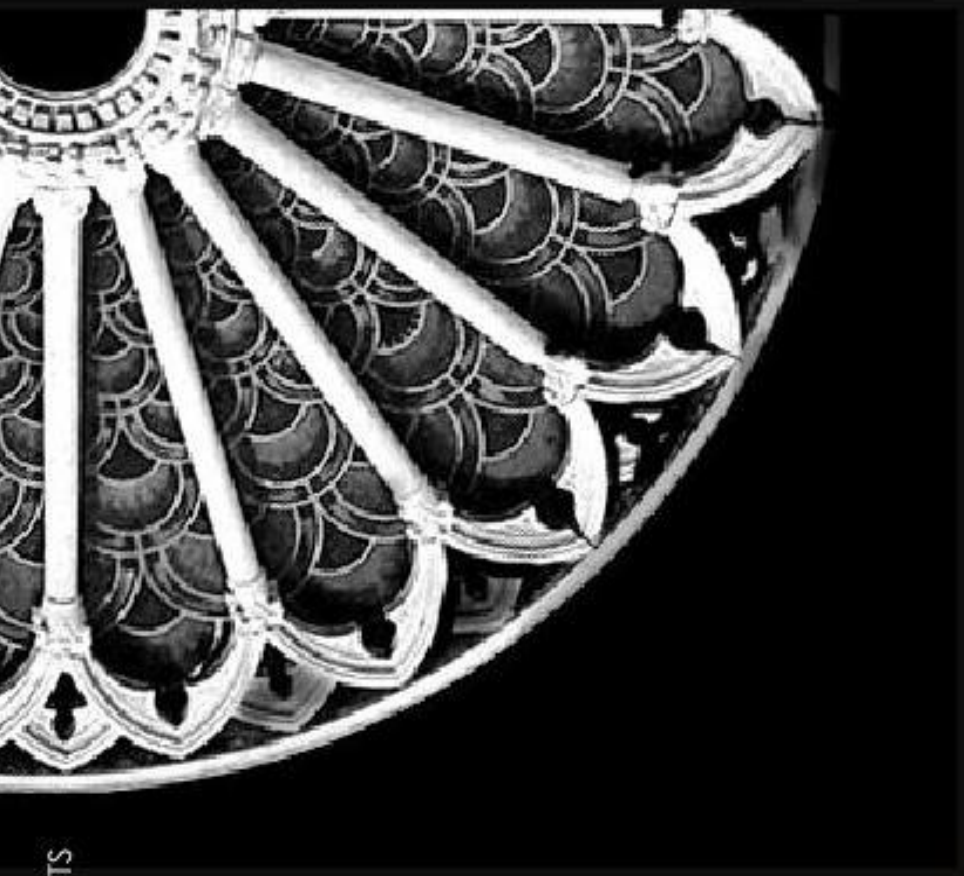

XIIIth EUROPEAN BAT RESEARCH SYMPOSIUM

1 - 5 September 2014 Šibenik, Croatia

BOOK OF ABSTRACTS

XIIIth EUROPEAN BAT RESEARCH SYMPOSIUM - CROATIA 2014 - BOOK OF ABSTRACTS

Book of Abstracts

XIIIth European Bat Research Symposium

Publishers
Croatian Biospeleological Society – www.hbsd.hr
HINUS Ltd. – www.hinus.hr

Editors of abstracts
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Prepress
HINUS Ltd.

Cover design
Miran Križanić

Printed by
DENONA

Zagreb, 2014

ISBN 978-953-99931-9-9

ISBN 978-953-6904-31-0

XIII EUROPEAN BAT RESEARCH SYMPOSIUM

September 01- 05, 2014
Šibenik, Croatia

Book of Abstracts

Programme

Book of Abstracts

List of Participants

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CBSS- Croatian Biospeleological Society, *leading organisation*

Caving Club „Ursus Spaeleus",Croatia
Croatian Mountaineering Club - Speleological Department Sv. Mihovil, Croatia
DDISKF - Dinaridi – Society for the research, surveying and filming of Karst Phenomena, Croatia
Geonatura Ltd. Consultancy in Nature Protection, Croatia
IUCN SSC Chiropteran Specialist Group, UK
National Park Krka, Croatia
Naturalis Biodiversity Centre, Netherlands
Tragus – Association for Bat Conservation, Croatia
Vincent Wildlife Trust, UK
WWF – Mediterranean Programme, Croatia

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Financial support

Ministry of Science, Education and Sports of the Republic of Croatia

National Park Krka

PROGRAMME

SUNDAY, 31 AUGUST

15.00 *Registration Desk open*

19.00 *Welcome Drinks*

MONDAY, 1 SEPTEMBER

08.00 *Registration Desk open*

09.00 *Welcome to Delegates and Official Opening*

Morning Session I Origin, Distribution and Evolution
Convener
Suren Gazaryan

09.30 – 09.45 DNA BARCODES FOR ASSESSING THE TAXONOMIC DIVERSITY OF PALAEARCTIC BATS: FURTHER STEPS
S.V. Kruskop, A.V. Borisenko, V.S. Lebedev, I.V. Artyshin, A.A. Bannikova

09.45 – 10.00 MOLECULAR RECONSTRUCTIONS IDENTIFY EAST ASIA AS THE CRADLE FOR THE EVOLUTION OF THE GENUS *MYOTIS* (CHIROPTERA, VESPERTILIONIDAE)
M. Ruedi, B. Stadelmann, Y. Gager, E.J.P. Douzery, C.M. Francis, L.K. Lin, T. Guillén Servent, A. Cibois

10.00 – 10.15 THE ALPINE DISTRIBUTION-PATTERN AND ECOLOGICAL NICHE OF *PLECOTUS MACROBULLARIS*
A. Alberdi, J.R. Aihartza, O. Aizpurua, I. Garin

10.15 – 10.30 THE BACULUM IS A RELIABLE MORPHOMETRIC CHARACTER TO DISTINGUISH THE CRYPTIC BAT SPECIES *PIPISTRELLUS PIPISTRELLUS* AND *P. PYGMAEUS*
A. N. Herdina, P. Hulva, I. Horáček, P. Benda, C. Mayer, H. Hilgers, B.D. Metscher

10.30 – 11.00 *Coffee/Tea break*

Morning Session II	Conservation Biology *Convener* Henry Schofield
11.00 – 11.15	IRISH BAT MONITORING SCHEMES REVEAL IMPACTS OF ARTIFICIAL LIGHTING ON BAT ACTIVITY T. Aughney, N. Roche, S. Langton, D. Lynn, F. Marnell
11.15 – 11.30	A PASSIVE FIELD STUDY OF THE IMPACT OF ARTIFICIAL LIGHTENING ON LESSER HORSESHOE BATS J. Baker, F. Mathews, J. Day, K.J. Gaston, H. Schofield
11.30 – 11.45	DARK LANDSCAPES FOR BATS: IS IT TIME TO SWITCH OFF THE LIGHTS? J. Day, J. Bennie, K.J. Gaston, H. Schofield, K. Barlow, F. Mathews
11.45 – 12.00	AMENITY LIGHTING OF WATERWAYS: IMPACTS ON DAUBENTON'S BATS F. Mathews
12.00 – 12.15	CHANGING THE EXTERNAL ILLUMINATION OF CHURCHES TO REDUCE DISTURBANCE FOR BATS - EXAMPLE FROM SLOVENIA M. Zagmajster
12.15-14.30	*Lunch*

Afternoon Session I Conservation Biology

Convener

Stéphane Aulagnier

14.30 – 14.45 MASSIVE BAT MIGRATION ACROSS THE ALPS: IMPLICATIONS FOR WIND ENERGY DEVELOPMENT

F. Bontadina, A. Beck, A. Dietrich, M. Dobner, C. Eicher, A. Frey-ehrenbold, K. Krainer, F. Loercher, K. Maerki, M. Mattei-Roesli, H. Mixanig, M. Plank, A. Vorauer, S. Wegleitner, K. Widerin, D. Wieser, B. Wimmer, G. Reiter

14.45 – 15.00 DESIGN OF BAT SURVEYS AT WIND FARMS

S. Richardson, F. Mathews

15.00 – 15.15 METHODS FOR STUDYING POST-CONSTRUCTION EFFECTS OF WIND POWER ON BATS IN CENTRAL EUROPE CANNOT BE DIRECTLY APPLIED IN SOUTHERN FINLAND

S. Aminoff, N. Hagner-Wahlsten, E.M. Kyheröinen, A. Lindén, J. Brommer, A. Brutemark, M. Fred

15.15 – 15.30 BAT ACTIVITIES AND BAT FATALITIES AT DIFFERENT WIND FARMS IN NORTHWEST GERMANY

P. Bach, L. Bach, K. Ekschmitt

15.30 – 15.45 WHEN ARE BATS ACTIVE IN HIGH ALTITUDES ABOVE THE FOREST CANOPY? – ACTIVITY DATA FROM WIND MASTS ALLOWS THE PREDICTION OF TIMES WITH HIGH COLLISION RISKS

J. Hurst, H. Schauer-Weisshahn, M. Dietz, E. Höhne, M. Biedermann, W. Schorcht, I. Karst, R. Brinkmann

15.45 – 16.00 BAT MORTALITY AT A WIND FARM: A CASE STUDY OF A 42 MW WIND FARM IN TULCEA COUNTY, ROMANIA

D.Ș. Măntoiu, M. Tibirnac, L. Bufnila, A. Doba, M. Nistorescu

16.00 – 16.30 *Coffee/Tea break*

Afternoon Session II Conservation Biology

Convener

Peter Lina

16.30 – 16.45 BAT ACTIVITY AT NACELLE HEIGHT OVER FORESTS
H. Reers, R. Brinkmann

16.45 – 17.00 TURBINE IN YOUR BACKYARD: WILDLIFE IMPACTS AND PUBLIC ATTITUDES TO SMALL SCALE TURBINES
C.K. Tatchley, K.J. Park

17.00 – 17.15 BAT HABITAT AND LANDSCAPE ASSOCIATIONS IN HIGH WIND RESOURCE AREAS OF IRELAND: IMPLICATIONS FOR WIND ENERGY
Ú. Nealon, I. Montgomery, E.C. Teeling

17.15 – 17.30 ASSESSMENT OF BAT MORTALITY RISKS AROUND HUMAN ACTIVITIES USING UNATTENDED RECORDINGS FOR FLIGHT PATH RECONSTRUCTION, AN AFFORDABLE METHOD FOR BAT BEHAVIOURAL AND CONSERVATION STUDIES
C. Roemer, Y. Bas

17.30 – 17.45 BAT SURVEILLANCE WITH STATIONARY AUTOMATED DETECTORS: WHAT IS THE ROLE OF TEMPORAL VARIABLITY?
A. Bruckner

17.45 – 18.00 EUROBATS LECTURE
S. Gazaryan

19.00 – 20.00 *BatLife Europe Partnership Meeting*

20.30 *Gastro Evening*

TUESDAY, 2 SEPTEMBER

08.00 *Registration Desk open*

Morning Session I Bats in the Anthropocene, Conservation Biology, Origin, Distribution and Evolution

Convener

Wieslaw Bogdanowicz

09.00 – 09.15 BATS AND THEIR ECTOPARASITES AS RESERVOIR HOSTS FOR PATHOGENIC BACTERIA

T. Lilley, V. Veikkolainen, E.J. Vesterinen, A. Pulliainen

09.15 – 09.30 HOST SPECIFICITY IN BED BUGS AND ITS IMPLICATION FOR BAT CONSERVATION

K. Wawrocka, T. Bartonička

09.30 – 09.45 ON THE PRESENCE AND ECOLOGY OF *GEOMYCES DESTRUCTANS* IN EURASIA AND ITS RELATIONSHIP WITH BATS

S.J. Puechmaille, M. Fritze

09.45 – 10.00 WNS IN CZECH REPUBLIC: RESULTS OF FIVE YEARS OF MONITORING

I. Horáček, T. Bartonička, R.K. Lučan,
ČESON (Czech Bat Conservation Trust)

10.00 – 10.15 VIRULENCE OF WHITE-NOSE SYNDROME FUNGUS *PSEUDOGYMNOASCUS DESTRUCTANS* IN EUROPE

H. Bandouchová, T. Bartonicka, H. Berková, J. Brichta, J. Černý, V. Kovacová, M. Kolarik, B. Köllner, P. Kulich, N. Martínková, Z. Rehak, G.G. Turner, J. Zukal, J. Pikula

10.15 – 10.30 PREDICTING *GEOMYCES DESTRUCTANS* DISTRIBUTION AND LIKELY ROUTES OF EXPANSION: BUILDING OF RECIPROCAL MODELS FOR EURASIA AND NORTH AMERICA

H. Rebelo, S.J. Puechmaille

10.30 – 11.00 *Coffee/Tea break*

Morning Session II	Bats in the Anthropocene, Conservation Biology, Adaptations and Evolutionary Ecology *Convener* Joxerra Aihartza
11.00 – 11.15	TEMPORAL CO-OCCURRENCE AND NICHE DIFFERENTIATION IN INSECTIVOROUS BAT ASSEMBLAGES C.E. Kubista, G. Fritsch, A. Bruckner
11.15 – 11.30	BAT'S RESPONSES TO INSECT AVAILABILITY IN SOUTHERN FINLAND E.J. Vesterinen, T. Lilley, N. Wahlberg
11.30 – 11.45	BEYOND FORAGING HABITATS: DISPLAYING THE IMPORTANCE OF PREY SOURCE HABITATS IN BAT CONSERVATION A. Arrizabalaga-Escudero, J.L. Garcia, A. Alberdi, I. Garin, J.R. Aihartza, U. Goiti
11.45 – 12.00	FISH STIMULUS RECOGNITION AND REGULATED RESPONSE TO TARGET DISAPPEARANCE OF FISHING *MYOTIS CAPACCINII* O. Aizpurua, J. Aihartza, A. Alberdi, I. Garin
12.00 – 12.15	CONSTRUCTING BAT HOUSES MATCHING THE THERMAL CHARACTERISTICS OF NATURAL ROOSTS IN TREE CAVITIES: AN EXPERIMENTAL STUDY B. Van der Wijden, L. de Bruyn
12.15 – 14.30	*Lunch*

Afternoon Session I Bats in the Anthropocene, Conservation Biology, Adaptations and Evolutionary Ecology

Convener

Hugo Rebelo

14.30 – 14.45 SEX DIFFERENCES IN HABITAT USE OF TEMPERATE BATS IN URBAN AREAS

P.R. Lintott, N. Bunnefeld, K.J. Park

14.45 – 15.00 SPECIES COMPOSITION AND HABITAT PREFERENCES OF BATS IN A DECIDUOUS FOREST COMPLEX ADJACENT TO A LARGE CITY CONURBATION

M. Ciechanowski, T. Rytelewski

15.00 – 15.15 HABITAT SELECTION IN *PIPISTRELLUS KUHLII*

E. Miková, M. Uhrin, M. Balogová, S. Danko, P. Hradická, R. Chromá, M. Kipson, P. Ľuptáčik

15.15 – 15.30 BECHSTEIN`S BATS *MYOTIS BECHSTEINII* IN AN URBAN LANDSCAPE: RELICT OR EXPLORER?

M. Dietz, A. Krannich, O. Simon

15.30 – 15.45 CAN WE PROTECT URBAN BATS UNDER THE HABITATS DIRECTIVE?

G.F.J. Smit, A.J.H.M. Korsten, F.L.A. Brekelmans, D.B. Kruijt

15.45 – 16.00 INTERACTIONS BETWEEN BATS AND BREATHABLE ROOFING MEMBRANES – PERSPECTIVES FROM UK RESEARCH

S.D. Waring, E.A. Essah, K. Haysom

16.00 – 16.30 *Coffee/Tea break*

Afternoon Session II	Adaptations and Evolutionary Ecology *Convener* Frank Bonaccorso
16.30 – 16.45	BRIDGING THE DROUGHTS: ADAPTATIONS OF A MEDITERRANEAN BAT SPECIES V. Mata, F. Amorim, P. Alves, P. Beja, H. Rebelo
16.45 – 17.00	FLIGHT ACTIVITY AND LANDSCAPE USE OF INDIVIDUAL BRAZILIAN FREE-TAILED BATS G.F. McCracken, T.H. Kunz, D.K.N. Dechmann, K. Safi, M. Wikelski
17.00 – 17.15	STEREOTYPIC FLIGHT PATHS: A WAY TO FOCUS ATTENTION WHILE FORAGING? K. Hulgard, C. Moss, L. Jakobsen, A. Surlykke
17.15 – 17.30	FROM SENSORY LIMITATIONS TO ROOST FINDING STRATEGIES IN BATS I. Ruczyński, K. Bartoń
17.30 – 17.45	FREQUENT ROOST-SWITCHING IN TREE-DWELLING BATS AND HOW TO KEEP THE GROUP UNITED L. Naďo, P. Kaňuch
17.45 – 18.00	FEMALE MATE CHOICE CAN DRIVE THE EVOLUTION OF HIGH FREQUENCY ECHOLOCATION S.J. Puechmaille, I.M. Borissov, S. Zsebok, B. Allegrini, M. Hizem, S. Kuenzel, M. Schuchmann, E.C. Teeling, B.M. Siemers
18.00 – 18.30	*Free programme*
18.30 – 20.30	*Poster Session**

**Note: Participants may set up their posters from 8AM, Monday, 1st September 2014. Poster stands will be available until Friday 12:00 PM, 5th September 2014 so Participants are kindly asked to remove their poster presentations until then. All the materials needed for setting up will be obtained by Organisers.*

WEDNESDAY, 3 SEPTEMBER

08.00 *Registration Desk open*

09.00 *Conference Excursion*

THURSDAY, 4 SEPTEMBER

08.00 *Registration Desk open*

Morning Session I Conservation Biology
Convener
Daniela Hamidović

09.00 – 09.15 BAT RESEARCH AND CONSERVATION IN "NIETOPEREK" BAT RESERVE (WESTERN POLAND)
T. Kokurewicz, F. Bongers, M. Ciechanowski, L. Duvergé, A. Glover, J. Haddow, A. Rachwald, M. Rusiński, C. Schmidt, H. Schofield, K. Wawrocka, W. Willems, A. Zapart

09.15 – 09.30 BAT ACTIVITY AT HIBERNACULA THROUGHOUT THE YEAR IN GERMANY
K. Kugelschafter, H. Dieterich, C. Harrje, E. Hensle, M. Göttsche, F. Gloza-Rausch

09.30 – 09.45 HOW SENSITIVE ARE LESSER HORSESHOE BATS (*RHINOLOPHUS HIPPOSIDEROS*) DURING HIBERNATION?
J. Zukal, K. Kopperová

09.45 – 10.00 THERMAL IMAGING AS A TOOL FOR MICROHABITAT PREFERENCE ANALYSIS OF BATS IN A GYPSUM QUARRY
P. Priori, D. Scaravelli

10.00 – 10.15 THERMAL CONDITIONS IN BUNKERS USED BY HIBERNATING BATS
R. Gyselings, F. Borms, B. Van der Wijden, L. de Bruyn

10.15 – 10.30	WINTER DISTRIBUTION, ALTITUDINAL MIGRATION, AND USE OF HIGH ELEVATION CAVES BY THE ENDANGERED HAWAIIAN HOARY BAT, *LASIURUS CINEREUS SEMOTUS* F.J. Bonaccorso, K. Montoya-Aiona, C.A. Pinzari, C.M. Todd
10.30 - 11.00	*Coffee/Tea break*
Morning Session II	Conservation Biology *Convener* Danilo Russo
11.00 – 11.15	BATS IN AN 'ECOLOGICAL DESERT': ACTIVITY AND ABUNDANCE OF BATS IN COMMERCIAL CONIFEROUS PLANTATIONS L. Kirkpatrick, D. Dent, S. Bailey, K.J. Park
11.15 – 11.30	BATS IN FRAGMENTED WOODLANDS: IMPLICATIONS FOR THE DEVELOPMENT OF ECOLOGICAL NETWORKS E. Fuentes-Montemayor, K. Watts, N. MacGregor, K.J. Park
11.30 – 11.45	HOW TO PLAN AN EFFECTIVE AND ECONOMIC ACOUSTIC INVENTORY OF BATS IN TEMPERATE FORESTS J.S.P. Froidevaux, F. Zellweger, K. Bollmann, M.K. Obrist
11.45 – 12.00	ACOUSTIC LURE GIVES INCREASED EFFICIENCY FOR SHORT-TERM SURVEYS OF BAT DIVERSITY IN TROPICAL RAINFOREST D.A. Hill, S. Anuar, A.J.J. Macintosh, A.N.N.M. Ghazali
12.00 – 12.15	ROADSIDE SURVEYS AND GOOGLE STREET VIEW REVEAL DIFFERENCES IN *PIPISTRELLUS PIPSTRELLUS* AND *PIPISTRELLUS PYGMAEUS* HABITAT USE A. Dick, N. Roche
12.15 – 12.30	THE SOLE EUROPEAN FRUIT BATS ON THE BRINK OF EXTINCTION R.K. Lučan, T. Bartonička, I. Horáček, M. Weiser, H. Nicolaou
12.30 – 14.30	*Lunch*

Afternoon Session I Adaptations and Evolutionary Ecology, Genetics: from phylogenies to populations

Convener

Sebastien Puechmaille

14.30 – 14.45 BABYSITTING AND ASPECTS OF NONMATERNAL INFANT SUPPORT IN THE CARNIVOROUS BAT *MEGADERMA LYRA*

W. Bogdanowicz, K.E. Rajan, A.S. Arasamuthu, G. Marimuthu, M. Dabrowski

14.45 – 15.00 MODELLING SURVIVAL FROM FIELDWORK DATA: A CASE STUDY ON THE SOCIAL BAT *MOLOSSUS MOLOSSUS*

Y. Gager, O. Gimenez, D.K.N. Dechmann

15.00 – 15.15 POPULATION RECOVERY IN GREATER HORSESHOE BATS IS AIDED BY PUP SEX MANIPULATION

R. Ransome, H. Ward, S.J. Rossiter, G. Jones

15.15 – 15.30 TELOMERES AS ADAPTATIONS FOR LONGEVITY IN THE LONG LIVED BAT SPECIES, *MYOTIS MYOTIS*

N.M. Foley, D. Jebb, S.J. Puechmaille, E.C. Teeling

15.30 – 15.45 THE CURIOUS CASE OF SAVI'S PIPISTRELLE (*HYPSUGO SAVII*): NEW INSIGHT ON ROOSTING ECOLOGY AND BEHAVIOUR FROM THE MEDITERRANEAN REGION

M. Kipson, M. Šalek, R.K. Lučan, T. Bartonička, E. Miková, M. Uhrin, H. Jahelková, A. Pušić, D. Kovač, M. Majer, I. Horáček

15.45 – 16.00 TRACKING THE ONSET OF SPRING MIGRATION DOES NOT SHOW THE EXPECTED SEX DIFFERENCES IN A LONG-DISTANCE MIGRATING BAT

D.K.N. Dechmann, W. Fiedler, K. Safi, K. Varga, M. Wikelski, T. O'Mara

16.00 – 16.30 *Coffee/Tea break*

Afternoon Session II Genetics: from phylogenies to populations, Conservation Biology

Convener

Javier Juste

16.30 – 16.45 UNVEILING THE SYSTEMATICS OF BROWN LONG-EARED BATS IN IBERIA: NOTES ON GENETIC, MORPHOMETRY AND ECHOLOCATION

H. Santos, J. Juste, C. Ibáñez, J.M. Palmeirim, R. Godinho, H. Rebelo

16.45 – 17.00 PHYLOGEOGRAPHY AND THE TAXONOMIC POSITION OF *MYOTIS MYOTIS* AND *MYOTIS BLYTHII* IN THE WESTERN PALAEARCTIC (CHIROPTERA, VESPERTILIONIDAE)

A. Furman, E. Çoraman, Y.E. Çelik, T. Postawa, J. Bachanek, M. Ruedi

17.00 – 17.15 THE STATUS OF BLASIUS'S HORSESHOE BAT (*RHINOLOPHUS BLASII*) IN THE PĂDUREA CRAIULUI MOUNTAINS, ROMANIA: ANSWERS FROM MOLECULAR MARKERS

SZ. Bücs, E. Jakab, CS. Jére, I. Csősz, R.L. Jakab, L. Barti, F. Szodoray-Parádi, O. Popescu

17.15 – 17.30 DEEPLY DIVERGENT BARCODES: ANCIENT POLYMORPHISM OR CRYPTIC SPECIES?

T. Andriollo, Y. Naciri, M. Ruedi

17.30 – 17.45 INFLUENCE OF METHODS IN DETECTING CONVERGENT EVOLUTION ACROSS MULTIPLE GENES IN ECHOLOCATING BATS AND CETACEANS

K.T.J. Davies, G. Tsagkogeorga, J. Parker, B.K. Lim, S. Jarman, L.M. Dávalos, S.J. Rossiter

17.45 – 18.00 A MULTI-GENE STUDY INTO THE MOLECULAR EVOLUTION OF DIET IN NEWWORLD LEAF-NOSED BATS

K. Warren, L. Davalos, B. Lim, G. Tsagkogeorga, K. Davies, S.J. Rossiter

20.00 *Banquet*

FRIDAY, 5 SEPTEMBER

08.00 *Registration Desk open*

Morning Session I Conservation Biology
Convener
Radek Lučan

09.00 – 09.15 CATCHING BATS: THE FRENCH TRAINING PROGRAM
J. Marmet, J.F. Julien, C. Kerbiriou

09.15 – 09.30 CALLS FOR CONSERVATION: HOW ECHOLOCATION SERVED THE RED LIST COMPILATION OF SWISS BATS
M.K. Obrist, T. Bohnenstengel, H. Krättli, F. Bontadina, C. Jaberg, M. Ruedi, P. Moeschler

09.30 – 09.45 EIGHT YEARS OF ACOUSTIC BAT MONITORING IN FRANCE: INCREASING SAMPLING EFFICIENCY WHILE COMMONEST SPECIES' ACTIVITY IS DECREASING
J.F. Julien, A. Haquart, C. Kerbiriou, Y. Bas, A. Robert, G. Loïs

09.45 – 10.00 DEVELOPMENT OF BAT MONITORING IN THE UK USING ACOUSTIC SURVEYS AND CITIZEN SCIENCE
K. Barlow, K. Jones

10.00 – 10.15 CONSERVATION REQUIREMENTS FOR THE BAT COMMUNITY IN THE MALTESE ISLANDS
C.M. Mifsud, A. Vella

10.15 – 10.30 THE LESSER HORSESHOE BAT: OPTIMISING SURVEILLANCE TO DETERMINE TRENDS AND THREATS
N. Roche, S. Langton, T. Aughney, D. Lynn, F. Marnell, N. Kingston

10.30 – 11.00 *Coffee/Tea break*

Morning Session II Origin, Distribution and Evolution

Convener

Manuel Ruedi

11.00 – 11.15 WHAT STORY DOES GEOGRAPHIC SEPARATION OF INSULAR BATS TELL? A CASE STUDY ON SARDINIAN RHINOLOPHIDS

D. Russo, M. di Febbraro, H. Rebelo, M. Mucedda, L. Cistrone, P. Agnelli, P.P. de Pasquale, A. Martinoli, D. Scaravelli, C. Spilinga, L. Bosso

11.15 – 11.30 DIFFERENT BAT GUILDS PERCEIVE THEIR HABITAT IN DIFFERENT WAYS: A MULTISCALE LANDSCAPE APPROACH FOR VARIABLE SELECTION IN SPECIES DISTRIBUTION MODELLING

L. Ducci, P. Agnelli, M. di Febbraro, L. Frate, D. Russo, A. Loy, G. Santini, F. Roscioni

11.30 *Closing Ceremony*

ABSTRACTS

[O] = oral presentation
[P] = poster presentation
[*] = student presentation

FISH STIMULUS RECOGNITION AND REGULATED RESPONSE TO TARGET DISAPPEARANCE OF FISHING *MYOTIS CAPACCINII* [O*]

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The Long-fingered Bat, *Myotis capaccinii*, is the only European bat known to fish in the wild. It captures fish using a variation of the trawling technique employed for hunting insects, but the way in which fish are discriminated from insects has to date not been addressed. We designed two experiments to (1) identify the stimuli used by bats for detecting and recognising fish and (2) measure the reaction of bats facing fish disappearance. We set a stimulus-recognition experiment and observed which types of stimuli triggered capture attempts. We observed that bats only attacked targets protruding at least momentarily above the water, while waves did not trigger any hunting attempt. Additionally, bats performed different types of attacks upon stationary and temporary targets. Stationary targets, namely submerged fish with their mouth protruding above the water, were attacked using shallow and short dips and an echolocation terminal phase where buzz I and buzz II exhibited similar durations. However, temporary targets, i.e. fish that protruded their mouth for a short period of time and then disappeared, were attacked using deep and long dips and a terminal phase biased towards buzz I-type calls. These attack-patterns were parallel to the attack-techniques described for hunting insects (= stationary target) and fishing (= temporary target), suggesting that instead of their morphological features bats rely on the sudden disappearance of the prey to discern fish from insects. Additionally, we observed that the buzz-ratio and dip-length were correlated to the time of fish disappearance, which implies that bats are able to adjust their hunting technique as they forage. Nevertheless, fish disappearing during buzz II emission were tackled as a stationary target, indicating the reaction-time of bats to prey stimulus variations is limited to the approach phase and buzz I.

THE ALPINE DISTRIBUTION-PATTERN AND ECOLOGICAL NICHE OF *PLECOTUS MACROBULLARIS* [O*]

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The Alpine Long-eared Bat, *Plecotus macrobullaris,* was described in 2002 and since then contrasting information regarding its ecological preferences has been published. In order to shed light on the controversial perception of the species' ecology, we collected as many distribution records as we could and we carried out samplings in multiple alpine environments to obtain a more accurate representation of the undersampled high-mountain areas. We captured 201 *P. macrobullaris* individuals in 54 sampling sites located above the treeline (1,450-2,450 m a.m.s.l.), and observed that it is the most common bat in the alpine area in Europe. Using the updated distribution information we compared the geographical range of *P. macrobullaris* with 504 vertebrate species from Europe and found that *P. macrobullaris* shares a distribution pattern with four birds (*Montifringilla nivalis*, *Pyrrhocorax graculus*, *Tichodroma muraria* and *Prunella collaris*) and a rodent (*Chionomys nivalis*). We identify it as '*palaealpine distribution*', as being widely distributed in the southern Palaearctic, but restricted to the main mountain ranges. Subsequently, to reveal the ecological factors driving such a distribution, we modelled the ecological niche of *P. macrobullaris* at two different scales; we used distribution locations for a broad-scale analysis and precise roosting locations obtained by radiotracking for a fine-scale analysis. Topographic variables outperformed climatic predictors, and the steepness of the landscape was identified as the most important variable in the broad-scale model. The best explanatory climatic variable was the mean summer temperature, which showed that *P. macrobullaris* is able to cope with mean temperature ranges spanning up to 20 °C. The fine-scale model highlighted the importance of rock-availability. In fact, all the mentioned palaealpine species share the quality of foraging in open-space areas and sheltering in natural rock structures such as fissures or talus slopes, even though *P. macrobullaris* also makes use of buildings. We concluded that the distribution of *P. macrobullaris*, and probably the rest of the palaealpine species, is mainly shaped by topographic factors that provide rock-abundant and open-space habitats rather than climatic determinants, and that these species are not cold-adapted, but rather cold-tolerant eurythermic organisms.

METHODS FOR STUDYING POST-CONSTRUCTION EFFECTS OF WIND POWER ON BATS IN CENTRAL EUROPE CANNOT BE DIRECTLY APPLIED IN SOUTHERN FINLAND [O*]

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Due to international commitments to renewable energy, the building of wind power facilities increases throughout Europe. Adverse effects on bats have been demonstrated and migrating bats are especially at risk. In Finland, no information on mortality caused by wind turbines based on systematic searches is available. For planning purposes and post-construction study recommendations we studied bat activity and mortality at five wind power facilities, in southern Finland. Acoustic data was recorded from May to October 2013. Wind facilities in southern Finland differ from those in Central Europe, as they are smaller and mostly placed in forested areas. We hypothesize that the detection of bat carcasses varies with vegetation type under the wind turbines and we study how weather affects bat activity around wind turbines for potential recommendations on turning off turbines when bat activity is high. We show that bat activity and species composition varies between wind power facilities. Higher wind speed and rainfall are associated with lower bat activity, while temperature has no effect. Search efficiency trials were conducted to determine detection differences between vegetation types and resulted in a classification of carcass detection rate in different vegetation types. The main recommendations from the study are that carcass searches around turbines should be restricted to vegetation types where detection rate is over 25%, searches should be conducted for several consecutive days in the same area due to potentially low but not zero mortality rates. Overall the connection between bat activity and bat mortality needs to be further studied. The study shows that conditions in southern Finland differ from those in Central Europe, and recommendations for post-construction studies in Central Europe cannot be applied directly to studies in southern Finland. This study offers methodological guidelines for future studies on the impact of wind power on bats in Finland.

PARK LANDSCAPE AS A REFUGE FOR BAT FAUNA IN CENTRAL EUROPE [P]

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Formerly predominantly forested landscapes of Central Europe underwent very significant modifications during the last centuries from cultivation by man. The changes are strongly reflected in land use and land cover. The landscape is currently dominated with agro-ecosystems, urban landscape and forest plantations. Landscape changes also affected the composition of the fauna, as man-made habitats significantly lack a number of key elements necessary for the survival of many species. These key elements include, for example, the presence of snags, very old trees with hollows and loose bark, large amounts of vegetation edges and numerous water bodies. These phenomena persist in the current landscape frequently only in landscape parks, large chateau parks and related ancient lanes. We studied bat communities using netting and detectoring in several parks and found an extraordinary diversity of bat communities accompanied with the presence of rare species, which strongly contrasted with the relatively poor communities of agro-ecosystems and forests plantations in the surrounding landscape. Parks seems to be a very important refuge for bat communities in a significantly modified Central European landscape.

DEEPLY DIVERGENT BARCODES: ANCIENT POLYMORPHISM OR CRYPTIC SPECIES? [O*]

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A growing number of molecular surveys have shown that a single fragment of the mitochondrial genome can identify most species of vertebrates, including those that are elusive for direct observation, such as bats. One desirable property of such barcode approach to identify species is that interspecific genetic distances are larger than intraspecific ones. In bats broad surveys have shown that such a barcode gap has been observed in most species, but there are major exceptions. European Kuhl's Pipistrelle, *Pipistrellus kuhlii*, is among these exceptions as individuals differing by up to 6% genetic distance at the COX gene were found in sympatric populations. This raises the question as to whether members of each major clade represent cryptic species or simply retained ancient polymorphism. To address this question, we sequenced the barcode of 100 *P. kuhlii* from Switzerland where two major clades are known to coexist. Based on these barcodes, we also genotyped each individual at five additional microsatellite loci, i.e. neutral nuclear markers transmitted by both parents, to measure effective gene flow between individuals from both clades. This allowed us to solve the dilemma whether members of the two mitochondrial clades represent distinct biological species or are elements of a single panmictic population.

