

Bat Conservation Trust National Bat Conference

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Conference abstracts 2010

Bat monitoring at Finemere Wood

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When North Bucks Bat Group started in 2002 we decided that we needed a focal project to enthuse the new members. After visiting Wytham Woods and seeing the incredible numbers of bats that used the bird boxes there, we thought a bat box project based on this model would be the best option. When we first started we had no idea of what to expect but as the project developed it became more and more fascinating. It was clear that there was a lot to be learned from the scheme and we gradually refined our methodology and procedures to reflect this and to take advantage of the opportunity our results provided. As a consequence the project has developed into an ongoing study of woodland bat behaviour – particularly in relation to bat boxes. It has great potential to develop further and we are committed to encouraging continuing research. So far the project has produced two MSc dissertations with another in production. These have investigated the effect of shade on box selection, the comparative efficacy of detectors and bat boxes as monitoring tools, what proportion of time is spent in boxes and natural roosts during the maternity period, and the current research which is attempting to build on these studies by looking in greater detail at which boxes are selected and why. The long term aim is to develop a practical monitoring mechanism which can be reproduced in other woodlands allowing effective long term population monitoring of woodland bat populations.

The Combe Down Stabilisation Project at Bath from 2000 to 2009

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This £154 million project, funded by English Partnerships, was implemented to safeguard over 500 houses and 1,500 people living above two adjoining disused limestone mines, called Firs and Byfield mines. These mines, and others nearby, form one component of the Bath and Bradford on Avon SAC, designated for its horseshoe bat populations.

Bat Pro Limited was appointed in 2000 to carry out comprehensive baseline bat surveys to assess the bat use of the mines throughout each year. At least 8 vespertilionid bat species were identified by either swarming or hibernation surveys, in addition to both greater and lesser horseshoe bats. The former was the only species to both breed and hibernate underground.

Engineering methods were designed to infill most of the 45 acres of the Firs/Byfield complex after approval by Bat Pro and NE. This approval required significant works to other mines nearby as compensation for the losses at the complex. A very limited area of Firs was retained, and a larger area at Byfield, following the works that proceeded under an agreed bat protocol. Bats were excluded from Byfield in September 2007 to permit works to occur there. All works ended in December 2009. An agreed monitoring period lasting for 10 years has just begun.

The talk summarises the project's progress, concentrating on the bat survey methods used, and the bat population changes that were identified to summer 2010.

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Bats in the urban landscape

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We present the results of a survey of the bat communities in the vicinity of ponds within the Birmingham and Black Country conurbation. This was motivated by the relatively limited evidence basis for urban bat conservation and broader research questions regarding urban landscape structure and ecological processes. Our method aimed to address issues such as survey bias, through selection of similar sized ponds, stratified between five urban land classes. These classes were derived through the cluster analysis of widely available Ordnance Survey land cover data, allowing the results to be compared to other UK sites. We also aimed to reduce bias in recording method, by using a walking survey and stationary Anabat SD1 to record data on species richness and activity. Our main hypothesis was that bat communities and their activity would differ between ponds set within different urban land classes. Regarding survey techniques, the most successful was species dependant, suggesting a combined approach is best. For each species or species group, presence and activity was sensitive to landscape context at different scales. However, in some cases it was the arrangement of this land cover that was important. Much of the variation in bat communities between survey sites could not be explained, and it is suggested that research into the impact of lighting, roost availability and the abundance of insect prey would be beneficial.

Conservation of cave-dwelling bat species in Turkish Thrace

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Many of the cave habitats in Turkish Thrace are under threat because of factors such as cave tourism, stone quarries, and treasure hunting. The lack of management plans is one of the most important deficiencies that impede the conservation of these sites and their inhabitants. In order to fill this gap, the cave-dwelling bat populations in Yıldız Mountains were surveyed in collaboration with the Ministry of Environment and Forestry, caving clubs, and Boğaziçi University Institute of Environmental Sciences. Approximately 42,000 bats, representing nine species, were recorded in 22 sites, *Miniopterus schreibersii* was the most abundant species, followed by *Rhinolophus ferrumequinum* and large *Myotis*. According to an evaluation of conservation needs, nine caves merit High Conservation Priority for urgent protection as Nature Reserves and eight caves are proposed for Natural Monument status under the National Parks Law. We also compared our survey data (2009) with the results of the 2001 census to examine possible changes in populations' abundance and structure over the last few years. No drastic differences were observed in diversity indices; however, the comparison of counts shows that there might be a decrease in populations of large *Myotis* and medium-sized *Rhinolophus*.

