 1997). Migration to south and southwest over the sea was observed and marked concentrations of more than ten bat species were found at certain points. Further observations were then collected in 1997-1999 and from 2000 and 2001 migration movements were studied on Southern Gotland and Öland (IA & LB) and at Falsterbo, Skåne (PB & LB). Direct observations with detector and strong visible light were used as well as automatic recording boxes. The studies give data on flyways on land, species composition and which flight directions the bats use when they leave the coast.

ACTIVITY PATTERNS OF A COLONY OF GREATER MOUSE EARED BATS *MYOTIS MYOTIS* IN A MOTORWAY BRIDGE

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The investigated colony of about 250 Greater mouse eared bats live in a motorway bridge near Mellingen, 7 km SO of Weimar (Germany). Prior to reconstruction and redevelopment of the bridge several studies for the protection of this colony were carried out between the end of March and the middle of November 1997. During this time the bats used the bridge as a nursery roost and for reproduction. The flight activity of the colony in the shelter was recorded by an automatic recording system using the bats ultrasound. Additional observations of outflying bats completed the study of temporal activity in the roost. A small window at the western bridge was the main transit scope for the colony. For hunting the bats leave their roost about 27 min after astronomical sunrise. The colony needed between 45 and 60 min for outflying but rainfalls prolonged the outflying phase. The normal outflight course was unimodal. When rain starts in the night the bats returned earlier from hunting. The flight activity inside the bridge increased between 0,5 and 1,5 hours after rainfall in comparison with the same time the night before and after. Normally the colony

showed a nocturnal flight activity pattern with three peaks inside the brigade. In addition to the peaks at outflight and inflight there was a lower peak around midnight due to some bats who came back for a rest. In the middle of July fledged juveniles exhibited a high flight activity in the shelter the whole night through. The study showed that the Greater mouse eared bats used this uncommon nursery roost in a motorway bridge for the whole summer season, not only for day roosting but also during the night.

MONITORING BAT ACTIVITY BY USING BAND TRANSECTS

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During the last decades an intensified agricultural land use and changing of agricultural techniques has had a major impact on many habitats in many countries. The common practice of redistribution of land into larger lots (re-allocation) is suspected to have had a negative impact on the overall species abundance and densities. In order to prevent this in the future the Flemish government ordered Natuurpunt to carry out a study in Herenthout, in the northern part of Belgium. The study includes data on habitat preferences by bats in a mainly agricultural region that is characterised by landscape structures such as woodland edges, hedges, tree lanes and hedgerows.

Between May and October 2001 a study was conducted for studying bat activity correlated to the different landscape structures in that area (around 1500 ha).

Band transects were used to study bat activity. 10 routes were chosen at random. A band transect consisted of 30 stops with a distance of 50 m between each point, or 1.5 km for a full transect. On each stop, bat activity is recorded during 3 minutes. With a D240 bat-detector, connected to a mini-disc recorder, all activity was recorded in heterodyne as well as in time-expansion. Recordings were analysed by BatSound Pro. Each transect was monitored 3 times during the summer season.

On a total of 900 observation points, 348 (38.7 %) had no bat activity; in total 674 bats were recorded and allocated to 5 different species: *Pipistrellus pipistrellus* (599 observations, 89%), *Eptesicus serotinus* (n = 41, 6.1%), *Nyctalus noctula* (n = 8, 1.2%), *Myotis daubentonii* (n = 4, 0.6%), *Myotis mystacinus* vel. *brandtii* (n = 3, 0.5%) and Chiroptera species (n = 19, 2.8%).

At the same time, we surveyed the whole region at random, using the same D240 bat detector technique. During 20 evening survey's, 192 bats (belonging to 6 species) were recorded.

By using the band transect method, we can clearly indicate where bats are preferentially hunting. We believe this method to be a favourable tool in landscape management and planning.

CHANGES IN THE NUMBER OF BATS IN A COLONY AND THE TIMING OF EVENING EMERGENCE

Maciej Fuszara

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The poster presents changes in the number of bats occupying a maternity roost during the summer season. Three consecutive seasons are compared and the influence of weather on the colony's dispersal is briefly discussed. The timing of the evening emergence of bats and its dependence on temperature, cloudiness, wind speed, precipitation, time of sunset and the number of bats in the colony are also presented.

Thursday, 29 August

Wetland species**Oral communications****HABITAT SELECTION AND MASS DYNAMICS OF DAUBENTON'S BATS *MYOTIS DAUBENTONII* HIBERNATING IN NATURAL CONDITIONS IN W. POLAND****Tomasz Kokurewicz***Agricultural University of Wrocław, Department of Zoology and Ecology, Cybulskiego 20, PL-50 205 Wrocław, Poland.
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The black chin spot, an unique age criterion, allowing to distinguish individuals in their first year of life from bats older than one year, made possible to study the age related hibernation strategies during hibernation in natural conditions. Due to the localisation of the winter colony on elevation of 800m a.s.l., in severe mountains climate, the winter feeding and winter migrations could be excluded in population under study. Restriction of disturbance to two inspections per season and individual marking allowed to investigate the relationship between the body mass in the beginning and in the end of hibernation (November and March) and difference in overwinter mass loss between adult and sub-adult Daubenton's bats *Myotis daubentonii*. In course of observation period the median hibernation temperature and the distance of hibernating bats from the cave entrance were significantly declining, while the frequency of animals roosting in crevices was increasing. The selection of optimal hibernation temperature by bats was possible by changing the distance from the cave entrance ($r_s = 0.73$, $n = 615$, $P < 0.001$) and the height of hibernation place ($r_s = 0.16$, $P < 0.01$), while selection of high relative humidity, by roosting in low temperature ($r_s = -0.26$, $P < 0.001$) and/or by selecting hibernation places situated lower on the cave walls ($r_s = -0.26$, $P < 0.001$). The lack of records of sub-adult individuals in January and February and substantial decline of number of males Daubenton's bat, suggests that some individuals having smaller fat reserves were hibernating in the rubble on the bottom of the cave. In such micro-habitats, they could probably find low temperature and high relative humidity, which allow them to minimise the arousal frequency. Sub-adult bats were found hibernating in significantly lower temperature ($Z = -3,1$, $P < 0.01$), in places situated lower on the cave walls ($Z = -2.2$, $P < 0.05$) and in March were using crevices more frequently ($c^2 = 5.4$, $P < 0.05$) than bats older than one year.

FORAGING STRATEGY OF DAUBENTON'S BAT *MYOTIS DAUBENTONII* IN RELATION TO INVERTEBRATE AVAILABILITYVictoria L.G. Turner, **Dean A. Waters** & Claudia Vollrath*School of Biology, University of Leeds, Leeds LS2 9JT, England*

Non-volant and volant invertebrates fall into rivers where they may be gaffed off the surface by foraging *Myotis daubentonii*. This species also aerial hawks volant insects and we suggest that the proportion of surface gaffs and aerial hawks should be related to water surface and aerial invertebrate density respectively. To test this hypothesis, free-living *M. daubentonii* were filmed throughout the night at two sampling locations. Simultaneous invertebrate availability was measured by aerial sweep netting and river surface drift nets. At both sites, surface invertebrate density was two orders of magnitude greater than aerial insect density but the overall foraging strategy was aerial hawking (85.7%) with only 14.3 % gaffs. However, at one site, bats preferentially aerial hawked (> 84 %) in the hour after sunset when mean aerial insect density was highest (0.3 insects/m³). Bats predominantly gaffed for three hours in the middle of the night when the mean surface invertebrate density peaked at 17 individuals m⁻³ and mean aerial insects were minimal (0-0.04 insects/m³). At the second site, aerial hawking dominated all night (79-96 %) regardless of surface invertebrate density. Results are discussed in terms of energetic constraints of foraging strategies and food availability.