HABITAT PREFERENCES OF THE BARBASTELLE BAT, *BARBASTELLA BARBASTELLUS* (SCHREBER 1774), DURING THE BREEDING SEASON [P*]

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To acquire knowledge about the habitat preferences of the Barbastelle Bat, *Barbastella barbastellus* (Schreber 1774), four woodland types were examined. The research took place in two voivodeships (Lower Silesia and Greater Poland), during the breeding season in 2012 in the following woodlands: riparian mixed forest in the valley of River Odra, Ślęża massif, oak wood near Krotoszyn, and the Czeszowska Plain. Species composition, tree size, amount of dead and dying trees and the density of undergrowth were measured at each site. Additionally, mistnetting and recording were carried out in the previously mentioned areas. Lactating females of the Barbastelle Bat were captured in the oak wood near Krotoszyn and Czeszowska Plain, confirming the breeding of the species in these two sites. Detector recordings showed the highest amount of passes/h - 5 - in Dąbrowy Krotoszyńskie, and the lowest – 0.5 passes/h - on the Ślęża massif. The study shows that woodlands rich in oak *Quercus* and beech *Fagus* are prefered by the Barbastelle Bat.

RESOURCE PARTITIONING IN THE SYMPATRIC SIBLING BAT SPECIES *RHINOLOPHUS EURYALE* AND *RHINOLOPHUS MEHELYI,* BASED ON MOLECULAR DIET ANALYSIS [P]

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Rhinolophus euryale and *R. mehelyi* are sibling bat species that show a high degree of overlap in morphology and echolocation. According to previous studies of their foraging ecology, both species forage mainly on moths in and along forest edges both in allopatry and sympatry. Segregation in foraging habitats has been suggested as the main mechanism allowing the coexistence of both species. However, due to the low taxonomic resolution of traditional methods to analyse diet and their limitations to reveal ecological processes concealed under the prey category Lepidoptera, we aimed to elucidate if there are subtle but functionally relevant differences between the consumed prey of the two bat species in sympatry. Using DNA barcoding and Next Generation Sequencing technologies we identified 335 MOTU from the faecal samples of both species: 243 MOTU from 36 *R. euryale* individuals and 240 MOTU from 36 *R. mehelyi*. Foraging niche breadth did not differ between *R. euryale* and *R. mehelyi* (Levin's standarized index B = 0.28 and 0.26 respectively) although both species showed a low dietary overlap (O_{jk} = 0.169). We compared representative sequences for each MOTU to the BOLD database (The Barcode of Life Data System). We were able to successfully identify 35% of all 335 MOTU, of which more than 84% belonged to Lepidoptera for both species. Although these results may suggest that both species have a similar niche breadth it seems that they show a lower niche overlap than we would expect if we consider the morphology and echolocation characteristics. This resource allocation could be achieved through a different habitat use in sympatry, as observed in earlier studies, aided by a presumed difference in prey availability related to these habitats. However, we were limited in ability to delve deeper into any functional analysis regarding prey ecology due to the low taxonomic identification success. This reflects the need to complete the DNA barcode reference database of the lepidopteran community in the foraging areas of these two sympatric rhinolophids in central Iberia.

COMPARISON OF MACROMOTH COMMUNITIES AROUND TWO CONTRASTING *RHINOLOPHUS EURYALE* COLONIES [P]

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Moths are a key group for the functioning of many ecosystems, acting as herbivores or pollinators. They are also the staple prey of many bats. Since it seems that habitat disturbance may affect moth community composition, the food supply, and thus the survival, of moth eating bats may be at stake. However, few studies have examined moth communities within the foraging areas of bats across different levels of landscape disturbance. *Rhinolophus euryale* is a species that mainly forages on moths. In the Atlantic region it is known to occur both in seminatural landscapes as well as in plantation-dominated landscapes, although the differences in their food supply have not been addressed. We captured moths using UV light traps placed within a 5 km radius of two *R. euryale* breeding roosts in order to compare macro-moth community between two contrasting foraging landscapes: 1) dominated by meadows interspersed with a large hedgerow network and deciduous woodland patches, 2) dominated by exotic tree plantations. Moths were identified to the lowest possible taxonomic level. According to preliminary results performed at the generic level, the seminatural landscape showed higher diversity indices than the plantation-dominated landscape. Further, 40% of the individuals in the plantation-dominated landscape belong to a single genus. Unless bats hunt selectively on some species, a higher taxonomic diversity of moths might reduce the uncertainty of the food supply in both time and space. The results agree with previous findings on the relationship between the colony size and the configuration of the surrounding landscape.

BEYOND FORAGING HABITATS: DISPLAYING THE IMPORTANCE OF PREY SOURCE HABITATS IN BAT CONSERVATION [O*]

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Bat-prey interactions are usually described as static images limited to a given space and time. However, these interactions may change seasonally and ontogenetically. Ontogenetic habitat switches are common in holometabolous insects, the main prey of most European bat species. The source habitats of larval stages could vary and be spatially far from the sink habitats of imaginal stages. Consequently, the availability of prey for predators may not only depend on the suitability of habitats where they and adult insects forage, but also in the source habitats needed by insect larvae to develop the first ontogenic stages. We evaluated the link between the source habitats of the moths consumed by the moth specialist *Rhinolophus euryale* and those used by this bat to forage to assess to what extent they match. We analysed the diet composition of 19 adult *R. euryale* within each prebreeding, breeding and postbreeding periods using DNA barcoding and Next Generation Sequencing technologies. Then, we checked the ontogenetic habitat switch of prey larvae by searching for larval feeding guilds in the literature. Lepidopterans were the largest consumed prey group (97% of the total identified prey taxa). We identified a total of 153 moths at species level over all the three periods. In both prebreeding and breeding 45% of identified moth species depend on herbaceous plants related to meadows and forested habitats as the main host plant for their caterpillars, and between 29-37% to broadleafed tree species. In the postbreeding period, 64% of the caterpillars depend on herbaceous plants for foraging, whereas broadleafed trees and other habitat-related plants comprised 36% of caterpillars' feeding guilds. These results show that a considerable proportion of moths consumed by *R. euryale* in a seminatural rural landscape depend in their first ontogenic stages on habitats other than hedgerows or forest edges, the main foraging habitat of *R. euryale*. This highlights the importance that a diverse heterogeneous landscape plays as prey source for the Near Threatened *R. euryale*. We suggest that prey source habitats should be taken into account when proposing conservation guidelines for bats.

IRISH BAT MONITORING SCHEMES REVEAL IMPACTS OF ARTIFICIAL LIGHTING ON BAT ACTIVITY [O]

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Despite much anecdotal evidence regarding the impacts of street lighting on bats, no systematic or comprehensive studies have been carried out in Ireland to date. Using data collected from two bat monitoring schemes – a car-based driven method, and a foot-based waterways survey, we analysed the impacts of street lights on activity levels or presence of four species.

For driven transects we categorised street lamp types into white (mercury vapour), yellow (high pressure sodium) and orange (low pressure sodium). Orange lights were most frequently recorded across the island along driven transects and white lights were the least common. We found that activity levels of Leisler's Bat, *Nyctalus leisleri*, along roads were significantly positively impacted by the presence of yellow and white street lights. This fits with predictions based on the species' fast flight style and medium body size. Leisler's Bat is Ireland's largest resident species. We found no significant impact, positive or negative, on activity of the two most common species of pipistrelle (*Pipistrellus pipistrellus* and *P. pygmaeus*) recorded by the car-based scheme. This contrasts with findings in other countries, where these species have been positively associated with lit roads. We hypothesise that vegetation cover along lit stretches is another factor that may impact pipistrelle activity and requires further study.

For foot-based waterways surveys during which Daubenton's Bat, *Myotis daubentonii*, is the target species for monitoring, we found, in 2011, that it was 9% less likely to occur at waterway survey spots if artificial lights (colour not noted) were present along waterway transects. This fits with predictions regarding *Myotis spp.* avoiding street lights. Additional data was collected in 2012 and 2013, whereby surveyors recorded light location (i.e. nearside river bank or far-side river bank relative to the surveyor position) and colour of lighting present. It was found that lights of all colours negatively impacted on the presence of Daubenton's Bat, especially when located on the nearside river bank, but yellow lights had the greatest impact.

BAT ACTIVITIES AND BAT FATALITIES AT DIFFERENT WIND FARMS IN NORTH-WEST GERMANY [O]

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North-west Germany is characterized as a flat and relatively open, highly agriculturally-used landscape. It is also known for strong winds since it is situated along the North Sea coast. This has led to a high density of wind energy facilities. At present, c. 5,300 wind turbines are installed in an area of about 300 x 400 km.

In this talk we would like to compile the results of post-construction monitoring of eleven wind farm facilities both at the coast and more inland. The data are part of the evaluation of mitigation measures performed by different consulting agencies. In most cases a carcass search with carcass removal trial and search efficiency control was conducted. Bat carcasses were usually searched for every third day. In addition the bat activity was also monitored. In most of the projects we recorded bat activity at nacelle height with Anabats SD1 and SD2 (Titley Electronics, Australia) with two exceptions, where an Avisoft-System (Avisoft Bioacoustics, Germany) was installed. In some wind farms we recorded the bat activity at ground level and at nacelle height.

To identify driving factors of bat activity (as measured by the contacts) and bat fatalities, we performed a general linear model analysis (GLM). In order to estimate parameters which have influence on activity and fatalities, we modelled different parameters such as landscape, rotor radius, wind speed, temperature. In view of the fact that the main threatened species in our investigation is Nathusius´s Pipistrelle Bat, *Pipistrellus nathusii*, we mainly concentrated on this species.

Although the model quality was not high, there were significant correlations: site itself seems the main driving factor for the differences in bat activity, followed by seasonality, wind speed and temperature. Surprisigly, bat activity was not correlated with bat fatalities.

Bat activity at ground level and at nacelle height was correlated, but this correlation was positive only in the late summer season (when the activity was also the highest). We found a negative correlation in other months.

A PASSIVE FIELD STUDY OF THE IMPACT OF ARTIFICIAL LIGHTING ON LESSER HORSESHOE BATS [O*]

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Throughout Europe, bats suffer from reduced habitat availability and connectivity. It is unclear whether artificial night lighting provides an additional challenge to population stability.

We used passive monitoring in the field to measure the impact of artificial lighting on Lesser Horseshoe Bats. Unlike previous research which has focused on roosts and their immediate surroundings, we took a landscape-scale approach, and considered patch size and connectivity. We also examined whether lighting alters species assemblages, by exploring the relative abundance of *Pipistrellus spp*., which are not considered to be light shy. We monitored presence/absence using 50 full-spectrum detectors located within a 2 km radius of eight Lesser Horseshoe Bat maternity roost sites across the south west of England between April and July in 2012. Activity was compared at light and dark locations of similar habitat. In this presentation we will show that Lesser Horseshoe Batactivity is affected significantly by lighting regime, and discuss the implications for the movements of bats across the landscape.

VIRULENCE OF WHITE-NOSE SYNDROME FUNGUS *PSEUDOGYMNOASCUS DESTRUCTANS* IN EUROPE [O]

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While *Pseudogymnoascus destructans* has been responsible for mass bat mortalities from white-nose syndrome (WNS) in North America, its virulence in Europe has been questioned. To shed light on the issue of host-pathogen interaction between European bats and *P. destructans*, we examined seventeen bats emerging from fungus-positive underground hibernacula in the Czech Republic during early spring 2013. Dual wing-membrane biopsies were taken from *Barbastella barbastellus* (1)*, Myotis daubentonii* (1)*, Myotis emarginatus* (1)*, Myotis myotis* (11)*, Myotis nattereri* (1) and *Plecotus auritus* (2) for standard histopathology and transmission electron microscopy. Non-lethal collection of suspected WNS lesions was guided by trans-illumination of the wing membranes with ultraviolet light. All bats selected for the present study were PCR-positive for *P. destructans* and showed microscopic findings consistent with the histopathologic criteria for WNS diagnosis. Ultramicroscopy revealed oedema of the connective tissue and derangement of the fibroblasts and elastic fibers associated with skin invasion by *P. destructans*. Extensive fungal infection induced a marked inflammatory infiltration by neutrophils at the interface between the damaged part of the wing membrane replaced by the fungus and membrane tissue not yet invaded by the pathogen. There was no sign of keratinolytic activity in the *stratum corneum*. Here we show that lesions pathognomonic for WNS are common in European bats and may also include overwhelming full-thickness fungal growth through the wing membrane equal in severity to reports from North America. Intercontinental differences in the outcome of WNS in bats in terms of morbidity/mortality may therefore not be due to differences in the pathogen itself.

DEVELOPMENT OF BAT MONITORING IN THE UNITED KINGDOM USING ACOUSTIC SURVEYS AND CITIZEN SCIENCE [O]

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Bats provide an important role in ecosystems and can be used to assess environmental change. Long-term monitoring of bat populations is therefore essential to determine changes in population trends. The UK's National Bat Monitoring Programme utilises multiple survey types, including acoustic surveys, to assess changes in bat populations over time. Acoustic survey methods currently rely on simple, tuneable bat detectors with species identification carried out in the field by trained volunteers. Here we discuss alternative approaches to bat population monitoring using acoustic techniques which take advantage of the significant technological developments in hardware and automatic identification software that have occurred since the start of the UK's monitoring programme in 1996. We discuss potential future options for acoustic monitoring of bat populations using citizen science in the United Kingdom and more globally.

USING PHYLOCLIMATICS TO TEST FOR MODES OF SPECIATION WITH THE NEW WORLD SPECIES OF THE BAT GENUS *MYOTIS* AS A MODEL [P]

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Determining and understanding the mechanisms of the formation of new species comprises one of the fundamental questions in evolutionary biology. Although the original ideas emphasized allopatric speciation as the dominant mechanism in species formation, the prevalence of sympatric speciation, crudely speciation in the absence of an allopatric barrier, cannot be ignored during the formation of new species, with even skeptics agreeing on its existence. In addition, if allopatric and sister species also diverge in the environmental conditions that they are found in, as well as geographic components, there may also be ecological components to the speciation process. In this study, I try to tease apart the components of the mode of speciation (allopatric/sympatric *vs.* ecological) utilizing environmental niche models with the New World bats of the genus *Myotis* as a model to explicitly model geographic ranges, to compare the distribution ranges of the sister species in the genus, and to extract niche information in terms of bioclimatic variables to understand patterns of overlap between species. In addition phyloclimatic reconstructions were made to determine putative ranges of ancestral nodes, and age-range correlation analysis was employed to see if there was any association between range overlap and ages of nodes. The results indicate preliminary allopatric modes of speciation for sister species, and even some older nodes, with some examples for sympatric distributions as well. However, in all cases, there was evidence for ecological differentiation of niches. The allopatric mode of speciation was also supported in the age-range correlation analyses, with the younger nodes showing evidence for allopatry that decreases with node age. The phyloclimatic reconstructions give hints of potential ancestral ranges for the Neotropical and Nearctic clades. The analyses also show that the examination of the distribution patterns of sister species can provide data on the extent of hybrid zones, and potential expansion patterns, helping formulate hypotheses that can be tested subsequently.

POPULATION DYNAMICS OF BATS AND NOCTURNAL INSECTS IN THE NIEPOŁOMICE FOREST, SOUTHERN POLAND [O]

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Research on bats carried out in the Niepolomice Forest (10,800 hectares) during the second half of the 20th century indicated the sporadic occurrence of these animals in the late summer and autumn. The objective of the current study was a comparison of the population dynamics of four genera of bats (*Myotis spp., Eptesicus spp., Pipistrellus spp., Nyctalus spp.*), and nocturnal insects in the lowland forest complexes of the Niepołomice Forest, situated 35 km east of Cracow. The studies were conducted in 2011 and 2012 in moist deciduous woods (*Tilio-Carpinetum*), and moist mixed coniferous forests (*Pino-Quercetum*) which, combined, cover 49.9% of the studied forest complex.

The studies were carried out during 6 months (May, June, July, August, September, and October) of each year, in 12 locations where records were made, along line transects and on 12 study plots. Echolocation observations were conducted with the use of a Pettersson D-240X detector, whilst the catching of nocturnal insects was carried out with the use of a UV lamp, and a MIX-type reflector. The recording of echolocation signals were continued at each location for 30 minutes, with 5-minute intervals. It was assumed that within each time interval, all echolocation signals of a given genus of bats came from a single individual. The insects caught were counted and weighed, separately for moths and the other insects. For the first few months, the relative number of bats increased from 5.8–7.0 individuals/station × 0.5 h^{-1} in May, to 8.1–13.2 individuals/station × 0.5 h^{-1} in July, and then dropped dramatically to 1.2–2.5 × 0.5 h^{-1}. Similar trends were found in the population dynamics of nocturnal insects: 111.1 individuals/station × 0.5 h^{-1} in July, versus 32 individuals/station × 0.5 h^{-1} in August. The mass of insects caught increased from 0.42 g/station × 0.5 h^{-1} in May, to 2.08 g/station × 0.5 h^{-1} in July, and then decreased to 0.05 g/station × 0.5 h^{-1} in October. A dramatic drop in the numbers of bats in August was probably caused by the reduction of their potential food supply base i.e. the seasonal decrease in the number of nocturnal insects, particularly moths, which might be the cause of the migration of bats from the Niepołomice Forest area.

BABYSITTING AND ASPECTS OF NON-MATERNAL INFANT SUPPORT IN THE CARNIVOROUS BAT *MEGADERMA LYRA* [O]

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Of the 1,300 extant species of bats, only a few species are documented as helping to raise the offspring of others, which includes food sharing and pup guarding. We examined patterns of maternal infant support within the Indian False Vampire Bat, *Megaderma lyra*. We captured 189 individuals from 4 maternity colonies in southern India and genotyped them at 9 microsatellite loci. We identified the mothers in 68% of 74 young aged 1 to 27 days. In 3 cases, mothers nursed alien offspring despite their own dependent young still being present in the colony. Juveniles of 1–16 days old were babysat by their mothers as well as other females (the ratio close to 1:1), whereas juveniles older than 16 days (around the age when young start practising flights) were cared for mostly by their mothers (15:1). In the present study, we document the 1st case of nanny babysitting in bats, and this phenomenon was time-dependent, suggesting that babysitting is related to the guarding of pups, either assuring appropriate body temperature at the early stage of a pup's development and/or avoiding predation at a time when pups are unable to fly. This finding also supports the kin selection hypothesis, as nannies were more closely related to the young that they cared for than expected by chance.

WINTER DISTRIBUTION, ALTITUDINAL MIGRATION, AND USE OF HIGH ELEVATION CAVES BY THE ENDANGERED HAWAIIAN HOARY BAT, *LASIURUS CINEREUS SEMOTUS* [O]

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We examine an altitudinal migration that involves winter and spring presence of Hawaiian Hoary Bats, *Lasiurus cinereus semotus*, in the Mauna Loa Forest Reserve (MLFR), Hawaii Island. Acoustic detection of hoary bat vocalizations were recorded with regularity outside 13 lava tube cave entrances situated between 2,200 to 3,600 meters a.s.l. from November 2011 to April 2012. Vocalizations were most numerous in November and December with the number of call events and echolocation pulses decreasing through the following months. Visual searches found no evidence of use as hibernacula nor do these bats appear to shelter by day in these caves. Nevertheless, many bats fly deep into such caves as evidenced by numerous carcasses found mummified or as skeletons in cave interiors. The occurrence of feeding buzzes around cave entrances and observations of bats flying in acrobatic fashion in cave interiors point to the use of these spaces as foraging sites. It is very likely that *Peridroma* moth species (Noctuidae), the only numerous nocturnal flying insects sheltering in large numbers in rock rubble and on cave walls in the MLFR, serve as the principle prey attracting Hoary Bats during winter to the high elevation caves of the MLFR. This unusual daily migration appears to be driven by high elevation winter foraging and not by roosting sites.

MASSIVE BAT MIGRATION ACROSS THE ALPS: IMPLICATIONS FOR WIND ENERGY DEVELOPMENT [O]

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For the last two decades, the installation of wind parks in Europe has been accelerated to reach the ambitious targets of the energy turnaround and to combat climate change. Especially hill tops, ridges and alpine passes benefit from continuous winds. Therefore, remote sites throughout the European Alps are increasingly proposed for wind parks in order to harbour the extensive winds, and to concurrently avoid conflicts near human settlements and restricted protected areas in the lowlands. It is well known that myriads of migrating birds regularly cross the Alps in spring and autumn. Many discoveries of marked bats point to the fact that they cross Europe, but the phenology and flight routes of migrating bats are still obscure. In this study, within the framework of international cooperation throughout the European Alps, we aimed to undertake long-term observations of bats to better understand the seasonal occurrence of local and migrating bat species.

We conducted continuous acoustic monitoring using broadband ultrasound recorders on towers, in the nacelle of wind turbines and on the ground, from spring to autumn. A dozen recording sites were distributed across the Alps in Austria, Germany and Switzerland, including control sites in the lowlands.

We found a regular presence of bats at sites up to 2,500 m a.s.l., with surprisingly high bat species richness at many alpine sites, including both local and migratory species. While there was a high variability between the sites, we recorded peaks with massive migration, especially during a few weeks in autumn. At some valleys and passes in the Alps hundreds of bat sequences were recorded in single nights, indicating that many thousands of bats were crossing the perimeter of a wind park in the course of the season.

Our results clearly demonstrate that the Alps are regularly used for foraging by local bats and as seasonal routes through Europe by migrating bats. We strongly recommend to carefully monitor planned wind energy sites in the Alps, including those in valleys and on alpine passes, and to implement appropriate mitigation measures to protect the threatened bat species.

BAT SURVEILLANCE WITH STATIONARY AUTOMATED DETECTORS: WHAT IS THE ROLE OF TEMPORAL VARIABLITY? [O]

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Surveying bat populations by recording their calls with stationary detectors has become increasingly popular in recent years. Due to their unsupervised mode of action and the vast amount of data they collect in a short time, stationary detectors are an efficient complement to other methods, and are especially well suited for broad-scale surveys and monitoring.

Before such studies can be designed properly, however, the sampling properties of stationary devices have to be fully understood. An aspect of particular importance for optimizing recording schemes is the need for replicating sampling nights: how does the number of nights correlate to the probability of detecting species? Is it more efficient to expose detectors several nights in a row, or to distribute the recording over the warm season? Are particular sampling schemes optimal for all species - or do we have to consider the specific biology of migratory species?

From early April to mid-October 2009, bat activity, species composition and richness at nine water bodies in Austria were monitored in parallel using stationary detectors (batcorders). Preliminary results indicate large night-to-night variability of species activity and no apparent influence of sampling date on species detection probability. This indicates that neither the temporal arrangement of recording nights over the warm season, nor species identity, have to be taken into account for designing optimized surveillance schemes.

CAVE ACCESS AND BAT PROTECTION IN ROMANIA: LEGISLATION AND GUIDELINES [P]

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To inform bat researchers about the authorization process regarding access to Romanian caves and bat fauna, we present the current situation according to national legislation. The protection of the Romanian bat populations is primarily achieved under the umbrella of several international conventions and appropriate national legislation. With the establishment of the Natura 2000 network, and custodian status of institutions and organizations, an additional level of protection was obtained. In 2012, under the supervision the Romanian Ministry of the Environment and Forests (RMEF), the Speleological Heritage Committee (SHC, Comisia Patrimoniului Speologic - CPS) was formed. The SHC is the first level of access control for activities involving caves (caving, tourism, research, modifications inside caves etc). The SHC is also tasked with evaluating requests for sampling inside Romanian caves (bats, invertebrates, fossils etc). To download the application form, go to: http://www.mmediu.ro/beta/comisia-patrimoniului-speologic. Secondly, in the case of activities organized inside protected areas, custodians issue permits based on the management plan of the protected area. If activities involve entering caves, the Romanian cave emergency unit (Salvaspeo) must also be contacted. To ensure that planned activities do not overlap, and are not in conflict with the conservation priorities and research activities of the main bat research bodies in Romania (the Romanian Bat Protection Association and the „Emil Racoviță" Speleological Institute), we recommend contacting the two organizations, and local bat researchers. This also ensures optimal planning of activities, as local bat researchers can offer valuable information and also help in obtaining permits. In the case of caves, the issuing of permits, in parallel with the activity of rangers, has lead to the decline of uncontrolled cave tourism. This directly and positively affects bat populations. Large scale projects (such as the LIFE+ project "Bat conservation in Pădurea Craiului, Bihor and Trascău Mountains" LIFE08 NAT/RO/000504) contributed significantly to the durable protection of the Romanian bat fauna. The project's most important conservation activity was the bat-friendly gating of 15 highly important caves in NW Romania, thereby assuring an undisturbed medium for bats. Permits to enter these closed caves can also be obtained from SHC and custodians.

THE STATUS OF BLASIUS'S HORSESHOE BAT, *RHINOLOPHUS BLASII*, IN THE PĂDUREA CRAIULUI MOUNTAINS, ROMANIA: ANSWERS FROM MOLECULAR MARKERS [O]

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Since January 2012 we have regularly identified *R. blasii,* using several research methods, in the Gălăşeni Cave, situated in the northern part of the Pădurea Craiului Mountains. The site is located more than 100 km north of the nearest location reported in the scientific literature. The mixed colony of *R. euryale* and *R. blasii* found in the cave is predominantly formed by *R. blasii*. In order to determine if the colony from the Gălăşeni Cave is isolated from southern core population, we genetically compared *R. blasii* specimens with bats from southern colonies from over 250 km away in the Cernei Mountains (southern Carpathians). We sampled a total of 46 *R. blasii* from three locations, and using standard molecular methods, analyzed them at the level of the HVII region of the D-loop (352 bp) and the 12S rRNA-tRNA val-16S rRNA region (937 bp). Preliminary results provide evidence that *R. blasii* colonies are genetically highly uniform, with only 20 variable sites for the 1.289 bp analyzed. The 14 variable sites in the HVII region defined four haplotypes, the most widespread being H1-HVII, present in 43 of the 46 *R. blasii* specimens. The three remaining HVII haplotypes are restricted to the southern colonies, to a single bat each. The six variable sites in the 12S region defined two haplotypes, the most widespread being H1-12S, with only a single *R. blasii* having a different haplotype. The northernmost colony of the Gălăşeni Cave is fixed for both the H1-HVII and H1-12S haplotype. Our results suggest that the Gălăşeni colony is not isolated from the southern core populations, but shares the same haplotypes, and that gene-flow is probably maintained through yet unknown *R. blasii* colonies. In addition, the Gălăşeni colony, being at the northern distribution limit of *R. blasii*, exhibits the typical low genetic diversity of marginal populations. Future conservation measures should take into account this low genetic diversity, to ensure the long-term protection of the Gălăşeni *R. blasii* population. Future research should also aim at identifying as yet unknown *R. blasii* colonies from the western Carpathians, and re-evaluate known *R. euryale* colonies.

THE WINTER BAT FAUNA OF ANTHROPIC UNDERGROUND ROOSTS IN ROMANIA [P]

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Anthropic underground roosts (abandoned mines, cellars, crypts) are important habitats for bats across Europe, sheltering in some cases large colonies and/or a high species diversity. Here we present data gathered during the winter field seasons of the period 2009-2014, in 34 Romanian anthropic underground roosts, located in several Natura 2000 sites. From the 34 roosts investigated, 25 (>70%) were suitable for hibernation. Only nine roosts did not have a winter bat fauna in the survey period, but can act as temporary roosts in other periods. We identified 17 out of the Romanian 31 bat species. The most frequent species are the large *Myotis* species (*M. myotis*, *M. oxygnathus*), the Lesser Horseshoe Bat, *R. hipposideros*, the Greater Horseshoe Bat, *R. ferrumequinum*, as well as Natterer's Bat, *M. nattereri*, and the Western Barbastelle, *B. barbastellus*. The largest colony of any surveyed anthropic underground roost in Romania was identified in the crypt of the Călugăreni Monastery, numbering a maximum of 45 *R. hipposideros*. Regarding species diversity, we can conclude that anthropic underground roosts in Romania are highly diverse, sheltering a large number of species, in some cases rivaling that of important caves. We identified three roosts with 10 or more species present during the survey period: the abandoned mines of the Albioara Gorge (10 and 12 species, respectively), and the prospecting mine gallery from Zărneşti (10 species). Based on our results, anthropic underground roosts in Romania provide ideal hibernating conditions for a large number of species. While assessing the threats faced by these types of roosts, we can conclude that abandoned mines are rarely visited by tourists and cavers, and are more threatened by collapsing entrances/galleries, but also by inappropriate and/or forced closings. Roosts located beneath buildings (cellars, crypts) are more prone to disturbance, but confirmed on-site experiences show that locals are usually aware of the presence of bats and do not wish to disturb them (such as the case of the *R. hipposideros* colony at the Călugăreni Monastery). In the future, conservation measures in Romania must take into account the protection of anthropic underground roosts.

GEOMETRIC MORPHOMETRIC ANALYSIS OF CRANIAL VARIATION IN EUROPEAN HORSESHOE BATS (CHIROPTERA, RHINOLOPHIDAE) [P*]

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We analysed size and shape variation of crania among five species of European horseshoe bats (*Rhinolophus ferrumequinum*, *R. euryale*, *R. blasii*, *R. mehelyi* and *R. hipposideros*) using methods of landmark-based geometric morphometrics. Besides the obvious size differences, we aimed to investigate whether these species differ in overall shape variation, as well as in its components (allometric and non-allometric). Significant differences were obtained in cranial size, as well as variation in the level of overall shape. After principal component analysis (PCA), Greater Horseshoe Bat was separated from the other four species along PC1 axis, while the PC2 axis segregated Lesser Horseshoe Bat from the other analysed species. Effect of size on shape variation was statistically significant, and allometry accounted for about 30% of the variation in shape. We also observed that European horseshoe bats follow a uniform pattern of size-dependent shape changes. However, PCA of non-allometric component of the shape variation showed clear separation of Greater and Lesser Horseshoe Bats from medium-sized horseshoe bats along the PC1 axis. Inter-species shape differences were detected at both the level of overall shape variation and its non-allometric component. Although different in size and overall shape, crania of Greater and Lesser Horseshoe Bats were fairly similar at the level of non-allometric shape variation, i.e. after correction for allometry.

TICKS (ACARI: IXODIDAE) PARASITIZING BATS IN SERBIA [P*]

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Ticks are recognized as important vectors of pathogens and are known to parasitize large number of host species. Serbia is an area scarcely researched regarding the distribution and host association of ticks parasitizing bats. The present research has been initiated within the framework of determination of the role of different bat species as hosts to ticks and as potential reservoirs of tick-borne pathogens in Serbia. Here we present new findings and records of tick species collected from bats in the central Balkan peninsula. Data about ticks from bats were collected at 7 localities in Serbia. Bats were caught using mist nets placed at cave entrances, identified to species, forearm measured, weighed and sexed, and released at the site where caught. To search for ticks on bats, the whole body of the host was carefully examined, and any ticks found were removed using forceps, before being pooled per bat individual, placed in tubes with 70% ethyl alcohol and labelled appropriately. Both morphological and molecular approaches have been used for determination of taxonomic status of the tick species. Ticks were separated by developmental stage and gender (adults) and identified to species level by using standard morphological keys. The cytochrome oxidase subunit I (COI) gene was used for molecular analysis. Representative samples were chosen and DNA extracted from whole ticks or legs. For amplification of COI gene universal primers LCO1490 and HCO2198 were used. We examined 419 individuals of 11 bat species: *Rhinolophus ferrumequinum, R. euryale, R. hipposideros, Myotis capaccinii, M. emarginatus, M. daubentonii, M. myotis/oxygnathus, M. mystacinus, Nyctalus noctula, Plecotus austriacus* and *Miniopterus schreibersii.* A total of 160 ticks of two species (4 *Ixodes vespertilionis* and 156 *I. simplex*) were collected from four different bat species (*Rhinolophus euryale, R. ferrumequinum, Miniopterus schreibersii* and *Myotis mystacinus)*. *Ixodes simplex* was the most abundant and widespread tick. The study presents the first records of *I. simplex* in Serbia, where collected specimens were parasitizing *Miniopterus schreibersii,* and the first published records of *Ixodes vespertilionis* found in western Serbia.

HABITAT ASSOCIATIONS OF BATS IN AGRICULTURAL LANDSCAPES IN SERBIA [P*]

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There is a general lack of published information about the importance of different habitats and features for bats in agricultural landscapes in Serbia. Around 66% of land in the country is used for agriculture. Agriculture, as one of the main pillars of the country's economy, is developing and intensifying, putting biodiversity and bats, as the country's strictly protected species, in danger. This research aimed to identify suitable habitats and features in agricultural landscapes and initiate first steps for the development of practical guidelines for protection of bats in agricultural landscapes of Serbia. The research took place during the period August-October 2013 at dispersed territories of Avala, Fruska Gora, Lower Danube area, Obedska bara and Zasavica. Six land use types were surveyed: arable land, grassland and pastures, scrub, deciduous and mixed forest, coniferous forest and water bodies. Echolocating bats were recorded using two Song Meter (SM2Bat+) bat detectors, one of them being placed at the centre of the habitat, and the other at the edge of the habitat. A total of 41 different sites were visited, while 73 recording points were analysed with regard to bat calls using BatSound and Sonochiro softwares. Recorded bat calls were analysed to the level of species, or to the level of bat species group (e.g. *Myotis spp.)*. The most frequently detected species (considered as number of positive points/total number of points monitored) were *Pipistrellus kuhlii/nathusii* (80.9%) and *Nyctalus noctula* (58.9%). A Generalized Linear Model (GLM) was used to evaluate the influence of habitat composition and structure on bat presence. The GLM results highlighted that the arable land and the landscape structure significantly influence the presence of species, such as *Nyctalus noctula* (explicated deviance of the model = 41.6%; AIC value = 81.76). Starting from these first results and to better evaluate the influence of habitat type and landscape structure on bat presence, we use aerial images to derive high resolution land cover maps (photo interpretation technique) of our study area. All of our data were uploaded in a GIS system (QGIS 2.2) to provide a deeper and more qualitative interpretation of the relationship between bat species presence and environmental characteristics.

UTILISING UNSKILLED VOLUNTEERS IN THE RECORDING OF BAT DATA: A CASE STUDY FROM THE *OUR BEACON FOR BATS* LESSER HORSESHOE BAT PROJECT IN MID-WALES, UNITED KINGDOM 2011-2014 [P]

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The Lesser Horseshoe Bat, *Rhinolophus hipposideros,* population in Wales is recovering following a severe historical decline which led to the species becoming increasingly rare in the early 20th century. In common with many bats, it remains a species that is still little known to the general public. Although its populations are recovering, it remains vulnerable to loss of suitable roosting sites and habitat fragmentation. The Vincent Wildlife Trust manages five key maternity roosts in the upper Usk Valley within 24 km of each other. All are located within the Brecon Beacons National Park and the area is designated as a Natura 2000 site for its population of over 3,000 animals.

The *Our Beacon for Bats* project aims were to educate members of the local community about their resident bats, and train them in detection techniques so that they could gather data on the landscape use of Lesser Horseshoe Bats. These data would then be used to encourage, manage and enhance the land to improve roosting opportunities, connectivity and foraging habitat for the bats.

Some 100 volunteers and 12 different landowners from the neighbourhood participated in the project (1,840 volunteer hours). The results of volunteer bat detector records provided the basis for a Bat Map of the area. Four WW2 pill boxes were adapted as night roosts and new purpose-built night roost designs were trialed. Habitat improvements in the area saw the planting of nearly 3 km of hedgerows and 2 ha of woodland.

Involving so many volunteers in a relatively small area was time-consuming and ideally required a full-time project officer (only part-time was provided). An exit strategy was needed to manage further volunteer opportunities once the project had finished and unforeseen time was spent clarifying inconsistent or incomplete data. However, the investment in this project was valuable to the long-term conservation of the bats with the additional publicity gained helping to elevate understanding of the lesser horseshoe bat in this important area of conservation. Overall the project led to a greater understanding of the level of resources needed to undertake the activities planned with the number of volunteers involved.