British Waterways Wildlife Survey

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The majority of UK waterways are cared for by British Waterways, who look after more than 2,000 miles of 200-year-old canals and navigable rivers, as well as 92 reservoirs. Our canals not only provide great roosting and foraging habitats for bats, they also support some of the UK's most important wildlife habitats, including 18 Natura 2000 sites and 74 SSSIs. The waterways are incredibly important habitat corridors bringing wildlife into the hearts of our towns and cities, as well as some of our more intensively farmed landscapes. Although the canals were not built for wildlife, they have become excellent places for a wide range of diverse and rare species.

British Waterways carries out its annual wildlife survey between March and October each year, which includes a photographic competition. Everyone can take part and each record helps our ecologists to monitor, protect and conserve the amazing biodiversity found on our canals and rivers. The survey is open to everyone, you can enter as many records as you like and it's a great day out. Last year, people reported more than 42,500 sightings of over 300 different species of birds, amphibians, reptiles, insects and mammals.

With half of the UK living within five miles of a canal, river, reservoir or dock, there's never been a better time to get close to nature. Visit your local waterway and make a note of what you've seen - you can download a guide to the wildlife survey at www.Waterscape.Com.

Examining evidence for demographic Allee effects in nine UK bat species

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Social species should be susceptible to demographic Allee effects when their populations become too small for social behaviours to be efficient. Using the extensive datasets of the UK's National Bat Monitoring Programme, we assessed this hypothesis by examining the dynamics of nine bat species at summer maternity roosts.

For each species, we smoothed roost counts for the influence of weather and an annual trend using Generalised Additive Models before measuring the empirical support for three major population dynamics in their roost dynamics. The models were: (i) no growth, (ii) negative density feedback, and (iii) negative density feedback with an Allee effect. We repeated our analyses using roost counts smoothed for weather effects only and also for unsmoothed roost counts

Four of the nine species (44%) analysed here showed high support for an Allee effect, a very high incidence compared to the 1.1% emerging from a recent analysis of 1198 taxonomically diverse species. Soprano pipistrelle, Natterer's bat and the greater and lesser horseshoe bats all revealed higher support for the Allee model over the alternatives. For the soprano pipistrelle and greater horseshoe bat, this result was robust to smoothing of roost counts for an annual trend and weather effects, respectively. The lesser horseshoe bat revealed higher support for an Allee effect only when using original roost counts.

Synthesis and applications - Our results support the notion that social species are more susceptible to demographic Allee effects. At an individual species level, our findings necessitate the careful monitoring of bat species affected by Allee effects, particularly at declining roosts that will require early conservation action to prevent their abandonment. Globally, our results suggest that many social bat - and other - species might be susceptible to demographic Allee effects, and an elevated risk of population extirpation.

Our vision for bat conservation

Julia Hanmer, Bat Conservation Trust; jhanmer@bats.org.uk

I am delighted to share with you our vision of what we at BCT need to do to secure the future of bats in our changing world and news on recent steps we've made towards achieving this. In my first year as CEO, I've been hugely inspired by the energy, passion and dedication of everyone involved in bat conservation. In at the deep end, at first I literally felt we were having a year without hibernation, with all of our activity, partnerships and advocacy for bats. Now I am confident we have developed a clear picture of what ultimate success will look like, and of the vital steps we need to take, in partnership, to get there. BCT is working to **discover** the evidence we need to understand bats' conservation status, ecological requirements and the pressures they face; to **act** on this evidence through good practice guidelines, through practical demonstration of landscape management for bats and by improving and enforcing legislation and finally to **inspire** key audiences to support our vision of a world where bats and people thrive together in harmony. I will be illustrating these themes with examples from the Bechstein's bat project, toolkits for planners and our recent venture into social networking, as well as updating you on our partnerships with Bat Groups.

Bats, birds and biodiversity

Nick Tomlinson, BCT trustee, Dorset and Somerset Bat Groups; bats@elephantsears.org

Our understanding of how many species respond to major habitat management works can sometimes be limited. The RSPB's Radipole Lake is a major urban wetland reserve and a key bat feeding site within the urban conurbation of Weymouth. The RSPB is undertaking a major reedbed restoration at Radipole, funded by Natural England. Having discovered Nathusius' pipistrelle feeding on the site as part of an anabat trial in 2008 (the fourth record for the county), a project was started to try and shed some light on how the existing bat populations behaviour might change in response to that restoration. Early results show impressive changes in feeding patterns and activity levels, across a range of species, in newly restored areas, but also hint at possible declines in use, as habitat features mature, although species specific effects are not yet clear.