Wetland species**Posters*****MYOTIS DASYCHEME* IN UKRAINE : CURRENT STATE AND DISTRIBUTION****Andriy-Taras Bashta***Institute of Ecology of the Carpathians, Koselnytska street 4, UK-79026 Lviv, Ukraine*

Pond bat *Myotis dasycneme* is one of the Europe's rare and threatened species. This species is included to Ukrainian Red Book (the 3rd category - rare species). Only single findings of Pond Bat were known up to the last decade in Ukraine. Unknown status of species caused our special investigations of Pond bat distribution. During the period of 1990-2001 years approximately 30 records of *M. dasycneme* are known in Ukraine in general. The main territory of summer distribution of Pond bat involved mainly northern and north-western regions, which have characteristic biotopes for this species: great number of lakes and

the dense net of canals and rivers. All our findings of maternity colonies of Pond bat come from there. The colonies are situated in buildings, on attics as well as behind the wood elements of wall. Foraging specimens have been caught by nets also, but only close to rivers and canals. The migration way probably lies across the territory of Western Ukraine that is confirmed by the catching of migration specimens as well as by mass flying inside buildings. All findings in the migration period come from Western Ukraine and were noted in August - of the beginning of September. Pond bat is noticed more rarely in the winter period, but the geography of findings is wider: catacombs near Odessa city - South (letter. inform. O.Fedorchenko), caves near Kyiv - Central Ukraine (Likhotop, Tkach & Barvinsky 1990), artificial caves in Kharkiv region - East (Vlashchenko 2001), mines in Podilla - West (Tyshchenko 2002).

Our investigations showed that Pond bat is not so catastrophically rare species as it was considered earlier. However, analysis of investigation data and literature on the distribution of Pond Bat suggests that the species could be >1500 specimens on the territory of Ukraine. More detail evaluation of species quantity is very problematic and it needs more investigations.

The question: could Ukrainian population of Pond bat be the part of greater population concentrated on the territory of Eastern Baltic countries and Byelorussia and which exists as one the whole with places of more or less concentration, or could this population (occupying probably the territory of North-Eastern Poland and Byelorussia as well) be spatially relatively isolated ?

BODY WEIGHT CHANGES IN MALE DAUBENTON'S BAT *MYOTIS DAUBENTONII* DURING SUMMER

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Body weight changes of adult and juvenile male Daubenton's bat during summer were studied in a summer habitat in Hesse (Germany) in the years 1998 - 2001. Animals from the resident population were regularly captured along the flightpath from April to October, and body weight was determined using a digital balance.

Median values of body weight of adult individuals differed significantly between fortnightly periods (Kruskal-Wallis-ANOVA by ranks: $H = 141.75$, $p < 0.001$). Median body weight increased from 7.0 g in the second half of April to 7.8 g in the first half of May (U-Test with Bonferroni correction: $p < 0.001$). Between the second half of May and the first half of August, median body weights fluctuated between 7.8 g and 8.3 g. From the first half of August to the second half of September, median body weight significantly increased from 8.0 g to 9.3 g (U-Test with Bonferroni correction: $p < 0.01$). Highest median body weight (9.6 g) was recorded in the second half of October. Thus, whereas body weight of adult males remained fairly constant during early and mid summer, a pronounced increase occurred in late summer/early autumn. Median body weight of juvenile males ranged between 6.5 g in the first half of July and 8.5 g in the second half of October. Differences in median body weights over the studied period were significant (Kruskal-Wallis-ANOVA by ranks: $H = 21.70$, $p < 0.01$). During the month July, August, and September, median body weight of adult males was always significantly higher than that of juveniles (U-Test with Bonferroni correction: $p < 0.001$), whereas in October the difference was no longer significant.

SIGNIFICANCE OF WATER BODIES FOR INSECTIVOROUS BATS IN A SEMI-HUMID TROPICAL FOREST IN THE YUCATAN PENINSULA, MEXICO

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The region of the Calakmul Biosphere Reserve is characterized by a dry season during which water is restricted to natural rain collectors called locally "aguadas". These conditions offer the opportunity to determine the importance of "aguadas" as open areas and water sources for bats. During the dry season of 2002, we compared species richness and activity of insectivorous bats in "aguadas", forest gaps and continuous forest (control) in the Calakmul region. We called a unit a combination "aguada"-gap-control, and four of these units were established. The mean distance between each element of a unit was 100 m. We realized five samplings of each unit from March to May. For a given unit, sampling was simultaneous, and lasted for 1.5 h using the ANABAT II system. We evaluated bat activity with the acoustic activity index (AAI) proposed by Miller (2001). For both species richness and AAI, we found a striking difference between "aguadas", gaps and controls. Species richness (N) and AAI were significantly higher in "aguadas" (N=10; AAI=120), followed by gaps (N=4; AAI=22), and finally controls (N=1; AAI=1). These differences might be due to the differential disponibility of insects, though it remains to be demonstrated. Our results highlight the importance of "aguadas" in areas where water is discretely distributed over the landscape.

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SUBSPECIFIC STRUCTURE OF *MYOTIS DAUBENTONII* AND COMPOSITION OF "*DAUBENTONII*" SPECIES GROUP**Sergei V. Kruskop***Theriological Department, Zoological Museum of Moscow M. V. Lomonosov State University, Ul. Bolshaya Nikitskaya 6, RU-103009 Moscow, Russia*

Myotis daubentonii is one of the most widely distributed bat species, which synonymy includes at least 11 valid names. According to our investigations this species can be divided into two groups of forms, conditionally Western and Eastern. The oldest name for the second one is *M. d. petax* Hollister, 1912. Both groups differ in several measurements (first of all - cranial and dental) and in some details of dentition. Border between groups passes westwards from that it was traditionally interpreted, and animals from the South of Central Siberia belong to the eastern complex. However, there is some geographic variability inside each group. We did not find any difference between Central European specimens and animals from European Russia. Meantime, animals from Western Siberia and, probably Ural Mts., slightly differ and may represent distinct subspecies. In eastern complex we can suppose three forms: Sayan-Transbaikalian, Amur-Mantjurian (*Ioukashkini* ?=*chosanensis*) and Ussurian (*ussuriensis*). However, Altayan population ("petax") highly variable and includes animals similar to all three forms. The whole *daubentonii* species group include at least 7 Eurasian species (listing newly described Vietnamese endemic *M. annamiticus*), plus 4 forms of uncertain taxonomic position. Amongst these species, small mountainous forms: *M. longipes*, *M. csorbai* and *M. annamiticus* with low rostrum and deep fronto-nasal flexure, can be divided into their own subgroup or group. *Myotis lucifugus* as well as other nearctic species provisionally excluded from *daubentonii* group, which thus has transeurasian distribution pattern.

A LONG TERM STUDY OF POPULATION OF DAUBENTON'S BAT *MYOTIS DAUBENTONII***Radek Luèan¹ & Vladimír Hanák²**¹ *Department of Zoology, Faculty of Biological Sciences, University of South Bohemia, Branišovská 31, CZ-370 05 Èeské Budjovice, Czech Republic*² *Department of Zoology, Charles University, Vinièná 7, CZ-128 43, Praha 2, Czech Republic*

A population of Daubenton's bat was studied in the Northern part of Tøeboò basin (S-Bohemia, Czech Republic) during period 1969 - 2001. Netting and banding bats were applied together with controls in their day-time roosts (tree cavities, one building) and bat detecting in the foraging places. In total, 3122 records of 1643 individuals was obtained. Significantly higher representation of females of all age classes was found in the sample. The sex ratio changed during a season with higher proportion of males (up to 44 %) in spring and autumn period, while females prevailed during the late spring and early summer when nursery colonies were present in the area. Survival analysis did not reveal differences in survival probabilities between both sexes. Mean longevity was assessed on 4,5 years (being actually higher, of course). Mean group size in roosts has changed throughout the season with a peak before parturitions while considerable decrease was observed during the lactation period, apparently due to different female energetic strategies for the late gestation and lactation periods, respectively.

A variation in degree of sex segregation throughout the reproduction season and possible bias of non random sampling on sex ratio in the sample are discussed.