THE PHYLOGENY OF THE LARGE MOUSE-EARED BAT COMPLEX (CHIROPTERA: VESPERTILIONIDAE) IN ANATOLIA AND THE TURKISH THRACE [P*]

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In this study, the phylogenetic relationship between the representatives of the large mouse-eared bat species complex (*Myotis myotis, Myotis blythii/oxygnathus* and possible subspecies) inhabiting Anatolia and Thrace were examined, with particular focus on the actual number of evolutionary significant units within this complex. The tissue samples used in the study were collected from various cave-dwelling colonies throughout Anatolia and the Turkish Thrace. The morphological traits, including dental and forearm measurements, were analyzed together with genetic markers: highly variable regions of the mitochondrial DNA and eight nuclear microsatellites. While many new mitochondrial haploytpes were found, the overall structure of the haplotype network for this bat complex remained the same as in previous studies. The nuclear data were analyzed using Bayesian clustering methods. The results gathered from these analyses do not indicate the existence of evolutionary significant units within *Myotis myotis, Myotis blythii/oxygnathus* in the geographical region investigated, with the exception of some non-significant local variations. The morphological differences, which were previously claimed to be indications of possible subspecies (i.e. *M. m. macrocephalicus* or *M. b. omarii*) are shown to be gradual changes following the east-west axis.

STUDIES REGARDING BATS FROM MERIDIONAL CARPATHIAN MOUNTAINS, ROMANIA [P]

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Between 2004-2014 we carried out an inventory of bats in subterranean shelters (40 caves, 2 tunnels, 3 abandoned mines), 25 buildings (attics, churches, schools, abandoned buildings), and we made recordings in fixed points (localities, various habitats, including alpine areas and 8 glacier lakes), and more than 300 km of transects in the Retezat Mountain, Lotrului-Parâng Mountain, Cindrel Mountain, Căpățânii Mountain, Făgăraş-Iezer Mountain, Bucegi Mountain and Piatra Craiului Mountain.

We identified 22 species in Fagaras Mountain: *Rhinolophus hipposideros, Myotis myotis/oxygnathus, M. emarginatus, M. daubentonii, M. bechsteinii, M. brandtii, M. mystacinus, M. nattereri, Nyctalus noctula*, *N. leisleri, N. lasiopterus, Eptesicus nilssonii, E. serotinus, Vespertilio murinus, Barbastella barbastellus, Pipistrellus pipistrellus*, *P. pygmaeus, P. kuhlii, P. nathusii, Plecotus auritus, P. austriacus* and *Miniopterus schreibersii*; 8 species in Retezat Mountain: *Rhinolophus ferrumequinum, R. hipposideros, M. schreibersii, N. noctula, P. pipistrellus, P. austriacus, M. nattereri, M. daubentonii*; 5 species in Bucegi Mountain: *R. ferrumequinum, R. hipposideros*, *M. myotis/ oxygnathus, M. emarginatus*; 11 species in Piatra Craiului Mountain: *R. ferrumequinum, R. hipposideros, M. myotis/oxygnathus, M. daubentonii, M. bechsteinii, M. emarginatus, N. noctula, B. barbastellus, P. pipistrellus, P. pygmaeus, M. schreibersii*; 5 species in Lotrului Mountain: *M. bechsteinii*, *N. noctula, B. barbastellus, P .pipistrellus, P. pygmaeus*; 5 species in Cindrel Mountain: *N. noctula, N. lasiopterus, V. murinus, E. serotinus, P. pygmaeus.*

In the Căpățânii Mountain we detected 10 species: *R. ferrumequinum, R. blasii*, *R. mehelyi*, *M. myotis/oxygnathus, M. bechsteinii, M. capaccinii*, *M. daubentonii, M. mystacinus, B. barbastellus, M. schreibersii.*

We made observations regarding the altitudinal distribution of species, 19 hibernating and 5 nursery shelters, observations on habitat preferences and the influences of altitude variation regarding pulse parameters in echolocation and social calls.

One of our most important findings is the largest hibernating bat colony of *R. ferrumequinum* for Romania, of 2,500 individuals in Şălitrari Cave from Retezat Mountain, and another large hibernating bat colony, with <100,000 individuals in Şura Mare Cave *(M. schreibersii and Pipistrellus pipistrellus*) and two *Nyctalus noctula* bat colonies (one hibernating in Şura Mare Cave, and one nursery colony in Cioclovina cu Apă Cave) from Lotrului-Parâng Mountain.

PRELIMINARY SURVEY OF THE MOUNTAIN BAT ASSEMBLAGE AT VALLE DEL SILENCIO, PARQUE INTERNACIONAL LA AMISTAD, COSTA RICA [P]

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In February 2014 we carried out a preliminary survey of bats at Valle del Silencio, in the Talamancan montane cloud forest, Costa Rica, at elevations ranging between 2,536-2,360 m.a.s.l. During seven nights we conducted a total of 415 mist-net hours; 276 hours correspond to monofilament nets, and 139 hours to polyester nets. We captured a total of 56 bats, a capture rate of 0.13 bats per net hour. In monofilament nets a total of 50 bats were captured for 276 net hours (0.18 bats per net hour), whereas in polyester nets we captured 6 bats during 139 net hours (0.04 bats per net hour). We captured a total of 9 species from the families Phyllostomidae (*Sturnira ludovici*, *Dermanura toltecus*, *Hylonycteris underwoodi*, and *Anoura cultrata*) and Vespertilionidae (*Lasiurus blossevillii*, *Myotis nigricans*, *M. oxyotus*, *M. keaysi*, and *Myotis spp*.). These data report elevational records for *D. toltecus* and *M. keaysi*. *Sturnira ludovici* was the most commonly captured bat, with a relative abundance of 43%, followed by *M. keaysi* with a relative abundance of 18%, and *M. oxyotus* with 14%. The only two species captured in polyester nets were *S. ludovici* and *H. underwoodi*. The Simpson diversity index for the captured bats was 0.74. The species accumulation curve shows that an asymptote has not been attained with our sampling effort of 7 sites surveyed only once.

Simultaneously we set an unattended bat detector (Pettersson Elektronik D-500) in 5 of the sampling spots/nights for 30 hours, getting 272 ultrasound recordings from bats. A preliminary analysis reveals at least 12 different sonotypes, some of them identified as belonging to the species caught in nets (*M. keaysi, M. nigricans, M. oxyotus, M. spp., L. blossevillii*). Others most likely belong to molossids, and based on the characteristics of their ultrasound pulses and intervals, their closest species seem to be *Eumops glaucinus, E. nanus, Nyctinomops laticaudatus, Tadarida brasiliensis* and *Molossus rufus*.

SPECIES COMPOSITION AND HABITAT PREFERENCES OF BATS IN A DECIDUOUS FOREST COMPLEX ADJACENT TO A LARGE CITY CONURBATION [O]

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Structure of bat assemblages and their habitat use in forests are known to be shaped by spatial structure of tree stands. In managed forests that structure is strongly affected by logging and associated management practices, creating new foraging sites and commuting roads for bat species that prefer low clutter but also reducing availability of natural roosts (old hollow trees). Thus, forest management is regarded as the main source of anthropogenic impact on the structure of assemblages of woodland bats. However, much less attention is paid to the effects of urbanization of areas directly adjacent to the forest areas, although some bat species – even of those foraging in woodland – appear to benefit from increases in availability of anthropogenic roosts (buildings). The study was conducted in Oliwa Forests, an intact complex of mostly beech-pine woodland, bordering a Tricity (Gdańsk, Sopot and Gdynia), a conurbation of northern Poland. Bat echolocation calls were recorded on linear walked transects, using two detectors (Pettersson D-230 working in frequency division and Pettersson D-240X working in time-expansion) and audio digital recorder. In total 10 bat species were recorded. Although the forest provides abundant natural roosts for tree-dwelling bats (numerous stands of age about 100-150 years), in June-July, i.e. during lactation, the assemblage was dominated by the strongly synanthropic, house-dwelling *Eptesicus serotinus* that appears to originate from urbanized area and penetrates the forest, using the extensive network of roads. During autumn migration and mating, however, the assemblage was dominated by the much more eurytopic *Pipistrellus pipistrellus*. Typical tree-dwellers (*Nyctalus leisleri*, *N. noctula*, *Pipistrellus nathusii*, *Myotis nattereri*) constituted only 24.5% of all passes (call sequences). During the lactation period, bats preferred riparian forests, clearings and small peat bogs, while avoiding dry mixed and deciduous woodlands. During autumn migration and mating all habitats were used in proportion to their availability. Particular species differed in habitat preferences. *E. serotinus* selected clearings and avoided deciduous forests. *P. pipistrellus* selected riparian forests and meadows, while avoiding all dry woodlands and peat bogs. *Myotis spp.* and *Pipistrellus pygmaeus* selected only peat bogs and avoided dry woodlands. *Nyctalus spp.* preferred clearings, forest edges and riparian forests, while avoiding dry mixed forests and peat bogs.

INFLUENCE OF METHODS IN DETECTING CONVERGENT EVOLUTION ACROSS MULTIPLE GENES IN ECHOLOCATING BATS AND CETACEANS [O]

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Several recent studies have identified numerous loci that show patterns of molecular evolution consistent with convergent sequence evolution between echolocating mammals; in this case represented by species from the two lineages of laryngeal echolocating bats and the toothed whales. Here we present initial results of an in-depth study analyzing many of the loci showing the highest levels of convergent evolution in a wider taxonomic sample of echolocating species. We focused on ~220 genes previously shown to have the strongest support for bat–bat and bat–cetacean convergence. These include a number of genes relating to hearing and thus, potentially may be involved in the specialized high-frequency hearing of echolocating mammals. Orthologous sequences were extracted from bat and cetacean RNAseq datasets using a blast approach, and these nucleotide sequences were then combined with published genomic data and aligned. In total, taxonomic coverage included 38 bat and four cetacean species. Two methods were used to quantify convergent sequence evolution between our sample taxa: first a method based on comparing site-wise support along alignments for alternative phylogenetic tree topologies, and second, a method that estimates the probability of convergent substitution based on inferences of ancestral amino acids. Gene trees were constructed to visualize overall phylogenetic signal, and we modeled selection pressures acting on echolocating taxa compared to non-echolocating species. Additionally, we sought to correlate the presence of any positive selection and convergent evolution in the echolocating taxa. We found that detected levels of convergence differed across both loci and the method used. Differences between our results and those previously published are likely to be caused by differences in either taxonomic or alignment coverage. We explore the possibility that some structural/functional domains may predispose a locus to exhibiting higher levels of convergent amino acid substitutions and conclude by discussing the impact of our findings in relation to the evolutionary history and acquisition of echolocation in bats.

DARK LANDSCAPES FOR BATS: IS IT TIME TO SWITCH OFF THE LIGHTS? [O*]

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Artificial night lighting is increasing globally. While localised effects on some species have been reported, such as bats, turtles and moths, relatively little is known about the cumulative impact of lighting over broad spatial scales. We investigated these effects by exploring the relationship between the size and location of bat roosts and the spatial arrangement and intensity of light at a landscape scale.

We used a recently developed technique to extract levels of night-time light from satellite imagery. Using data from the Bat Conservation Trust's National Bat Monitoring Programme (NBMP) we assessed light pollution levels within home ranges and sustenance zones for seven species: *Rhinolophus hipposideros*, *R. ferrumequinum*, *Myotis nattereri*, *Plecotus auritus*, *Pipistrellus pipistrellus*, *P. pygmaeus* and *Eptesicus serotinus*. The roosts of species generally considered as light-shy were not only locally dark, but surrounded by a landscape that was significantly darker than that surrounding roosts of species considered as light-tolerant. Light-avoiding species included *R. hipposideros*, *R. ferrumequinum*, *P. auritus* and *M. nattereri*. Light-tolerant species were *P. pipistrellus, P. pygmaeus* and *E. serotinus.* For all species, there were negative correlations between roost size and light pollution levels.

Having established the importance of light in the wider landscape to bat colonies, we explored the potential benefits of altering the duration of night-time lighting. Using data collected from roost sustenance zones of 8 *R. ferrumequinum* roosts (256 sampling points and 1,280 nights of data), we compared hourly activity levels of *R. ferrumequinum* with that of the light-tolerant *P. pipistrellus*. For both species, the level of activity decreased as number of hours after sunset increased. Therefore the maximum benefit to bats is likely to be gained by switching off street lighting in the early evening. Current proposals for part night-time lighting schemes will largely miss this window.

TRACKING THE ONSET OF SPRING MIGRATION DOES NOT SHOW THE EXPECTED SEX DIFFERENCES IN A LONG-DISTANCE MIGRATING BAT [O]

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Long-distance migration is a rare phenomenon in European bats. Genetic analyses and banding studies have shown that females cover distances of up to more than 1,000 km, whereas males are sedentary or migrate only short distances. The onset of this sex-biased migration occurs shortly after waking up from hibernation and when the females are already pregnant. We therefore predicted that the sexes are exposed to different energetic pressures in early spring, and this should be reflected in their behaviour and physiology. We investigated this in one of the three European long-distance migrants, the Noctule Bat, *Nyctalus noctula*, in southern Germany. In contrast to our predictions we found no difference between male and female home range size, habitat use, frequency and duration of activity bouts, or diet. Females emerged from hibernation with a better body condition and maintained this "head start", but the rate of mass increase was the same in males and females. We followed the first migration steps of radio-tagged individuals from an airplane, and found that all females, as well as some of the males, migrated away from the wintering area in the same northeasterly direction. Sex differences in long-distance migratory behaviour were confirmed through stable isotope analysis of fur, which showed greater variation in females than in males. Probably, as both sexes are confronted with the same conditions after hibernation, they are doing the best they can and different energetic pressures are not reflected in the behaviour. Interesting results that warrant further investigation are the better initial condition of the females and the highly consistent direction of the first migratory step in this population, as summering habitats of the Noctule Bat occur over a broad range in northern Europe. Only research focused on individual strategies will allow us to fully understand the migratory behaviour of European bats.

ROADSIDE SURVEYS AND GOOGLE STREET VIEW REVEAL DIFFERENCES IN *PIPISTRELLUS PIPISTRELLUS* AND *PIPISTRELLUS PYGMAEUS* HABITAT USE [O*]

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Using data from the All-Ireland Car-Based Bat Monitoring Scheme we examined the habitat requirements of *Pipistrellus pipistrellus* and *P. pygmaeus* in Ireland. This monitoring scheme involves volunteers driving known survey routes along roads while simultaneously recording time expanded ultrasound to Android smart phones. It is administered by Bat Conservation Ireland.

Using geo-referenced bat call data gathered in July and August 2012, we carried out a fine-scale comparative study of roadside habitat use by the two species. In 2012, 15 x 1.6 km transects were driven using Android phones within 15 x 30 km grid squares (225 independent survey transects). Locations of echolocation calls from each species were randomly selected from this survey dataset. Buffer zones were created around each bat call location. Linear habitats were analysed within each buffer zone and distances were measured from each call location to the nearest important habitat features. A combination of aerial photography, Google Earth™, Google Street-view™ and CORINE datasets were used to determine habitat features and distances. Google Street-view™ was a particularly valuable tool in identifying and categorising features within each buffer.

P. pygmaeus was more likely to be present in areas with tall, more structurally complex features, for example tree canopies or unmanaged hedgerows. *P. pipistrellus,* although favouring the same broad habitat, occurred more often where there was less canopy cover, more agricultural land, managed hedgerows and low features like exotic garden foliage and fences. *P. pygmaeus* was found to have more specialist habitat preferences and significantly stronger associations with broadleaf woodland, riparian zones and lakes. Explanations for differences will be discussed. This study will help inform countryside management practices in Ireland for the benefit of both species.

CONNECTING POPULATIONS OF GREATER HORSESHOE BATS, *RHINOLOPHUS FERRUMEQUINUM*, AT THE NORTHERN BORDER OF THEIR DISTRIBUTION – A MODELLING APPROACH [P]

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The Greater Horseshoe Bat, *Rhinolophus ferrumequinum*, has undergone a serious population decline in Central Europe caused by habitat deterioration and habitat loss resulting in a decrease of carrying capacity and fragmentation. We examined the spatial ecology, habitat use and key landscape features in a vital maternity colony of *R. ferrumequinum* in the northern part of their current European distribution in Luxembourg. In total, 3,559 fixes from 26 radio-tracked individuals were calculated. Results from radio-tracking were used to establish conservation measures in the landscape around the maternity roost. The tracked individuals showed commuting flights along hedgerows, streams and small forest patches. *R. ferrumequinum* preferred semi-open, but richly structured traditional farmland habitats such as orchards, pastures and parkland habitats. The landscape configuration around the buffered radio fixes was characterised by higher habitat diversity than in the surrounding region.

In an ongoing process we calculated the habitat connectivity to influence the spatial distribution within the home-range of the maternity colony and also in the direction of the nearest populations, in northern France. For this we applied a cost-distance analysis to identify habitat connectivity at different landscape levels. This modelling approach identifies both cost paths between recent colonies (e.g. between Luxembourg and northern France) also as cost paths to landscapes with historic populations (e.g. in western parts of Germany).

Our results indicate conservation efforts on areas where the potential for habitat connectivity and landscape texture together should be taken into account to preserve endangered bat species along with other local biodiversity.

BECHSTEIN`S BATS, *MYOTIS BECHSTEINII,* IN AN URBAN LANDSCAPE: RELICT OR EXPLORER? [O]

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Bechstein´s Bat is a characteristic species of European mixed deciduous forests. This bat species is a fundamental part of old-growth deciduous forest ecosystems characterized by mature trees, high amount of tree cavities, tree diversity, habitat tradition and low fragmentation rate by humans. Recently the distribution range of Bechstein´s Bats is characterised by a pattern of insular occurrence. The main factor explaining this insular pattern, however, is the historical reduction of old grown deciduous forested areas by man, the changing forest structure and forestry management aspects of forests nowadays.

It was, therefore, surprising to find two maternity colonies of Bechstein`s Bat in two small forests at the border of the city of Frankfurt/Main in central Germany. Both forests are fragments of the large ancient historic oak and beech tree forests well known from the 8th century AD, at the edge of the town and bordered by highways, railways and urban settlement. We radio-tracked 14 reproductive females from both colonies to identify day-roosts, feeding grounds and flight-paths in this fragmentated habitat. Simultaneous cross-bearings resulted in a total of 1,866 fixes (range 70 – 212 per individual). Radio-tracking illustrates the strong connection of Bechstein's Bats with the old oak forests, both for roosting and for hunting. Bats also used tree lines between the buildings to cross streets and reach feeding grounds in parks, garden plots and riversides. Spatial organization of home-ranges and individual core feeding areas reflects the social organization with two different maternity colonies living in close proximity but with only a small overlap in habitat use.

Results confirm the value of old growth forests for the tree-dwelling Bechstein`s Bat, not only in large woodlands, but also in urban landscapes. We confirmed that both colonies in Frankfurt/Main live in a fragile situation, with limited resources and decreasing habitat capacity caused by human aggregation, forestry practice cutting old oak trees, and ongoing fragmentation.

BECHSTEIN`S BAT, *MYOTIS BECHSTEINII,* – A FLAGSHIP SPECIES FOR FOREST CONSERVATION [P]

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The most characteristic bat species that lives in western Palaearctic forests is perhaps the tree-dwelling insectivorous Bechstein's Bat, *Myotis bechsteinii*. Both morphologically and bioacoustically, Bechstein´s Bat is ideally adapted to using resources in wooded areas. We radio-tracked 93 different reproductive females from 13 nursery colonies in different landscapes distributed in Germany and the Grand Duché of Luxembourg to identify key habitat requirements and habitat types preferred by Bechstein`s Bats. We located 270 nursery-trees and determined that Bechstein`s Bats clearly preferred woodpecker-made cavities. Roosting group sizes were highest in woodpecker-made cavities and they give the possibility of social thermoregulation that might also influence daily energy expenditure.

We mostly found Bechstein`s Bats in temperate old oak-hornbeam woodlands and beech forests with high amounts of tree cavities. Further favourable habitats are traditional orchards and semi-open parklands with old solitary broadleafed trees. Reproductive females fly within a short range of their occupied trees; most of the feeding grounds are closed associated to the day-roosts - within distances of less than 1 km. Females use their small individual foraging ranges repeatedly and they segregate their foraging ranges in order to increase foraging efficiency. Individual home-ranges ranged from 4.8 – 274.7 ha and they included core feeding areas covering 2.1 ha (SD: 0.7; min-max: 0.3 – 9.1 ha).

The strong segregation of individual core feeding areas, even during lactation, is remarkable and leads to the assumption that an exclusive core feeding area implies advantages in terms of foraging efficiency. Neighbouring colonies also preferably foraged close to their colony roosting range, but still showed almost no overlap with foraging ranges from other colonies.

The actual use of habitat types at all scales strongly differed from the availability in the study areas, which indicates that female Bechstein's Bats required a specific habitat niche. Bechstein`s Bats are considered to be largely dependent on old growth mature natural forests. The species is considered highly threatened by the IUCN and in "need of strict protection" by the European Commission. For the conservation of maternity colonies, it is vitally important to identify roosting sites that are well connected to foraging habitats providing high quality prey and an exclusive usage of core areas for all colony members.

THE GREATER NOCTULE BAT, *NYCTALUS LASIOPTERUS*, IN FRANCE: DISTRIBUTION, ECOLOGY AND CONSERVATION ISSUES [P]

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The first hint of possible breeding of the Greater Noctule Bat, *Nyctalus lasiopterus*, in France was in July 2006 when a dead lactating female was found on the Atlantic coast (Landes department). Since then, development of ultrasonic surveys for environmental impact assessments and mortality monitoring at wind farms increased the number of contacts with the species all over southern France. However it was not until the end of June 2012 that the first roosts were discovered, of breeding females in the Lévézou (Aveyron department, Midi-Pyrénées) and another colony (sex unknown) about 180 km to the north, in the Puy-de-Dôme department (Auvergne region). Both areas are part of the same geographical region, the Massif Central.

We used different techniques for our studies: bat detector surveys, mist-netting and telemetry, with bat detectors at dawn to follow by car and foot a flying individual to its day roost, as well as afternoon listening for social calls in woods to locate roosts.

Up to now the presence of 61 Greater Noctules Bats has been assessed in the Lévézou district and other colonies are likely. In the Puy-de-Dôme, 29 individuals were counted leaving the roost, but several groups seem to cohabit in the same forest where more than 70 potential roosts are available.

During the 2012-2013 study 32 Greater Noctule Bats were mist-netted in the Lévézou and nine females were radio-tracked. In the Puy-de-Dôme one non-breeding female was briefly followed by telemetry in 2013. We present here the first results of this dual study: the arrival of the species in spring (data from 2014), the parturition period that apparently starts at the end of May or beginning of June, the type of habitats and roosts, the results of the study on summer diet by comparing prey DNA from the faeces with GenBank database, and some behavioural notes.

Finally we also present new prospects for the study of the Greater Noctule Bat and its conservation.

DIFFERENT BAT GUILDS PERCEIVE THEIR HABITAT IN DIFFERENT WAYS: A MULTISCALE LANDSCAPE APPROACH FOR VARIABLE SELECTION IN SPECIES DISTRIBUTION MODELLING [O*]

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Revealing the scale at which organisms perceive their habitat is crucial to better understand how anthropogenic environmental changes influence them. To address this issue for bats we implemented a multiscale landscape approach to variable selection considering three spatial scales: 1, 5 and 10 km to develop presence-only Species Distribution Models for four species representative of different guilds, *Nyctalus leisleri*, *Rhinolophus hipposideros*, *Myotis emarginatus* and *Pipistrellus pipistrellus*. The analysis was set in a district of central Italy (Tuscany). Variables were derived from topographical and habitat maps with a 100 m resolution: Digital Terrain Model (DTM), hydrographic map and Corine Land Cover 2006 (CLC). From CLC we computed 13 landscape indices using Fragstats 4.1, 8 calculated at class level (for each category of CLC) and 5 at landscape level, considering three moving windows set at the three spatial scale: 1, 5, and 10 km. To include the three spatial scales in the analysis of DTM and hydrography we calculated for each layer a focal statistics using Arcmap10. Overall we obtained 380 variables. As presence occurrences, we used all the records obtained for the region in the last 15 years: 56 locations for *N. leisleri*, 169 for *R. hipposideros*, 89 for *M. emarginatus* and 189 for *P. pipistrellus*. To identify the most appropriate scale, for each variable we developed univariate models using BIOMOD and selected the ones whose Area Under the receiver operating Curve (AUC) was ≥ 0.85. The variables that passed this threshold were further selected by applying a procedure to exclude those whose correlation coefficient was ≥ 0.5. The multivariate models were robust as AUC for all species was ≥ 0.9 and True Skill Statistics (TSS) > 0.7. The variables selected are all related to landscape indices underlining the importance of landscape structure for species distribution. *P. pipistrellus* selected variables only at a 10 km scale, *N. leisleri* and *M. emarginatus* selected two scales, 5 km and 10 km, whereas *R. hipposideros* also selected variables at 1 km. These findings make it possible to tailor Species Distribution Models (SDMs) according to species-specific landscape requirements rendering our approach a significant step towards a more effective planning of land management for bat conservation.

PHYLOGEOGRAPHY OF WHISKERED BATS [P*]

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Whiskered bats are genetically and morphologically highly variable. Currently some divergent genetic lineages can be distinguished only by molecular markers. For example, the mitochondrial gene ND1 allows reliable separation of four genetic lineages. This includes the species identification of the well accepted species *M. mystacinus, M. alcathoe* and *M. brandtii* and a fourth lineage assigned to *Myotis aurascens*. However, other taxa, for example *bulgaricus*, still have not been resolved and their traditional taxonomic status is highly questionable.

We performed a phylogenetic analysis based on a 450 bp of the mitochondrial ND1 from 274 individuals of whiskered bats, covering 13 countries extending from the Caucasus through the Balkans to central Europe. In order to have a better assessment of the intraspecific divergence we included all whiskered bat samples available in Genbank, where, of 183 sequences, 55 originate from our previous research. Thereby the study territory is increased, with sequences from east to central Asia, Middle East and Iberian Peninsula. We used Hapstar 0.5 for haplotype visialization, Arlequin 3.5 to performed Analyses of Molecular Variance, and DNAsp 5.10 to compute neutrality tests and parameters of sequence polymorphism.

The minimum Spanning Networks indicate three main geographic groups: Caucasus, Balkan and Central Europe for *M. alcathoe*, *M. brandtii, M. mystacinus* and *Myotis aurascens.* Signal of population growth was detected in *M. brandtii* and *M. mystacinus* populations (high expansion coefficient values and negatives values of neutrality tests). In contrast, low expansion coefficient and not significant positive Fs values were detected in *M. alcathoe* and *M. aurascens* populations, which indicates relative constant population size. Pairwise F_{ST}-values showed high genetic distance from 0.1 to 0.9. Greatest pairwise F_{ST}-values were calculated between Caucasus and Central Europe, being moderate between Balkans and the other two regions.

Looking at the distribution areas of *M. mystacinus* and *M. aurascens* and results of neutrality tests and haplotypes of Minimum Spanning Networks, the ND1-sequences of the *M. aurascens*-type corresponds to the form *bulgaricus*, traditionally assigned as a subspecies of the whiskered bat: *Myotis mystacinus bulgaricus*.

Ongoing research on nuclear markers and microsatellites will hopefully help to resolve the phylogeography of the cryptic whiskered bats in the future.

TELOMERES AS ADAPTATIONS FOR LONGEVITY IN THE LONG LIVED BAT SPECIES, *MYOTIS MYOTIS* [O*]

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Among Mammals there exists a wide diversity of animals with differing longevity potentials. In general, small bodied mammals with a high metabolic rate are short lived and large bodied mammals are long lived. Bats are an exception to this rule – the oldest bat ever captured was a 41yr old *Myotis brandtii* weighing just 7 g. Telomeres are TTAGGG repeats which form protective caps at the end of chromosomes which shorten as organisms age. This study aims to modify a qPCR assay to measure telomere length in humans for use in bats, and to determine if telomere shortening occurs in a wild population of the exceptionally long lived vespertilionid species *Myotis myotis*. Bats were captured (n ~ 450) with modified Harp Traps from 4 roosts in Brittany, France. DNA was extracted from wing biopsies using the Promega Wizard SV Extraction kit. Bats were sorted into age cohorts and samples (n = 45) were assayed in triplicate using a modified qPCR assay. The ratio of the average telomere Ct to SCG Ct (T/S) was calculated. We show that telomeres in the long lived species *Myotis myotis* do not shorten as they age. This finding is supported by previous studies which have shown evidence for positive selection in telomere maintenance genes in bats. Further study is necessary to understand how telomere length is maintained in this long lived bat species, *Myotis myotis*.

HOW TO PLAN AN EFFECTIVE AND ECONOMIC ACOUSTIC INVENTORY OF BATS IN TEMPERATE FORESTS [O*]

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Efforts to assess and track changes in species composition in a context of habitat modification or climate change are subject to the trade-off between the effort invested and the gaining of information.

Known to be efficient and cost-effective, passive acoustic methods rapidly became a popular choice of ecologists to study faunistic biodiversity. However, the accuracy of the data collected is species and habitat specific. In particular, this applies to bats that show distinct activity patterns in three-dimensionally structured habitats such as forests.

We assessed the completeness and effectiveness of 21 acoustic sampling schemes corresponding to the combinations between three temporal sampling patterns and seven spatial sampling designs. We performed an acoustic sampling in 32 forest plots, each containing three micro-habitats - forest interior, canopy and forest gap - which represented the three dimensional characteristics of forests. We compared bat species richness and sampling effort with species accumulation curves fitted with the clench equation. Furthermore, we estimated the costs incurred by our best sampling schemes.

We recorded a total of 145,433 echolocation call sequences of 16 bat species during the field sessions. Results showed that sampling in both vertical and horizontal stratification of the forest synchronously during full nights proved to be the best option to faithfully predict total bat species richness. When the number of available detectors is limited, the second best choice was to sample only the forest gaps and forest interior simultaneously. The extension of these sampling schemes at two to three different forest locations resulted in the best cost-benefit ratio when assessing bat species richness on a larger scale.

Our study highlights that multiple passive acoustic sampling schemes should be performed with reference to cost-benefit ratios when planning an accurate and feasible inventory. Establishing the best sampling scheme is a crucial step for optimising species inventories, and particularly for rare species or species with low detection probabilities.

BATS IN FRAGMENTED WOODLANDS: IMPLICATIONS FOR THE DEVELOPMENT OF ECOLOGICAL NETWORKS [O]

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Habitat loss and fragmentation are amongst the greatest threats to biological diversity. Current actions to reconnect fragmented landscapes include creating new habitat patches and restoring, expanding and connecting existing patches to develop functional 'ecological networks' (a suite of core habitat areas connected by buffer zones, corridors and smaller 'stepping stones' that allow species or their propagules to move between them). However, limited empirical evidence on the relative merit of the different elements of ecological networks has resulted in much uncertainty on how to prioritise alternative actions for their development (e.g. increasing habitat area vs. connectivity). In the United Kingdom, a long history of woodland fragmentation and creation (e.g. through woodland planting schemes) makes this the ideal habitat to represent – and evaluate the relative merit of – the components of ecological networks. Woodland is also one of the most important habitats for bats because it offers roosting and feeding opportunities for many species. During the summer of 2013 we conducted acoustic surveys in 31 woodland patches of different character (e.g. size and degree of connectivity) to study how Pipistrelle Bats were influenced by local- and landscape-level woodland characteristics. Preliminary analyses indicate that *P. pygmaeus* was most strongly influenced (positively) by the amount of woodland in the surrounding landscape (within 3 km), but also by local woodland characteristics such as age and amount of understorey cover, with higher activity in older woodlands and in woodlands with relatively little understorey. Similarly, *P. pipistrellus* was influenced by the amount of understorey cover in woodland patches and by woodland age; patch size had a marginally significant (positive) effect on this species' activity levels. Our findings suggest that local woodland management (e.g. controlling understorey growth) as well as landscape-level actions (e.g. increasing woodland cover at large spatial scales) are important to develop ecological networks for Pipistrelle Bats. Our findings also suggest that mature woodlands should be protected and that newly planted woodlands are unlikely to be used to a similar extent by Pipistrelle Bats for several decades. These findings provide urgently needed scientific evidence to underpin actions to develop ecological networks for highly mobile species such as bats.

PHYLOGEOGRAPHY AND THE TAXONOMIC POSITION OF *MYOTIS MYOTIS* AND *MYOTIS BLYTHII* IN THE WESTERN PALAEARCTIC (CHIROPTERA, VESPERTILIONIDAE) [O]

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We analyzed a fragment of the mitochondrial hyper variable control region and eight microsatellite loci of 224 large mouse-eared bats. The bats were sampled from 79 sites distributed across their Western Palaearctic range. The morphologically identified *M. myotis* and *M. blythii sensu lato* share mitochondrial lineages, and show no species segregation. Conversely, multilocus genotypes are highly consistent with morphological species assignment, confirming the distinct biological species status of *M. myotis* and *M. blythii s.l*. We propose that the observed cytonuclear discordance resulted from an initial allopatric divergence and a succession of asymmetric mitochondrial introgressions during the eastwards expansion of *M. myotis* and the westwards expansion of *M. blythii*. We did not find any genetic discontinuities that might correspond to the recognized subspecies of *M. myotis* (*myotis* and *macrocephalicus*) or to the subspecies of *M. blythii* (*oxygnathus, omari, risorius,* and *lesviacus*). Accordingly, we suggest that they represent local morphological variants with little taxonomic relevance. On the other hand, we report the unexpected subdivision within *M. myotis* into eastern and western components, with an overlap zone in the Balkans.

MODELLING SURVIVAL FROM FIELDWORK DATA: A CASE STUDY ON THE SOCIAL BAT *MOLUSSUS MOLUSSUS* [O*]

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In the large order of bats we find a broad range of social systems along with ecological and morphological gradients over different habitats. Sociality in bats is thought to have evolved under different selective pressures, one major driver being social thermoregulation. However, this does not explain the high occurrence of social groups in tropical species. One reason for sociality is increased foraging efficiency through information transfer about ephemeral food sources.

The socio-ecology of a species greatly influences the net effects of the many costs and benefits of sociality in relation to group size. Based on modelling approaches, we predicted that an ideal, but fairly small group size, should be most strongly linked with survival in a socially foraging bat. To test this, we conducted a capture-recapture study on *Molussus molussus,* a narrow-winged open-aerial neotropical insectivore, known to forage in groups. Between 2012 and 2014, we captured and marked individuals from groups of varying size. As the species has a harem mating system, with only a few adukt males present with a limited tenure, we focused on the adult females that are extremely faithful tot their roosts

We used Multi-State Mark recapture methods to model survival as well as transitions between colonies of different size, while accounting for imperfect detection. Model parameters included group size and capture period. We created group categories using quantiles on group size distribution (1 to 22 adults) and found a strong effect of group size on the performance of the different models. We discuss the results of survival analyses in the light of the costs and benefits linked to group size, such as improved foraging efficiency and completion or maintenance of group cohesion on the wing.

Our study is the first one to show a direct link between survival and group size in a free-ranging bat, emphasizing the importance of investigating alternative of additional explanations in order to understand the evolution of sociality.

MI CASA ES TU CASA – HABITAT USE BY BATS IN ARGENTINIAN TOWNS: A PRELIMINARY ASSESSMENT [P*]

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Urban environment can represent an important source of information about ecological strategies in bats. As with the human population, bats will depend more and more on this particular ecosystem. The urban environment can provide hunting grounds, as well as refuges, in a variable availability to many different species of bats due to the complexity of this kind of territory. A first attempt to correlate urban landscape variables and habitat use by bats was performed in Argentinians towns by correlation with bioacoustical investigation.