Habitat preferences of UK bats as revealed by NBMP monitoring data

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The National Bat Monitoring Programme (NBMP) provides a unique opportunity to study the habitat associations of British bats at a national scale. We used data from the NBMP colony counts and field survey to investigate the relationship between bats and various habitat metrics, including landscape composition, habitat fragmentation and the attributes of hedgerows. Data were available for seven species, lesser horseshoe bat, Natterer's bat, serotine, noctule, brown long-eared bat, common pipistrelle and soprano pipistrelle. For every species, bat activity and roost location were positively associated with either the proportion of broadleaved woodland in the landscape or the distance to the nearest broadleaved woodland patch. The majority of species were also more likely to roost and forage in landscapes with a greater proportion of grassland than would be expected by chance. At a smaller scale, the presence of hedgerow trees increased the incidence of common and soprano pipistrelle at points adjacent to hedgerows. These findings suggest that the availability of broadleaved woodland plays an important role in determining landscape suitability for the bat species tested here, and that incidence of bats in agricultural landscapes could be increased by measures that promote the establishment and maintenance of hedgerow trees.

Monitoring *Mystacina*: PIT- tagging bats in New Zealand

Jane Sedgely, New Zealand Department of Conservation, Christchurch and Worcestershire Bat Group; janesedgely@talktalk.net

In 2004, project 'Operation Ark' was launched in the Eglinton Valley, Fiordland with the aim of protecting birds and bats from introduced mammalian predators. Exit counts at bat roosts proved to be inadequate at detecting changes in populations, so other methods were sought in order to assess the effectiveness of conservation management. A ringing and mark-recapture programme was highly successful detecting trends in populations of long-tailed bats (*Chalinolobus tuberculatus*). However, captive trials on lesser short-tailed bats (*Mystacina tuberculata*), showed that rings caused unacceptable damage to both forearm and wing. In 2006, we began a collaborative study to assess if passive integrated transponder tags (PIT-tags) could be a suitable alternative. We adopted an ethical and staged approach: in 2005, JS went to Germany to obtain training in the technique; in 2006, we trialled two different tagging systems on captive lesser short-tailed bats; in 2007, we tested our marking and handling systems under field conditions and trialled antenna and dataloggers at roost holes; in 2008, we began our monitoring project. By the end of the 2008/2009 field season we had tagged 588 bats and the dataloggers recorded a total of 8275 registrations of 366 individuals. Up to 94% recovery rates indicated that PIT-tagging did not have a negative impact on lesser short-tailed bats. Preliminary results show changes in the bat population in response to increases in rat numbers. We conclude that PIT-tagging can be used as an ethical alternative to ringing when robust monitoring is required.

Population ecology of Daubenton's bats in the Yorkshire Dales

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Being part of a large group can have several clear benefits, including reduced predation risk, communal nursing, allogrooming and information transfer. Large colonies of animals may appear to be random and chaotic upon initial analysis, however, internal factors such as sex and age, and genetic properties or individual choice will often lead to preferred or avoided associations between individuals. Social network analysis was developed to analyse human behaviour, but has also been used to analyse the social association patterns of a wide range of animals, including fish, cetaceans, ungulates and bats.

This talk will discuss the results of investigations into the social structure of Daubenton's bat populations along the River Wharfe in the Yorkshire Dales National Park. Analyses revealed a social structure comprised of several clusters of bats, with cluster highly correlated with roost membership. High levels of within cluster associations were estimated in contrast to very low levels of between cluster associations. Several cutpoint individuals were identified, linking clusters of bats at high association levels that would otherwise be separate. These individuals may be of particular importance in knowledge transfer, gene flow and the potential spread of EBLV. The calculated average length of association between individuals was 175 days, but observational data suggest this is an underestimate.

Knowledge of the structure of bat communities is of particular importance in understanding the behavioural and ecological roles of individuals, the potential spread of viruses such as EBLV, and in being able to effectively target limited conservation resources.

Bats underground - delving into the underworld in the name of research

Dave Anderson, Towneley Hall Museum and East Lancashire Bat Group; DAnderson@burnley.gov.uk

East Lancashire is an area that has been historically under represented by bat species and roost records. With this in mind East Lanc's Bat Group is undertaking a focused project identifying potential underground sites that may be used for hibernation, transition, and swarming.

But what do we count as underground? How and where do you find information on these sites? Are they restricted to limestone areas? And might the answer to where do all the bats go in winter be right under our feet? Hints and tips will be offered on some orthodox and some not so orthodox sources of information.

Halfway through the project we have managed to greatly expand the number of sites surveyed, discovered new species records for the area, found more questions than answers, worked closely with other interested parties and grappled with the thorny subject of access.

Advances in understanding of bat lyssaviruses

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There are now eleven recognised lyssavirus species, and most of these have bats as reservoir hosts. In the past three years significant advances have been made in our understanding of the epidemiology of these viruses, our ability to detect them and also their interaction with the bats themselves. Recent advances include discovery of new viruses, discovery of known viruses in new areas, novel diagnostic techniques and mathematical modelling of transmission dynamics. These advances will be discussed, along with their implications. Despite intensive research, there are still many unanswered questions relevant to both public health risks, and to the bat populations themselves.