SEXUAL SEGREGATION IN ITALIAN DAUBENTON'S BATS *MYOTIS DAUBENTONII***Danilo Russo***School of Biological Sciences, University of Bristol, Woodland Road., Bristol BS8 1UG, England
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In 2000-2001 I investigated sexual segregation in *Myotis daubentonii* from the Abruzzo (Central Italy) population. I mist-netted 133 bats at sites respectively below 880 and above 970 m a.s.l. Females only occurred below 880 m, while males were observed at all sites but were less frequent than expected below 880 m a.s.l and occurred more than expected above 970 m a.s.l. Of four day-roosts examined, the one above 970 m a.s.l. was occupied by males only, while bats from both sexes were captured at those at lower altitudes. A few bats from both sexes were captured at a night-roost below 880 m a.s.l. The % Body Condition Index (BCI) was compared between adult males from below 880 m and above 970 m a.s.l. In April-June males from low-elevation sites showed a higher BCI, but no difference occurred in August. The upper elevational limit for females in Italy lies at a higher altitude (ca. 900-950 m a.s.l.) than that recorded in Northern Europe. The possible mechanisms (physiological constraints and competition between sexes) leading to sexual segregation in *M. daubentonii* and in other bat species are discussed.

LINK BETWEEN THE SUMMER DISTRIBUTION OF THE POND BAT *MYOTIS DASYCHEME* AND THE WATER QUALITY OF BROAD WATERCOURSES IN THE PROVINCE OF WEST FLANDERS, BELGIUM

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During the period 1998 to 2001 bat detector surveys were carried out throughout the province West-Vlaanderen with special attention to the extensive network of watercourses. During this survey, the rare pond bat was discovered. Pond bats are known to forage on chironomid midges, moths and caddis flies over large, open water surfaces of ponds, rivers and canals. Although there are many large watercourses in the province, only three are listed to have a good water quality: the upstream half of the canal Ieper-IJzer (near Ieper), the entire canal Damme-Sluis and the downstream half of the canal Bossuit-Kortrijk (near Kortrijk). Three areas with concentrations of pond bats were found: the surroundings of Ieper, the area around Damme and the area south of Kortrijk. The first maternity roost of the pond bat in Flanders was found north of Ieper, in a brewery near a canal strip with good water quality, where they have been observed hunting frequently. The Ieper town moats have a gradually improving water quality from the south-west end, where a polluted brook enters the moats, to the northeast end thanks to the long retention time of the almost stagnant water. With an image intensifier pond bats have been seen foraging on mothlike insects above the north-eastern moat, the strip with the best water quality. In these parts of the moats caddis fly larvae have been found. Pond bats seldom forage over the more polluted south-western moats. South of Kortrijk, pond bats were observed commuting over the heavy polluted river Schelde, but flight paths of this group partially lead to the canal Bossuit-Kortrijk where a good water quality exists. According to our observations, the pond bat seems to select - at least in the west of Flanders - those areas where large open water surfaces where good water quality is available.

STUDY OF A CAVE-DWELLING COLONY OF *MYOTIS DAUBENTONII* IN BAVARIA, GERMANY

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A study was made between 1999 and 2002 of a small cave in Garching a.d. Alz, Bavaria (Germany), used by a colony of *Myotis daubentonii*. It was observed that the cave, which had been modified into a cellar, was employed as a summer roost from April till October, but was abandoned in winter except by single hibernating individuals. In 1999, the cave was used as a nursery; the following years, the pregnant females left shortly before giving birth, leaving behind males and females without offspring. Fledged juveniles arrive at the cave in July and their numbers increased until August, whereas those of adults gradually decreased. The number of adults (mainly males) rose again in September, but by October only a few individuals, mainly juveniles, were left. The bats roosted together in a cluster at the top of the cave except in winter.

The study shows that bats occasionally reproduce in Central European caves. It also indicates that even caves that are small and not important as hibernation roosts can play an important role as roosts for males in summer, and for all ages and sexes in the period between fledging and hibernation.

Roosts

Oral communications

FLIGHT ACTIVITY OF BATS AT THE ENTRANCE OF A NATURAL CAVE

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Activity patterns of bats were investigated at the entrance of a natural karstic cave (Kateřinská cave, Czech Republic). The activity was recorded automatically with a double infra-red light barrier allowing discrimination between those bats leaving and entering the cave. The five most abundant bat species were *Myotis myotis*, *M. emarginatus*, *M. daubentonii*, *M. nattereri* and *M. bechsteinii*, as revealed by netting.

Five periods were defined on the basis of bat flight activity: a) Hibernation period (November - late March), with very low activity. b1) Departure period 1 (late March - mid April), with intensive departure during the first quarter of the night. b2) Departure period 2 (mid April - beginning of June), with departure activity in the first quarter, and a small number of bats entering the cave in the fourth part of the night. The peak of activity was in the second part of the night. c) Summer period (mid June - mid July), with low activity. d) Autumn activity (late July - late October), with very high activity and increasing number of bats entering the cave. The peak of activity was around midnight.

There was a positive correlation between the number of bat passes through the entrance and

outside ambient temperature and a negative correlation between the number of passes and barometric pressure. Rain had no significant effect on the level of bat activity.

RELATION BETWEEN BATS, CLIMATE AND AIR MICROORGANISMS IN A CAVE FROM ROMANIA

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A survey of bats dynamics, and of the temperature and humidity was undertaken monthly during a one year period in a Romanian cave. Some air microorganisms were also seasonally determined. The cave investigated is in the Somesan Plateau (N-W Romania), a limestone area, at 319 m a.s.l.. In the vicinity of the cave there are potatoes and maize cultures, meadows, plum orchards and also forests, being thus an excellent hunting and feeding habitat for bats. Minimum 4 species of bats populate this cave. The most abundant is *Myotis myotis*, which represents a permanent inhabitant with nursery and winter colony; the second one is *Miniopterus schreibersii* who visits the cave in autumn, and forms a mating colony. *Rhinolophus ferrumequinum* and *Rhinolophus hipposideros* were recorded singly next to the greater mouse-eared bat colony, sometimes in winter. Near the bats colonies the temperature varies between 1°C and 11.6°C (6.3°C close to the hibernating bats) and the relative humidity was high all over the year (80% - 100%), the lowest values being registered in winter. The location of the colonies in the cave was determined by these two physical factors and also by the structure of walls and the ventilation system. Concerning the air microorganisms our investigations showed the direct relation with bats in the cave, the most pronounced air infestation being near the nursery colony, in the summer period. The total count plate mesophylic aerobes was very high (11317), followed by Fungi (3929 cfu/m³), *Staphylococcus* spp (1152 cfu/m³), *Streptococcus* spp. (1152 cfu/m³) and Gram negative bacteria (209 cfu/m³).

A STUDY OF BATS IN BARN CONVERSIONS IN HERTFORDSHIRE

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Many timber framed barns are used by bats that roost in mortice joints within the timber structures. Most of these barns are now redundant and are being converted into dwellings. Attempts have been made to give advice on how to accommodate bats in these conversions. This paper examines what has happened to the bats following conversion of twenty-nine of the forty barns where bats have been previously recorded. Bat roosts have been lost at twenty of the twenty-nine developed sites. Eleven barns remain undeveloped; all have bats still present. Only two of the eleven developed Natterer's sites were found to have bats still present. These two sites had been provided with recessed entrances which allow the bats access to several mortice joints. Bats have been found to accept a reduction in the number of available mortice joints. However, breeding has not yet been proved so this type of provision may not be maintaining the colony at a favourable conservation status. Bat lofts have not been successful for this species; they prefer an open flight path into barns which can be maintained by the use of recessed entrances. Care needs to be taken to ensure that the recessed area for the bats does not suffer from light pollution. Brown long-eared bats (*Plecotus auritus*) are using twenty-five sites. Twenty have been developed. Bats were absent in fourteen and present in only two. Bats were still present at all of the undeveloped sites. The provision of a bat loft for Brown long-eared bats *Plecotus auritus* has been found to be an almost complete failure. Pipistrelle *Pipistrellus* sp roosts were found at eleven sites. Six have been developed and bats were absent from all but one. All five undeveloped sites still had bats present. Early action at the planning stage prior to development is most likely to result in a conversion that is sympathetic to bat usage.