Recordings of 10 minute duration were performed using a Pettersson D-240X bat detector in time expansion mode connected to an iRiver digital recorder. All the sequences were analyzed in order to count bat passes and to separate species. Due to lack of appropriate information about sound recognition in the Argentinian fauna, the species were designated as taxon A, B, etc. on the basis of frequencies of maximum power, starting and end frequencies and interpulse interval. Four different locations related to the presence of parks, water and lights have been selected in three towns: Buenos Aires (population 3,000,000, on the coast, area 60 x 30 km), La Plata (population 750,000, on the coast, area 25 x 20 km) and Chascomús (population 42,000, close to a lake and agriculture landscape, area 4 x 3 km).

On the 14 species recorded from the Buenos Aires area, 6 were found in the recordings. The three towns have similar faunistic composition but one species was found only in La Plata, which also lacks one other present in the other two localities. Each recording site has from 1 to 4 species flying, with a huge difference in the passes/minute rate. La Plata show a mean of 0.55 passes per minute with a st.dev. (Standard Deviation) of 0.2138, Buenos Aires park 0.8 p/m with a st.dev. of 0.8299, and Chascomus 1.62 p/m with a st.dev. of 1.08. Using Kolmogorov-Smirnov test for $p < 0,05$ only Chascomus is significantly different.

The large parks, with open water and old trees, in the middle of a huge town seems to encourage a higher diversity and activity compared with a small village surrounded by agriculture. The role of bioindicators of the bat community can be confirmed and used to suggest better management of the urban environment.

BAT WINTER ACTIVITY IN AN ABANDONED MINE, WESTERN SWITZERLAND [P]

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The winter activity of hibernating bats is poorly described in the literature and although it is well known that all hibernators arouse periodically, individuals are often considered as inactive for very long periods. One hypothesis to explain arousals is opportunities for foraging during winter, and should thus be correlated with changes in temperature in or around the hibernation site. Nowadays, modern recording devices allow us to quantitatively follow bat activity in or near hibernacula in a semi-automatic way, thus minimizing the disturbance to hibernating bats. In this study, over two years we monitored bat winter activity in an abandoned mine in Baulmes, western Switzerland. Sixteen species of bat visit the site through the year, a couple of them using it as a hibernaculum, the most important one being a population of several thousand specimens of Pipistrelle Bat, *Pipistrellus pipistrellus*. Other, rare species sometimes winter in the mine, although mostly isolated or in small groups. We used three batcorders (EcoObs, Germany) set at different distances into the mines, and recorded bat activity between October and April. Recordings were identified to species or species group level. Activity was monitored, as well as temperature at the different stations. We investigated the influence on bat activity of temperature, date and time period during the night for the different bat species. Our results show a relatively high activity of some species and suggest that it strongly depends on temperature. We discussed these results in the context of environmental requirements of hibernating bats and the potential risks to overwinter survival.

HETEROGENEITY OF *EPTESICUS SEROTINUS* IN (EASTERN) EUROPE [P]

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Until recently, all populations of *Eptesicus serotinus* from western Europe to the Volga River have been referred to one subspecies – *E. s. serotinus*. During recent years several papers were published on the phylogeny of serotine bats in the Old World (e. g. Juste et al. 2013; Çoraman et al., 2013). It was shown that *E. serotinus* in Europe is not as monomorphic as was supposed before. However, differentiation and status of some geographic "forms" are still not clear.

This work deals with the description of taxonomic heterogeneity of (East)-European *Eptesicus serotinus* based on analysis of nuclear DNA. Skin samples of 258 individuals of *E. serotinus* throughout Europe were collected (from Ukraine, the Netherlands, Poland, Russia (European part), Germany, Lithuania, Moldova, Bulgaria, Austria, and Belarus). The 18S-ITS1-5.8S region was analysed using the BAT-16S-for1 and BAT-16S-rev1 primer set. Among the analysed samples two distinct clades were revealed: an "eastern form" (79 individuals) and a "western form" (179 ind.). The "western form" obviously corresponds to *E. s. serotinus* and includes samples from western Europe to central Ukraine. The "eastern form" includes samples from eastern Europe (Ukraine, Moldova and western Russia). Samples of *E. lobatus* (Zagorodniuk, 2009) and *E. s. turcomanus* from the Lower Volga Region fall into the clade of the "eastern form". In general, the "eastern form" was recorded in the northern Caucasus and Lower Volga Region, southern and eastern parts of Ukraine and Moldova. For today, the western border of this form's range may be drawn by the line Kiev–Chişinău. All analysed samples to the west of this line belong to the "western form". The zone of overlapping ranges of the forms covers NE and SW regions of Ukraine and Moldova. Both forms may be considered as evolutionarily young and very closely-related taxa. Their contact zone is quite similar to contact zones between other closely-related taxa of East-European mammals. The appearance of such a zone can be explained by recent opposite invasion of both western and eastern forms into the ranges of each other.

BAT ACTIVITY IN FORESTS IN THE BESKID MOUNTAINS (THE CARPATHIANS, POLAND) [P]

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The species structure and habitat preferences of bats foraging in forests are still not well known. In the years 2012-2015 the University of Life Sciences in Poznań is carrying out a research project which aims at identifying bats' activity in forests depending on age, spatial structure and species composition of stands. One of the goals of the project is to investigate bat activity at two levels of the forest (3 m above the ground and canopy level).

Data on bat activity was collected by means of 8 automatic recorders Batcorder 3.0 (ecoObs, Germany) in fixed monitoring sites of the European forests monitoring network (ICP Forests). Registration of bats' calls was carried out in the period June-July 2013 in 57 monitoring sites in fir forests in the Beskid Mountains (the Beskid Wyspowy, the Beskid Sądecki and the Beskid Niski) which are in the northern part of the Carpathians. At each site 2 batcorders were installed on a tree at two heights: 3 m above the ground and at the tree top (averagely 24,5 m). In every site bats activity was recorded for 2 consecutive nights.

The sample collected for 2 nights from 57 trees at 2 levels (228 samples) provided 3,790 calls of bats. 3,545 calls were assigned to bat species or taxonomic group. At least 15 bat species were recognized: *Rhinolophus hipposideros*, *Myotis myotis*, *M. bechsteinii, M. nattereri*, *M. alcathoe*, *M. daubentonii*, *M. dasycneme*, *Pipistrellus nathusii*, *P. pipistrellus*, *P. pygmaeus*, *Nyctalus noctula*, *Eptesicus nilssonii*, *E. serotinus*, *Vespertilio murinus* and *Barbastella barbastellus*. Among the recorded bats the most frequent were: *Myotis* – 35.0%, *Nyctalus/Eptesicus/Vespertilio* – 28.7%, *E. nilssonii* – 8.4%, *N. noctula* – 7.7%, *P. pipistrellus* – 6.2%, and other *Pipistellus* species – 4.2%.

Bats were recorded in tree canopy twice as frequently (2,539 calls) as close to the ground (1,251 calls). At canopy level nyctaloid (42.3%), *E. nilssonii* (12.5%) and *N. noctula* (10.8%) dominated whereas *Myotis* prevailed near the ground (75.0%). The share of the group pipistrelloid amounted to 10.3%.

AN INVESTIGATION OF THE PHYLOGEOGRAPHY AND THE EVOLUTIONARY HISTORY OF *MINIOPTERUS SCHREIBERSII* (MAMMALIA: CHIROPTERA) USING NUCLEAR MICROSATELLITES [P*]

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Miniopterus schreibersii is a cave-dwelling species, which is well suited for phylogeographic investigations at a large geographic scale, because of its subcosmopolitan distribution and it consisting of lower taxa, many of which have been elevated to species level recently. In this study, 496 samples that were collected from the entire range of *M. schreibersii* were analyzed using nuclear microsatellite markers to investigate the taxonomy, evolutionary history and conservation of the species. In this way, the phylogeography of the species was examined in detail, across its whole global distribution area, in order to expand the existing knowledge of its phylogeographic history significantly and to provide the necessary validation of the studies that only made use of the mitochondrial markers. The examination of these nuclear loci confirmed the findings of previous studies and provided a more complete picture of the species' genetic distribution. Significant differentiations of the nuclear DNA were detected between 10 regions, North Africa, Lebanon, Cyprus, Anatolia, Russia, Thrace-Balkans, Slovakia, Italy, France, and Iberia, where the sample populations were located. This study also confirms the pattern of local differentiation previously detected in mitochondrial DNA.

THERMAL CONDITIONS IN BUNKERS USED BY HIBERNATING BATS [O]

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Bunkers and small cellars often receive less attention than large hibernation sites, but they can be important for hibernating bats in an anthropogenic landscape. Moreover, small hibernation sites are often purpose-built in the context of nature conservation or mitigation. A good understanding of climatic conditions and behaviour of these structures in relation to the preferences of bats is of high importance for the success of such measures.

In the forests to the north of Antwerp a lot of bunkers survive from World War I. Some of them have been closed to the public to function as hibernation sites for bats. We equipped a number of them with a set of 11 data loggers per bunker to register temperature and humidity. We chose bunkers that were closed as well as bunkers that were open, and bunkers with standing water on the floor and bunkers without. The aim was to compare the different types of bunkers, and to gain insight on gradients inside these small hibernation structures. Also, outside temperatures were logged to be able to assess the buffering capacity. Bats in the bunkers were counted every two weeks, and for each census precise location of the bats was noted.

Bunkers that were closed had a higher mean temperature, higher humidity and higher buffering capacity. Bunkers that were open, however, were still buffered compared to the outside. Bunkers that were closed always had 100% humidity, irrespective of the amount of water on the floor. This was not the case with open bunkers. Also the numbers of hibernating bats differed, as well as the bat community. *Myotis daubentonii* and *Myotis nattereri* were found mostly in bunkers that were closed, *Myotis mystacinus* and *Plecotus auritus* were found in bunkers that were open. Within the structures small temperature gradients could be detected, but there was no relationship between inside gradients and the location of hibernating bats.

We conclude that closing of the bunkers improved the conditions for hibernating bats. Within a set of small structures different conditions must be reached by using different gates for closing them, rather than relying on inside gradients.

HIBERNATING LESSER HORSESHOE BAT, *RHINOLOPHUS HIPPOSIDEROS*, STILL GROWING IN NUMBERS IN THE VETERNICA CAVE, CROATIA, AFTER WINTER RESTRICTIONS FOR VISITORS AND NEW GATING [P]

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The cave Veternica, near the capital Zagreb, has been open for tourists since the 1960s, but bat friendly management started to develop in 2003 as a result of co-operation between the Nature Park Medvednica and the Croatian Biospeleological Society. Restriction of tourist visits during bat hibernation was introduced in 2003 and a bat-friendly gate was built in 2006, with annual bat monitoring started in 2007. In the cave 18 bat species have been recorded until now. The cave is an important hibernation site for 8 bat species: *Myotis bythii*, *M. daubentonii*, *M. emarginatus*, *M. myotis*, *M. nattereri*, *Rhinolophus hipposideros*, *R. euryale* and *R. ferrumequinum* and an important summer roost for *R. euryale* and *Miniopterus schreibersii.* Winter monitoring is performed every year and includes two counts in January and February. The numbers of Lesser Horseshoe Bats in winter increased from 6 individuals in 1996 to 437 in 2013, and the trend shows significant exponential growth. This is probably related both to the restriction of touristic visits in the winter time and changes in cave gating from solid doors to horizontal bars. There are also reports from Czech Republic and Slovenia on growth in numbers of Lesser Horseshoe Bats with similar trends in some caves. Therefore we suspect that this increase in lesser horseshoe bat numbers may be a consequence of bat-friendly cave management and possibly reflect the bats' social learning.

MYOTIS DAUBENTONII AND *M. CAPACCINII* RECORDED ON KRK ISLAND, CROATIA [P]

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Krk Island is located in the northern Adriatic Sea and is fairly close to the Croatian mainland with which it is connected since 1980 by a 1,430 metre long bridge. During past research 11 bat species were recorded on the island of Krk: *Miniopterus schreibersii*, *Myotis blythii*, *M. capaccinii*, *M. emarginatus*, *Nyctalus noctula*, *Pipistrellus pipistrellus*, *P. kuhlii*, *Rhinolophus blasii*, *R. euryale*, *R. ferrumequinum* and *R. hipposideros*. In July 2012 a bat inventory of the Njivice lake area was conducted using mist netting, echolocation recording and roost search. The only mist netted species was a juvenile female *Myotis daubentonii* which has been recorded in the vicinity in the nearby area of the town of Rijeka on the Croatian mainland (data older than 50 years). *Myotis capaccinii* was recorded on the island of Krk for the first time in the autumn migration during 2007 in the area of the Vrbničko polje tunnels, and we also confirmed the species in July 2012. Lake Njivice is exceptionally rich in biodiversity. It is one of the 2 major water reservoirs on the island and is surrounded by a highly structured mosaic of habitats: dense stands of shrubs, woodland, wet and dry grassland and pastures. Various types of woodland habitat (oak, old willow forests, hornbeam) may support roosting demands of *M. daubentonii* whereas *M. capaccinii* depends on underground roosts. Two large freshwater bodies (Lake Njivice and Ponikve) approximately 10 km apart, support the hunting habitat of both species. The findings of *M. daubentonii* and *M. capaccinii* are around 10 km apart and there is still more research needed to confirm species overlap on the island. The island of Krk is the only island in Croatia with confirmed recording of *M. daubentonii*.

METHODS FOR THE MODELLING OF BAT POPULATION SIZES AND THE EVALUATION OF BAT ACTIVITY LEVELS USING ACOUSTIC RECORDINGS [P]

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One of the most popular methods to assess bat activity rates is the setting of high sampling-rate unattended recorders. After one or more nights, a certain number of bat contacts are recorded on a site. However, in order to estimate species' activity levels, it is necessary to compare data with standards. Actichiro is a methodology aiming to supply indexes and reference numbers for environmental assessment and monitoring. It is based on about one million recording files collected by Biotope between 2007 and 2011 on about 2,000 sampling sites in France, with Anabat (Titley) and SM2BAT (Wildlife Acoustics) recorders.

Between different recordings originating from different observers, biotic and abiotic bias occur, such as bat detectability according to their emitted frequencies, temperature, humidity, material quality, gain, ease in species identification, etc. In order to reduce those factors, two stable measurement units have been suggested: (i) the percentage of presence/site and (ii) the amount of positive minutes/night the species is present.

Activity is presented for 30 species and species-groups in the French Mediterranean. *Pipistrellus kuhlii*, *P. pipistrellus* and *P. pygmaeus* are the most frequently contacted species, recorded at about 80 % of the sampling sites and with a mean of 50 to 60 minutes of activity per night. The majority of the other species are contacted at less than 40% of the sites with less than 10 minutes of activity per night when they are present.

A method is proposed to attempt to link species' activity rates with population size. Activity results are weighted according to detectability distances and the action radius proper to each species. According to these results, the number of bats in the French Mediterranean is close to 10 million individuals (with more than 8 million pipistrelles). A very detectable species like *Tadarida teniotis* is frequently contacted in the field, but might have the lowest population size of the area.

Actichiro has been developed to answer a widespread need for an objective methodology in the assessment of the quality of a site for bat conservation purposes and impact assessment studies.

NON-INVASIVE GENETIC TESTS FOR IDENTIFICATION OF BAT SPECIES OF THE BRITISH ISLES [P*]

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Non-invasive genetics is increasingly being used as a tool for the conservation management of wild mammal species, including bats. The use of real-time PCR as a method of analysing DNA samples collected in the field has significant advantages over conventional PCR and DNA sequencing, in reducing the time and cost involved in laboratory work, and additionally provides a measure of the quality of a DNA sample which can inform the worth of more detailed subsequent DNA analysis of particular samples. Species-specific real-time PCR species identification assays were designed for the eleven bat species that have been recorded in Ireland, namely *Pipistrellus pipistrellus*, *P. pygmaeus*, *P. nathusii*, *Nyctalus leisleri*, *Plecotus auritus*, *Myotis daubentonii*, *M. nattereri*, *M. mystacinus*, *M. brandtii*, *Rhinolophus hipposideros* and *R. ferrumequinum*. All of these species are resident in Great Britain, and additional DNA tests were designed for the remaining seven bat species resident in Great Britain, namely *N. noctula*, *P. austriacus*, *Eptesicus serotinus*, *M. bechsteinii*, *M. alcathoe*, *M. myotis* and *Barbastella barbastellus*. All eighteen DNA tests were found to be species-specific, with no cross-species amplification between species in this set. These DNA tests were applied to a field study to increase the number of known bat roosts in County Waterford in southern Ireland. In total 44 roosts were non-invasively sampled by collecting bat droppings of varying quantity and quality, which were analysed using the panel of DNA tests applicable to Ireland, as described above. The bat species present could be identified from 32 (72%) of these roosts. This panel of DNA tests will add to the array of tools available to bat surveyors to identify bat species using roosts and will be especially useful in cases where roosts contain multiple species, where the number of bats present is small, or where bats are otherwise difficult to observe directly.

THE BACULUM IS A RELIABLE MORPHOMETRIC CHARACTER TO DISTINGUISH THE CRYPTIC BAT SPECIES *PIPISTRELLUS PIPISTRELLUS* AND *P. PYGMAEUS* [O*]

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Since the increase of molecular techniques in taxonomy, further cryptic species have been discovered in the genus *Pipistrellus* and in other bat genera in the Western Palaearctic. Thus it is important to find morphological characters for discriminating those species. *Pipistrellus pipistrellus* (Common Pipistrelle) and *P. pygmaeus* (Soprano Pipistrelle) have been recognized as separate species since 1997, but still no reliable morphological species discriminating character has been found. These cryptic species are usually identified by their call frequencies and genetically. The baculum (os penis, os glandis, os priapi) has long been used successfully in species discrimination. In this study, we demonstrate how to reliably separate *P. pipistrellus* and *P. pygmaeus* by simple baculum measurements. The bacula of museum specimens (National Museum, Natural History, Prague) that had already been identified by molecular genetic methods, were imaged with high-resolution microCT. Several measurements were taken on virtual thick sections of size-calibrated volume images. Their value for species discrimination was tested by discriminant analysis with leave-one-out cross validation. *P. pipistrellus* and *P. pygmaeus* specimens can be discriminated by measuring the projected length, projected height, and projected width of the baculum. Baculum shape variation was also analysed using geometric morphometrics, but principal component analysis of baculum shape variation was not sufficient to separate the species. Most of the interspecific variation in baculum shape can be found in the proximal third (the base) of the baculum. Most individual variation can be observed in lateral view, especially in the shape of the curve. Baculum measurements can be used to classify single specimens and could also be taken without microCT imaging, on a resected baculum. Such methods for quantifying details of morphology are becoming more important to distinguish cryptic species of bats and other mammals.

ACOUSTIC LURE GIVES INCREASED EFFICIENCY FOR SHORT-TERM SURVEYS OF BAT DIVERSITY IN TROPICAL RAINFOREST [O]

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In many tropical rain forests large numbers of microbats can be caught by setting harp traps or mist nets across trails. However, the catch tends to be dominated by species that make frequent use of trails, while those species that typically fly in the cluttered environment of the forest understorey are much less likely to be caught. Our previous work has shown that the Autobat acoustic lure, which produces simulations of bat social calls, can greatly increase capture rates of narrow-space foraging bats in temperate forests. Here we report the first systematic test of this method in tropical rainforest. The experiment was run for 4 hours on each of 20 nights in Bukit Panchor State Park, a rainforest fragment of 445 ha in Penang State, Malaysia. Each night two harp traps were set inside the forest, and two were set across narrow trails. In each location one trap was fitted with an acoustic lure, while the other was a control trap with no acoustic lure. 858 bats were caught, including 25 species belonging to six families. The catch was dominated by species of *Rhinolophus* and *Hipposideros* and there was no significant effect of the lure on capture rates of these bats. However, when data for all other microbat species were combined, both number of bats and mean species diversity caught with the lure were >5 times higher than for the control traps. Recordings of social calls of resident species were not available, and so all but one of the stimuli produced by the lure were based on social calls of temperate bat species. In the future, the lure can be optimized for use in tropical rain forests by developing stimuli that simulate calls of resident species to further increase both capture rates and diversity of species caught. The acoustic lure has great potential for increasing the efficiency of short-term surveys of bat diversity in tropical rainforests.

WNS IN CZECH REPUBLIC: RESULTS OF FIVE YEARS OF MONITORING [O]

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Since 2008, when the first proof of *Geomyces destructans* on bats in Czech hibernacula was undertaken (cf. Martinkova et al. 2010), the traditional monitoring of bat hibernacula (ca 800 sites) performed from 1969 was supplemented with careful screening for the appearance of fungal mycelia on bats and their sampling. In addition, from 2009 we performed a standardized late winter monitoring in more than 100 hibernacula, which provided quantitative data on incidence and prevalence of geomycosis in particular regions during five consecutive winters.

* *G.d.* mycelia were found in 10 bat species but only in two of them regularly (*M. myotis, M. emarginatus*).
* In total 22,715 individuals of *M. myotis* (by far the species most infected) were examined, 3,450 being *G.d*. positive.
* Mean prevalence significantly increased from 2009 to 2012 (7.8%, 11.91%. 19.24%), a significant decrease was recorded in the winter of 2012/2013 (13.57%), yet the data from 2013/2014 (27.7%) disprove any linear trend.
* Mean incidence varied from 52.4% (2013) to 64.7% (2011)
* Despite temporal variations, the pattern of geographic (between-regions) variation remained unchanged throughout all five winters: mean regional values were low in lowland and karst regions (prevalence 0 to 7%, incidence 20 to 42%) while in submountain hibernacula and/or those situated in dynamic relief with stone debris cover and high surface humidity were quite high (prevalence 22 to 58%, incidence 55 to 100%).
* Contrary to expectations, we found no significant relation between prevalence of geomycosis and abundance of hibernating populations or cluster size. The vast majority of observed cases referred to the weakest stage of infection, severe damages (e.g. lesions on auricles or wings, identical in histological respect to WNS syndrome) were rather exceptional.
* No case of mortality directly caused by *G.d*. was recorded.
* The pattern of prevalence does not suggest that *G.d.* is a specialized pathogen.

The considerable difference between Europe and U.S.A. in mortality associated with WNS and its possible causes (different tactics of hibernation, habituation to skin injuries due to high ectoparasite load in Europe etc.) are discussed.

HYPSUGO SAVII AND OTHER MEDITERRANEAN BATS HAD ALREADY COLONIZED CENTRAL EUROPE IN THE EARLIEST HOLOCENE [P]

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The bat fauna of Central Europe includes the apochoric elements not recorded prior to the Holocene (*M. myotis, M. blythii, P. austriacus, Eptesicus serotinus, R. hipposideros* or *P. pipistrellus)* and even those invading only during recent decades (*Hypsugo savii* and *P. kuhlii)*. The spread of these species was assumed to be promoted by the post-Neolithic anthropogenic landscape rearrangements and/or current climatic changes. Such a view is supported by the absence of these species in the early Holocene fossil record from mass cave assemblages; in other types of deposits bats are quite rare. A continuous stratigraphic sequence providing a rich and reliable record of bats has not been available. However, during the years 2007 to 2013, we excavated such a series in a semi-open cave neighbouring Býčí Skála cave in Moravian Karst, Czech Republic. The total thickness of the series is 10 m, 21 different horizons of debris and soil colluvia have been distinguished. Six AMS radiocarbon data (from 1,2083 cal BP at the base to 8,453 cal BP at the top of the series) confirm continuous sedimentation and intactness of the series. In total more than 3 tons of sediments were washed, which provided enormously rich osteological material representing more than 3,000 individuals (MNI) of 52 mammalian species (together with more than 30 *spp* of other vertebrates). The bats comprise about one third of the total sample, though in the deepest layers (up to c. 10.7 ky BP) they are relatively rare. Until now, 18 *spp.* of bats has been identified. Besides the predominant *P. pipistrellus*, *B. barbastellus, N. noctula, V. murinus* and *M. bechsteinii,* which appear continously from the base of the series, and other common mid-European species (such as *P. auritus, M. nattereri*), we found several quite unexpected items: *R. hipposideros* (7 individuals since 11 ky), *M. myotis* + *M. blythii* (15 ind. since c. 11 ky), *Miniopterus schreibersii* (7 ind. from 9.6 to 8.4 ky), *R. euryale* (2 ind. at c. 8.8 ky) and *H. savii* (3 ind. from 10 to 9.8 ky). The latter three have not been recorded north of the Carpathian Basin (apart from the current expansion of *H. savii*) and with the other three were certainly not expected to occur in Central Europe at the millenia along the Pleistocene/Holocene transition.

STEREOTYPIC FLIGHT PATHS: A WAY TO FOCUS ATTENTION WHILE FORAGING? [O*]

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The Big Brown Bat, *Eptesicus fuscus*, uses echolocation for orientation and foraging. *E. fuscus* scans its surroundings by aiming its sonar beam at relevant objects, and changes its pulse repetition rate and number of sonar sound groups depending on clutter density and target movements. However, in a foraging situation, the bat's attention must necessarily be divided between navigating its surroundings and catching prey. As the bats receive stroboscopic updates whenever they echolocate, catching moving evasive prey, while keeping a lookout for obstacles, could conceivably be a difficult task. By using stereotypic flight paths in known areas, bats may be able to reduce the amount of attention needed for orientation and therefore focus more attention on foraging. A previous experiment has shown that *E. fuscus* does adopt stereotypic flight patterns when navigating obstacles in laboratory conditions.

Here we investigate whether *E. fuscus* free-flying in the wild uses stereotypical flight paths when foraging in a semi-open field.

A microphone array with nine ¼" G.R.A.S. microphones arranged in a cross shape was placed at Lake Artemesia, MD, USA. The area was a rectangular open space (approximately 20 m x 45 m) flanked by a high fence and a deserted road on either end of its longer dimension, and a thicket of trees and a small creek on opposites sides of its narrower dimension. We computed the bats' 3D position at each sonar call emission based on arrival time differences at the nine microphones in the array determined by cross-correlation and triangulation. Subsequently we estimated flight paths based on the sound emission times. Each flight path was displayed to visualize if any stereotypic flight paths were present, that is, whether there was a stable trajectory the bats used.

Although the foraging area was a semi-open field with no clear obstacles other than the field boundaries, the bat flew in a stereotypic flight path while hunting for prey. These flight paths may aid the bat in focusing its attention and limited perceptual "bandwidth" on catching prey.

WHEN ARE BATS ACTIVE IN HIGH ALTITUDES ABOVE THE FOREST CANOPY? – ACTIVITY DATA FROM WIND MASTS ALLOWS THE PREDICTION OF TIMES WITH HIGH COLLISION RISKS [O]

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The development of onshore wind farms implies a high risk for high-flying bat species, which frequently die from collision with rotating blades or from barotrauma. In Germany, wind farms are increasingly installed in woodlands, where bat activity is presumed to be especially high. To predict times with high collision risk, factors influencing bat activity in high altitudes have to be determined. Wind masts, which are constructed at prospective sites for wind farms, provide a great opportunity to survey bat activity in different altitudes during pre-construction studies.

In this study, we analyzed bat activity data from wind masts at different forest sites in Germany. At all sites, bat activity was surveyed continuously by automatic ultrasonic recorders during several months at ground level and at different heights above the canopy up to 100 m. All recordings containing bat calls were assigned to a species or a group of species with similar calls. Simultaneously, wind speed and temperature data were collected at different heights.

Preliminary analysis indicates a general activity pattern at all sites despite differences in overall activity level. Only a small percentage of the total bat activity was measured above the canopy. *Pipistrellus pipistrellus*, *Pipistrellus nathusii* and the EpNyVe group *(Eptesicus/Nyctalus/Vespertilio)* were frequently recorded at height, invariably species with high fatality rates. Activity at high altitudes peaked in late summer while activity at ground level was more evenly distributed throughout the year. Furthermore, bat activity at height greatly depended on meteorological factors, showing an increase in activity with decreasing wind speed and increasing temperature.

The results show that wind mast surveys provide a suitable method to measure bat activity at different heights. On this basis, bat activity can be predicted and curtailment measures can be developed for the operation of the prospective turbines. Further studies are required to monitor the quality of those predictions.

This study is part of a research project on bats and wind energy in forests, funded by the Federal Agency of Nature Conservation by means of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety.

OCCURRENCE OF NATHUSIUS'S PIPISTRELLE, *PIPISTRELLUS NATHUSII*, IN SHALLOW INLAND LAKES IN SOUTHWEST FINLAND [P]

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Nathusius's Pipistrelle, *Pipistrellus nathusii*, is a widespread species especially in the central and eastern parts of Europe. In Finland, it is until now less frequent and only few observations of breeding individuals have so far been made, mainly in the southernmost parts of the country. Acoustic surveys of migratory bats have, however, indicated that the distribution of *P. nathusii* covers a much larger area than this. Nathusius's Pipistrelle is a long-distance migrant that travels from its breeding grounds in NE Europe to Central Europe to hibernate. In Finland, most observations of *P. nathusii* have been made during autumn migration, when the species is also regularly observed on the west coast of the country. In Finland, the studies on migratory bats have mainly focused on the coastal areas of the Baltic Sea. Only limited data has been collected from their distribution further inland. In this project, I study the occurrence of Nathusius's Pipistrelle in the inland waters in the Satakunta region (SW Finland, 61.5─61.9 °N). In the study the activity of *P. nathusii* around the shallow lakes is compared with reference sites located in the coastal zone of the Baltic Sea. In the years 2013─2014 data will be collected from 33 distinct locations (15─18 sites/year), of which 12 are situated along the coastline and 21 at the lakes 2─35 kilometers inland. At each site the acoustic activity of bats is monitored using an automatic bat detector (SM2/Anabat) stationed in the field continuously from early May to the end of September. Preliminary results of the project show that significantly higher activity of *P. nathusii* was observed in the sites located in or close to the coastline of the Baltic Sea. However, although less frequent, observations of the species were also regularly made in the inland sites, suggesting that the distribution of *P. nathusii* reaches further inland than previously expected. Over 95% of the observations were made during a three-week period from mid-August to mid-September. This activity peak coincides with the presumed autumn migration observed previously in the earlier studies conducted in Finland.

AUTUMN SWARMING OF BATS AT UNDERGROUND SITES IN THE APUSENI MOUNTAINS (ROMANIA) [P]

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Autumn swarming is a key moment in the life cycle of bats, when large numbers of bats, representing many species, visit underground roosts, primarily caves with large chambers near the entrance. This behaviour facilitates mating, and also provides the assessment of adequate hibernacula. At important swarming sites, bats can gather from large areas, in this way also playing an important role in the gene-flow between populations. In Romania the main mating season of bats, depending on species, geographical location of roosts and weather conditions, extends from the end of July to mid-October, with the peak activity between mid-August and the end of September. In the period 2010-2013, mist netting was carried out, at the end of summer and during autumn, at different underground sites in the Apuseni Mountains, an area with extensive karst and important bat populations. During this period a total of 57 netting events were carried out at 32 different underground roosts. Altogether 19 bat species were identified and a total of 1,348 individuals were captured. The most frequent species were Schreiber's Bent-winged Bat, *Miniopterus schreibersii,* (21% of all captured specimens), Greater Mouse-eared Bat, *Myotis myotis,* (20.1%); Bechstein's Bat, *Myotis bechsteinii,* (10.8%); Lesser Mouse-eared Bat, *Myotis oxygnathus,* (8.8%); Greater Horseshoe Bat, *Rhinolophus ferrumequinum,* (7.2%); and Geoffroy's Bat, *Myotis emarginatus,* (6.5%). Some of the swarming sites are also important nursery and hibernation roosts for *M. schreibersii*, *M. myotis*, *M. oxygnathus* and *R. ferrumequinum*, and probably this is the main reason for the high percentage of these species. The number of males, typically for swarming sites, significantly exceeded the number of females, 68% of all captured specimens were males. When comparing results of mist-netting from different caves in the study area, it is notable that all roosts show different species composition and abundance. Based on this fact, key roosts could be used for species-specific monitoring. The high rate of activity at important swarming sites has also important implications in conservation, and has to be taken in consideration in the planning of conservation measures implemented at the entrance of underground roosts (e.g. fitting grilles and fences).

MONITORING HUMAN ACTIVITY USING LIGHT-SENSORS TO ASSESS THE EFFECTIVENESS OF REGULATORY MEASURES IN CAVES [P]

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Human disturbance is a major threat to bats roosting in subterranean cavities. During recent decades a general decline in cave-dwelling bat colonies has been observed, along with an increase of human caving activities. The main conservation strategy for cave-dwelling bats seeks to deter people from entering the roosts, what may be achieved by fences or advisory panels, usually aided by legal regulation. The ultimate effectivity of the measures is commonly assessed by the size variation of bat colonies, but measuring human activity in the caves is necessary to assess the direct effectiveness of the implemented measures, thus assuring that the observed variations occurred as a result of an actual decrease in caving activities. One possible method for monitoring human presence in caves is the use of light-sensors connected to data-loggers that allow recording light events as a surrogate of human presence. We aimed to evaluate the effectiveness of the conservation measures and the usefulness of the mentioned monitoring method.; once advisory panels and fences were installed in eight bat-roosting caves in Basque Country, we remotely monitored subsequent visits by people using light-sensors. We found that both kinds of measures deterred people from entering the caves, although human presence persisted. The results revealed a considerable difference in activity level between monitored caves. The light-sensing and data-logger technique was able to assess the effectiveness of the measures, though the reliability of the electronic devices at high humidity environments should be ensured beforehand.

FORAGING AND ROOSTING PATTERNS OF A BAT COMMUNITY IN NORTHERN BAVARIA [P*]

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Our goal was to determine how different bat species that live in sympatry partition a complex habitat mosaic. This fieldwork was carried out in the area around Forchheim, northern Bavaria, during May and June 2014. The Natura 2000 area "Oertlbergweiher mit Oertlberg" consists of old forest stands and more than 500 years-old ponds and is embedded in a mosaic of different habitats such as urban area, garden plots, agricultural land and meadows. The forest itself includes both coniferous monoculture and broadleaved compartments, but, mostly, it is a broadleaved forest consisting of old oaks, hornbeam and beech. It is rich in diverse sized tree holes and dead wood, an indication of a rich habitat for insects and an abundance of roosting opportunities for bats. We captured bats using mist nets and all bats were captured at the same locations, within a limited area close to the forest edge. Males only of different species (*Myotis spp., Pipistrellus spp.)* were then fitted with transmitters and were radio-tracked using both a car antenna and H antennas. We tracked the bats for several nights and collected fixes by triangulation. The results showed that the selection of day roosts was either restricted to only forest sites for *Pipistrellus pygmaeus* and *Myotis bechsteinii*, or changed between forest and man-made structures (houses, garages) for *Pipistrellus pipistrellus* and *Myotis nattereri*. The broadleaved forest around the capture site was intensively used by species that focused on a very small area for foraging. Other species extended their foraging bouts beyond the forest border to forage at the ponds or in the gardens or went to forage within mixed stands of forest that are dominated by coniferous forest.