Bat habitat preferences in urban areas

Cath Laing, Sussex Bat Group; cath.laing@talk21.com

Although bats present in the UK have been found to prefer a mosaic of woodland, water and grassland/woodland edges, little research has been undertaken showing preferences in urban areas. In this study, bat activity was assessed in relation to habitat composition in three areas of Brighton and Hove. Data for this project was gathered by volunteers undertaking bat detector transects. The area where bat activity exceeded that expected, based on survey effort, had significantly more woodland and garden. Average patch size for garden, park and woodland in this area was also larger than in the two comparison areas. Across the city, bat activity in and 20m around parks and woodland also was significantly higher. A similar analysis of street trees found no association between these features and bat activity. In the UK, legal protection of bats focuses on the conservation of roosts rather than habitat (except for four species). In urban areas, where suitable habitat is scarce and bat activity favours garden, park and woodland, particularly those of relatively large patch size, there may be a case for ensuring adequate habitat networks in order to preserve the favourable conservation status of bats as required by European legislation. Further research is needed to assess whether quality or management of urban habitat has a significant impact on bat activity.

Predicting changes in Southeast Asian bat species distributions over 20,000 years

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Predictive maps were created of the current distributions and habitat requirements of around 146 bat species over Southeast Asia, using presence-only data to generate these predictions.

To create these predictions the known distribution of each species are paired with geological, physical and climatic maps of Southeast Asia in MaxEnt (Phillips *et al.*, 2006-<http://www.cs.princeton.edu/~schapire/maxent/>) which then uses these eco-geographic variables to determine niche requirements, and therefore extrapolate the current distribution.

Using this information; models were produced under projected future climate-change scenarios and predicted changes in land-cover (forecasting to the year 2100). Additionally predictions of the past distributions (hindcasting) of these species have been created to look at possible glacial refugia, ancient seaways and migration routes during the Last Glacial Maximum (21kya) and the last Interglacial Period (120-140kya). Species distribution predictions were combined to show “hotspots”, for each timeframe, to mediate conservation and research prioritization.

We also attempt to explain the causes of the zoogeographic divide which exists around the Isthmus of Kra in mid-peninsula Thailand. Principal Component Analyses of climate over the region reveals an intersection of climatic zones within this area. Furthermore, sea-level changes on the narrow isthmus may have caused high regional extinctions in response to post-glacial sea level rises, compounded by a lower probability of recolonisation due to the limited peninsular width (peninsula effect). These factors combined with geologic instability exacerbate the climatically mediated boundary. No physical division of the area would be necessary to cause the observed zoo-geographic divide.

Irish Bat Monitoring Schemes 2003 to 2010

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Five of Ireland's 10 bat species are monitored on a yearly basis by Bat Conservation Ireland. Various methods are employed to complete these monitoring schemes. Three species, the common pipistrelle, soprano pipistrelle and Leisler's bat are monitored using a car-based protocol whereby surveyors drive known road-based routes while recording encountered bat ultrasounds to time-expansion bat detectors. Analysis and identification is carried out post-survey. This scheme has been in operation since 2003. The Daubenton's bat is monitored using heterodyne bat detectors employed by volunteers during walking transects along assigned waterways and is based on the BCT Waterway Survey. This scheme has been in operation since 2006 in Ireland. The brown long-eared bat is monitored using multiple roost emergence counts over the summer months and this scheme has been in operation since 2008. Bat Conservation Ireland is responsible for administering these schemes which are funded by a combination of funding partners including the National Parks and Wildlife Service and the Northern Ireland Environment Agency. Power analysis has been carried out on the data for all three monitoring schemes to determine whether red or amber alert declines can be accurately detected. Results derived from these surveys have provided to-date new data on bat species distributions across the island, as well as initial population trend data. In addition, these schemes have introduced hundreds of volunteers to bat survey work and considerable positive media coverage promoting bat conservation.

What genes can tell us about bats that we would otherwise not have known

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Genetic analyses have revolutionised our perspectives in biology in recent years. I will show how genetic analyses have been used

- a) To clarify evolutionary relationships among bat families and species.
- b) To identify cryptic species that had previously been inseparable by their appearance.
- c) To understand colonisation patterns of bats after the last ice age.
- d) To determine genes involved in the evolution of echolocation.
- e) To understand patterns of relatedness among bats in colonies.
- f) To better inform conservation planning.

Now that it is becoming relatively straightforward to sequence entire genomes of animals, we will soon be able to determine some of the genetic mechanisms that have resulted in bats evolving specialised adaptations such as flight, echolocation and hibernation.