MONITORING BATS IN UNDERGROUND HIBERNACULA OF CZECH REPUBLIC: 33 YEARS OF STUDY

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A greatly standardized monitoring of bat hibernacula (one control per winter only, at the first decade of February each year, visual accounts without disturbing bats) is regularly performed in Czech Republic since 1969 when the project started with 23 localities. Recently, the regular census covers more than 300 hibernacula. The data on population development in the localities monitored over 30 year period supplemented with data from further 177 localities for which the continuous sequences longer than 10 year are available enabled us to compare patterns of abundance changes in individuals species and estimate the

major trends in population development of mid-European bats over last 30 years. Among other, a considerable increase in abundance of several species (particularly *Myotis myotis*) during the last 15 years is worth mentioning.

(* & M. Andira, L. Barèiová, T. Bartonieka, Z. Bauerová, H. Bekková, P. Benda, J. Brabec, L. Bufka, P. Bürger, Z. Buziè, J. Chytil, J. Eervený, D. Duhonský, L. Dvořák, P. Eleder, O. Fabiánek, J. Flousek, J. Gaisler, V. Hanák, V. Hanzal, D. Horáček, M. Jirouš, M. Józ a, M. Kareš, M. Koudelka, P. Koutný, M. Kováčik, V. Lemberk, R. Luèan, I. Málková, J. Neuwirt, P. Nová, A. Nový, M. Průcha, A. Reiter, J. Rejl, Z. Rumler, Z. Øehák, E. Sádovská, J. Šafár, D. Šefrová, T. Svačina, J. Veselý, Z. Vitáček, M. Vlašín, V. Vohralík, J. Wagner, K. Weidinger, D. Weinfurtoová, P. Zbytovský, J. Zima, J. Zukal)

INFLUENCE OF TEMPERATURE IN THE SELECTION OF ROOSTS BY THE SOPRANO PIPISTRELLE *PIPISTRELLUS PYGMAEUS* : RELEVANCE FOR THE DESIGN OF BAT BOXES

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The Soprano pipistrelle *Pipistrellus pygmaeus* (55 kHz) is a house-dwelling species, frequently affected by exclusion from buildings. Bat boxes try to address this problem, functioning as alternative roosts. However, they are often ineffective, probably because they fail to meet the species requirements. Temperature is certainly one of the most important factors influencing roost suitability. Consequently, in order to improve the design of bats boxes for pipistrelles, it is important to understand the thermal conditions of its roosts in buildings.

We studied roost microclimates and bat's thermal preferences within roosts in buildings. In addition, we monitored bat boxes of different colours to find which of these had similar thermal characteristics to roosts in buildings, and which were occupied.

Roosts in buildings were characterised by high temperatures and wide temperature ranges. Bats were found to select warm places within the roosts, but avoiding extreme high temperatures. The black (warmest) bat boxes were always occupied, exhibiting similar temperatures to the roosts in buildings. However, due to their limited temperature range compared to that of roosts in buildings, these were not suitable when environmental temperatures were very high.

Modifying the design of these bat boxes to provide them with a wider internal temperature range, may increase the success of the relocation of pipistrelle colonies.

OPTIMIZING THE THERMAL BEHAVIOUR OF BAT-BOXES

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Bat-boxes are often used to replace roosts in buildings. However, they often fail to attract bats, which may be caused by inadequate thermal conditions. Bats are likely to select roosts in which they can minimize metabolic costs, only possible within certain temperature ranges. There is no good universal bat-box design, because internal temperatures are determined by environmental temperature and radiation, which vary geographically. Consequently, their design has to be adapted to the climate of the region in which they will be set up.

Our objective was to quantify the thermal consequences of various manipulations of the structure and colour of boxes, and exemplify how to adapt them to different climates. We used as a reference a grey "BCI" nursery box, and evaluated the thermal impact of 15 design changes. Experiments were carried out simultaneously to avoid the confounding effect of day-to-day climatic variations. The mean daily high during the experiments was 22,3°C.

The changes that were most successful at keeping the boxes cool were painting the box white (just 9°C above the environmental temperature), installing a double roof (+16°C), and a wide roof ledge that shadowed the walls of the box (+18°C). We consider that the two later designs were more successful because they lower the temperature while keeping a relatively broad range of temperatures available within the box. The highest temperatures were reached by painting the upper half of the box black (+ 27°C above environmental temperature), painting the box black (+27°C), and covering the front of the house with a glass (+ 48°C). The black box, however, had a lower range of internal temperatures available.

The capacity to manipulate box temperatures with design changes is tremendous; at mid-day the range of temperatures among our 15 boxes was about 40°C. We assume that the best bat-boxes remain at comfortable temperatures for long periods, while keeping a broad range of internal temperatures available. We will exemplify how these conditions can be met in different climates using the results of this study.

**FACTORS INFLUENCING THE SELECTION OF ROOST CAVITIES BY BATS
IN THE BIALOWIEZA PRIMEVAL FOREST, EASTERN POLAND**

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Relationships between cavity structure and roosting choice by bats were investigated in two habitats of the Białowieża Primeval Forest, Eastern Poland. The two habitats included (1) the natural forest stands of the Białowieża National Park (Biosphere Reserve) and (2) managed forest. 73 roosts of six bat species (*Nyctalus noctula*, *N. leislerii*, *Myotis daubentonii*, *M. brandtii*, *Plecotus auritus*, *Vespertilio murinus*) were inspected in the study area, and 12 features measured. Tree hollows occupied by bats were significantly higher above ground level and at longer distance to the nearest tree than random ones. The bats preferred hollows with narrow entrances and long safety distance (maximum distance from entrance to the farthest point of the hollow). They appeared to be selecting against wet, shallow, and extremely large cavities.

DO BATS SELECT TREE CAVITIES FOR REASONS OF MICROCLIMATE: AN EXPERIMENTAL STUDY

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The availability of suitable roost sites is essential for the survival of bats. Selection of specific roost sites by breeding female bats has consequences for survival and reproductive success. However, factors that influence roost site selection by bats under natural conditions are poorly understood. The influence of microclimate on the selection of roost sites is not clear. For bats roosting in buildings it has been shown that temperature is one of the most important factors. In forest-dwelling bats, however, this was never investigated. During previous research we found that roost site selection of the tree cavity dwelling species *Myotis daubentonii*, *M. nattereri* and *Plecotus auritus* is based exclusively on cavity parameters. Bats showed a marked preference for narrow cavities with high ceilings. The study of cavity microclimate in the field is extremely difficult due to the lack of control over several variables and the absence of suitable replications. Therefore, we chose to use an experimental approach. The goals of this study are 1) the creation of artificial tree cavities with a thermal régime approximating the thermal characteristics of natural tree cavities and 2) to test the influence of individual cavity parameters on the internal thermal régime. The influence of entrance tunnel length, entrance diameter, number and position of entrances, internal height, internal diameter and wall thickness of the cavity was tested. The results yield that there is a relationship between several cavity parameters selected for by bats and the thermal régime of the cavity. It may therefore be possible that bats select tree cavities for reasons of microclimate and that the preferences found in the field for certain cavity types merely reflect a selection for certain thermal régimes. This should, however, be further investigated.

Roosts

Posters

RESULTS OF LONG-TERM STUDY OF BATS IN SMOLINSKAYA CAVE, MIDDLE URALS

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First data about bats in Smolinskaya cave are dated by the end of the XIX century. In 1956 Petr Strelkov reported the presence of 852 bats in this cave: 680 *Myotis dasycneme*, 170 *M. daubentonii*, 2 *M. brandtii*. Our research in Smolinskaya cave started in 1958. In 1950-s - 1960-s the number of wintering animals decreased dramatically because of regular presence of tourist groups in the cave. During winter of 1960-1961 the number of animals decreased 6 times. At the same time we found a great number of bat killed by sticks and stones. In 1964 the number of wintering bats was 80. The studies of bats in Smolinskaya cave resumed in winter 1996-1997. The maximum number of wintering animals was registered in winter 1998-1999: 1730 *M. dasycneme*, 111 *M. daubentonii*, 4 *M. brandtii*, 2 *Eptesicus nilssonii*.

Analysis of seasonal dynamics of the colony of bats indicated that disintegration of wintering colony occurs usually in the beginning of May. Males stay in the cave in summer. Many animals inhabit the small grottos and holes in the tress in the surroundings of the cave. The establishment of winter colony begins in September and lasts until the end of November. During the period of wintering animals gradually move to the grottos with the lower temperatures.