EIGHT YEARS OF ACOUSTIC BAT MONITORING IN FRANCE: INCREASING SAMPLING EFFICIENCY WHILE COMMONEST SPECIES' ACTIVITY IS DECREASING [O]

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A nationwide acoustic monitoring program based on both car transect and point counts was launched in France in 2006. Data gathered from more than 200 car transects and 1,200 point counts, surveyed twice each year, reveal a strong negative trend, 10~15% a year, of *Pipistrellus pipistrellus, Nyctalus leisleri* and *Eptesicus serotinus* activity. *P. pipistrellus* activity presents a similar evolution in three broad habitat types, woodland, farmland and urban areas. Conversely, *P. kuhlii* looks almost stable while *Myotis spp*. activity is clearly increasing. Altogether, these results are both congruent with the positive trend described in the recently published European Environment Agency report, "European bat population trends" concerning several *Myotis* species and contrasting in revealing an opposite trend for three of the commonest hawking species.

Going further it is now possible, thanks to automatic recorders able to achieve full-night sampling, to increase the amount of data and, more specifically, the sampling efficiency for the more elusive species such as *Myotis, Plecotus* and *Barbastella*. So, we are launching a third citizen science protocol to take advantage of these new detectors and of the progress made in the automatic processing of the mass of data they yield. The statistical power of this protocol was ascertained by computer simulations, using data from several pilot studies and from many of Biotope's surveys resulting from environmental assessments. The same dataset allowed us to establish a frame of reference for the measured activities as a function of the sampled habitats. That way, we will be able to analyze trends of many more species than before and to evaluate their relative abundance and changes in different habitats.

AN OVERVIEW OF BAT FAUNA (CHIROPTERA) OF BOSNIA AND HERZEGOVINA, WITH THE FIRST RECORD OF *PIPISTRELLUS NATHUSII* [P]

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Bosnia and Herzegovina (BiH) is one of the least studied countries in Europe with respect to bats. Little has been published so far and data are mostly scattered, sometimes in obscure publications. During preparation of this review, all available published data have been gathered and analyzed (31 relevant publications found), data from museum collections have been collated (7 natural history museums, 5 local museums and other institutions) and all accessible voucher specimens have been re-examined; new original data on bats (more than 400 records) have also been collected in the last 13 years.

The oldest published record of a bat from BiH is an intriguing find of *Pteropus spp.* in 1886, while the first scientific data on bats were given by Bolkay in 1924 and 1926, as lists of specimens stored in the Land Museum Sarajevo. From the second half of the 20th century there are just sporadic data from few regional researchers (c. 10 persons and 10 publications), who collected data mostly as part of other mammal research. In the 21st century, specific and more systematic surveys on bats started (including use of roost checks, mist netting and use of ultrasound detectors) resulting in a considerable increase in the knowledge of bats and their distribution, as well as involvement of local bat researchers. Altogether, the presence of 29 bat species can be confirmed in BiH so far. Data on 28 species can be found in literature (*Rhinolophus hipposideros*, *R. ferrumequinum*, *R. euryale*, *R. blasii, Myotis myotis*, *M. oxygnathus, M. bechsteinii*, *M. nattereri*, *M. emarginatus*, *M. mystacinus*, *M. brandtii*, *M. daubentonii*, *M. capaccinii*, *Pipistrellus pipistrellus*, *P. pygmaeus*, *P. kuhlii*, *Hypsugo savii*, *Eptesicus serotinus*, *Vespertilio murinus*, *Nyctalus noctula*, *N. leisleri*, *Plecotus auritus*, *P. macrobullaris*, *P. austriacus*, *P. kolombatovici*, *Barbastella barbastellus*, *Miniopterus schreibersii* and *Tadarida teniotis.*), while we report *P. nathusii* for the first time. Three species mentioned in the literature cannot be considered as part of the present BiH bat fauna: the finding of *Pteropus spp.* is regarded as exceptional, *Nyctalus lasiopterus* is listed without supporting data and *Eptesicus nilssonii* is known only from fossil findings. Although the bat fauna of BiH is heavily understudied, some underground roosts can already be recognized as being of high conservation importance for bats, harbouring large numbers of individuals and species.

THE CURIOUS CASE OF SAVI'S PIPISTRELLE, *HYPSUGO SAVII*: NEW INSIGHT ON ROOSTING ECOLOGY AND BEHAVIOUR FROM THE MEDITERRANEAN REGION [O*]

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Savi's Pipistrelle, *Hypsugo savii*, underwent an impressive change of its distribution range during the last two decades: a typical submediterranean species gradually spread to Central Europe, north of the Alps. All records from the newly colonized areas of Carpathian and Vienna Basins including the most recent northernmost record from the centre of the Bohemian Massiff, Czech Republic, come exclusively from towns. This suggests that a switch from a lithophilous roosting strategy to synanthropic way of life might represent a significant component of its range expansion, responding both to the effects of urban heat islands and the current trend of climate change. Yet, until now, only little is know about the ecology of this species, and published data are mostly restricted to mere faunal records.

In order to investigate its roosting habitats and behaviour, we radio-tracked pregnant and lactating females during June and July of 2012, 2013 and 2014 in the core of its historical rangent in the Mediterranean region (Rtina, Croatia). In total, we found 45 day roosts and measured their microclimatic conditions. We found no essential differences between roosts of pregnant and lactating females. The roosts were situated within holes in limestone pavement at ground level, the first confirmation of such a roosting strategy among European bat species, except for a single pregnant female which roosted in crevices of brick and stone village houses on two occasions. Pregnant females mainly roosted solitarily and formed small groups (2-5 animals) shortly prior to parturition, whereas lactating females were usually found in small groups (2-9 animals), with the exception of one solitary lactating female. In comparison to unoccupied holes, the roost holes were significantly deeper and with smaller entrances. Microclimatic conditions measured on two levels within a roost hole (shallow at c. 5 cm depth, and deeper at c. 15 cm deep) indicated that the deeper level provides more stable microclimatic conditions and a vertical thermal gradient, enabling a bat to choose the most favourable conditions. Further results regarding macrohabitat scale roost choice and home range analysis will also be presented.

BATS IN AN 'ECOLOGICAL DESERT': ACTIVITY AND ABUNDANCE OF BATS IN COMMERCIAL CONIFEROUS PLANTATIONS [O*]

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The majority of UK forest cover is commercial coniferous plantations, which are dominated by fast growing exotic spruces and commonly perceived as species depauparate ecological deserts. Bats are highly sensitive to land use changes and are all reliant on woodland to some degree, yet most habitat selection studies are either focused in areas where coniferous woodland presence in the landscape is low or find that bats will preferentially use other habitats. Perhaps as a consequence of this the effect of forestry practices on bat populations have been largely ignored in the UK, and surprisingly little is known about their use of commercial forests. Whilst native woodlands are likely to offer the most optimal conditions for bats, some studies show that plantation woodlands may represent a previously undervalued habitat for bats.

Here, I present the results of a study using acoustic monitoring and trapping to assess bat populations in commercial coniferous plantations. I found that, contrary to what may be expected, bats are present in Sitka Spruce plantations in the UK with nine species either caught or recorded, representing all species expected to be in the study area. In addition breeding female *P. pygmaeus* and juveniles were commonly caught. Activity and relative abundance of bats varied by species on different spatial scales and in response to different management stages of Sitka spruce plantations, but not necessarily with nocturnal prey abundance and diversity.

BAT RESEARCH AND CONSERVATION IN "NIETOPEREK" BAT RESERVE (WESTERN POLAND) [O]

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The Central Sector of Międzyrzecz Fortified Front was built in the 1930s and during World War II to protect Germany from the east. It comprises 35 defensive bunkers connected by underground railway tunnels of a total length of c. 32 km. Natura 2000 site PLH080003 "Nietoperek", covering an area of 7377.37 ha, is the eighth largest bat hibernation site in the EU. 12 species hibernate in the main underground system. The maximal bat number, 37,693 individuals, was recorded in January 2008. The longest migration distances of bats to "Nietoperek" are: 257 km (*M. daubentonii*), 242.1 km (*M. brandtii*) and 226.7 km (*M. myotis*). The calculated area of migration of *M. myotis* from eastern Germany to "Nietoperek" totals 17,053 km^2 (MCP method), indicating that protection of this relatively small site has an impact on the survival of bat populations in the Central-European lowlands. A management plan for "Nietoperek" was prepared by an international team of bat workers and is awaiting acceptance by decree of the Polish Minister of Environment. Since 1999, winter bat censuses have been organised in the middle of January, in a single day, between sunrise and sunset. From 1999 to 2005 these were carried out biennially, then annually from 2005 to the present. The results of 12 censuses indicated a statistically significant increase of *M. myotis* (r = 0.88, F = 35.42, df = 1.10, P < 0.001, y = 12383.0 + 849.38x) and *M. dasycneme* (r = 0.84, F = 24.35, df = 1.10, P < 0.001, y = -2.62 + 2.24x). Increasing but not significant trends were recorded for *M. nattereri*, *P. auritus* and *M. bechsteinii*. Declines were observed for *B. barbastellus* (not

significant) and *M. daubentonii* (r = 0.59, F = 5.46, df = 1.10, $P < 0.05$, y = 8406.9 - 202.8x). The average temperatures in September, October and the 31 days before the censuses are considered to influence recorded bat numbers by affecting the process of autumn fat accumulation and/or by forcing bats to hibernate in more stable microclimatic conditions in crevices, where the animals are less likely to be detected by observers.

RECOVERY OF A PHYTOPATHOGENIC BACTERIUM, *LONSDALEA QUERCINA*, FROM A LESSER HORSESHOE BAT IN MORAVIAN KARST, CZECH REPUBLIC [P*]

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White-nose syndrome monitoring efforts in the Czech Republic also includes the collection of skin swabs for bacterial culture to evaluate skin condition in different species of central European bats. Thus, 137 samples from bats were cultured for bacteria in 2013. These cultures yielded a variety of bacterial isolates including a phytopathogen. This isolate was identified as *Lonsdalea quercina* by MALDI-TOF and, after 16S rRNA gene analysis, as *Lonsdalea quercina ssp. britannica*, i.e. the causal agent of bark canker and drippy nut disease of oaks. It was cultured from a Lesser Horseshoe Bat, *Rhinolophus hipposideros.* While migratory animals are known to act as long-distance vectors for infectious agents, this bat species (*Rhinolophus hipposideros*) is particularly sedentary, with the average movement between summer and winter roosts between 5 to 10 km, and the maximum reported migration of up to 150 km. Therefore, it is clear that the phytopathogenic agent is present in the area of the Moravian Karst, yet the role of bats in its transmission or as reservoir hosts is unknown. This disease of oaks in Europe was first described in Spain in 1992. The affected trees show progressive loss of vigour, foliage reduction, early leaf senescence and exudates from bark. A similar condition was noted in oaks in Britain. Few bacterial pathogens are reported to cause disease in oaks. The oak isolates from Britain and Spain were assigned to two novel subspecies, *Lonsdalea quercina ssp. britannica* and *Lonsdalea quercina ssp. iberica*, respectively. Our finding is the first report of *Lonsdalea quercina* in the Czech Republic. The Lesser Horseshoe Bat may bio-indicate presence of the phytopathogenic bacterium in broad-leaved forests of the Moravian Karst and phytopathologists should inspect the area for signs of oak disease and decline.

BACTERIAL SKIN COLONIZATION ASSOCIATED WITH WHITE-NOSE SYNDROME-AFFECTED AND HEALTHY BATS IN EUROPE [P*]

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White-nose syndrome (WNS) is a cutaneous fungal disease of hibernating bats associated with a psychrophilic fungus *Pseudogymnoascus* [formerly *Geomyces*] *destructans*. WNS has devastated bat populations across the eastern United States during the past eight years and has the potential to cause extinction of several species. Little is known about interactions between *Pseudogymnoascus destructans* and bacteria on the wing surface of bats. A total of 126 bats were examined when monitoring WNS and its causative agent in the Czech Republic. Bat species were represented as follows: *Myotis myotis* (33), *M. emarginatus* (33), *M. daubentonii* (22), *M. bechsteinii* (13), *M. mystacinus* (6), *M. nattereri* (9), and *M. brandtii* (10). The left wing membrane was transilluminated by ultraviolet light in order to detect WNS lesions. These were later enumerated from photos. Other samples collected from the skin of each bat were those for fungal culture, bacterial culture and quantitative analysis of *P. destructans* DNA (qPCR). Bacterial isolates obtained from bats were detected and identified by MALDI-TOF and sequence analysis of 16S rRNA gene. *Pseudomonas* and *Serratia* bacteria were found consistently, followed by *Arthrobacter spp*. Interactions of fungal and bacterial isolates were tested *in vitro*. Importantly, all *Pseudomonas* isolates were able to inhibit the *Pseudogymnoascus* fungus, while *Serratia* isolates mostly did not. This finding corresponds with field data. When *Pseudomonas* only was present on the bat´s skin, the number of WNS lesions was significantly lower compared to the skin colonization by *Serratia* only. Deciphering the diversity and function of these microbes may provide insights into the roles they play in maintaining the health of bats.

ECOLOGICAL AND PHYSIOLOGICAL CHARACTERISTICS OF THE BLOOD SYSTEM OF *MYOTIS DASYCNEME* (BOIE, 1825) IN THE URALS [P]

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Investigation was made on a bat species with ecological plasticity, *Myotis dasycneme,* inhabiting background territories of the Urals. Blood indices were investigated in the automatic Bio-Medical Analyzer BC – 5800c Shenzhen Mindray (China). It was found that the growth and development of the bat is accompanied by significant changes in the red blood cell indices against the background of a stable white blood cell count. Thus, with age the number of erythrocytes and haemoglobin level increased, thrombocyte aggregation increased, blood coagulation was accelerated, involution of blood plates was observed ($p < 0.05$). No significant differences were revealed between males and females except haemoglobin content: 187.9 ± 3.2 g/L in males, 177.6 ± 1 in females ($p = 0.01$). Males of *Myotis dasycneme* had a tendency to an increase of the main parameters of the red blood cell, which corresponded to the literature data. It is know, that male and female sex hormones significantly affect the haemopoiesis. Androgens, to be more precise, products of their metabolism, make erythropoiesis more intensive. Estrogens make erythropoiesis less intensive. Therefore, in the puberty period higher indicators of haemoglobin and erythrocytes were in males in comparison with females. The analysis of obtained data has proved that *Myotis dasycneme,* during preparation for hibernation, had a notable increase of erythrocytes (11.1 ± 0.2 T/L - in autumn, 9.3 ± 0.5 T/L - in summer, $p = 0.02$). Similar changes were observed in haemoglobin (177.6 ± 2.1 g/L и 152.6 ± 5.7 g/L according, $p= 0.01$) and haematocrit (51.2 ± 1.1 % - autumn, 45.1 ± 1.8 % - summer, $p = 0.03$). The average erythrocyte volume was lower (46.7 ± 0.3 fL - in autumn, 48.5 ± 0.8 fL - in summer, $p = 0.03$). The revealed changes may show that in autumn, during preparation for hibernation, the blood system adapted itself to temperature changes of the environment and possible or further hypoxia.

INTEGRATION OF BAT CONSERVATION CONCERNS IN THE DEVELOPMENT OF WIND ENERGY PROJECTS IN SWITZERLAND [P]

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Like several European countries Switzerland is promoting wind energy projects according to its exit strategy from nuclear and fossil-fuel power. As bats can be killed by wind turbines the Swiss government has charged the *Swiss Coordination Centre for Bat Protectio*n to elaborate recommendations for the integration of bat conservation concerns in the development of wind energy projects enabling the realisation of wind turbines. These propositions are based on the involvement of all stakeholders implicated in wind energy projects. The project resulted in the elaboration of a global strategy for the implementation of bat conservation in the following three important stages of a wind energy project: the feasibility study, the planning and building phase, and the operating phase.

Feasibility study: For the purpose of getting planning reliability for wind energy projects, a standardized procedure for a fast preliminary check of potential conflicts with the conservation of bats based on existing data and on a site evaluation has been generated. It leads to recommendations for the benefit of the wind energy planner regarding four different categories of potential impacts.

Planning and building phase: The preliminary checks build an important basis for the later investigations in the environmental impact assessment (EIA) process for clarifying the potential impacts on bats. Therefore best practice guidelines have been developed. The extent of the investigations will thereby be adapted to the impact category of the preliminary checks but will allow site specific requirements. If populations of endangered bat species are affected, the displacement of the turbines should actually be envisaged.

Operating Phase: If required to reduce bat mortality, a site-specific stopping algorithm, when high bat activity is expected, should be established after the building of the turbines. Post-construction control of the success of these measures will allow an optimization of the stopping algorithm. The residual mortality should be compensated for by suitable measures in favour of the affected species.

SURVIVAL CONSTRAINTS DUE TO DIET AND HIBERNATION STRATEGY OF *MYOTIS NATTERERI* [P*]

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In winter 2010/2011 a Natterer's Bat, *Myotis nattereri*, die-off occurred in several hibernacula

in northern Germany. So far no reasons for this event have been found, but different explanations have been discussed, such as malnutrition or disease.

From monitoring data of hibernating Natterer's Bat at two major hibernacula at the Brunnen Meyer near Münster and the Bad Segeberg limestone caves, it is known that Natterer's Bats arrive late at their hibernacula in mid-September, and also start late with hibernation in mid-December. Therefore, an early winter could have hindered Natterer`s Bats in their preparation for hibernation at the hibernation site, meaning a low success in gaining enough fat resources.

To survey the diet of Natterer's Bats during arrival at the hibernacula, faecal samples were collected at both sites in November and December 2012.

Analysis of the dietary samples showed Araneae and Dermaptera as the main components of the diet. Other taxa found were Lepidoptera (larvae and imagines) and Diptera (Brachycera and Nematocera) but also small amounts of Coleoptera (Curculionidae), Chrysopidae, Opiliones and Hemiptera (Aphidoidea). These data are congruent with recently published molecular dietary data. The weather data from 2010/2011 show a severe and early onset of winter and a long duration, which had great negative impact on prey availability, the hunting success of prehibernating Natterer's Bat and thus the survival during hibernation. The influence of changing climate and the discussed increase in extreme weather events, such as early and severe winter, on the Natterer's Bat at the north of its distribution range is discussed.

DIET OF THE INSECTIVOROUS BAT *PIPISTRELLUS NATHUSII* DURING AUTUMN MIGRATION AND SUMMER RESIDENCE [P*]

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Migration is a well known phenomenon in vertebrates. Yet bats have received little attention and only in the recent decades has knowledge been gained. It is known that migration can cause significant changes in behaviour and physiology due to changing energy demands. Dietary shifts, for example, have been shown to occur in birds before the onset of migration. For bats it is not known if a change in diet occurs during migration, since mainly breeding season related dietary preferences have been documented. Also, it is known that fat rich diets and thus high fat deposits do increase the flight range of migratory bats. Within the bats some species can be regarded as long-distance migrants, covering up to 2,000 km on their journey between summer and winter roosting areas. *Pipistrellus nathusii* (Vespertilionidae), a European long-distant migrant, travels each year along the Baltic Sea from north-eastern Europe to hibernate in central and southern Europe. This study presents data on the dietary habits of migrating *Pipistrellus nathusii* in relation to the dietary habits during the breeding season. We analysed samples from bats on autumn migration caught at the Ornithological Field Station in Pape, Latvia, and from samples collected in summer roosts. We applied both morphological identification and molecular analysis to study the diet. Diets between the groups of bats on migration and breeding bats were rather similar. Diptera and Lepidoptera are the major prey groups both during breeding and during migration. However, certain prey groups could be assigned to the differing foraging habitats used during migration compared with summer residence.

DNA BARCODES FOR ASSESSING THE TAXONOMIC DIVERSITY OF PALAEARCTIC BATS: FURTHER STEPS [O]

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The Palaearctic bat fauna is not very speciose; however, it is distributed over a vast and complex geographic area, leading to considerable phylogeographic divergence and corresponding alpha-taxonomic problems. We used nucleotide substitution patterns in the mitochondrial cytochrome oxidase subunit I gene (COI) – the standard DNA barcode region in animals - to reassess the taxonomic diversity within Eastern Palaearctic bats, in the light of earlier taxonomic findings. All fourteen Palaearctic bat taxa raised to species rank in the past 25 years are clearly separated by DNA barcodes.

DNA barcoding analysis of recently obtained material, particularly from the regions of Central Asia, highlighted several new cases of cryptic diversity and additional taxonomic problems requiring further in-depth studies. These data suggest at least three previously undetected taxonomic splits: Caucasian *Myotis nattereri* is highly divergent from bats occurring in lowland East Europe; *Barbastella* shows genetic divergence across the eastern part of its range, suggesting the presence of at least two previously unrecognized species; and *Rhinolophus ferumequinum* shows deep divergence between western and eastern populations. In the latter case available genetic data let one even suppose paraphyly within *R. ferrumequinum* s.l. High genetic diversity was shown to exist within Mongolian *Plecotus*, although the revealed genetic lineages cannot always be associated with existing named forms. On the other hand, one taxon, *Eptesicus bobrinskoi*, was proposed to be conspecific with *E. gobiensis*; three pairs of traditionally accepted subspecies did not show significant genetic divergence; and no evidence was obtained for splitting Central Asian populations of *Myotis nipalensis* from *M. aurascens*. These results demonstrate that chiropteran taxonomic diversity remains understudied even among the relatively well surveyed Palaearctic fauna. Although a comprehensive approach is required to resolve these taxonomic questions, DNA barcoding is a convenient and accurate method for highlighting them.

PRELIMINARY BAT SURVEY IN DHATI-WELEL NATIONAL PARK, ETHIOPIA [P]

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Dhati-Welel National Park is newly established and requires investigation even at the basic level. The park is situated in the very west of Oromia, close to the border of South Sudan, and it can be supposed that its fauna should demonstrate more affinities with that of Sudan rather than of the Ethiopian Plateau.

Brief faunal study focused on mammals and birds was carried out in February, 2014, by the Ethio-Russian Biological Expedition, at the request of the Oromia Forest and Wildlife Enterprise. A bat survey covered different types of biotopes though not in equal proportion due the lack of time and for reasons of security. Bat individuals representing up to 17 species from seven families were captured and examined in the hand. The most remarkable records include *Rhinolophus hildebrandtii* (first record in Ethiopia north of the Rift Valley), *Myotis tricolor* and *Laephotis wintoni* (both species were found more than 250 km from previous known sites). The remaining species list includes *Epomophorus gambianus*, *Rhinolophus landeri*, *R. fumigatus*, *Triaenops afer*, *Hipposideros centralis*, *Nycteris hispida*, *Chaerephon pumila*, *Miniopterus arenarius*, *Pipistrellus hesperidus*, *Neoromicia nanus*, *N.* cf. *guineensis*, *N.* cf. *somalicus*, *Scotophilus dinganii*, and *S. leucogaster*. It looks very probable that the actual bat fauna of Dhati-Welel is definitely more rich. Some species can make seasonal short-range migrations, to occur at the surveyed area only in wet season; other, having low population density, may live in some specific biotopes and avoid capture during our survey. Such high diversity, especially since observed in so short a time, was previously seen by us in the Godare forest in eastern part of Gambella and in the Alatish National Park. Both territories are situated not too far from Dhati-Welel. This suggests a general increase of bat diversity in the western part of Ethiopia.

TEMPORAL CO-OCCURRENCE AND NICHE DIFFERENTIATION IN INSECTIVOROUS BAT ASSEMBLAGES [O*]

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Temperate bats mainly feed on insects. Various species often hunt at the same site and share the same food resources. Therefore, species with similar hunting strategies (e.g. foliage gleaners, aerial hawkers) and the same prey preferences might exhibit strategies for niche differentiation to avoid competition. To test if species co-occur randomly on hunting sites, we recorded bat activity at 157 sites in eastern Austria (Europe) between early June and late September 2010 and 2011 by using automatic recording ultrasound detectors ("batcorders"). We hypothesized that species of the same feeding guild are more likely to exhibit niche differentiation (that is, occur less often together than expected by chance) than species of different guilds. Secondly, we expect co-occurrence of species less often in long time intervals (e.g. the sampling night) than in short time intervals (e.g. 10, 5 and 3 minutes) due to direct interactions between competing individuals.

UTILIZATION BEHAVIOUR OF ARTIFICIAL WINTER ROOSTS BY *NYCTALUS NOCTULA* IN NORTHERN GERMANY [P]

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Contrary to their southwards autumn migration behaviour, a colony of Noctule Bats, *Nyctalus noctula,* is known to occupy seven bat boxes for their annual hibernation at a roost site in northern Germany. To investigate the hibernation behaviour of this colony, in 2004 the specific winter roosts were equipped with small units of light barrier systems for automatic monitoring. Based on the accumulated data of 10 years, activity patterns and the number of hibernators can be determined. Roost occupation starts in mid-November and continues until mid-December. Per year, on average, 750 Noctules hibernated in the bat boxes with a maximum of 260 individuals per roost. In the course of March, the Noctules vacate the hibernacula. Characteristic for the occupation behaviour of hibernacula was the arrival of large groups of up to 12 Noctules. In 2013 the arrival of one third of the hibernators can be confined to three nights in late November and the beginning of December. In spring, roost vacation again happened in large groups of individuals, whereby some boxes with more than 100 individuals were completely abandoned within a few hours in one evening. In 2014 about 60% of the Noctules left the roosts over three days in late February and the beginning of March. By mid-March only groups with few individuals were recorded. Roost occupation and vacation followed a fixed temporal pattern that was independent of weather conditions. These new findings about activity patterns in *N. noctula* contain information relevant to optimizing run-times of wind farms, as November and March have so far not been included in bat surveys.

BAT ACTIVITY AT HIBERNACULA THROUGHOUT THE YEAR IN GERMANY [O]

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Different types of hibernacula were surveyed to investigate seasonal usage by bats, among them a natural cave, three mines, a cellar and five large artificial roost boxes. Light barrier systems were installed at roost entrances to document bat activity. Based on these data activity patterns and balances were compiled per roost. Additionally, the light barrier systems at the cave and the mines were equipped with camera units to enable species identification.

The cave studied is the largest known hibernaculum in Germany, and regularly used by approximately 24,000 bats. *Myotis daubentonii* is the dominant species and makes up one third of the hibernating population, followed by *Myotis nattereri* which accounts for up to another third. Numerically *Myotis bechsteinii* plays an important role with 400-500 individuals. The first mine studied is utilized by c. 200 bats, including approximately 100 *Myotis emarginatus.* The second mine contained c. 1,600 bats, among those some 800 *Myotis nattereri* and 600 *Myotis bechsteinii*. Up to 300 *Myotis daubentonii* hibernated in the third mine. About 4,000 to 6,000 *Pipistrellus pipistrellus* hibernate in the cellar. The bat boxes are regularly utilized by approximately 500 *Nyctalus noctula* as winter roosts.

Major differences were detected concerning the timing and the process of leaving the hibernacula. While *N. noctula* leaves the roost in groups and within a few days by mid-March, the other species take several weeks to vacate their hibernacula. A large proportion of *M. nattereri* and *P. pipistrellus* leave the roosts in mid-March, followed by *M. daubentonii* early in April. *M. bechsteinii* have their exit peak in late April and *M. emarginatus* follows later in May. Similar behavioural differences among species were recognized during the occupation of winter roosts. Also, during the summer months, regular use of all winter roosts was detected. While only few *N. noctula* visited the hibernacula in summer up to 1,000 *M. daubentonii, M. nattereri* and *M. bechsteinii* made use of the natural cave.

Bat activity at hibernacula and other roosting sites throughout the year offers valuable information for roost protection and species conservation.

NON-INVASIVE MONITORING OF HIBERNACULA USING LIGHT BARRIER SYSTEMS COMBINED WITH PHOTO TECHNIQUE [P]

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Traditional census techniques for bats in hibernacula are associated with disturbance and only provide an incomplete overview of numbers and species. Small bats and bats hiding in cracks and crevices are easily overlooked in visual counts while larger, free hanging species are over-represented. Alternative, automatic methods are scarce and only available as prototypes. As a general non-invasive monitoring technique, light barrier systems were developed and installed at the entrances of several hibernacula in Germany. The system documents bat passes precisely (to the second) for further analysis. To enable species identification a photo monitoring unit was constructed and connected to the light barrier system. Triggered by light barrier registrations, high qualities photos of individuals entering and leaving the roosts are taken that allow identification to species level. Over a period of several years, simultaneous visual and automatic bat counts at hibernacula revealed enormous differences in numbers, up to a factor of ten, between the two methods. Decreasing population trends at hibernacula due to visual counts, turn out to be increasing according to automatically accumulated data. The photo unit offers the monitoring of population trends at the species level, which often remains undetected when the general population size appears stable. Following population trends at the species level is crucial for species conservation and for the identification and protection of significant roosting sites.

BAT ACTIVITY AT OFFSHORE WIND FARMS IN THE NETHERLANDS [P]

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A pilot study in the autumn of 2012 revealed that bats occurred regularly in both Dutch offshore wind farms. A total of 189 call sequences was recorded at Offshore Wind Farm Egmond aan Zee (29 Aug-20 Oct) and 25 at Princess Amalia Wind Farm (4-23 Sept). Nathusius's Pipistrelle, *Pipistrellus nathusii*, was the most commonly observed species, and Noctule Bat, *Nyctalus noctula*, was recorded a few times. Most bat activity occurred in early September and was strongly correlated with the weather conditions. Bats were only recorded during nights with low or moderate wind speed, no precipitation and high ambient pressure. The observed pattern of occurrence indicates that the observations of Nathusius's Pipistrelle refer to migrants. The observations of Noctule Bat possibly concern migrants as well, but they could also be residents from the mainland, which may use the wind parks as a foraging area. There are no indications that the observations refer to disorientated or drift migrants.

BATS AND THEIR ECTOPARASITES AS RESERVOIR HOSTS FOR PATHOGENIC BACTERIA [O]

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Although a plethora of pathogenic viruses have been found to colonize bats, bat bacterial flora and its zoonotic threat have not been studied in detail. New molecular methods provide tools to investigate the possible pathogen diversity of organisms. In a study initially conducted as a quantitative metagenomic analysis of the faecal bacterial flora of Daubenton's Bat in Finland, DNA of several hemotrophic and ectoparasite-transmitted bacterial genera were detected, including *Leuconostoc*, *Enterobacter*, *Lactococcus*, *Chlamydia* and *Bartonella*. Furthermore, *Bartonella spp.* were also either detected (PCR) or isolated (culturing) from peripheral blood (*Eptesicus nilssonii, Myotis daubentonii, Myotis mystacinus*) and ectoparasites (*E. nilssonii, M. daubentonii, M. brandtii)* of bats caught while foraging with mist-nets and harp trap. *Bartonella* spp. are facultative intracellular bacteria that typically cause long-lasting hemotrophic bacteraemia in their mammalian reservoir hosts, such as rodents. The bacteria here isolated from Finnish bats belong to the *Candidatus*-status species *B. mayotimonensis*, a recently identified etiologic agent of endocarditis in humans, and a new *Bartonella* species. Phylogenetic analysis of bat-colonizing *Bartonella* spp. throughout the world demonstrates a distinct *B. mayotimonensis* cluster in the Northern Hemisphere. The findings of this field study highlight bats as potential reservoirs of human bacterial pathogens and also suggest faeces could be used to monitor bacterial flora in bats.

SEX DIFFERENCES IN HABITAT USE OF TEMPERATE BATS IN URBAN AREAS [O*]

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Urbanisation is a major driver of the global loss of biodiversity. In order to mitigate its adverse effects it is therefore essential to understand what drives species' patterns of habitat use within the urban matrix. Whilst many animal species are known to exhibit sex differences in habitat use, adaptability to the urban landscape is commonly examined at the species level, without consideration of intraspecific differences. For example, whilst the high energetic demands of pregnancy and lactation in females can lead to sexual differences in roost selection and foraging activity, little is known of intraspecific differences in the response of bats to urbanisation. We studied differential responses of male and female *Pipistrellus pygmaeus* to woodland character, patch configuration and the composition of the surrounding landscape in fragmented urban woodland patches. Lower female abundance was found within woodlands that were poorly connected, highly cluttered, with a higher edge-to-interior ratio and fewer mature trees. In contrast, habitat quality and the composition of the surrounding landscape were less of a limiting factor in determining male distribution. These results indicate strong sexual differences in the habitat use of fragmented urban woodland, and this has important implications for our understanding of the adaptability of bats to urbanisation.

SEASONAL POLYOESTRY IN A TEMPERATE BAT: REPRODUCTIVE SEASONALITY OF THE EGYPTIAN FRUIT BAT, *ROUSETTUS AEGYPTIACUS*, AT THE NORTHERN LIMITS OF ITS DISTRIBUTION [P]

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We collected and analyzed data on the annual course of reproduction of the Egyptian Fruit Bat, *Rousettus aegyptiacus*, in two climatically distinct areas, the Mediterranean and the Egyptian desert, located at the northern limits of the species' distribution. In both regions, reproductive seasonality was characterized by distinct bimodality in birth timing regardless of climatic differences. A low incidence of simultaneous pregnancy and lactation indicated that both seasonal bimodal polyoestry with and without post-partum oestrus may occur in both regions, with a possibly lower incidence of post-partum oestrus in females from the Mediterranean population. Observed shifts in birth timing between the Mediterranean and the desert study area corresponded to regional differences in fruiting phenology of major dietary plants. The male reproductive cycle was synchronized with that of females. The period of testicular recrudescence occurred during the peak pregnancy period. Because testis size was related to body mass irrespective of body size, we hypothesize that food abundance is an important trigger of male sexual activity. *Rousettus aegyptiacus* is the sole species with seasonal bimodal polyoestry among Palaearctic bats.

THE SOLE EUROPEAN FRUIT BATS ON THE BRINK OF EXTINCTION [O]

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Egyptian Fruit Bats, *Rousettus aegyptiacus*, occurring on the island of Cyprus represent the sole and genetically unique fruit bat population in Europe and, simultaneously, one of the northern-most populations of any pteropodid bat worldwide. Here, we report an unprecedented precipitous decline observed between 2005 and 2013 when overall population size decreased by more than 90 per cent from more than 8,000 individuals in 2005 to less than 800 individuals in 2013. The remaining population displays a sex ratio highly skewed toward males, a situation quite different from that observed before the decline, as well as in vital populations examined in Turkey and Lebanon. The outcomes of modelling the effects of human disturbance and climate on bat numbers give evidence that both factors may play an important role in the population collapse. Since bat numbers in easily accessible roosts experienced, on average, a higher decrease than less accessible ones, we hypothesize that human disturbance could play an important role. However human activity alone could hardly explain the observed decline. Although Cypriot fruit bats have been persecuted as agricultural pests throughout the 20th century, their numbers were still high at the beginning of 21st century. We hypothesize that rising annual temperatures, and the second most extreme drought over the last 110 years coinciding with the most severe population decline, may have heavily impacted fruit bats through disruption of fruiting phenology of food plants and decreased accessibility to water. Effective conservation measures are urgently needed and should first include strict protection of roosting sites throughout the island.

A COMMON PLATFORM FOR SPATIAL DATA COLLECTION IN BAT RESEARCH AND CONSERVATION: BAT MOBILE [P*]

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Field data collection has always been one of the most important activities in environmental sciences, particularly to a domain that relies heavily on a large number of observations in order to support its theories, such as the biological sciences. As new research methods are devised by specialists in various fields, the quantity of information collected in the field is increasing. A common data collection platform can be a solution for groups of researchers who want to process a sample using different approaches, from complex spatial dispersal models of rabies in bats, to a simple species distribution model generated using only the presence of a given species of interest. Using one central database can help reduce user biases related to data transfer from the field to the laboratory. Also it may help reduce stress on bat populations, through the idea that a user will collect as much information as possible in a certain visit, which can also be useful for other specialists. The datasets contained in such a platform have been generated for the West Palaearctic bat fauna, in relation to certain field and laboratory data collection methods, such as wind farm mortality studies, mist netting, virology, toxicology, stable isotopes or genetic samples, necropsy results, injuries and rehabilitation attempts. Data can be added both in the field, using an Android device, preferably with access to GPS and camera, and via a browser interface. This can help specialists working in the laboratory to complete their studies with location and other important observations which can be obtained only in the field. Another important use for the application will be public participation, allowing non-researchers to get involved and to help protect bats by reporting injured individuals via their smartphone or contacting specialists in the area if they want to safely relocate a bat colony from their home. Also, they can observe the progress of an injured bat in a given rehabilitation centre. Data extraction from the application will allow a certain user, or a group of users, to download ArcGIS compatible files, ready for any type of spatial analysis related to bat research. In time, this can generate important datasets that can lay the foundations for a comprehensive study using species distribution models, and can facilitate collaboration between chiropterologists in Europe.