BATS OF NATURAL AND ARTIFICIAL CAVES OF GEORGIA**Alexander Bukhnikashvili, Joseph Natradze & Andrei Kandaurov***Institute of Zoology of Georgian Academy of Science, 380062 Tbilisi, Georgia*

From 32 bat species living in Caucasus, in caves are registered 17. 9 species of them inhabit Georgia, in particular: *Rhinolophus ferrumequinum*, *R. hipposideros*, *R. euryale*, *R. mehelyi*, *Myotis blythii*, *M. mystacinus*, *Pipistrellus pipistrellus*, *Plecotus austriacus*, *Miniopterus schreibersii*. In Georgia are about 2000 caves. From the data gathered by laymans, it is known, that in 68 natural caves there were earlier bats, in some caves there were even large congestions. Artificial caves investigated worse, the data were available only from two items, David Gareji and Vardzia. Since 1998 we start regular researches the caves. More than 200 caves was investigated. In 11 natural and 11 artificial caves, bats were found. The most often inhabitants of caves are *R. ferrumequinum*, *R. hipposideros*, *M. blythii*, *M. schreibersii*. Nowadays *M. schreibersii* meets less often, than earlier. Nursery colony of *R. ferrumequinum* 900-1100 spec., *M. blythii* 500-600 spec. (largests in Georgia); and wintering colony of *R. ferrumequinum*, *R. hipposideros*, *M. schreibersii*, *R. euryale* was marked. Also was found constant colony *R. euryale* 200 spec. this year. *R. mehelyi* is not found yet by us. As result of all our investigation, previously we offer the following conservation status: *R. ferrumequinum* NT, *R. hipposideros* NT, *R. euryale* EN, *R. mehelyi* CR, *M. blythii* NT, *M. mystacinus* DD, *P. pipistrellus* LC, *P. austriacus* DD, *M. schreibersii* EN.

CONCLUSIONS OF SUCCESSFUL SETTLEMENTS IN BAT HOUSES**Csaba Endre Fehér***White Raven Nature Conservation Association, Csabagyongye u. 50/A, H-8360 Keszthely, Hungary*

From December of 1997 to April of 1998 in the 140 km² marshy territory of Small-Balaton bird's reserve 100 small and 70 large bat houses were installed. During the preceding research on bat fauna of this region of the Balaton Uplands National Park 10 bat species were found. Typical house-dwelling species, such as *E. serotinus*, *P. austriacus*, *M. myotis*, occurred in the outer areas. Non-typical house-dwelling (settling in tree-holes, too) species were *P. pipistrellus*, *P. pygmaeus*, *P. nathusii*, *N. noctula*, while rare species were *V. murinus*, *M. nattereri* and *P. auritus*.

The lack of roost was conspicuous especially in the case of *P. nathusii*, because its specimens often occurred even between wooden planks of high-stands, which were exposed to harsh weather and disturbance as well. Most of our bat houses were constructed to meet the needs of this small-bodied species.

During the first year in the installed small bat houses generally one or two settled *P. nathusii* were observed, but in the large ones, only two months after the installation, two nursery colonies (approx. 300 specimens) of *P. nathusii* were found.

Since 1998 the number of successful settlements in bat houses has been growing continuously, in addition to *P. nathusii*, *P. pipistrellus*, *P. pygmaeus* and *N. noctula* nursery colonies have also settled. In spring of 2002 the occupation ratio of bat houses is 81,4%.

SEASONAL DYNAMICS OF BAT NUMBERS IN TWO CAVES IN SOUTH EASTERN SLOVENIA**Klemen Koselj***S.D.P.V.N. - Slovenian Association for Bat Research and Conservation, Prešernova 20, SI-1000 Ljubljana, Slovenia.
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During the years 1997, 1998 and the first half of 1999, the numbers of bats in two caves were monitored on the same days at least once a month.

Ajdovska jama pri Nemški vasi is a small cave in the hills west of Krško in South-Eastern Slovenia. It harbours the largest maternity colony of Mediterranean horseshoe bat (up to 300 individuals) in the country. A number of these bats was also present in the cave during the mating season together with a few greater *R. ferrumequinum* and lesser horseshoe bats *R. hipposideros*. The latter two species also hibernated in the cave. A single hibernating barbastelle *Barbastella barbastellus* was observed during February 1999.

Kostanjeviška jama is a large tourist cave situated 12 km south of Ajdovska jama pri Nemški vasi at the foot of Gorjanci hills, near the Croatian border. We monitored the numbers of all three horseshoe bats in arbitrary chosen fixed areas in tourist and non-tourist part of the cave. The largest numbers of each species occurred during the hibernation, but some individuals also roosted in the cave during the summer. The Lesser horseshoe bat was the least and the Mediterranean horseshoe bat the most gregarious species. The Greater horseshoe bat changed the position, whereas the group of Mediterranean horseshoe bats was almost always in the same hall in the non-tourist part. They appeared to be mildly torpid throughout, and were aroused easily. However, the greater and the lesser horseshoe bats, which roosted in the tourist part, tolerated well the presence of visitors, sometimes no more than 10 cm away from their position.

THE IMPORTANCE OF SMALL CELLARS TO BAT HIBERNATION IN POLAND

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The aim of this study was to determine the importance of small underground hibernacula to bats in Poland. Cellars located outside buildings and basements were inspected in many regions of the country (from north-east to west). Among 9 species recorded in over 500 sites, *Plecotus auritus* was the most frequent and abundant. In many cellars only single individuals were found but the highest density was 0.6 individuals per m³ of space inside a roost. Regional differences in species composition of bats hibernating in cellars depended mostly on the structure of local bat communities. *Myotis daubentonii* was much more abundant in north-eastern part of the country, while *Plecotus austriacus* in the south. On the other hand, some species seemed to avoid (e.g. *Myotis myotis*) or prefer (*Plecotus spp.*) this type of winter roost. Species diversity was highest in cellars of North-Eastern Poland (the coldest region) where they are very important hibernation sites. Despite the fact that less than 10% of inspected cellars are inhabited by bats, these roosts are of great importance at least to such species as: *Plecotus auritus*, *P. austriacus* and *Myotis daubentonii*. Calculations made for Central and North-Eastern Poland - 1/5 part of the country, ca. 60 000 km² - (Lesiński & Kowalski 2001) showed that small cellars could be winter roosts for minimum 10 000-15 000 individuals of bats yearly.

Lesiński G. & Kowalski M., 2001. The importance of small cellars to hibernation of bats in central and north-eastern Poland. *Nietoperze*, 2: 43-52.

THE LARGEST HIBERNACULUM OF EUROPE

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The Western Carpathians, Romania's largest limestone area, provides many suitable underground roosts for bats. One of them is the Huda lui Papara cave, which hosts - during wintertime - a unique bat aggregation. The cave is situated at 567m a.s.l., has a total length of 2,022 m, an entrance up to 25m high, large chambers and corridors. During our visits we recorded a temperature variation between -0.5 and 4.7°C, and a relative humidity of 82-96%, close to saturation, caused by the river, which crosses the cave. The survey of the cave was done during the winter months, yearly, starting from 2000. 10 bat species - sharing the roost - were identified: *Rhinolophus ferrumequinum*, *R. hipposideros*, *Myotis myotis*, *M. blythii*, *M. daubentonii*, *Pipistrellus pipistrellus*, *Nyctalus noctula*, *Vespertilio murinus*, *Barbastella barbastellus* and *Miniopterus schreibersii*. The total number of bats in the cave is about 53,000-56,000 specimens. The number of individuals alters yearly. More than half of the aggregation is composed of *Miniopterus schreibersii* (about 32,000-33,000 specimens). Estimated at 2,000 bats/m², for the moment they represent 90% of the actually known hibernating individuals in Romania. The second largest number of specimens is represented by the pipistrelle bats, with a total number of 15,000-17,000 individuals, estimated at 3,150 bats/m². The *Myotis myotis* and *M. blythii* species are represented by 4,340 bats, the *N. noctula* with up to 1,000 specimens, the *R. ferrumequinum* with cca. 570 individuals, the *R. hipposideros* with 40 bats, the *B. barbastellus* with about 50 bats, the *M. daubentonii* with 5 specimens, and there is only one record of *V. murinus*. Huda lui Papara cave legally is not protected, and is frequently used by tourists. The lack of an active roost protection legacy makes vulnerable the long-term existence of the species and the hibernaculum. Increasing the value of this site represented by the bat diversity, one could increase the value of all karstic areas in Central-Eastern Europe. A regional conservation and management plan for these underground bat habitats would be clearly of a high priority.

PRELIMINARY DATA REGARDING THE EVOLUTION OF THE OCCURRENCE OF CAVE DWELLING BATS IN SOUTHERN AND WESTERN CARPATHIANS, ROMANIA

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The last global report on the bats' status in Romania was conducted in the '50s. Since then no comprehensive study was published. We initiated a new research of the region in 1999, and compared our data with those found in literature. We realised an overview of 60 underground sites inhabited by bats.

Miniopterus schreibersii is quoted as a common cave species in Romania, which often form colonies of several 10,000 individuals. Nowadays they present much smaller nursery colonies, with less than 5,000 specimens, or disappeared completely from the 36 quoted sites. 90% of the currently known winter aggregations, more than 30,000 specimens, are hosted during hibernation by a single cave. *Rhinolophus ferrumequinum* is quoted on 39 locations of the region, and was found by us on 32 locations. The species forms only small nursery colonies in caves, up to 50 individuals, although large hibernating colonies were recorded, with hundreds of individuals. This discrepancy is due to the preference of the species for forming nursery colonies in buildings. A connection of such a nursery colony with several caves was proved. *Rhinolophus hipposideros* is quoted on over 50 locations, although it was found only in a small number, not more than 50 specimens, mainly during hibernation. *Myotis myotis* / *blythii* were also common species for caves; nowadays they form mixed colonies in the region, with up to 5,000 individuals. The presence of *Pipistrellus pipistrellus* and *Nyctalus noctula* in caves during hibernation is remarkable. The first one forms colonies of several 10,000 individuals, the latest one of ca. 1,000 specimens. *R. euryale* and *M. capaccinii* form colonies up to 200 specimens. The other 13 species, *R. blasii*, *M. bechsteinii*, *M. brandtii*, *M. mystacinus*, *M. daubentonii*, *M. dasycneme*, *M. emarginatus*, *M. nattereri*, *Eptesicus serotinus*, *Plecotus auritus*, *P. austriacus*, *Barbastella barbastellus* and *Vespertilio murinus*, were recorded only accidentally; they do not form large colonies in caves. Even though it seems that some species are not endangered, the literature data is lacunar or missing. One can suppose that the colonies found by us are only the remain of the former populations, which were drastically reduced by human interference.

DATA ON THE DISTRIBUTION OF BAT SUMMER COLONIES IN THE SURROUNDING OF THE MORAVIA KARSTIC AREA

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Moravian Karst, Czech Republic, is an important central European hibernaculum, where thousands of hibernating bats have been found every year. However, summer shelters and their distances to the hibernation places of these bats are poorly known.

Between May and August 2001 an area of 2826 km² (a circle of 30 km around the hibernaculum) was surveyed for the occurrence of bat colonies. In total 187 buildings of various types (mainly churches) have been checked, 64 % of them were at least temporarily used by bats (bat droppings), 51 shelters (27%) were inhabited by a colony of bats (more than 3 specimens). About 5500 specimens of 6 bat species were found.

In the most abundant species, *Myotis myotis*, the population of adult females living in the area under study was estimated to be 3700 individuals. This number more than twice exceeded the number of *M. myotis* hibernating in Moravian Karst. Data about winter - summer movements of this species indicates no preferable direction of dispersal and quite high rate of intercolonial movements.

SUMMER ROOST SITES OF *MYOTIS BRANDTII* IN EASTERN POLAND

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We investigated the occurrence of rare *Myotis brandtii* in buildings of forest settlements and bat boxes in the Mazowsze and Podlasie Lowland (Central-Eastern Poland). Altogether, 15 summer roosts of *M. brandtii* were recorded: 10 were situated in houses, 3 in Issel type bat boxes and 2 in natural tree hollows. All roosts were situated in the forest or on its edges. Window shutters in houses were used more frequent than the attics. Buildings were occupied either by single individuals or by small groups up to 6 bats, including lactating females with their juveniles. One nursery colony shared an attic with 3 other species. Adult bats (both sexes) were detected in houses and wooden bat boxes in August and possibly used them for mating. In the Łuków Forest, *M. brandtii* belonged to the group of bats the most frequently recorded in buildings during summer along with: *Plecotus auritus* and *Eptesicus serotinus*. In the Bia³owie¿a Primeval Forest 2 colonies were found to use natural hollows in two large oaks *Quercus robur*.

**ROOST SELECTION BY THE BARBASTELLE *BARBASTELLA BARBASTELLUS* IN APENNINE WOODLANDS
(CENTRAL ITALY) AND ITS IMPLICATIONS FOR BAT CONSERVATION IN FOREST MANAGEMENT**

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This project aims to determine roost selection by Italian barbastelles (*Barbastella barbastellus*). The study is in progress at the Abruzzo, Lazio and Molise National Park (Central Italy). In Italy, a major threat to the survival of this tree-dwelling species is represented by the critical loss of roosts due to inadequate woodland management and fires. Hence, information on roost selection is necessary to develop guidelines for woodland management that will specifically take into account protection of this endangered bat species. The bats are mist-netted at drinking sites and fitted with 0.5 g radio-tags. Roosts are located by radio-tracking. Structural features of roost-trees are assessed and compared to those of randomly selected trees from the study area to identify the factors which determine roost choice in barbastelles. In July-August 2001, we identified 19 roosts used by 7 lactating and post-lactating females. Roosts were located at 1280-1630 m a.s.l. All of the roosts were in *Fagus sylvatica* trees, most of which dead or dying trees. The bats were often observed roosting in the space under loose bark. Some of the roosts were used by maternity colonies. Roost switching was shown by some individuals. Our preliminary results show that dead trees are important to *B. barbastellus* in the study area and should be carefully protected. We identified an area of primary importance for barbastelles which deserves special protection. We are indebted to the Nando Peretti Foundation and the Ente Autonomo Parco Nazionale d'Abruzzo, Lazio and Molise for funding this study.

MAIN AND SATELLITE ROOSTS OF A *RHINOLOPHUS HIPPOSIDEROS* COLONY IN SOUTHERN BAVARIA, GERMANY

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In 2001, a study was conducted to observe main and satellite roost use in a nursery colony of 40 adult *Rhinolophus hipposideros*. Three different buildings and a cave were in use as roosts, whereby the buildings were frequented from May to September and the cave was in use throughout the year. The main roost was located at an old power station, namely in a small attic warmed by the heat of the engines. A cooler, neighbouring room was used regularly by a few individuals, and when the temperature in the main roost exceeded 34°C by the majority of the colony. Two attics in buildings located 30 m and 400 m away respectively from the power station were used by single individuals or small groups of up to eight bats including unfledged juveniles.

Inspections made of the cave every two weeks from April to September revealed that it was being used as a day roost by up to eight individuals. Horseshoe bats were also observed using it as a night roost, juveniles were never observed in the cave. Only one or two hibernating individuals were seen in the cave in winter, indicating that most of the bats leave the area for hibernation.

Friday, 30 August

Conservation

Oral communications

ECOLOGY AND CONSERVATION PROBLEMS OF BATS IN BANGLADESH

Sohrab Uddin Sarker, Noor Jahan Sarker, Feroj Jaman & Taslima Akter

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Present study is based on direct field observation in woodland, forests of rural and urban areas in the country and laboratory research since 1968. Thirty-two species of bats have so far been reported from Bangladesh including a large horseshoe bat (*Microtis hipposideros*) a newly recorded species from a cave in the hilly forest. Of these, ecological and conservation problems were studied on Fruit bats (*Pteropus giganteus*) false vampire (*Megaderma lyra*), greater yellow bat (*Scotophilus heathi*) and lesser yellow bat (*S. kuhlii*), and pipistrelles (*Pipistrellus coromandra* and *P. mimus*) including horseshoe bat.