BAT MORTALITY AT A WIND FARM: A CASE STUDY OF A 42 MW WIND FARM IN TULCEA COUNTY, ROMANIA [O*]

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Bats are affected by wind developments but the magnitude of the negative impact is hard to assess due to a series of variables that can strongly affect total fatality predictions. This case study presents the results of a one year survey of the collision rates of local and migratory bat populations. A carcass search survey was conducted every two weeks, from mid-April to mid-November. The search area under each turbine was represented by a square with a 50 m side, in which the searcher would carry out transects that had a 2.5 m observation length per side. Precise navigation and data collection was ensured via a DGPS with real time correction processing. Searcher detection accuracy and carcass removal tests were conducted using batches of 30 *Mus sp.* carcasses per trial, randomly dispersed using similar predefined locations. Static and mobile acoustic monitoring sessions were performed in the nights after the searches took place, by means of a Pettersson D-500X and a D-1000X, both with external directional microphones. Using spatial data, such as land use together with digital elevation data, and the results from the acoustic monitoring, a Markov model was generated in order to establish the areas where bats are more abundant and vulnerable. A total of 49 carcasses were collected and identified to various taxonomic levels. The 37 carcasses identified to species level belonged to: *Pipistrellus nathusii*, *P. kuhlii*, *P. pipistrellus*, *P. pygmaeus*, *Vespertilio murinus* and *Nyctalus noctula*. Only one case of barotrauma was recorded, the rest of them being hit by the blades. The presence of bat carcasses was favoured by higher temperatures (Spearman $\rho = .697$, $p<0.001$) and reduced by higher wind speeds (Spearman $\rho = .360$, $p<0.05$). Similar results were also recorded for the acoustic monitoring. The turbines that produced more carcasses were located near feeding or transit areas. Corrected mortality estimations reached 4.75 bats/turbine/year, or 2.26 bats/MW/year. The ratio between the detected species via acoustic monitoring and identified carcasses is lowest with *V. murinus,* and places *P. nathusii* on the other extreme, with the highest number of carcasses found and the highest number of contacts in the acoustic monitoring, which peaked in July.

CATCHING BATS: THE FRENCH TRAINING PROGRAM [O]

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In the context of the French national action plan for bats conservation and in response to requests from the French bat worker community, a training programme for catching bats has been developed in France since 2013. Useful, but invasive, capture techniques are largely used to confirm species, sex and breeding status, to sample biological tissues or to fit radio-transmitters for further survey work. Thus, it was essential that bat workers undergo theoretical and practical training, on technical, ethical and health aspects. The implementation of this programme was a good opportunity to discuss these practices and to identify guidelines for the whole bat workers' community. The project and the training tools will be presented in order to compare and discuss what is done in other countries.

BRIDGING THE DROUGHTS: ADAPTATIONS OF A MEDITERRANEAN BAT SPECIES [O*]

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The availability of natural roosts has been one of the major limiting factors in bat conservation in recent decades. A number of man-made structures mimic the conditions occurring in natural roosts and can be of major importance for the survival and conservation of many bat species. In the U.S.A., the use of bridges by bats as roosts has been widely studied, however bat research in Europe seldom targets such structures. Since 2011 we have been studying the use of modern bridges by bats, particularly in north-eastern Portugal. Overall, 17 species were found roosting in bridges. *T. teniotis* was the most frequently found, followed by species from the genus *Pipistrellus*. The large colonies of *T. teniotis* identified through this study have been a major opportunity to set up several studies targeting this poorly known bat species, the majority of which are ongoing. However, during 2012 the region suffered one of the harsher droughts of recent decades, thus giving us an opportunity to study how the populations of this Mediterranean bat reacted. Our results from 2012 and 2013 show that the breeding success of *T .teniotis* was much lower in the former, with a lower number of pregnant females and juveniles. Interestingly we found no significant differences in Body Mass Index (BMI) between the two years. We also compared the precipitation values and Normalized Difference Vegetation Index (NDVI) between both years. Regarding 2012, the precipitation values were the lowest since 1983, and the NDVI was well below the median for the period of 2001-2013. For 2013 both variables were above the median values for the considered periods. Water availability is an important resource for reproductive females, while NDVI influences prey availability. Individuals of *T. teniotis* seem to favour their fitness rather than reproductive success, despite being a bat species with a strong Mediterranean affinity, and so adapted to dry years with low water availability and prey abundance. These results give us important insights on the impacts of Climate Change on Mediterranean bat species, for which an increase of drought episodes (duration and frequency) may have a significant impact on those populations.

AMENITY LIGHTING OF WATERWAYS: IMPACTS ON DAUBENTON'S BATS [O]

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The extent and intensity of artificial lighting is increasing rapidly, with potentially important implications for bats. This study was designed to assess the effects of lighting on Daubenton's Bats, *Myotis daubentonii*, a species widespread throughout Europe and one commonly affected by amenity lighting of waterways. A randomised controlled experiment was conducted at 5 sites, using three different levels of light together with a dark control. Bat activity was measured using SM2 bat detectors and aquatic insect emergence was monitored at the same sites using floating traps. A graded response to lighting was seen, with bat activity declining with increasing light intensity. There was also evidence that foraging was less efficient in areas with more intense lighting, with an observed decline in the ratio of feeding buzzes: search phase calls. Insect emergence was also affected by lighting, though the responses varied between trichopterans and chironomids. Given the potential for animals to habituate to environmental disturbances over time, the findings are discussed in the context of observational studies of Daubenton's Bat activity in areas routinely subjected to lighting.

RECENT RESULTS OF FLIGHT PATH ANALYSIS OF BATS WITH NETWORKED ARRAYS OF SENSORS [P]

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Flight path tracking is a new emerging technology that may provide insights into the acoustical behaviour of bats in their environnement. Concerning the technology, there are multiple ways of using an array of microphone sensors to track the flight path, especially when these arrays can be put together via a network communication protocol (wireless local area to wireless wide area). In this work we investigate different ways of instrumenting the field in relation to the information scientists want to collect about the animal behaviour. We demonstrate that there exist three scales for which a network array technology can collect the original set of acoustic data. The microscopic scale gives an accurate image (1cm-1m accurate) of the behaviour of bats in relation to their close environment of the order of the animal sonar detection range. The mesoscopic scale (1m-10 m accurate) gives a concrete view about how the bat behaviour adapts to habitat changes. We finally discuss how the macroscopic scale (1km-100 km accurate) can be addressed with the most recent webbased technologies, the so-called Internet of things, to solve large-scale habitat questions, such as urban city or forest occupation, and finally provide fruitful information at the climate scale.

The poster will show concrete results of bat behaviour analysis obtained in the field with different kinds of network protocol.

HOW TO CONSERVE A SPECIES OF FAVOURABLE CONSERVATION STATUS - THE LESSER HORSESHOE BAT - IN IRELAND IN THE 21ST CENTURY [P]

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The most recent population estimate for the Lesser Horseshoe Bat, *Rhinolophus hipposideros*, in Ireland is 14,000 individuals and represents a slight increase compared to previous estimates. It is the only Habitats Directive Annex II bat species for Ireland, and in the most recent report on the *Status of EU Protected Habitats and Species in Ireland* it was declared 'Favourable' under all the headings used to assess a species' conservation status, including Range, Population, Habitat and Future Prospects.

Yet a number of recent research publications point to areas of concern that need to be addressed now in order to prevent problems for this species in the future. One of these is the discovery of the low gene flow between colonies in the north and south of its distribution, with indications that there are already two distinct clusters within Ireland. The other is the identification of marginally favourable habitat separating these two regions, as a result of agricultural intensification and urbanisation.

Although the practical conservation measures needed to address these concerns exist, the major challenge is finding a funding mechanism for their delivery. A number of options will be presented to start the discussion on how to ensure the Lesser Horseshoe Bat in Ireland can occupy the full extent of its potential range, thus ensuring sufficient gene flow, which in turn will guarantee population viability.

FLIGHT ACTIVITY AND LANDSCAPE USE OF INDIVIDUAL BRAZILIAN FREE-TAILED BATS [O]

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The ~ 2 + million Brazilian Free-tailed Bats that emerge and forage each night from Frio Cave in Texas, U.S.A., have a nightly flight range of up to 100 km and are known to feed at altitudes of at least 1,200 m above ground level. However, information on the bats' dispersal, flight activity, and foraging behaviour has relied, to date, on radar observations of mass movements and acoustic surveys, and little is known of the movements, flight behaviour, or habitat use of individual bats. The complete nightly flights of individual, radio-tagged female Brazilian free-tailed bats were tracked from an aircraft on eight nights (1 bat each night) during mid-July, from the bat's emergence until the bat returned to the cave or an alternative day roost. All bats emerged from the cave before dusk and flew continuously for six + hours. Individuals made use of previously unreported gliding flight behaviour, and flew at velocities and to distances that are consistent with and/or exceed expectations from movements estimated using Doppler radar. One lactating female made use of an alternative day roost within a building located 28 km from the cave, demonstrating that not all lactating females are faithful to maternity roosts. We report the use by individuals in flight of natural and man-altered landscape features and infer flight patterns with reference to local wind and meteorological conditions.

CONSERVATION REQUIREMENTS FOR THE BAT COMMUNITY IN THE MALTESE ISLANDS [O*]

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Islands offer unique ecosystem characteristics due to their small size. However, additional pressures are introduced as a result of limited resources and reduced gene flow, and consequently such bat communities require special conservation considerations. The order Chiroptera on the Maltese Islands is a significant contributor to the local mammalian species diversity, yet, previous records show inconsistencies with respect to the identity of certain bat species. During this study such irregularities were addressed and species-specific ecological requirements were explored with the aim of introducing measures for effective bat conservation management within the Maltese Islands.

A bat detector recording system allowed analyses of echolocation calls. 36 sites, selected by stratified random sampling, were studied during multiple seasons by recording echolocation calls along a 1 km line transect and simultaneously recording environmental variables. An automated signal parameter extraction algorithm and artificial neural networks (ANNs), allowed the identification of seven species: *Hypsugo savii*, *Pipistrellus kuhlii*, *Pipistrellus pipistrellus*, *Myotis punicus*, *Plecotus austriacus*, *Rhinolophus hipposideros* and *Tadarida teniotis*. The detection of each species in a specific time interval allowed the formulation of an activity index used to investigate seasonal distribution and habitat use.

Using manual identification and ANNs, 94% of the bat passes recorded were identified to species level, while *Pipistrellus* spp. accounted for the other 6%. By means of the activity index it is indicated that *P. pipistrellus* is the most common bat species in the study area followed by *P. kuhlii* and *H. savii*, highlighting the different adaptation capabilities of bat species to the anthropogenic and semi-natural habitats of the Maltese Islands. Further analyses using distribution maps have shown all species recorded to have a widespread distribution across the Maltese Islands except for *R. hipposideros* and *P. austriacus,* highlighting the conservation priorities for the habitats used by these two species.

Primarily, this study has shown that bat species conservation management needs to be species-specific. Additionally, acoustic methods used for bat species identification and quantitative analyses, such as those used during this study, can be used to elucidate species-specific patterns and ecological requirements, and hence may be integrated into future long-term monitoring programmes of bat population trends in the Maltese Islands.

WINTER DIGESTION IN BATS (CHIROPTERA) [P*]

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Hibernation during the winter period is typical for Mid-European bat species. This results in minimizing metabolism and in torpor. According to our observations Mediterranean Horseshoe Bat, *Rhinolophus euryale,* produces faeces in the temperate zone throughout winter. The faeces contain remains of prey in the beginning of the winter season, and also at its end, but during the middle of the hibernation period bats produce mostly jelly-like guano. Production of faeces during the whole winter period causes water loss and consumes energy. Also, metabolic processes are not reduced to such a rate as was expected. The presence and the amount of digestive enzymes in the faeces should demonstrate if digestion processes also continue during the hibernation. It is further unclear which enzymes bats produce *de nuovo* and which are produced by symbiotic bacteria. We collected ten guano samples from foil laid under the hibernating colony of Mediterranean Horseshoe Bat in the Baradla Cave (Hungary) during the winter 2012/2013. We determined the amount of soluble proteins in the samples by modification of the Bradford method. Glukosaminidase, chitobiase and endochitinase were determined using fluorimetric chitinase assay kit based on release of 4-metylumbeliferone. Alfa-amylase was determined by chromogenic tablet assay. We confirmed that the faeces contained soluble proteins. We demonstrated the presence of amylase, glukosaminidase, chitobiase and endochitinase (also protease – analysed from just two samples) in the winter faeces during the whole winter period. Amylase and protease are not adapted for acidic pH in the stomach. They were active just in pH6. All three chitinases were active in both pH3 and pH5, but significantly more in pH5. We cannot confirm if *Rhinolophus euryale* is able to produce mammalian chitinase or to exploit chitinolytic micro-organisms in the intestine only. We assume that chitinases remain active as an adaptation of the species to arousals and occasional foraging during the winter. This poster is the result of the Project implementation: KVARK - quality education and skills development for doctoral and post-doctoral students of Pavol Jozef Šafárik University in Košice, ITMS: 26110230084, supported by the Research & Development Operational Programme funded by the European Social Fund (ESF).

HABITAT SELECTION IN *PIPISTRELLUS KUHLII* [O*]

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A rapid range expansion of *Pipistrellus kuhlii* has been observed throughout Europe and, apart from natural habitats, the species is common in city centres and in roosts in artificial structures. *Pipistrellus kuhlii* exhibits one of the highest degrees of synanthropy among bat species in Europe. Other studies described foraging and affinity of the species to urban habitat, but research of spatio-temporal activity based on a radiotracking approach has not been reported yet. This study was conducted in Michalovce city (eastern Slovakia), where the northernmost maternity colony of *Pipistrellus kuhlii* roosts in prefab slots. Two radio-tracking sessions were conducted, corresponding to the pre-breeding period (June 2013) and post-lactation period (August 2013). Altogether 15 adult individuals were marked, ten of them (2 females and 3 males in June, and 3 females and 2 males in August) were used for analysis. The main land-use types recognized in the study area (MCP for all fixes) were as follows: open habitat, urban habitat, riparian habitat, forest and scrubland, and urban green patches. Based on χ^2 goodness of fit test, we concluded that both sexes of *Pipistrellus kuhlii* select particular foraging habitats in all seasons. Urban and riparian habitat, including rivers, dam water and riparian vegetation, were the most important foraging habitats. We identified six artificial roosts that were interlinked and communicate. We conclude that *Pipistrellus kuhlii* is well adapted to human activities and urban habitat. This presentation is the result of the Project implementation of KVARK – quality education and skills development for doctoral and post-doctoral students of Pavol Jozef Šafárik University in Košice, ITMS: 26110230084, supported by the Research & Development Operational Programme funded by the European Social Fund (ESF).

SURVEILLANCE OF RABIES AND RESIDUES OF HEAVY METALS IN CENTRAL EUROPEAN BATS [P*]

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As the interest in the study and conservation of bats throughout the world grows, bats have been recognised to host a diversity of viruses of zoonotic potential. Insectivorous bats are also known to bioaccumulate toxic pollutants and declines in their absolute numbers in recent decades have been documented. The aim of this study, therefore, was to screen central European bats for lyssaviruses as well as for residues of heavy metals in tissues. In cooperation with wildlife rescue centres and institutions dealing with protection, treatment, rehabilitation and research of bats in the Czech Republic we managed to obtain over several recent years 980 specimens of bats that died naturally or were euthanased for incurable injuries such as traumatic loss of extremities. Given that all European bats are protected, it is an extremely valuable source of material for research. Likewise, we obtained oral swabs and collected blood samples from 420 specimens in a non-lethal way while monitoring bats for white-nose syndrome in the Czech Republic in 2012 to 2014. Bat species included *Myotis myotis*, *M. daubentonii*, *M. bechsteinii*, *M. nattereri*, *M. brandtii*, *M. mystacinus*, *M. emarginatus*, *M. dasycneme, Rhinolophus hipposideros*, *Eptesicus serotinus*, *E. nilssonii*, *Plecotus auritus*, *P. austriacus*, *Barbastella barbastellus*, *Pipistrellus pipistrellus*, *Vespertilio murinus*, and *Nyctalus noctula*. RT-PCR with universal lyssavirus primers was used to screen for lyssaviruses in tissues (brain, salivary glands). Seroprevalence of rabies antibodies in bats was measured using a commercial indirect ELISA kit. Quantification of heavy metals in samples (liver, bone, hair) was carried out using inductively coupled plasma-mass spectrometry. Results of the present study are unique due to both the large sample size, the lack of prevalence data of rabies and epidemiological risk assessment regarding synanthropism of different bat species in the Czech Republic, and ecotoxicological implications of importance for veterinarians, zoologists, nature conservation and rescue centre professionals.

THE SPATIAL AND SOCIAL DYNAMICS OF NATTERER'S BAT, *MYOTIS NATTERERI* [P*]

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Previous studies have described the scale of bat communities, but there are still significant gaps in our understanding of the spatial and social dynamics of bats. For example, we need to better understand social structure and contacts at an individual, class and community level if we are to assess the importance of particular roost sites and the effects of their removal on their conservation. Natterer's Bats, *Myotis nattereri*, were caught during 2013 at Wallington National Trust Estate, Northumberland, UK, and marked using combinations of rings, radio-transmitters and, during 2014, passive integrated transponders (PIT tags). Catching was by hand (within roosts where applicable), by static hand net, by harp trap and using mist-nets. Tree roosts were characterised and attendance at these roosts monitored. During 2013, 20 *M. nattereri* were caught and ringed. Ten natural tree roosts were identified. Bats appeared to switch roost every 2-3 days. This data along with additional data collected in 2014 will enable us to describe the network of roosts used by a single community. The data about individuals, their movements and the roosts they use will provide a uniquely detailed description of a bat community and their social and spatial dynamics. This has significant potential benefits for policy development and implementation (e.g. informing Favourable Conservation Status: FCS) and bat conservation.

COHORT VARIATION IN LIFE HISTORY TRAITS OF A RARE WOODLAND BAT (*MYOTIS BECHSTEINII*) [P]

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Temporal variation in life history traits of a species, including survival and reproduction, can influence the dynamics of a population. In long-lived species, such temporal variation can manifest itself as cohort variation in life history traits affecting population growth through variation in survival and reproductive success. This study looked at cohort variation in a small vespertilionid bat, the Bechstein's Bat, *Myotis bechsteinii*, using long-term ringing data from juveniles born in a closed maternity colony. The study used a colony of Bechstein's Bats that roosted in 80 Schwegler 2FN and four 1FW bat boxes in woodland in southern England.

A comprehensive ringing programme of the colony started in May 1999, with monthly checks of the boxes taking place every year from April to September. Biometric data were recorded from any animals found and an assessment of their breeding condition was undertaken. Newly encountered animals were marked using 2.9 mm Porzana rings (The Mammal Society).

To date, 627 individual animals have been ringed. The study found that juvenile female survival varied annually between 70% and 80%. Cohort variation in survival was explained by rainfall during early development and an additive effect of population size, which negatively influenced juvenile survival in their first year. Forearm length varied between cohorts, although an emerging trend for forearm length to increase with temperature during early development was not significant. The age of first parturition ranged from 1 to 5 years but did not show significant variation between cohorts. These results contribute to our understanding of population dynamics of long-lived species and can help conservationists to understand population trends for this rare species, through understanding the long-term effects on cohorts influenced by environmental conditions during development.

PROTECTION OF BATS IN THE NERETVA RIVER CATCHMENT AREA, BOSNIA AND HERZEGOVINA [P]

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More than 50% of Bosnia and Herzegovina (B&H) is comprised of limestone bedrock as part of one of the world most important karst regions: the Dinaric karst. The majority of B&H karst is located in the south-west part of the country and it largely overlaps the eastern Adriatic corridor and includes three Key Biodiversity Areas. Caves are numerous in the region and, not surprisingly, they are perfect sites for bat reproduction, hibernation and swarming sites. Because of the lack of past research, there are very few records of bats in B&H in general and in the Mediterranean area as well. Therefore the conservation status of bats species and their roosts is unknown, so the state government does not enforce any specific legislation for protection of bats and their habitat. There is an urgent need to fill these gaps in knowledge and generally to raise awareness of the positive ecological role of bats and their needs for protection. This is even more pressing considering the activities to designate Natura 2000 sites network in B&H. To gain a little more clear insight into the bats of Herzegovina, the *Center for Karst and Speleology* is carrying out a two-year project *Bats in the Neretva River Catchment Area*. It consists of four work packages: a) training volunteer bat workers, b) basic inventary of bats, c) education of the general public and involving civil society in nature conservation, and d) proposing conservation measures for selected bat roosts. In 2013 several workshops for volunteers were held and several field excursions were carried out. Through that, 15 bat species were recorded (*Rhinolophus ferrumequinum, R. hipposideros, R. euryale, R. blasii, Myotis myotis, M. blythii, M. nattereri, M. emarginatus, M. mystacinus, M. capaccinii, Nyctalus noctula, Pipistrellus kuhlii, Hypsugo savii, Eptesicus serotinus* and *Miniopterus schreibersii*), and several important bat roosts were discovered. For the first time International Bat Night was held in B&H, a booklet on bats and an accompanying film were made. The poster will present also the results of the 2014 season.

ROOST-SITE SELECTION PATTERN IN TREE-DWELLING BATS: META-ANALYSIS ON GLOBAL SCALE [P*]

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Vulnerability of tree-dwelling bats, natural rarity and their characteristic slow population growth are crucial features causing the need for understanding of their ecological requirements. In order to develop appropriate conservation policies and management plans, the number of studies indicating habitat selection increased rapidly in recent decades. However, the current knowledge about species-specific preferences of tree-dwelling bats does not allow general application to forest management plans. A second limitation is different sampling design or statistical analysis used across studies which, in some cases, produces different results. We conducted a meta-analysis of habitat selection studies in tree-dwelling bats for universal management recommendations based on available data. Such meta-analysis not only indicates general patterns in habitat use, but also links detected selection patterns with features of landscape where the studies were conducted. Thus, we tested how variability of roost-site selection correlates with landscape characteristics.

FREQUENT ROOST-SWITCHING IN TREE-DWELLING BATS, AND HOW TO KEEP THE GROUP UNITED [O*]

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Frequent roost-switching over relatively long distances is a typical behavioural characteristic in many tree-dwelling bats. Change of microclimatic conditions and increasing parasite infestation are factors forcing bats to leave the current roost and search for another. Switching of the roost site is time-consuming due to limited searching capability of bats exploring the environment for a new roost, and potentially dangerous due to the risk of group disintegration. How members of bat colonies asses the information about the potential roost and make both individual and collective decisions during roost-switching is largely unknown. Using continual recording of bat activity at the most frequently occupied roosts by infrared data-loggers we obtained spatio-temporal information about movements of a nursery colony of Leisler's Bat, *Nyctalus leisleri*. We used this to reconstruct a step-by-step progress of roost-switching events. Our results show that movement of the colony does not occur in a single event but most frequently in two or three such waves (days). The roosts which were actually unused were checked multiple times during the whole night, most probably by multiple individuals. This suggests a common decision process rather than some leadership in roost selection.

HOW TO BE A MALE AT DIFFERENT ELEVATIONS: ECOLOGY OF INTRA-SEXUAL SEGREGATION IN THE TRAWLING BAT *MYOTIS DAUBENTONII* [P*]

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Sexual segregation occurs in many bat species of temperate areas. Daubenton's Bat, *Myotis daubentonii,* constitutes an interesting model species as in several regions of Europe adult males are disproportionately abundant at higher elevations, while females are restricted to lower altitudes. Low-altitude males share summer roosts with females and may mate in summer as well as autumn.

We studied the ecology of intra-male segregation in a *M. daubentonii* population by exploring differences between two altitude zones (> 1,000 m a.s.l. and < 900 m a.s.l.). The study area was the Sangro River in Central Italy. We tested the following hypotheses:

1. High-altitude males (HM) will show a deeper daily torpor than low-altitude males (LM);
2. LM will have a better body condition;
3. HM will be more flexible in habitat selection;

Heterothermy was assessed by tagging bats with LB-2T Holohil temperature-sensitive radio-transmitters. HM used prolonged and deeper torpor as their Heterothermy Index (HI) was higher (N = 22, GLM ANOVA, $P < 0.05$). Scaled Mass Index measured for 198 bats showed that LM have a significantly better condition than HM (GLM ANOVA, $P < 0.005$); season (pre-birth and post-birth) had no effect on this factor but showed a significant interaction with elevation ($P < 0.01$). This effect reflected the dropping of LM body condition over the season, possibly because of energy loss due to reduced opportunities to use torpor. We assessed habitat selection by radiotracking 23 bats. LM mainly selected riparian vegetation whereas HM were more generalist. Additionally, as one controversial issue is whether HM are excluded from lower elevations by intraspecific competition with resident bats, we attempted to test this by translocating 10 HM to a low-altitude roost. Eight of them moved back to high elevation in one or two nights, two stayed at low altitude but roosted separately from resident bats and selected marginal habitat. Although not fully conclusive, our results are in agreement with the competition hypothesis.

Overall, living at high altitude offers more effective heterothermy so that the main benefit for LM is not energetic but probably reproductive as they may increase fitness by summer mating.

BAT HABITAT AND LANDSCAPE ASSOCIATIONS IN HIGH WIND RESOURCE AREAS OF IRELAND: IMPLICATIONS FOR WIND ENERGY [O*]

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Wind energy developments worldwide often have fatal consequences for bats. At least four of Ireland's nine resident bat species have shown considerable mortality at wind energy facilities in mainland Europe. However, due to Ireland's unique landscape characteristics, bats have developed different habitat associations and behaviours compared to their European counterparts and overseas research findings do not readily transpose to the Irish situation. Even within Ireland, little is known of how bats use open, upland habitats where wind turbines tend to be sited. This research constitutes the first step in investigating the impacts of wind turbines on bats in Ireland by identifying areas potentially sensitive for bats and suitable for wind energy development. Car-based monitoring was used to gather bat presence data exclusively within areas of high wind. In 2013, 54 transects of 50 km were completed. With this data, we tested an existing bat habitat suitability model constructed for Ireland and found it unsuitable for predicting bat presence in areas of high wind speeds. Using MaxEnt predictive modelling, bat habitat and landscape associations were modelled to predict patterns of bat distribution exclusively in areas with large wind resources. This research will inform future research on bat fatalities at wind turbines as well as appropriate wind farm planning.

CALLS FOR CONSERVATION: HOW ECHOLOCATION SERVED THE RED LIST COMPILATION OF SWISS BATS [O]

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Red Lists are indispensable tools in conservation planning, decision-making and monitoring trends of extinction risk. The Red List of threatened bats in Switzerland dates back to 1994, well before current IUCN guidelines. In tackling its revision, we made accessible information from national databases of the Swiss Coordination Centre for Bat Protection and the Swiss Biological Records Centre. We also included museum records, and heavily invested in a field survey extending over five years. The sampling design included 101 one km^2 squares, coinciding with cells of Biodiversity Monitoring Switzerland. Each contained 10 points for acoustic surveys and additional mist-netting locations. Acoustic surveys employed an observer method combined with independent automated recording. Ultrasound recordings were repeated four times over different years and seasons, while netting was repeated twice. The selected sampling scheme had been pre-evaluated based on available recordings and a dedicated pilot study, taking into account imperfect detectability of species, varying occupancy rates, and available funding.

Acoustic and netting records of species were combined for modelling area of occupancy (IUCN criteria B2,a-c). Areas of river catchments containing a record were counted as occupied and summed to preliminarily judge a status of threat (Area < 2,000 km^2: VU, < 500 km^2: EN, < 50 km^2: CR, 0 km^2: RE). The resulting status was evaluated by experts and adjusted according to known changes of distribution, area of occupancy, habitat scarcity, or fragmentation of population, and finalized in consideration of foreseeable direct threats e.g. to habitats (Ludwig et al. 1991, BfN-Skripten 191). In the resulting new Red List of threatened bats 26 of 30 species present in Switzerland could be categorised. Of those 15 are threatened (3 CR, 5 EN, 7 VU), corresponding to 58%. Several species changed status, but the change in methodology from the last Red List makes interpretation difficult. Overall, the status of threat of Swiss bats is still considerable.

INTER-ISLAND GENETIC VARIATION AND POTENTIAL GEOGRAPHIC STRUCTURE IN OPE' APE' A: IMPLICATIONS FOR CONSERVATION MANAGEMENT IN HAWAII [P*]

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The Ope'ape'a, or Hawaiian Hoary Bat, *Lasiurus cinereus semotus*, is a federally endangered subspecies in the United States, whose current distribution, population size, and potential movements across the Hawaiian Islands are unknown. Recent research into the biogeographic history of Hawaiian bats has produced a fascinating picture of multiple colonization events and investigated the effective population sizes, rates of gene flow, and time of dispersal that separated this subspecies from North America. As part of a collaborative effort to understand current bat distribution and delimit population boundaries that may exist across the major islands, this poster will share preliminary population genetic data and examine the implications that might arise for management of distinct island populations. As the state of Hawaii's only endemic land mammal, research yielding information on population structure and genetic variation will aid local conservation management efforts to protect this species from threats such as habitat loss and the impacts of wind energy.

VOLUNTARY HELPLINE PROVIDES IMPORTANT DATA ON BATS IN SLOVENIA [P]

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The Slovenian Association for Bat Research and Conservation (SDVPN) is a non-governmental organisation in Slovenia that brings together those who share interests in protecting bats and their habitats. Since its founding in the year 1998 its members have been advising, assisting and educating the general public with issues concerning bats and their roost. In 2009, we started systematic recording of the public enquiries (calls, e-mail). Approximately 10 members gave their phone numbers on the internet for providing urgent help for people who found a bat or bat roost. All the work is done on a voluntary basis and SDVPN does not receive any funding to operate and administer the bat helpline and care network.

Data collected through the activities of the helpline between 1 January 2009 and 31 December 2013 (5 years) in Slovenia have been analysed. Each year we received over 120 enquiries, with the number increasing every year (from almost 100 in 2009 to 145 enquiries in 2013). In recent years we received more calls from people with a positive attitude towards bats (more than 90% of the calls) and less negative calls. Approximately half of the enquiries were solved by phone or e-mail conversation. In the other half of cases , mostly at our expense, we went to identify the bat in the field or to take it home for rehabilitation care. The most frequent species so recorded were those of the genus *Pipistrellus – P. nathusii* (50 animals), followed by *P. kuhlii* (32), *P. pygmaeus* (26) and *P. pipistrellus* (8). Other commonly found bat species were *Hypsugo savii* (20), *Nyctalus noctula* (19) and *Vespertilio murinus* (18). We were successful in nearly half (53%) of bat cases in rehabilitation care and those bats were released into the wild.

These results are important in several aspects, which all encourage us to continue with our voluntary phone helpline. The main reasons are:

- direct help provided to bats found grounded or injured,
- a fantastic opportunity for educating the public about bats and the importance of preserving these endangered animals,
- gathering the data on ecology and distribution of the bats in Slovenia.

NOTES ON *RHINOLOPHUS HIPPOSIDEROS* NUMBER DYNAMICS AND MICROCLIMATE IN A CAVE MATERNITY ROOST IN THE ALPINE BIOGEOGRAPHICAL REGION IN SLOVENIA [P]

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Rhinolophus hipposideros nursery colonies in the northern part of its range in Europe are almost exclusively in above ground roosts, e.g. building attics, and have been the subject of numerous studies. However, rare are ecological observations on *R. hipposideros* cave maternity roosts found in the southern part of its distribution. Therefore, the discovery of a nursery colony in the cave Pod kevdrom in Slovenia in 2011, offered opportunity for such research, making it even more interesting since, according to the EU Habitat Directive, the cave is situated in Alpine biogeographical region where most maternity roosts are known from buildings.

This cave, just 7 m long, was visited 16 times between mid-March and mid-October 2012. Bats were counted, some captured and sexed, aged and reproduction status assessed. One temperature and humidity datalogger was permanently placed in the cave, and additionally, temperatures were measured with a hand held thermometer in 4 places.

Up to 5 previous year juvenile animals (males predominated) were present in the cave during March. Only in mid-May were the first adult females recorded. Numbers of bats abruptly arose to more than 40–50 adults (including sub adults) in the beginning of May and that number of bats persisted in the cave till mid-July. The first pup was observed on 1 July, 7 pups were observed on 9 and 27 on 17 July. In the second half of July bat number began to decrease and in mid-August less than 10 bats, predominantly juveniles, dwelt in the cave. During different visits more than 60 bats were captured, but the presence of adult males was not detected.

During the presence of the maternity colony (appr. 1 May–31 July) the average datalogged temperature in the cave was 18.9 °C (st. dev. 3.5, min. 11.9, max. 27.4 °C) and average relative humidity 88.6% (st. dev. 8.3, min. 11.9, max. 99.3%). In comparison to external temperatures (measured by a state hydrometeorological station) the average cave temperature was not statistically significantly different from the general climate. However, minimum temperatures in the cave were significantly warmer, and both cave maximum temperatures and daily temperature oscillations were significantly lower than for the general climate, meaning that the cave offered bats a more stable environment.

BAT CASULTIES IN TRAFFIC – AN EUROBATS REGION PERSPECTIVE [P]

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In 2008, CMS/UNEP EUROBATS established a working group on the *Impacts on bats of roads and other traffic infrastructures* to examine the impact of traffic on bats. A Resolution in 2010 urged Parties and other Range States: to ensure that bats are taken into account during the planning, construction and operation of roads and other infrastructure projects; to promote further research into the impact of new and existing roads and other infrastructure on bats and into the effectiveness of mitigation measures; and to develop appropriate national guidelines, drawing on the general guidance to be published by the EUROBATS Advisory Committee. As a preparation for the guidance, over 200 literature sources and questionnaire responses were collated exclusively from EUROBATS range states. Over 25 countries have at least anecdotal knowledge of bat traffic casualties. Publications from Germany, France and United Kingdom form approximately 70% of published papers and another 20% were composed from contributions from Poland, Portugal, Ukraine, Ireland and the Netherlands. Although the earliest accounts of road and train bat casualties are known from the 1930s, the first review papers only appeared in the 1990s and it was another ten years before research effort focused on mitigation measures and the ecological consequences on bat feeding habitat and flight paths and fatalities, etc. According to sources most of the casualties arose from road traffic (30 species), although fatalities from train (6 species) and air traffic (5 species) may be underestimated. From approximately 1,400 specific accounts of bat casualties, it is evident that not only low-flying bat species such as *Rhinolophus* and *Myotis* species, but bats flying in middle or higher airspace, such as *Pipistrellus* and *Nyctalus spp.,* are traffic victims. In general that means that practically every bat species should be treated as a potential traffic casualty. Any additional information on traffic related bat casualties, as well as on other aspects related to bats and traffic, is welcomed for inclusion in the EUROBATS guidelines.