Yellow bats and pipistrelles were common and had wider in distribution all over the country. Fruit bats were fairly common in the plain woodlands than hilly and mangrove forests. Fruit bats roosted in colony in the woodland of the rural and urban areas. False vampire and other bats usually roosted in small colonies in hidden places like ruined buildings, crevices, tree holes and leaves of palm trees. Large horseshoe bats live in colony in the cave of hilly forests. Bats did not change their habitats until they were heavily disturbed or destroyed.

In recent decades population particularly of the fruit bat and false vampire decline rapidly due to reducing roosting, feeding facilities and human disturbances. Main problems of conservation of these bats are destruction of their roosting and feeding habitats, shortage of food due to increasing human population, agricultural expansion, development activities and uses of agrochemicals in the fruit gardens. Awareness, protection of woodlands, plantation of fruiting trees, national conservation action plan and international cooperation would assist the conservation of bats of Bangladesh.

GREATER HORSESHOE BAT *RHINOLOPHUS FERRUMEQUINUM* CONSERVATION IN ENGLAND

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Greater horseshoe bat *Rhinolophus ferrumequinum* is listed on Annex II of the EC Habitats Directive. Roost destruction and agricultural change in pastoral landscapes have been identified as contributory causes of significant population declines in the United Kingdom. The majority of large maternity and hibernation sites are now protected under domestic legislation and the largest populations in England are now designated as Special Areas of Conservation under European legislation. Since 1998 the Greater Horseshoe Bat Project has been working to support appropriate management of the landscapes around roosts in Southwest England. By March 2002 advice had been provided to over 110 farmers managing in excess of 9300 hectares of land. Management agreements have been used to support landscape enhancements, including hedgerow renovation, extensive grassland management and arable reversion. Monitoring data suggests that greater horseshoe bat populations may be recovering.

IMPLEMENTING THE BAT ACTION PLANS

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There are 1,001 species of bats, almost a quarter of which are globally threatened. The Chiroptera Specialist Group of IUCN's Species Survival Commission has produced two Action Plans examining conservation issues for all species and detailing recommendations for action to conserve the most threatened species and habitats. These Plans are aimed principally at key decision makers as well as organisations and individuals who are promoting bat conservation issues. The underlying threat to bats is pressure on resources from increasing human populations that leads to the loss or modification of foraging habitats and roosts. Bats frequently have a negative public image and this influences the response to the problem of rabies and vampire bats in Latin America and bats and commercial fruit growers in other areas of the world. In some areas, bats are persecuted because of an ignorance of their life history and role in ecosystems, while in others they are overexploited for food. There is also a general lack of information about the distribution, status, biology and ecology of many species. This presentation examines some of the more general issues relating to bat conservation. It highlights the priority areas where action is needed immediately at a global, regional and national level. It highlights in particular the global importance of islands and caves for bats.

Conservation

Posters

SELECTING SPECIAL AREAS OF CONSERVATION FOR BATS IN THE CZECH REPUBLIC

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The poster summarises results of a status analysis of bat populations in the Czech Republic carried out in 2000-2001. The study was aimed at the populations of bat species included in Annex II of the Habitats Directive (*Rhinolophus ferrumequinum*, *R. hipposideros*, *Myotis emarginatus*, *M. blythii*, *M. myotis*, *M. dasycneme*, *M. bechsteinii* and *Barbastella barbastellus*). At the first step, 3-5 most numerous hibernacula and nursery colonies in the country were selected in each species. Second, the national population of each

species has been classified, more or less objectively, into several sub-populations with respect to geographical segmentation and landscape features important for bat populations (e.g. karstic regions). 3-5 most numerous nursery colonies and 3-5 hibernacula have been then chosen in the particular sub-populations. Selection of the SACs based on this approach should ensure survival of the particular sub-populations in a relative welfare. Moreover, special attention has been paid to isolated and marginal populations of bats. Recent results of bat monitoring show an increase of population size at least in some species and the studies of feeding ecology of bats indicate that these animals are not an endangered group in the patchy Central-European landscape as far as their trophic resources are concerned. Therefore, effective conservation of bats in the Czech Republic should be aimed at eliminating factors that may threaten their roosts.

COMPARISON OF AERIAL DEPOSITION OF CADMIUM BEFORE AND AFTER THE CLOSURE OF AN OIL-FIRED POWER STATION IN THE VICINITY OF TWO GREATER HORSESHOE BAT NURSERY ROOSTS

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Aerial deposition of cadmium has been monitored from 1995 to the present by extraction of cadmium from petroleum jelly coated onto ceramic tiles placed near two nursery roosts and in the foraging area of greater horseshoe bats *Rhinolophus ferrumequinum*. Cadmium levels from aerial deposition recorded in 1995 near the two nursery roosts were in the range 0.08-0.13 mg/Kg. After the oil-fired power station closed during the winter of 1997 subsequent analysis showed a reduction in cadmium precipitation. Cadmium levels from aerial deposition have been compared with cadmium in bat droppings taken from the two nursery roosts and soil samples taken in the foraging areas.

SDPVN - WHAT ARE WE ALL ABOUT

Nataša Aupič¹ & Maja Zagmajster²

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SDPVN - Slovenian Association for Bat Research and Conservation is a non-governmental organisation, involving biology experts, students and all who have interest in bats. Our work began in 1998, as a part of the Biology Students' Society (Section for bat research and conservation), but in June 2001 we started the independent society. Our main goals are to improve the knowledge on distribution, ecology of bats in Slovenia, to recognise threats and recommend proper protection measures.

We organize various student research camps and workshops, like for example the "Workshop on identification of bats and localisation of roosts using bat detectors" We participate at international projects like "Central European Miniopterus Protection Programme". So far we organised three European bat nights: in 1999, 2000, 2001. This year a leaflet "Bats - Neighbours in need" will be issued..

We co-operate with Public Institution Park Škocjanske jame in preparation of the "Learning path on natural and cultural characteristics of Regional Park Škocjanske jame".

In 2000 we organised a project: "Bats - Animals of the year 2000" in co-operation with the magazine Proteus and Slovenian Natural History Society that involved a large number of schools.

We are also active on the field of legislation. Our members attended the Meeting of the Advisory Committee to EUROBATs Agreement and we work together with different NGOs in the preparation of important conservation documents and legislation.

AN INTER-REGIONAL CO-OPERATION IN BAT PROTECTION: THE SOUTHERN FRANCE CO-ORDINATION

Mélanie Némoz

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The French Mammal Society (Société Française pour l'Etude et la Protection des Mammifères, S.F.E.P.M.) includes a working group devoted to bat study and protection. This national network tightly collaborates with local associations of the 22 French regions.

In 1995, an overall census of roosts protected or to be protected (Roué 1995) highlighted the outstanding potentialities of Southern France for bat populations. At the same time this work highlighted that in this part of the country bat protection was less active than in most other parts. In order to promote and coordinate such activity in the 5 most southern regions (Aquitaine, Corse, Languedoc-Roussillon, Midi-Pyrénées and Provence-Alpes-Côte d'Azur) a project officer was appointed in 1999. Four missions were assigned to this position : encouraging an inter-regional co-operation; developing relations with national and

local administrative structures; helping regions to prepare and draft protection documents and supporting implementation of the national "Plan de Restauration des Chiroptères".

Thanks to the dynamism of batworkers, to regional groups' experience and to co-ordinator's work, bat study and protection dramatically increased during the last two years. Results are very promising and more ambitious plans (as a LIFE-Nature project) can be scheduled now.

Roué S.Y., 1995. *Inventaire des sites protégés ou à protéger à Chiroptères en France métropolitaine*. Muséum National d'Histoire Naturelle, Paris, 142p.

CHANGES IN NUMBER AND COMPOSITION OF BAT FAUNA AND CONSERVATION PROBLEMS OF THE CASTLE GRAD NA GORICKEM, NORTHEASTERN SLOVENIA

Primož Presetnik

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The castle Grad na Goričkem lies on the western hilly margins of the Pannonian basin. Its cellars provide a unique underground habitat, which are rare in the surrounding region. The cellars were found to shelter a small colony of *Miniopterus schreibersii*, *Rhinolophus hipposideros*, *Myotis myotis*, and occasionally at least four additional bat species.

This is the most northeastern location of *Miniopterus schreibersii* in Slovenia. Approximately one hundred individuals of this species use the cellars from spring to autumn. In late autumn *Miniopterus schreibersii* migrates most probably to Austrian caves, where they hibernate till the next spring. The castle cellars are also the most northeastern location of *Rhinolophus hipposideros*, which is the most abundant bat species in these cellars during winter. *Myotis myotis* uses the castle mostly as the autumnal mating quarters.

The most serious threat to bats, besides vandalism, is an imminent collapse of the castle wing above the cellars with the highest concentration of bats. Some conservation measures are already being implemented. The crucial element of the conservation of the bats, with special emphasis on *Miniopterus schreibersii*, is the correct renovation of the castle cellars.

Reproduction

Oral communications

THE NUMBER OF GREATER HORSESHOE BAT *RHINOLOPHUS FERRUMEQUINUM* BIRTHS IN SOUTH WALES VARIES WITH THE WINTER TEMPERATURES

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The Greater horseshoe bat *Rhinolophus ferrumequinum* is at the northern limit of its range in Southwest Wales where the number of births in two nursery roosts has been recorded each year since the roosts were discovered in 1978 and 1983. The number of births fell from 1978 to 1988 but has increased since then. The annual changes in the number of births correlates with the winter temperatures and can be well represented by a linear model. The species is known to feed during the winter and the condition of females in April is expected to depend on how often they have been able to feed on warm evenings in the preceding months. The number of pregnant females that eventually come to term is likely to reflect this. Winter temperatures in the XIXth century were lower than in the XXth century and calculations using historical temperatures indicate that the species probably colonized the area relatively recently. This is consistent with the low genetic diversity of the species in Southwest Wales.

MATING BEHAVIOUR OF THE BROWN LONG EARED BAT *PLECOTUS AURITUS*

Joanna Furmankiewicz

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In 2000-2002 mating behaviour of brown long-eared bat was studied in the city park in Wrocław and in two abandoned mining shafts in Sudety Mts. (SW Poland). Bats were netted, sexed and weighted, and the shape and colour of cauda epididymides was used to assess their reproductive status. 164 bats were banded using aluminium rings. The recapture rate was 24.4%. Social calls were recorded with the DAT recorder connected to the bat detector. In autumn 2001 and spring 2002 seven males and two females were radio-tracked using 0.52 g radiotransmitters. In early spring (March, April) and autumn (September-October) bats were swarming and emitting species-specific social calls near their hibernacula. Four different types of social calls were emitted during songflights, while chasing and from the sites situated on the tree branches and walls inside one of the shafts. The vocal activity in early spring was ten times higher than in autumn. In

spring the proportion of males with distended caudae epididymides was 84,8 % (n=92), while in autumn was 73,5 % (n=121). The radio-tracking data, collected at one of the shafts, showed that in spring and autumn bats foraged and roosted in daily shelters in the vicinity of the swarming site in the mine. They visited it on average 1,2 times during 4,3 days of observation. Some males covered up to 7 km to spend a few hours in the shaft, and the same night they flew back to their roosting places. These results demonstrated the importance of swarming sites in the studied species in spring and autumn, which are considered the mating period of brown long-eared bat. Thus the observed behaviour could be associated with mating. It also suggests that spring could be the main mating period for this species. The radio-telemetry project was financed by the State Committee for Scientific Research - grant KBN 6P04C 112 21.

FEMALES OF *PTEROPUS GIGANTEUS* ARE PROTECTED BY THE MEMBERS OF THE COLONY DURING PREGNANCY AND LACTATION

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Bats are unique mammals, well known for their behavioural characteristics. They are relatively smaller in size and have low fecundity rate. They have high survivorship. They have relatively long period of infant dependency and late sexual maturity.

Interspecific behaviour is of higher order in most of the species of bats. Indian flying foxes, *Pteropus giganteus*, exhibit one of the best behavioural features, which show colonial and social attributes of suborder Megachiroptera. Today, some of the most successful bats are those that form huge colonies, and *Pteropus giganteus* is one of such species. Some of the behavioural aspects of this species have already been noted. Present study focuses on the few other aspects, which are being reported for the first time. These are 'protection' and 'attention' given to the expecting mothers by other female members of the colony, etc.

Late abstracts

Posters

EVIDENCE OF SPERM STORAGE IN *PIPISTRELLUS KUHLII* (CHIROPTERA: VESPERTILIONIDAE) IN WESTERN IRAN

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We documented endometrial sperm storage in the uterus of two female *Pipistrellus kuhlii* at the time (mid-December) unrelated to imminent ovulation. Packing and perpendicular orientation of spermatozoa toward the endometrium, and unsuitability of the time of copulation are used to infer that *P.kuhlii* stores sperm in Western Iran.

STRATEGY FOR THE CONSERVATION OF BATS AND THEIR HABITATS IN THE FRENCH OVERSEAS TERRITORIES

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France administers a certain number of overseas territories located mainly in the tropical regions of the world, most of them being archipelagos of geologically and biogeographically highly diverse histories that bear remarkable endemic floras and faunas. This situation implies a strong responsibility for the French authorities to preserve the biodiversity of exceptional tropical island ecosystems and related species which depends on their management. These territories include Guadeloupe archipelago and Martinique Island in the Caribbeans, French Guiana within the neotropical Guiana belt, Réunion and Mayotte Islands in the Indian Ocean, Wallis and Futuna Islands and the New Caledonia archipelago in the South-West Pacific. The chiropterofauna of these territories forms the largest group of mammals, represented by 10 families, 62 genus and 132 species, amongst which 15 are at risk of extinction and 17 near threatened according to the latest IUCN conservation status (IUCN 1992 & 2001). The French Mammals Society, through its Overseas territories Bat Conservation Specialist Group has initiated a joint programme with local and national wildlife management agencies, national parks and protected areas, and local NGOs to develop a coherent conservation programme for bats in each of the French Overseas Territories. This strategy running for 5 years include a revision of species systematics, the completion of distribution maps using bioacoustic and capture inventories, a process for setting species-oriented and habitats-oriented priorities with the input of

atlas data into a conservation GIS and the synthesis of results into recommendations. The programme is also emphasizing conservation education and local capacity building for bat conservation, and is aimed at participating with regional programmes developed through the Chiroptera Specialists Group of the IUCN Species Survival Commission.

**THE ROOST PREFERENCE OF *NYCTALUS NOCTULA* IN SUMMER AND THE ECOLOGICAL
BACKGROUND OF THEIR URBANIZATION**

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The paper summarises the investigation of roost-selection of *Nyctalus noctula* (Schreber, 1774) in panel buildings and trees in Hungary. From 1997 September until 1999 July we explored 142 roosts on a 103 ha large housing estate and 21 roosts on a 30 ha large park.

In the blocks of flats bats prefer roosts at the height of 6-8 metres (64 % of the roosts) without any seasonal differences. Results show that there are no roosts below the height of 3 metres. The width of used entrance is minimum 19 mm. The position of vegetation and road around the buildings do not influence the roost selection. In the summer 35 % of the roosts are situated on the western walls. The rhythm of temperature fluctuation in that side best corresponds to the daily life cycle of bats. The density is 24 ind./ha, which is higher than in a natural forest, due to the possibility of dense roosts.

594 trees with more than one metre trunk-circle were examined in the Nagyerdő forest. My data suggested that the choice of roosts is not dependant on the species of the tree. The entrances of the roosts can be found at 4-15 meters height. No significant preference may be shown at any height. The direction of the roost entrance shows no significant preference as to the point of the compass. All known roosts have a round openings made by woodpeckers with a diameter of 4-5 cm. Noctule bats tend to choose entrances more or less pointed to the ground.

The roosts are situated at the height of 4-15 metres in case of both housing estates and forests, hence the choosing of roosts is similar in this respect. In housing estates the openings of roosts have the size of 19-50 mm, while in the forests 30-50 mm. There are small, only few centimetres large spaces in the panel crevices and tree-hollows. Both types have entrances on a vertical object (wall, tree). Bats living in forests can inhabit only in shaded hollows. In the housing estates Noctule bats prefer the western walls, where the correlation of the temperature fluctuation is the strongest with those in the tree-hollows.