FIRST CONFIRMATION OF *RHINOLOPHUS BLASII* IN BOSNIA AND HERZEGOVINA AND ITS POSSIBLE MATERNITY ROOST [P]

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Rhinolophus blasii is the rarest horseshoe bat in the western Balkans and, as such, the most endangered. Its range has shrunk in the past, since the species died out in northern Italy and Slovenia. It is still found in a few caves of the Croatian inland Mediterranean area and some islands where some winter and summer colony roosts are known. For Montenegro, the situation is not so clear, and in Albania the species is considered widespread, but apparently declining. In Bosnia and Herzegovina only one location was know up to now, in the vicinity of Sarajevo, and originating from the year 1891. This record is considered dubious, since it falls outside the expected range of the species. Therefore, the 2013 observation of a colony of *R. blasii* in the vicinity of Mostar is considered the first reliable data for this species in the country. A colony of approximately 50–70 *R. blasii* was found in the entrance part of the cave Prosječnica, on 16 August, during a survey of caves in the framework of the project *Bats in the Neretva River Catchment Area*. The group of *R. blasii* dwelt together with a few individuals of *R. euryale*. During evening mistnetting in front of the cave entrance 5 adult, 2 sub-adult and 7 juvenile females and 16 juvenile males of *R. blasii* were captured, together with 1 sub-adult female, 1 adult and one juvenile male of *R. euryale*. With ultrasound detector also *R. hipposideros* was recorded in the cave. Additionally 7 *Myotis oxygnathus*, 3 *M. nattereri*, 1 *M. emarginatus*, 1 *Hypsugo savii* and 2 *Miniopterus schreibersii* were caught but most probably did not roost in the cave. The presence of *R. blasii* juveniles indicates that the cave is serving as a maternity roost, however, since on our first visit on 29 June 2013 there were no bats in the cave, this colony possibly has an additional maternity roost somewhere in the vicinity. Currently bats are disturbed by occasional tourist visits, which are also not safe for tourists themselves, since unexploded bombs are scattered in the cave entrance. Conservation management for this cave habitat is of utmost importance for the conservation of *R. blasii* in the area.

THERMAL IMAGING AS A TOOL FOR MICROHABITAT PREFERENCE ANALYSIS OF BATS IN A GYPSUM QUARRY [O*]

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Nowadays thermal imaging can be used in the analysis of microhabitat selected by hibernating and breeding bats in underground roosts. The possibility to record temperature variation, arousals and site condition in a remote way allows the more convenient achievement of information on bat ecology. Also, the use of GIS modelling can create adequate models of roost use. In a few kilometres of a system of tunnels, largely disused, of a gypsum quarry of Monte Tondo, close to Riolo Terme in northern Italy, we recorded monthly the temperature in the different levels and spaces of the site, as well as of each individual or cluster of bats by infrared camera FLIR E30. It is interesting to note that despite the quarry being still active with noises and tremors, the colonies are present all year round in the system that offers a disparate variation of conditions of temperature and relative humidity. The species presents are *Miniopterus schreibersii*, representing the largest group which can reach 4,000 individuals during reproduction, *Rhinolophus hipposideros, R. ferrumequinum, R. euryale* also reproductive, *Myotis myotis* and *M. blythii* with a few hundred individuals during the breeding season.

During the hibernation period, in nearly every case the temperature of bats proved to be the same as the surrounding bedrock. Values of 7.5 to 8.5 °C in bodies are the most common during the deepest hibernation, without significant differences among species. After April *Rhinolophus spp*. move to other caves in the area and *M. myotis/blythii* arrive and arrange in clusters, active, and later they group with larger *M. schreibersii* clusters. Thermal imaging also enables the recognition of the time and modality of exits from the quarry, important to creating a "good practice" model for the use of the quarry.

FEMALE MATE CHOICE CAN DRIVE THE EVOLUTION OF HIGH FREQUENCY ECHOLOCATION [O]

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Animals employ an array of signals (i.e. visual, acoustic, olfactory) for communication. Natural selection favours signals, receptors, and signalling behaviour that optimise the received signal relative to background noise. When the signal is used for more than one function, conflicts amongst the different signalling functions may constrain the optimisation of the signal for any one function. Sexual selection through mate choice can strongly modify the effects of natural selection on signalling systems, ultimately causing maladaptive signals to evolve. Echolocating bats represent a fascinating group with which to study the evolution of signalling systems, as, unlike bird songs or frog calls, echolocation has a dual role in foraging and communication. It is nevertheless commonly assumed that echolocation has been shaped by ecology *via* natural selection. Here we demonstrate for the first time, using a novel combined behavioural, ecological and genetic approach, that in *Rhinolophus mehelyi*: (1) echolocation peak frequency is an honest signal of body size; (2) females preferentially select males with high frequency calls during the mating season; (3) high frequency males sire more off-spring, providing evidence that echolocation calls play a role in female mate choice. Our results suggest that sexual selection plays a role in call frequency allocation, most likely against ecological selection pressures, hence both evolutionary forces must be jointly considered in the study of acoustic signalling. These results highlight bats as a novel system with which to explore the interplay between natural and sexual selection on specific traits. The nature of this relationship has important consequences in understanding the evolution of animal communication systems, adaptation and speciation. Given its dual role in foraging and sexual selection, echolocation can be considered as a 'magic' trait, which can be at the same time under divergent selection and causing non-random mating.

ON THE PRESENCE AND ECOLOGY OF *GEOMYCES DESTRUCTANS* IN EURASIA AND ITS RELATIONSHIP WITH BATS [O]

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Geomyces destructans (Gd), the fungus associated with White-Nose Syndrome and mass mortalities in North America, has been found in many European countries and infecting many species, yet no mass mortality comparable to North America has ever been reported during contemporary times. Despite being infected by the fungus, it is not yet known to what extent European species are affected from such infection. It is nevertheless clear that understanding factors influencing the fungus presence and prevalence on bats is of prime importance. From an ecological perspective, our work addresses the following questions: (1) Does Gd presence explain mortalities observed at hibernacula, (2) does Gd prevalence (estimated with the naked eye) on bats vary over the course of the winter and over space, (3) is Gd present in the bat's environment and to what extent, (4) is the environment a reservoir for Gd, (5) which species are most infected by Gd, (6) which biotic or abiotic factors influence the presence of Gd in the environment and on bats. To answer these questions and with the help of a large network of bat researchers/biologists and conservationist, we sampled sediments and walls at more than 250 hibernation sites across the Western Palaearctic and to a lesser extent beyond. These sites encompass the range of most common underground bat hibernacula types known, e.g. caves, mines, cellars, tunnels, bunkers, quarries, castles. To be able to compare the results across the study area with as few biases as possible, the same sampling protocol, specifically developed for the current project, was applied at every site. Analyses for the presence of Gd in the collected samples were carried out using a combination of state of the art genetic and culture techniques. The main results show that Gd presence does not explain the occasional mortalities observed at hibernacula. The prevalence of Gd on bats drastically varies over the course of the winter and over space. Although not easily detectable, Gd is present in the environment around bats (walls, sediments) and such environment is hypothesized to act as a reservoir for Gd.

SYNANTHROPIC AND TREE-DWELLING BATS IN MIXED TREE STANDS OF BIAŁOWIEŻA FOREST, POLAND [P]

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Research was conducted in 2013-2014 in mixed semi-natural tree stands in Białowieża Forest (east of Poland). With the use of bat detecting techniques, animals were recorded along 7 line transects, which were situated along small dirt roads crossing the coniferous and deciduous tree stands, mostly of mature age. The research was carried out with Pettersson D-1000X bat detectors and BatSound 4 software. Comparison encompassed bat activity parameters (species, number of passes, number of feeding buzzes) and parameters of the woodland (species composition, number of tree holes in vicinity, density of the tree canopies above the transect).

Bat activity varied between transects, with the highest level in transects with more "open" space (higher percentage of open area between canopies). The data mostly referred to high flying tree dwellers like Noctule Bats, and synanthropic species, such as Serotine Bats. Nonetheless, Serotine Bats were limited to more open transects, whereas forest bat species were distributed more evenly. It is supposed that Serotine Bats were unable to cross parts of the forest of higher density. There was no visible relationship between average number of available tree holes in the vicinity of transects and the relative densities of bats. Attention needs to be paid to the presence of the relatively rare and endangered Barbastelle Bat, a species that is considered as strictly limited to deciduous forests, which were present across the whole study area.

POPULATION RECOVERY IN GREATER HORSESHOE BATS IS AIDED BY PUP SEX MANUPULATION [O]

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A long-term intensive banding study of a small wild population of Greater Horseshoe Bats in the UK, at the limits of their geographical range, showed two major population falls. Each was linked to several years of adverse climate. The first occurred in the early 1960s; the second in the mid 1980s. Population recovery took about 15 years due to delayed reproduction and single annual births.

In 1987 there were only 19 live births from all surviving mature females. Births slowly recovered to 31 in 1997 and 90 by 2011. Matrilines, each starting from a single ringed female that survived the mid-1980s crash, were followed up to 2011. The years after 1997 covered a period when food resources and climate favoured population expansion.

We predicted that successful females should give birth earlier (at age 2 years), rather than later (aged 3+ years) and should invest more heavily in female pups than in smaller male pups. Here we describe the sex ratio of pups born to individual females that produced at least 11 pups. We found that certain mothers showed significant sex ratio bias of their pups, with examples of both female- and male-dominated bias. Some matrilines included individuals which showed sex-ratio switching across generations.

The outcome of each matriline's life-history and sex-ratio strategies was assessed against predictions using an analysis of all births in 2011. Early births and sex ratio manipulation favouring females had major long-term impacts. Three matrilines dominated the population, providing over 50% of the pups born in this year. The first-born pups of these matrilines were also significantly biased towards female births.

PREDICTING *GEOMYCES DESTRUCTANS* DISTRIBUTION AND LIKELY ROUTES OF EXPANSION: BUILDING OF RECIPROCAL MODELS FOR EURASIA AND NORTH AMERICA [O]

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White-nose syndrome (WNS), an emerging infectious disease caused by the fungus *Geomyces destructans* (Gd), has been expanding year after year in North America, suggesting a recent introduction of the fungus (probably from Europe). Given the massive mortalities associated with WNS in North America, it is of prime importance to predict areas suitable for its causative agent, Gd. For this goal, we used species distribution modelling (SDM) techniques that have been proven to accurately predict current species distributions. The prediction of the expansion areas of introduced/invasive species is particularly challenging to SDM approaches. All SDM techniques rely on the assumption that a species is at equilibrium with the environment; hence a "snapshot" of current species' distribution would characterize that species' ecological niche. Yet, introduced/invasive species are frequently in a process of colonization of new ecosystems, where species may occupy and explore ecological conditions distinct from their native range. To reduce uncertainties in models' projections we used the reciprocal modelling approach where the full niche of the species is considered by including data from both Europe and North America. Additionally, the distributions of potential hosts were also considered to calibrate the models better, while assessing each potential host contribution for the fungal dispersion. We also calculated the similarities/differences in niche occupied by Gd between North America and Europe and highlight potential adaptations of Gd in North America. Results indicated that Gd distribution was limited by temperature variables. Model predictions comprised the currently known distribution of Gd in Europe but also areas where Gd has not yet been detected. Results showed a mismatch between the realised niche in Europe and North America. This indicates that Gd is probably not occupying its entire potential ecological niche in Europe, or that it experienced a fast adaptation to North American conditions. We also used recent observations of Gd in North America to validate models, showing that most of the current WNS dispersion follows corridors of predicted suitability. These results should be used as a proactive

BAT ACTIVITY AT NACELLE HEIGHT OVER FORESTS [O]

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Bats are increasingly affected by the increasing number of wind turbines, especially onshore. Currently, forested areas in Germany are regarded as suitable sites to further increase renewable energy production through wind energy. Forests are also very important habitats for most bat species, serving as hunting ground and/or roost site. Knowledge about how bats are affected by constructing wind turbines in forests, however, is basic at most. Besides the obvious destruction of roost sites and hunting habitat, collision with operating wind energy turbines is the most problematic effect. Bat activity in open space locations at nacelle height in Germany has been studied recently in two research projects and measures to reduce bat fatalities at wind turbines have been proposed. Data on bat activity over forest at nacelle height have only been collected since forest locations have been used for wind energy development and nacelle bat monitoring has become a more common practice.

In this research project "Construction and operation monitoring of wind energy in forests", funded by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), we gathered and analysed a huge set of acoustic monitoring data, collected at wind turbine nacelles over forests and open space from all over Germany. We analysed relationships between bat activity and meteorological parameters, and described daily and annual phenology of bat activity and species composition. The results were compared to previous findings for open space locations in the same geographical regions.

Preliminary results showed that bat activity over forests was very similar to open spaces. Daily and annual phenology as well as species composition were similar in forests and open spaces, but depended on geographical region. As in open spaces, bat activity over forest decreases with increasing wind speed and decreasing temperature. The data also show similar annual activity patterns, generally peaking in late summer. Our results suggest that measures developed to reduce bat fatalities in open spaces are also applicable to wind turbines placed in forests.

DESIGN OF BAT SURVEYS AT WIND FARMS [O*]

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Currently there are no fixed protocols for surveying bat activity at proposed and constructed wind farm sites, with high variability between and even within local planning authorities. Data is required to help standardise survey methods to assess the variability of bat activity both temporally and spatially. We monitored bat activity at 48 wind farm sites across Britain. Monitoring was conducted for an average period of 27 days (±SE 1) per site between July and September over 3 consecutive years (2011 to 2013). We recorded activity at ground level and hub height (average hub height: 62 m ± SD 16) for 3 randomly sampled turbines at each site. For bats in each genus, activity was always significantly higher at ground level compared to hub height. When considering only activity at height there was a significant negative relationship between activity and the height of the turbine hub for Common Pipistrelles and species of the genus *Myotis*. To assess the implications of temporal and spatial variation on sampling, we randomly sampled subsets of data for up to 21 nights. We focused on species in the genus *Pipistrellus* and *Nyctalus*, those most at risk of fatality. For sampling at height, 80% of the subsets with at least 14 consecutive nights had medians that were within 10% of the actual median obtain for the entire survey period. This indicates that failure to conduct a sufficient number of surveys may result in sites important for bats not being identified and therefore impacts on populations may be higher.

THE LESSER HORSESHOE BAT: OPTIMISING SURVEILLANCE TO DETERMINE TRENDS AND THREATS [O]

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Counts at winter hibernacula of Irish Lesser Horseshoe Bat, *Rhinolophus hipposideros*, have been undertaken since the mid-1980s, and summer roosts since the early 1990s. Annual surveillance is now carried out at approximately 100 sites in both seasons and data is maintained in a MS Access database. We analysed count records to determine the power of the data to detect changes, past trends and threats impacting on the species in Ireland.

Power analysis was carried out to determine the optimum number of sites and counts that need to be carried out in order to collect robust trend data in Ireland. For summer roosts, single season counts at just 50 sites will achieve sufficient power to detect red alert declines within 10 years, but more winter sites are needed to achieve the same power. In order to optimise limited staff availability, further power analysis suggests possibilities for maintaining annual counts at a limited number of core sites but counting every three years at others.

Generalised Linear Mixed Models (GLMM) were run on the data to determine whether there are significant variables that may impact trends. For summer sites, buildings described as 'derelict', 'disused' or 'ruin' tended to have significantly higher counts. For winter sites, buildings that have two or more storeys were found to house more bats. Generalised Additive Model (GAM) smoothing was applied to yearly estimates to examine trends. Both seasons' counts indicate that the species has increased significantly since the mid-1980s although the number of sites was small in the early years.

The Irish climate is characterised by high wind speeds and high rainfall especially along the western seaboard where this species is found. In a practical sense, these factors can result in speedy deterioration of 'disused' sites favoured by Lesser Horseshoe Bats, once a roof begins to let in water. This dynamic situation can make the status of sites difficult to track, and we will discuss our efforts to ensure optimal monitoring of the national population, while still taking into account the status of individual sites at risk.

ASSESSMENT OF BAT MORTALITY RISKS AROUND HUMAN ACTIVITIES USING UNATTENDED RECORDINGS FOR FLIGHT PATH RECONSTRUCTION, AN AFFORDABLE METHOD FOR BAT BEHAVIOURAL AND CONSERVATION STUDIES [O*]

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Impact assessments of human activities, such as use of roads or wind turbines, suffer from poor estimates of bat mortality and from a lack of knowledge concerning the factors influencing mortality risks. Carcass counts are indeed very time-consuming and often of poor reliance because of the rapid scavenging of bat casualties. However, recent developments, such as high sampling rate from unattended recordings and acoustic flight path reconstruction (FPR), opened the way to the gathering of much data on flight behaviour and to an accurate quantification of mortality risk. Here, microphone arrays were achieved by synchronising two SM2BAT (Wildlife Acoustics, USA) plugged to four microphones. This setting was used to perform whole-night recordings in different contexts, such as railways, roads and wind farms.

We present results gathered during three months on a 60 m mast prior to the potential installation of a wind farm in northern France. Flight heights of 4,125 bat passes of 12 species have been plotted. Reports in literature of carcasses found around wind farms correspond well with species demonstrating high flight behaviour, recorded acoustically in our study. Here, both *Eptesicus* and *Pipistrellus* bats had a decreasing activity with heights over 20 m, but still had low activity above 60 m. *Nyctalus* bats had a uniform distribution of flight heights from 20 m to more than 60 m. *Myotis* bats however had a rapidly decreasing activity with height, disappearing completely over 20 m. FPR seems therefore to be a suitable tool to predict species mortality risks prior to wind farm installations and makes possible a precise definition of heights under which wind turbine blades have a high probability to impact bats.

Data collected in different locations in France also provided relative detection ranges of the most common species in natural conditions and in various contexts. All results have been obtained using an automatic combination between the acoustic parameter measurements of SonoChiro and triangulation by a geometrical algorithm in the Sonospot software. This method makes FPR available to studies with small budgets while enabling the processing of large amounts of data originating from unattended recordings over several days to several months.

NEW FOSSIL BATS FROM THE LATE MIOCENE (TUROLIAN) OF THE UKRAINE [P]

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Late Miocene bats are well-known from the territory of modern Europe, but Turolian bat faunas are relatively rare. Most sites with fossil bats are karstic, those with alluvial genesis are rarest. From five riverine and lacustrine sites of the Ukraine a total of six bat species were identified, all belonging to Vespertilionidae. The biostratigraphic correlations of the examined mammalian faunas are MN 11-12 (Early Turolian). Fossil material is represented mostly by dental fragments and isolated teeth and stored in the Palaeontological Museum of the National Museum of Natural History in Kiev. A new species of *Pipistrellus*, close to the basal clades of the extant genus, is described from Altestovo 5 (MN 12). This and other remains of *Pipistrellus spp*. from the Egorovka 1 and 2 (MN 12) are to be regarded as the first reliable data concerning the early history of that widely distributed genus. The *Nyctalus sp.* from Palievo (MN 11) is one of the rarest Neogene records of this genus in Europe. *Vespertilio sp.* from Palievo and Egorovka 1 morphologically are similar to recent *V. murinus*. *Eptesicus* cf. *campanensis* from Novoelizavetovka 3 (MN 12) is, at present, the youngest known record of this species. *Eptesicus* cf. *kowalskii* from Egorovka 1 and 2 differs from the nominotypical taxon in being smaller and in having a less reduced M3. Turolian fossil bats from the Ukraine extend the distributional range of the reported taxa both in geographical and stratigraphical respects. These fossil bat assemblages are most similar to those from Bernardière, Lobrieu and Dionay (MN 11) of France. The bat taxa aggregation of the studied taphocoenosis from Ukraine is consistent with avian pellet origin. They include only *Pipistrellus, Vespertilio, Nyctalus* and *Eptesicus*. These bats are absent or very rare in numerous Neogene palaeokarst sites, suggesting that in the Neogene they roosted in refuges other than caves. Contrary to the Neogene, the Pleistocene remains of these bats in palaeokarstic sites of Europe become very common. It seems that at the end of the Neogene some forest-dwelling bats changed their roosting ecology. General deterioration of the climatic situation in the territory of Eurasia at the end of the Neogene could be the possible reason why, during hibernation, *Pipistrellus, Vespertilio, Eptesicus* and *Nyctalus* probably began to use karstic cavities, the microclimate of which is more stable.

FROM SENSORY LIMITATIONS TO ROOST FINDING STRATEGIES IN BATS [O]

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Based on a series of conducted experiments and literature review, in a simple theoretical model, we explore the benefits of tree selection, memory, and eavesdropping on searches for tree cavities by bats with short and long perception range. Our model suggests that correct identification of trees with cavities and memory are basic strategies decreasing the cost of roost finding, whereas perceptual range plays a minor role in this process. Eavesdropping constitutes a buffer that reduces the costs of finding new resources (such as roosts), especially when they occur in low density. We conclude that natural selection may promote different strategies of roost finding in relation to habitat conditions and cognitive skills of animals.

MOLECULAR RECONSTRUCTIONS IDENTIFY EAST ASIA AS THE CRADLE FOR THE EVOLUTION OF THE GENUS *MYOTIS* (CHIROPTERA, VESPERTILIONIDAE) [O]

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Sequences of the mitochondrial cytochrome *b* (1140 bp) and nuclear Rag 2 (1148 bp) genes were used to assess the evolutionary history of the cosmopolitan genus *Myotis,* based on a worldwide sampling of over 88 named species plus 7 lineages with uncertain taxonomic status. Phylogenetic reconstructions of this comprehensive taxon-sampling show that most radiation of species occurred independently within each biogeographic region. Considering the potential vagility of bats, and their current worldwide distribution, the overall number of transcontinental migrations in the *Myotis* radiation is surprisingly low. This illustrates the relative inability of *Myotis* species to cross some physical barriers such as the Panamanian, Bering and Gibraltar Straits. Molecular datings suggest an origin of all recent *Myotis* in the early Miocene (about 19 MYA with 95% highest posterior density interval 21-16 MYA). These dates are considerably younger than the current interpretation of the fossil record which suggests the existence of *Myotis*-like remains dating back to the Oligocene, some 34 MYA. Ancestral area reconstructions from the molecular tree further indicate that the eastern portion of the Asian continent has been an important centre of origin for the early diversification of all *Myotis* lineages. This is again in contradiction to claims that early Myotinae would have an African origin. We suggest that these major discrepancies might be due to homoplastic dental characteristics (myotodoncy versus nyctalodoncy) in *Myotis* that are commonly used to identify ancient taxa and which can mislead morphological interpretation of the fossil record.

WHAT STORY DOES GEOGRAPHIC SEPARATION OF INSULAR BATS TELL? A CASE STUDY ON SARDINIAN RHINOLOPHIDS [O]

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No evidence of competition-driven geographic separation exists for bats. Although mainland Mediterranean (*Rhinolophus euryale*) and Mehely's Horseshoe Bats (*R. mehelyi*) mitigate interspecific competition by habitat partitioning, this may not be true on resource-limited islands. On Sardinia, *R. mehelyi* is widespread but becomes rarer where *R. euryale* occurs. We hypothesize that Sardinian *R. euryale* (SAR) have a distinct ecological niche suited to persist where *R. mehelyi* density and competition are lower. Assuming that SAR originated from other Italian populations (PES) – mostly allopatric with *R. mehelyi* – once on Sardinia the former may have undergone niche displacement driven by *R. mehelyi*. Alternatively, its niche could have been inherited by a population of Maghrebian origin. The study was set in Sardinia, mainland Italy and Sicily.

We: 1) generated Maxent Species Distribution Models (SDM) for Sardinia; 2) calibrated a model with PES occurrences and projected it to Sardinia to see whether PES niche would increase *R. euryale* sympatry with *R. mehelyi*; and 3) tested for niche similarity between *R. mehelyi* and PES, PES and SAR, and *R. mehelyi* and SAR. Finally, by calibrating SDMs respectively with SAR and PES occurrences and projecting them to the Maghreb, we predicted *R. euryale* range in Northern Africa both in the present and during the Last Glacial Maximum (LGM). *R. mehelyi* and PES showed niche similarity potentially leading to competition. According to PES niche, *R. euryale* would largely co-occur with *R. mehelyi* on Sardinia. SAR and PES niches have null similarity. The current and LGM Maghrebian ranges of *R. euryale* were predicted to be wide according to SAR niche and negligible according to PES niche. SAR's niche allows *R. euryale* to persist where *R. mehelyi* is rarer and competition probably mild. This distinctive niche may either be the result of competition-driven niche displacement or a Maghrebian origin. A final answer may only come from molecular phylogeography.

ACTUAL CHECKLIST OF BATS FOR ALBANIA WITH AN OVERVIEW OF SPECIES RECORDS [P]

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Although the bat fauna of Albania – the area representing a Mediterranean biodiversity hotspot – has been scarcely known until recently, actually it is one of the best surveyed in the Balkans, with 32 species recorded and more than 1,500 bat records. The first available data, from 1914–1932, concerned museum specimens of *P. auritus* and *P. kuhlii*. Initial surveys focusing on cave dwelling bats were conducted in 1960 by Czech and Albanian zoologists and resulted in the first articles on bats from Albania (1961, 1964), covering 13 species. A further two species were reported up to 1970. Occasional field work by Czech and Slovak zoologists added five new species in 1991–1995. The latest review of Albanian bats (1996) included 24 species known at that time. Since the beginning of the 21st century many new bat species have been recognised in Europe, as a result of either the discovery of cryptic species or radical changes in taxonomy. This caused the extension of the list of species expected to be found in Albania. As a result of research conducted in 2003–2012, in 2010–2011 under the EUROBATS Project Initiative, we recorded 32 species: all the previously reported and 11 new species for the country. The first data on three of them (*M. alcathoe*, *P. pygmaeus* and *P. macrobullaris*) have already been published. Our research has confirmed that Albania belongs to the European countries with the highest bat species richness. In the Balkans, a higher number of species (35) has been recorded only in Bulgaria.

UNVEILING THE SYSTEMATICS OF BROWN LONG-EARED BATS IN IBERIA: NOTES ON GENETIC, MORPHOMETRY AND ECHOLOCATION [O*]

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Cryptic species, defined as distinct species with very similar morphology, may lead to biodiversity underestimates and may include threatened taxa within the cryptic complex. Due to increasingly rapid DNA sequencing and the advances in molecular methods over the past decades, many cryptic species have recently been identified. In this context, 20% of the Iberian bat species have been shown to harbour complexes of cryptic lineages, most likely due to this area's rich genetic diversity, as it was a major glacial refugium for several taxa. In this study we focused on the Iberian *Plecotus auritus/begognae* cryptic complex. Particularly, we aimed at clarifying the status of the endemism of the Iberian Peninsula *P. begognae*, traditionally identified as a subspecies of *P. auritus*. In previous studies we found that the nominate '*auritus*' lineage was restricted to the north and northeast, while *P. begognae* occupied mountain areas of the rest of the northern half of the peninsula. In a next step, we aimed at determining which traits could be differentiating *P. begognae* from its closest relative *P. auritus*. The phylogenetic relationships between these two species were investigated using molecular, morphological and acoustic data. For molecular analyses, both nuclear and mitochondrial genes were used to evaluate genetic differentiation between lineages, using over 30 samples. Additionally, several echolocation parameters were analysed in over 25 recordings of both hand-released and free flight *P. begognae* and compared with described parameters for *P. auritus*. Finally, specimens of *P. begognae* and of *P. auritus* were used in a detailed morphological study, where external, cranial and dental measurements were compared. Using all these methodologies, the different parameters that exist in both species were revealed, aiding in the clarification of *P. begognae* as a species.

COMPARISON OF TICKS' PRESENCE ON *MINIOPTERUS SCHREIBERSII* IN FOUR COLONIES IN ITALY [P]

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The ectoparasite community on bats has a composition related to both the presence of mono-, steno- or eury-xenous species, diversity in hosts' presence, and roost characteristics. In the context of a larger research project on parasite communities of bats, 4 colonies of *Miniopterus schreibersii* where checked for the presence of ticks. Colony A is at 44°15'20"N and 11°39'55"E, composed of around 4,000 *M. schreibersii* and 3-400 *Myotis myotis* and *M. blythii*, in a gypsum tunnel, with also a few dozen *Rhinolophus euryale*. Colony B is at 43°56'6"N and 12°26'28"E, in a limestone tunnel, and is composed during summer of around 2-300 *M. schreibersii* and around 100 *R. euryale*. Colony C is at 43°23'31"N 10°44'25"E, composed of around 1,500 *M. schreibersii*, 40-60 *M. blythii* and around 200 *R. euryale* in a galena mine tunnel. Colony D is in Sicily, at 36°43'19"N and 15°07'02"E, in a limestone cave, composed of around one thousand *M. schreibersii*, a few hundred *M. myotis, M. blythii*, *M. capaccinii, R. ferrumequinum*, *R. hipposideros* and a few *R. mehelyi*. In all the colonies 15 *M. schreibersii* were caught by mist net or hand net, checked for all external parasites and then released *in situ*.

Despite accurate search no ticks were found in colonies A, B and D. In colony C, 11 adults and 3 nymphs of *Ixodes simplex* were found on 6 bats (2 females and 4 males) of the total of 8 adult females, 6 adult males and one subadult checked.

Ixodes simplex is known to inhabit southern Europe, Turkey, Africa, Asia and Australia as the principal host is *M. schreibersii,* but also has been found on *M. myotis, M. blythii, Myotis nattereri*, *R .ferrumequinum, R. hipposideros,* and very rarely on *Nyctalus leisleri* and *Nyctlus lasiopterus*. This is the first record for mainland Italy, as until now only one specimen was found in a cave in Sardinia. The tunnel where colony C is located is the most humid of all the sites investigated.

DECLINE OF ROOST FACILITIES ENDANGERS GREY LONG-EARED BAT, *PLECOTUS AUSTRIACUS,* IN SAXONY (GERMANY) [P]

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The status of the population of the Grey Long-eared Bat, *Plecotus austriacus,* in the north-eastern part of the federal state of Saxony (Germany) was investigated in 2013. We searched buildings in 29 villages and small towns for roosts and inspected roosting sites recorded in the past. Additionally, three lactating females were radio-tracked in order to find nursery roosts.

According to the database of the Saxon State Office for Environment, Agriculture and Geology, 11 colonies of *Plecotus austriacus* have been recorded in the study area since 1990. In 2013 the existence of three nursery colonies was confirmed and one new colony was found.

The roost buildings of eight colonies had been reconstructed and five roosts were destroyed in the process.

The majority of roosts occupied by existing colonies are currently threatened either by renovation or demolition. If renovated houses were still being used, bats entered the attics by skylight windows and were constantly at risk of being excluded from the roost.

Existing colonies used at least two buildings situated nearby and had more suitable attics available in the vicinity. This suggests that the number of satellite roosts is an important factor for the survival of colonies under pressure of constuction activities.

Radio-tracked females belonged to two colonies of at least 6 and 12 animals respectively. They foraged in forests dominated by *Pinus sylvestris*, which cover 78% of the area within 4 km radius of the roosting sites.

We conclude that the destruction of roosts together with a decreasing number of suitable and accessible buildings is at present the leading cause of endangerment of *Plecotus austriacus* in north-eastern Saxony. Protection measures include the preservation of roost buildings, securing of access points, supervision of the building process during reconstruction, and encouragement of house owners to provide roosts.

AUTOMATED ACOUSTIC IDENTIFICATION: PUSHING TECHNOLOGY TO IDENTIFY BAT CALLS [P]

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Recent improvements in bat acoustic survey methods, especially automatic recording stations, have led to an analysis problem due to the amount of data obtained. In this project we propose to develop an automated computer programme for analyzing bat echolocation calls in general, and integrate classification models for species recorded in Portugal, based on ensembles of artificial neural networks. The programme is devised to quickly analyze and classify large amounts of recordings with minimum human intervention. The reference database of bat calls was obtained at 39 distinct locations throughout mainland Portugal. The recordings were made after the release of captured bats or at the entrance of known shelters to ensure a correct identification of the recorded species. At the present time, our database includes 1,132 recordings of individual bats (with over 8,000 echolocation calls) belonging to 23 different species. The computer program automatically distinguishes recordings of bat calls from those that only contain ambiance or insect noise, detects individual bat calls in a recording and measures 19 variables from each call, with information of the time and frequency domains. Several filtering algorithms to improve signal-to-noise ratio were implemented. Ensembles of neural networks based on the 19 variables measured from each call were trained for species classification. A two stage hierarchical classification scheme was implemented. First, calls are classified into broader groups of species: *Rhinolophus spp., Myotis spp., Pipistrellus spp. / Miniopterus sp., Barbastella sp., Plecotus spp.* and *Hypsugo* sp. / *Nyctalus spp. / Eptesicus spp. / Tadarida sp.* Calls previously included in a broader group are then classified to species level. This is an ongoing project but the results so far are quite promising. The database already contains recordings of more than 90% of all known bat species in Portugal. The computer programme, still a prototype, correctly selected and analysed more than 80% of the test recordings. The correct classification rates varied between 93% and 100% for the broader groups of species and between 50% and 100% for individual species.

CAN WE PROTECT URBAN BATS UNDER THE HABITATS DIRECTIVE? [O]

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In urban areas, species such as the Common Pipistrelle use a network of roosting sites. Roosting sites can be threatened by a variety of urban activities such as renovation, replacement and insulation of buildings. Roosting sites are protected under article 12 of the European Habitats Directive. In the Netherlands the Common Pipistrelle occurs in most cities, but the locations of its roosting sites is mostly unknown. For every project with impact on building structures a survey for possible roosting sites has to be carried out to prevent infringement of article 12. Surveys consist of multiple visits covering the maternity and mating period. This applies to large urban renovation projects as well as to small projects, like the insulation of a single building. Surveys for single building projects often only involve the buildings within the project area and only prevent damage to roosting sites that are actually used by bats at the time of each visit. This approach does not account for potential roosting sites that are temporarily not used at the time the survey is carried out. The city of Tilburg acknowledged that this practice results in loss of the availability of potential roosting sites, which in the long term will lead to a decline in the population of pipistrelle and other urban bat species. In 2013 a baseline survey was carried out to map roosting sites and distribution of bat activity within the city, using a standard survey method. Results show that mating sites are not a limiting factor in the city, but our knowledge of 'maternity roosts' is far from complete. However, possible mass hibernation sites were discovered quite easily. Based on this survey we present a framework for a pro-active approach to urban bat conservation. The framework manages the city as a bat biotope, where emphasis is given to avoiding bat fatalities during demolition or renovation, providing sufficient roosting facilities, improving connections with important foraging areas and protecting the so-called hot spots. Damage to small roosting sites is accepted, as long as killing bats can be avoided. Using this approach, the opportunity for improving the bat biotope in a city is seized, while a negative public attitude towards stringent protective legislature is avoided.

LIFE+ PROJECT - PROTECTION OF THE LESSER HORSESHOE BAT AND OTHER BAT SPECIES IN SOUTHERN POLAND (PODKOWIEC+) [P]

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The LIFE+ project, known as PODKOWIEC+, implemented since July 2013 aims at conservation of Polish populations of the most threatened bat species, especially the Lesser Horseshoe Bat, Geoffroy's Bat and the Greater Mouse-eared Bat, and creating opportunities for the increase in their numbers. Project aims are: conservation of the most endangered roosts, improvement of conditions at the most valuable localities, creating roosts, making surrounding habitat and flight paths safer for bats, and changing the public image and raising public awareness about bats.

The goals will be achieved by actions that fall into three categories:

- ✓ actions related to the safety and quality of roosts (i.e. roof renovations, erection of guano platforms, installation of bat entrances and anti-predator devices, grills, gates, hot-boxes, changes of roost illumination, building of brick, stone or wooden compartments in the structures)
- ✓ actions related to the safety and quality of surrounding habitat and flight paths (designing and maintenance of vegetation around bat roosts and providing bat-friendly illumination)
- ✓ actions promoting bats and the needs of their conservation.

Within five years, PODKOWIEC+ project implementation will provide conservation and quality improvement of up to 66 bat roosts in southern Poland:

- ✓ 9 roosts in buildings will be protected by refurbishing the roof and roof trusses friendly to bats
- ✓ 6 roosts will be fitted with special guano platforms
- ✓ in at least 40 roosts the conditions for bats and their safety will be improved by various bat friendly architectural adaptations and modifications
- ✓in the case of at least 40 roosts maintenance and improvement of their surroundings will be provided by structuring of the vegetation and modifying current illumination.

The currently implemented LIFE + project is part of a wider "Programme of the lesser horseshoe bat protection in Poland", carried out by Polish Society of Wildlife Friends „pro Natura" since 1996. Throughout all these years, implementing various projects, the Society managed to help bats and people by installing 30 platforms for collecting bat guano, performing 29 bat-friendly roof renovations, grilling entrances to 38 bat hibernacula, inclusion of the most important Lesser Horseshoe Bat roosts into the NATURA 2000 network or providing other forms of their legal protection.

PODKOWIEC+ project is co-financed by the European Union under the LIFE+ programme and the National Fund for Environmental Protection and Water Management.

TURBINE IN YOUR BACKYARD: WILDLIFE IMPACTS AND PUBLIC ATTITUDES TO SMALL SCALE TURBINES [O*]

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Wind power is an increasingly important method of electricity generation employed worldwide. While much of the focus in wind energy technology to date has been on wind farms, a relatively recent development is the expansion of the micro-wind sector (turbines generating < 50 kW), and there are now over 800,000 small wind turbines (SWTs) installed globally

Public attitudes place pressure on planning guidance and may act as a barrier to the expansion of renewable energy production, particularly of microgeneration technologies where the general public form a large proportion of consumers, with implications for the attainment of renewable energy targets. Our postal survey of the UK public found relatively high levels of acceptance of SWTs and this was higher from respondents with greater concern about, and belief in, climate change. Acceptance levels also depended on the type of setting in which the turbine was installed, with SWTs on road signs being most accepted and those in hedgerows and gardens least accepted. Concern about wildlife impacts was one reason for these differences.

Wind power can exert a range of potential negative effects on wildlife, in particular on birds and bats, and quantification of the potential wildlife impacts is necessary to inform planning guidance. Yet to date, there has been very little published research into the wildlife impacts of SWTs. We have conducted a field experiment using a before-after-control-impact methodology investigating the impact of SWTs on bat activity with particular focus on the role of distance from linear habitat features (e.g. hedgerows, treelines). Two sizes of SWT (0.1 kW and 0.6 kW on 5 m pole) were installed at three distances from linear habitat features (5 m, 20 m and 40 m). Bat calls were recorded at the turbine site and a control site 30 m away before and after installation of the turbines, and used to calculate the number of bat passes. Results for *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus* show a general decline in activity with greater distance from linear habitat features and some evidence that bats avoid areas around operating turbines.

FORMER MILITARY BUILDINGS IN ALBANIA: A KEY ISSUE FOR BAT PROTECTION [P*]

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In Albania there are thousands of military constructions built since the Middle Ages to control the land of this small Balkan country. From the Gjirokaster Castle to the communist bunkers distributed throughout the country, these fortifications play a key role in bat ecology, being used for maternity colonies, as hibernation sites, or as feeding areas.

Here are presented the results of the first ever monitoring of fortification-dwelling bats in Albania, which has been implemented during the last two years. This monitoring has been based on site visits, use of bat detectors and use of nets. In the framework of this study, 10 species have been identified and their use of the buildings has been specifically described.

This monitoring also gave an overview of the actual situation from a conservation point of view, underlining several issues that are facing these buildings, such as illegal destruction or conflicts between human use and bat activities. We give here some practical suggestions in order to promote sustainable use of these sites, and to protect the bat species using it.

BAT ASSEMBLAGES IN THE "NIETOPEREK" BAT RESERVE (WESTERN POLAND) AND THEIR CONSERVATION STRATEGIES [P*]

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Międzyrzecz Fortified Front, where Natura 2000 site PLH080003 "Nietoperek" is situated, was built by the Germans in the 1930s and during the World War II. It is composed of above ground bunkers connected by underground tunnels of c. 32 km total length. "Nietoperek" is the eighth largest bat hibernation site in EU. Monthly censuses were carried out from October to April during three consecutive winter seasons (2011/12 – 2013/14) in an area covering c. 30% of the tunnels. The aims of the study were:

1. to describe changes in numbers of each species through the course of the hibernation season,
2. to suggest deadlines for counting particular bat species to obtain maximal numbers and
3. to describe negative impact of tourism on hibernating bats. The results will be useful for the control of winter tourism in "Nietoperek". The total number of bats observed during the study was 37,869 individuals of 9 species. Because of difficulties in distinguishing the species without handling, *M. mystacinus* and *M. brandtii* were treated as one group. *M. myotis* constituted from 53% (first season) to 64% (last season) of all hibernating bats. The maximal numbers of individuals were observed in November (first two seasons) and in December (third season). *M. daubentonii* constituted from 27% (first season) to 21% (last season) and *M. nattereri* from 10% (first season) to 11% (second season) of all bats. During the three seasons the maximal numbers of *M. daubentonii* and *M. nattereri* were observed in November and December respectively. *B. barbastellus* and *P. auritus* constituted from 4% (first season) to 2% (last season) of the multi-species colony. The maximal numbers of *B. barbastellus* were observed in January, and *P. auritus* in January (first and second seasons) and in December (third season). Results indicated that the best period for counting maximal numbers of *M. myotis* and *M. daubentonii* is November, for *M. nattereri* is December and for *B. barbastellus* and *P. auritus* is January. The study undertaken in the part visited by tourists in winter (total length of 900 m) demonstrated a negative effect caused by human disturbance, with a 23% decline of total bat numbers.

CONSTRUCTING BAT HOUSES MATCHING THE THERMAL CHARACTERISTICS OF NATURAL ROOSTS IN TREE CAVITIES: AN EXPERIMENTAL STUDY [O]

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The availability of suitable roost sites is essential for the survival of bats. Roosts are used for mating, hibernation, and rearing the young; they offer protection from adverse weather and predators. Selection of specific roost sites by breeding female bats has consequences for survival and reproductive success. Tree cavities are scarce in most intensively managed western European forests. In the past, several attempts were made to provide forest dwelling bats with alternative roosts, with variable results. In general, these experiments failed to attract maternity colonies of typical tree cavity-dwelling bats, which seriously limits the potential of bat houses as a mitigation measure.

Previous research showed that the internal temperature regime of tree cavities, previously used by bats, are seriously buffered compared to the external temperature, and temperature peaks inside the cavity show a 6 to 8 hour delay compared to the external peaks. Slight differences in wall thickness had significant influence on the internal temperatures. Therefore, the influence of wall thickness, external color and material (wood or woodcrete) on the thermal characteristics of bat houses was further investigated.

The objective of this project was to investigate the relationships between wall thickness, material used and internal temperature regimes of artificial bat roosts. Based on those relationships, a type of bat house is suggested that approaches the thermal characteristics of natural tree cavities, but combines ease of manufacture, ease of control and relatively low cost.

BAT'S RESPONSES TO INSECT AVAILABILITY IN SOUTHERN FINLAND [O*]

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Studying bat's responses to insect availability has always been a challenging task. Modern techniques offer practical tools to go deep into the dietary analysis. In this study, the diet of Daubenton's Bat, *Myotis daubentonii,* was analysed using high-resolution data consisting of actual prey species and potential prey species. The largest proportion of their nutrition comes from a few highly abundant aquatic prey groups, but also many other prey items are consumed. This suggests that Daubenton's Bats are not very vulnerable to changes in insect availability.

Individual Daubenton's Bat faecal pellets were collected daily from one site during August–September 2013. Insects were collected synchronously using four insect traps. Faecal pellets were genotyped and clustered into individuals using known microsatellite markers. To control individual variation from the analysis, diet was analysed using next-generation-sequencing methods from pellets originating from the same bat individuals throughout the period. Insect availability was analysed using similar molecular methods. Bat diet was compared to insect availability on a daily basis.

Daubenton's Bats mainly consumed the most abundant insects. However, a large proportion of the diet consisted of various arthropod groups, endorsing Daubenton's Bat's status as a highly versatile predator. As expected, the majority of the diet consists of aquatic insects, but also many terrestrial arthropods are eaten. The composition of terrestrial prey items varied a lot between days and did not correspond to availability. The main dietary groups did not vary significantly between individuals, but minor dietary groups were randomly distributed through several arthropod orders and families.

Daubenton's Bats have direct response to insect availability. Bats get their main nutrition from the most abundant arthropod groups, but a large part of the energy also comes from arbitrary prey groups. Daubenton's Bats are not very vulnerable to changes in insect availability, since they can adapt to a wide prey spectrum.

INTERACTIONS BETWEEN BATS AND BREATHABLE ROOFING MEMBRANES – PERSPECTIVES FROM UK RESEARCH [O*]

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Since the introduction of breathable roofing membranes (BRMs) into UK roof construction (around 15 years ago), the production of non-woven materials for such purposes has more than trebled. These technical textiles are used in place of traditional roofing underlays, such as bitumen felt, in an attempt to reduce the increased risks of condensation associated with modern living. However, there have been a number of reports of bat mortality through entanglement with BRM filaments, when these are pulled loose through contact.

Investigations carried out over the past four years have used a wide variety of techniques to consider ways in which bats and BRMs interact, how this could pose potential dangers for bats and the implications for BRM service life performance and warranties. This research has found that all current BRMs on the UK market pose an entanglement risk to bats. It has also demonstrated that product breathability is, on average, reduced by a third, and watertightness properties can be removed altogether, following exposure to bats, potentially resulting in the early failure of roofing underlays. Whilst this research has focused solely on the issues recognised within the UK, reports of problems from other European countries demonstrate a need for more research, including into the potential for similar problems, and how to resolve them, across Europe.

A MULTI-GENE STUDY INTO THE MOLECULAR EVOLUTION OF DIET IN NEW WORLD LEAF-NOSED BATS [O*]

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The New World leaf-nosed bats (Family: Phyllostomidae) are a hyper-diverse clade in terms of both morphology and behaviour. The family contains a large number of species which are apparent dietary specialists, including carnivores, sanguinivores, frugivores and nectarivores. In this study, we assembled a suite of 50 candidate genes hypothesised to be implicated in the evolution of some of these specialised diets and used transcriptomes of 21 phyllostomid species and 16 other Yangochiroptera to create multiple sequence alignments which we could use to look for evidence of positive selection. This was achieved by using the codeml package of the PAML software to carry out tests for molecular selection within specific branches of the Phyllostomidae and between the Phyllostomidae and the other Yangochiroptera. Additionally, we assembled phylogenetic trees for each gene in order to investigate the possibility of convergent evolution where the same dietary specialisation may have evolved independently multiple times. While we found no evidence of positive selection in any of the candidate genes, several of the genes tested showed evidence of divergent selective pressures acting on the Phyllostomidae and the other Yangochiroptera.

HOST SPECIFICITY IN BED BUGS AND ITS IMPLICATION FOR BAT CONSERVATION [O*]

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Conservation of bats' roosts, nursery colonies or hibernacula, plays a crucial role in their survival. Active shift of bats from natural to human shelters creates well-known human–bat conflicts, but a factor that may exacerbate it is bats' ectoparasites that can occur in their roosts. In cases where the bats switch their roosts, or they are d*islodged* from shelters by renovations of houses, people complain repeatedly about the presence of cimicids in their flats. Cimicids are hematophagous insects for which life-cycle, reproduction and survival rate depend on blood from the hosts. *Cimex lectularius*, the most common species of the family Cimicidae, was found to be one that occurs both on bats and humans.

Due to a suspicion of the existence of two lineages of bedbugs - human and bat associated - our research focused on reproduction rate based on cross-feeding experiments to see if bugs from bats or humans can successfully survive, reproduce and develop on the other host's blood. During the bat blood experiment we found significant differences between both human and bat associated bedbugs, while no differences occurred with the human blood experiment between the survival levels. In moulting, differences between both groups were significant, particularly in the case of the bat blood experiment. In the case of the bat blood experiment we found higher probability of moulting in bat associated groups than in human associated groups. In the case of the human blood experiment, moulting probability was stable in both specific and non-specific, showing a similar pattern in both cases for all stages. This indicates an occurrence of two ecotypes within the one species *Cimex lectularius.* Our results show that the basal lineage of bugs associated with bats can survive quite well on the human host. This fact complicates the practical protection of bats and their roosts in human residences. On the other hand, bugs are physiologically adapted to long-term starvation, and rather than seek an alternative host they will wait for the return of the original one.

ERYTHROCYTE SIZE IN BATS - FACTOR DETERMINING HOST CHOICE IN CIMICIDS (HETEROPTERA: CIMICIDAE) [P*]

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Bats are hosts to many different parasites. Their ecology and morphology determine host choice and the preferences of different parasites for different bat species. One of the most common bat ectoparasite belongs to the family Cimicidae, hematophagous insects for which life-cycle, reproduction and survival rate depends on the blood of its hosts. Two lineages of *Cimex lectularius*, bat and human associated, have been established. Between the two lineages of bed bug fed on bat and human blood we found some differences in speed of moulting, length of life and reproduction success in cross-host experiments. Moreover, in bat associated bugs occurring on few bat species (*Myotis myotis, M. emarginatus*) and recently in a related bug - *C. pipistrelli* - different ecotypes specific to bat species were found. It was considered that the bug proboscis is very narrow and it is possible that red blood cells (RBC) do not pass through it. Therefore, the main aim of this study was to check if RBC size has an impact on the occurrence of cimicids on particular bat species. Except for one observation on *Plecotus auritus*, bed/bat bugs never occurred on some bat species (*Barbastella barbastellus, Rhinolophus hipposideros* and *Plecotus austriacus*). We called them 'non-specific' bug hosts, while other bat species were referred to as 'specific hosts'. We collected blood samples from seven bat genera represented by 12 different species of the family Vespertilionidae (n=20) and Rhinolophidae (n=1). Diameters of red cells from bat hosts - specific, non-specific - and humans were measured and compared. We find differences between bat species, however there was no clear correlation in erythrocyte size between specific and non-specific hosts. Therefore RBC probably is not an issue to explain why these bat species are not parasitized by cimicids.

CREATING A BAT INVENTARY IN FLEMISH BRABANT BY USE OF COMPLEMENTARY RESEARCH METHODS [P*]

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Only little is still known about the presence and distribution of different bat species in the province of Flemish Brabant (Flanders, Belgium). From 2012 to 2014, several research methods were combined to collect data about different species. The fieldwork especially focused on three species listed in the Habitats Directive Annex II: *Myotis emarginatus, Myotis myotis* and *Myotis bechsteinii.* Twenty forests and parks, well distributed over the whole province, were investigated with bat detectors. This resulted in 2,706 recordings of 14 different bat species, with the most abundant being *Pipistrellus pipistrellus* (1,716, 63.3%). Netting with the use of an acoustic lure was conducted in forested areas, resulting in 264 bats of 11 species caught. For finding *Myotis emarginatus*, automatic detectors were placed in stables and barns. In a stable where the presence of *M. emarginatus* was proved, netting was conducted. Trapped individuals were radio-tracked, and telemetry revealed a small roost, routes and foraging areas. Additional to the annually monitored hibernation sites (mainly icehouses and bunkers), permission was granted to count hibernating bats in two larger military sites – Fort Leopold and the Citadel of Diest. With seven different species, both sites appeared to be regionally important for hibernating bats. Mist-netting of swarming bats at these two sites and a tunnel in the large Sonien forest, resulted in 10 bat species – including *Myotis emarginatus* and *M. bechsteinii*. With *M. myotis* as the target species, 50 attics of churches and abbeys around larger old forests were checked for the presence of bats. Even though *M. myotis* was not found, 42 attics hosted other bat species. Visual observations, carcasses and DNA extraction from collected bat droppings showed that this included at least six species, mostly *Plecotus austriacus* and *P. auritus*. The use of the different research methods (manual bat detectors, automatic bat detectors, mist-netting with lure in forests, mist-netting in stables, telemetry, winter counts, swarming research, attic investigations and DNA analyses) provides complementary information about the presence and distribution of 15 bat species in the province.

"LIVING ON THE EDGE": UTILIZATION OF ROCK FACES AND QUARRIES BY BATS IN CENTRAL EUROPE [P*]

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To increase the understanding of bat activity in cliff habitats, ten rock faces and twelve quarries were studied in Carinthia, Austria.

In order to obtain information about bat activity and species assemblage, we placed automatic recording devices ("Batcorder") in rock faces. Furthermore, we compared bat activity in cliff habitats with other habitat types, such as water bodies, forests and settlements.

During the study we recorded a total of 39,418 call sequences and registered at least 19 bat species. From these, 15 bat species could be found in rock faces and quarries.

Species with the highest call activity in cliff habitats were *Pipistrellus pipistrellus*, *Hypsugo savii* and the species pair of *Pipistrellus nathusii/P. kuhlii*. In comparison with the other habitat types, cliff habitats were preferred by *Vespertilio murinus, Hypsugo savii* and *Eptesicus serotinus*.

No significant difference in bat activity was evident between the examined rock faces and quarries.

Although there was no difference in call activity between rock faces, water bodies and settlements, forest habitats were significantly less used.

Interestingly, the species assemblages were similar between cliff habitats and settlements, whilst all other habitat types showed clear differences in the recorded species composition. This raises the question: are cliff habitats the primary habitat for species nowadays found mostly in settlements?

THE EFFECT OF FOREST HABITAT-TYPES AND AGE CLASSES OF TREE STANDS ON THE POPULATION DENSITIES OF BATS AND NOCTURNAL INSECTS IN THE NIEPOŁOMICE FOREST, SOUTHERN POLAND [P]

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The population density of four genera of bats, as well as the population density and biomass of nocturnal insects were studied in Niepołomice Forest (10,800 hectares), located 35 km east of Cracow. The studies were conducted in June and July of 2011 and 2012, in young forest plantations, thickets, and timber stands in a *Tilio-Carpinetum* deciduous forest habitat, and in a *Pino-Quercetum* moist mixed coniferous forest habitat. A Pettersson D-240X detector, a UV lamp, and MIX-type reflector were used in the study.

The average population density of the studied genera of bats (N/ station × $0.5h^{-1}$, $\overline{x} \pm SE$) was highest in the timber stand of the deciduous forest habitat (DEC-T) where it amounted to 13.9 ± 0.77. A slightly lower population density (12.5 ± 0.85) was found in the plantations and thickets of the deciduous forest habitat (DEC-Y), still lower (10.5 ± 1.45) in the plantations and thickets of the moist mixed coniferous forest habitat (CON-Y), whereas the lowest population density (7.05 ± 0.56) was found in the timber stand of the moist mixed coniferous forest habitat (CON-T). Statistically significant differences in bat population densities were found between CON-Y and CON-T, between DEC-T and CON-T, and between DEC-T and CON-Y.

The biomass of insects (g/ station × $0.5h^{-1}$) was highest in the plantations and thickets of the deciduous forest habitat (2.73 ± 0.79), and lowest in the timber stand of the moist mixed coniferous forest habitat (1.02 ± 0.40). In the timber stand of the deciduous forest habitat, this value amounted to 2.20 ± 0.33, whereas for the timber stand of the moist mixed coniferous forest habitat it was 1.38 ± 0.19. Statistically significant differences were found between DEC-Y and CON-T, as well as between CON-T and DEC-T.

The number of lepidopterans (N/ station × $0.5h^{-1}$; $\overline{x} \pm SE$) was highest in the plantations and thickets of the moist mixed coniferous forest habitat (52.1 ± 8.58), similar in the plantations and thickets of deciduous forest habitat (49.3 ± 6.05), slightly lower in the timber stand of the deciduous forest habitat (43.2 ± 3.29), and lowest in the timber stand of the moist mixed coniferous forest habitat (27.5 ± 4.66). Statistically significant differences were found between CON-Y and CON-T, between DEC-T and CON-T, as well as between DEC-Y and CON-T.

The differences in population densities of bats in the four studied types of forest habitat result from the availability of nocturnal insects, particularly lepidopterans, whose numbers depend on the biomass of ground flora as well as on the annual growth of shoots of trees and shrubs. For this reason, in younger deciduous forests and mixed coniferous forests, as well as in the timber stand of deciduous forests, the population densities of bats are distinctly higher than in the timber stand of mixed coniferous forests.

CHANGING THE EXTERNAL ILLUMINATION OF CHURCHES TO REDUCE DISTURBANCE FOR BATS - EXAMPLE FROM SLOVENIA [O]

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Negative consequences of light pollution on biodiversity are being increasingly documented. Churches are often externally illuminated at night, while many of them present important nursery roosts for different bat species. Illuminating the roosts can disturb evening emergence time of bats, slow down juvenile growth, change bat flight paths, but also reduce the amount of their prey via negative effects on night active insects. Therefore, such structures should not be illuminated, but as this is not always possible, measures to reduce disturbing illumination should be developed. This was done in the project Life+ "Life at Night" (www.lifeatnight.si), where we searched for ways to improve the external illumination of churches to substantially decrease its negative effect on bats and moths. Selected project churches all had previously existing inappropriate illumination, which was changed with lights with less intensive, directed light, with UV filters and with shades to prevent illumination of the bat flight openings. For three years, the effects of three types of illumination were observed at each of the project churches: for year one it was the original (as before the project) and for the other two years it had specifically designed lights. Evening emergence behaviour of bats was observed at nine and juvenile growth at three churches, focusing on Lesser Horseshoe Bats, *Rhinolophus hipposideros*. Their response to a changing light regime was not the same at all the project churches. This can be explained by specifics of different churches and their surroundings, e.g. the position of flight openings differed according to the lights, resulting in smaller differences when lights were changed. At some churches, we detected obvious and positive response of the bats to the changed lighting regime. They started to emerge much sooner, and emerged in much shorter time. In church belfries, a considerably higher proportion of the bats flew out of the opening when it was shaded than when it was directly illuminated. The new lights are being offered as an example of good practice to improve the external illumination at other churches around the country.

LONG-TERM POPULATION TRENDS IN CENTRAL EUROPEAN BAT SPECIES IN BAVARIA (GERMANY) [P]

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In 1985 the Bavarian Environment Agency started a state-wide bat conservation programme that is still ongoing. It includes monitoring of hibernacula and summer colonies and has been conducted for the past 29 years by the two Co-ordination Centers for Bat Conservation located in the northern and southern parts of Bavaria. Data have been collected inter alia by a large number of volunteer bat workers and researchers. We analyzed these data to extract population trends using the freely available software programme TRIM (TRends & Indices for Monitoring data; Vers. 3.5.31).

Summer and winter roosts of *Rhinolophus ferrumequinum* and summer colonies *of R. hipposideros* show a strong increase in numbers with an average growth rate of up to 17% per year for *R. hipposideros* colonies, indicating a population density far below the habitat carrying capacity due to the crash of the population in the last century.

Similarly, in species such as *Plecotus auritus, Myotis daubentonii, Myotis nattereri, Myotis bechsteinii, Myotis myotis*, the group *Myotis mystacinus/brandtii*, and in *Barbastella barbastellus* winter census data indicate a strong population growth since the start of the monitoring programme in 1985. Over the last few years the growth has been decelerating or even negative (in the case of *Plecotus*), possibly caused by limited environmental resources, such as food or roost sites.

The average size of summer colonies has not increased in *Plecotus auritus, Myotis mystacinus/ brandtii,* and *Barbastella barbastellus*. *Myotis myotis* colonies increased only during the first 10-12 years of the study period. In these species the difference between winter and summer census suggests an increase in the numbers of colonies rather than growth in colony size. In contrast, the average colony size of *Pipistrellus pipistrellus* has decreased significantly since 2000. This could be explained by a modification in roosting behaviour or by decreasing population size.

The average group size of building-dwelling *Nyctalus noctula* has fluctuated without clear trend since 1985, in spite of the fact that this species is considered to be particularly vulnerable to collision with wind turbines.

THERMAL INSULATION AND THE PROTECTION OF BUILDING-DEPENDENT BAT SPECIES [P]

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A number of bat species rely on building crevices – as formed by fascia boards or cladding elements on outer walls – for reproduction or hibernation. However, renovation work and the thermal insulation of walls can make it necessary to obstruct access to bat roosts, whereby adequate replacements are required by law. Based on the broad experience gathered in southern Bavaria regarding the renovation of buildings used by *Nyctalus noctula*, alternative roost types that reconcile the requirements of modern thermal insulation with the needs of bats are suggested. Crucial factors for the conservation of the bat colonies are: the number of new roosts, the percentage of roosts renovated the location of new roosts in relation to the original roosts and the entrance situation. The colonization process following replacement of traditionally used crevices with compensatory roosts is also described in a number of cases.

SEASONAL CHANGES IN SPECIES COMPOSITION AND OVERNIGHT ACTIVITY OF BATS AT THE ENTRANCES OF THREE CAVES IN SLOVENIA [P*]

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Species composition and overnight activity of bats were monitored at three natural caves in three different geographical regions in Slovenia. From April to October 2012, ten observations of bats per cave were undertaken, at first in one month and later in two weeks intervals. During the day, bat presence in each cave was recorded, followed by overnight monitoring of bat activity at the cave entrance, using mist-nets and automatic bat detector recordings. Altogether, 510 individuals belonging to 16 bat species were recorded with mist-netting. The highest overnight activity was observed in August, when the number of bats almost doubled and the number of different species was highest, indicating the start of the bat swarming period. A trend of dominance of adult males was noted in all recorded species and at all the caves, while only in August and September the proportion of females and young increased. The number of bats trapped per night was positively correlated with ambient temperature. The part of the night with the highest detected bat activity also changed seasonally. *Rhinolophus hipposideros* and *R. ferrumequinum* were the most abundant species in spring and autumn months at two selected caves and at the same time also observed in the caves during the day. For most *Myotis* species, the highest activity was in late summer and autumn, e.g. *M. bechsteinii* in July-August, *M. daubentonii* in August-September and *M. nattereri* in September-October. Species composition differed between different caves, reflecting the characteristics of their geographical position and the surrounding landscape. The highest species numbers were detected at the cave "Dolga jama pri Koblarjih" in the Dinarides in SE Slovenia (13 *spp.),* and at the "Jama v Bihki" in the Alps in NW (*12 ssp.),* while at the cave "Jezerina" in the SW Slovenia, 9 species were recorded. During the study, some important new distributional data of species poorly known in Slovenia (*M. brandtii* and *M. alcathoe*) were collected. Regular and abundant visitations of caves by bats through most of the year, but especially in the swarming period, indicate the high importance for conservation of such underground sites.

NEW BAT SPECIES RECORDS FOR THE DINARA MOUNTAIN RANGE, CROATIA [P]

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This study was conducted on the Croatian part of the Dinara Mountain, which is part of the Dinaric Alps mountain range that extends from the Julian Alps in Slovenia to the Prokletije Mountains in Albania. The main goal of this study was to collect more data on bat species around its highest peaks. The research was part of an international inventory project „Dinara 2012" organized by BIUS- Biology Student Association. During July 2012 more than 10 underground sites were visited in search of bat summer colonies or potential winter hibernacula locations. During August 2012 bat research was carried out mainly on roads and paths within forests, forest edges and meadows in search for potential corridors and foraging areas, or as an exit to open habitats. This study confirmed seven bat species that have already been recorded for this area (*Miniopterus schreibersii, Myotis blythii, M. capaccinii, M. myotis, Rhinolophus blasii, R. euryale, R. hipposideros*). Five species recorded during this survey are new records for the Dinara Mountain (*M. mystacinus, M. nattereri, Nyctalus leisleri, N. noctula, P. auritus*). Now, the bat list for the Dinara Mountain range is complemented and the total number of bat species is 15 *(M. schreibersii*, *M. blythii, M. capaccinii, M. emarginatus, M. mystacinus, M. myotis, M. nattereri, Nyctalus leisleri, N. noctula, P. nathusii P. auritus, R. blasii, R. euryale, R. ferrumequinum, R. hipposideros)*. Since this is a very large and complex area more extensive research of this area would provide much better information on the species present, their activity and distribution.

HOW SENSITIVE ARE LESSER HORSESHOE BATS, *RHINOLOPHUS HIPPOSIDEROS*, DURING HIBERNATION? [O]

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The hibernation period is a very important part of a bat's life in the temperate zone, when the bats reduce the difference between body and ambient temperature to an absolute minimum. It is interrupted by periods of arousal, which requires costly thermogenesis. Arousal may occur for a number of behavioural and physiological reasons, including various types of disturbance. High frequency of disturbance of hibernating bats may lead to depletion of fat reserves and to death. The aim of our research was to determine how human presence in a cave would influence the hibernation behaviour of Lesser Horseshoe Bats, *Rhinolophus hipposideros*. Our study site was a natural cave which was opened for speleotherapy in 1997. During the last 15 years it has become an important hibernaculum with almost 350 hibernating bats. Bat activity was observed with a night-vision scope during two winters and all three hibernation periods i.e. pre-hibernation, deep hibernation and post-hibernation. Five main types of behaviour were differentiated. Additionally, ambient and wall temperature were measured to assess its changes as indirect impact of human presence.

Activity of hibernating bats was recorded during all hibernating periods. The highest level was achieved during pre- and post-hibernation but the two seasons under study differed significantly. "Swinging" when the bat slightly rotated around its axis to both sides, was the most frequent type of behaviour, representing 60% of all movements. The cascade effect, activation by a bat departing from the group of hibernating bats, was also recorded. In general, onset of bat activity was unsynchronized with sunset during hibernation and it was triggered by other external ecological factors. Ambient temperature, which highly correlates with cave temperature, seems to be the most important. The impact of cave visitation on hibernation behaviour was not confirmed. This study was supported by the grant of GACR No. 506/12/1064 and institutional support RVO:68081766.

ADDITIONAL ABSTRACTS

BAT INTERFERONS –DIFFERENCES AND SIMILARITIES IN RESPONSE TO LYSSAVIRUSES [P]

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Bats are found to be the natural reservoirs for many emerging viruses and transmitters of zoonotic viruses, such as lyssaviruses. In most cases, severe clinical signs caused by Lyssaviruses in other hosts (carnivores, humans) are normally not seen in bats. This indicates differences in the virus-host interactions. It is speculated that specific innate immune mechanisms, especially the interferon system, is determining the resistance of bats against viral pathogens. Interferons (IFNs) are cytokines produced in response to viral infection, and which trigger different pathways to block intracellular replication and to impede the infection of surrounding cells. A few studies have shown an antiviral activity of IFNs in fruit bats. However, the function of IFNs against lyssaviruses in bats is not studied yet. Due to the strict protection of endangered European bat species IFN studies in bats are nearly impossible. Therefore, we report here about the development of tools to investigate in-vitro innate anti-viral immune mechanisms in bats. Immortalized cell lines from Myotis myotis from different tissues (brain (MmBr), tonsil (MmTo), peritoneal cavity (MmPca), nasal epithelium (MmNep) and nervus olfactorius (MmNol)) were established after immortalization by SV 40 large T antigen. From M.myotis and from Nyctalus noctula bats the transcriptome was sequenced by next generation sequencing. Using these and publicly available databases the Type I interferons β, κ, ω and the type III interferons λ2, λ3 and λ were cloned and sequenced. Using the established cell lines which display different susceptibility to Lyssaviruses, the functions of sequenced interferons were characterized. Overall, the established cell lines and sequence databases are important tools to analyze antiviral innate immunity in M. myotis against neurotropic virus infections and present a valuable tool for a broad spectrum of future investigations in cellular biology and immunology of M. myotis.

BATS OF THE BRYANSK REGION (RUSSIA) [P]

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The Bryansk Region of Russia is situated in the central part of the Eastern European Plain (51°40′ - 54°05′ N. and 31°10′ - 35°20′ E.). Nerusso-Desnyanskoe Polesye is a natural subzone of the Bryansk Region, located at the southern border of coniferous forest, which covers most of the region. A bat survey was conducted in the Bryansk Region in 2004-2013. Fifty-seven localities in 20 of the region's 27 districts were included in the study.Using standard methods, 455 bat specimens were captured, most of which were released after observation and measurement. Currently, the bat fauna of the region includes at least 16 species, 12 of which have been confirmed by sightings in the past few years, namely: Myotis brandtii, Myotis mystacinus, Myotis daubentonii, Plecotus auritus, Pipistrellus kuhlii, Pipistrellus nathusii, Pipistrellus pygmaeus, Nyctalus leisleri, Nyctalus noctula, Eptesicus nilssonii, Eptesicus serotinus and Vespertilio murinus.During our survey Kuhl's pipistrelle, northern, lesser noctule, and serotine bats were first recorded in the Bryansk Region. Adult male Kuhl's pipistrelle was sighted twice in the same locality. This species has recently expanded its range northward, thus its presence here is to be expected. Northern bat, found here at the edge of its range, has been captured twice in the same place. Captured pregnant females confirm that the species reproduces in the region. This is the most western habitat for the lesser noctule in Russia. In 2013 Ukrainian researchers (Prilutskaya et al.) confirmed the whiskered bat inhabits the region. Later, we captured adult whiskered bat females in two other localities. One of the most remarkable changes in Polesye bat fauna is penetration into this area of the serotine. Since the middle of XXth century this bat has greatly expanded its distribution in Russia. Serotine was reported in Nerusso-Desnyanskoye Polesye for the first time in 2003. Until 2007 all records were of single male individuals. However, the first breeding colony was found in the western part of the region in 2008 and in Polesye in 2011. It is worth noting that all the analyzed individual males had "southern" mtDNA haplotypes, while animals from breeding colonies were carriers of the "western" – European –haplotypes, indicating two different paths of expansion of their distribution.

TO THE BOTTOM OF BULGARIA: FIRST REPORT OF GEOMYCES DESTRUCTANS FROM THE DEEPEST BULGARIAN CAVES [P]

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White-nose syndrome is an emerging infectious disease that has killed around 6 million hibernating bats in North America. It is caused by the recently identified Ascomycete fungus, Geomyces destructans, which invades exposed bat skin, but can be found in the soil and walls of temperate caves. The species occurs in Europe although it is not associated with mass mortality, probably because of a long coevolution with bats. Its presence has been confirmed in more than 10 European countries; bats with typical white growth on their snouts have been observed in Romania and European Turkey. There are reports on the fungus from 3 caves in Bulgaria, but our research was the first to include environmental sample collection and laboratory analysis.During the winter and spring of 2014 we collected soil samples and wall swabs from 6 caves (including the 3 previously reported) in different regions of Bulgaria, planted them on Sabouraud dextrose agar, and incubated them at a temperature of 4 °C. In a month we observed the typical white-green colonies of G. destructans in the dishes containing material from the caves Raichova dupka, Central Balkan, and Lednitzata, Middle Rhodopes. Under the microscope the fungus showed the curved conidia that are unique for the species, whose identity was also confirmed by DNA analysis in Greifswald, Germany. It is not clear if G. destructans is absent in the other caves because it is slow growing and can be inhibited by faster growing moulds which were abundant in most of the dishes. As a pilot study, ours will pave the way for future projects on G. destructans in Bulgaria. Only sampling of many different sites and combining different research methods will allow us to answer important questions on the biology, ecology and distribution of the fungus and develop appropriate conservation measures against a potentially dangerous pathogen in bats.

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