

GIVING BATS A GOOD INNINGS

EUROPEAN PROTECTED SPECIES WITH INTERNATIONAL APPEAL

By Andrew Cowan N.D.Arb. November 2002





Arboricultural & Ecological Research & Consultants Bats are perhaps one of the most misunderstood and maligned of small mammals. Possibly because we know so little about them, our fear of the unknown, has lead to a wealth of scare stories and fairytales that portray them as evil and creepy. However, these unusual nocturnal animals play many essential roles in our farming, forestry and urban landscape. Their decline is an indication of the sustainability of our countryside as a whole, because bats flourish best where the ecosystem is healthy and stable. Knowledge about bats roosting behaviour has been limited to observations made in and around residential dwellings. Where they have been found hanging up in the attic, flying around a barn or crawling out from under roof tiles. As a result, some bats have been associated, almost exclusively, with buildings, but this is not their natural habitat. In this article Andrew Cowan* explains the importance of trees and wooded landscapes to these, essentially, arboreal species'. Concluding with some background to the international efforts that have been taken to protect bats in Europe and how these have been transposed into Acts and Regulations, within the United Kingdom of Britain and Northern Ireland (UK), that have a direct influence on arboricultural and forestry management strategies.

THE IMPORTANCE OF ARBOREAL HABITAT

Bats are one of the most divers groups of mammals in the world with over a thousand known species, but we understand very little about them. They live in very specific ecological niches, and as such are very vulnerable to change. Trees and tree related habitats play a very important part in the life cycles of nearly all bat species.

The trees serve as sheltered habitat for the insects on which the bats feed, while also acting as landmarks and flight paths around the broader countryside. But possibly one of the most important aspects is the use of trees for roost sites. Bats are very depended on having a divers range of roost sites. During the summer some bats have been recorded using over thirty different roost sites, sometimes only staining in one site for one or two days. Even maternity colonies as a whole are not averse to moving, with each



The Brown long-eared bat (Pleotus auritus) has a particularly quiet call and flies very close to tree canopies. It is often found roosting in the roofs of buildings, but since it appears to take readily to the use of bat boxes, it is thought to be a common user of tree roost sites. Photograph by John Altingham 2001

mother carrying her juvenile hanging from her nipple and fur to the new roost location.

Bats use roosts for a range of different purposes for such needs as overnight stops during summer feeding, or gathering roosts in spring, to winter hibernation, mating and breeding, and different conditions are required for each. Roosts may contain few bats, or they may host several species and many individuals.

A number of different research projects have shown that on average an individual bat may spend 1.75 days in one place, before changing roost sites. While the average use of a single roost site by a colony of bats, from the first individual resident, to the last bat to leave, is 3-6 days.

Bats sometimes live more than twenty-five years, and have been recorded at up to thirty years old. Once a young bat has established a successful pattern of movement and roost use, this will be repeated annually throughout its life, with only minor deviations where roost sites are lost. A sustainable and divers range of roost sites can be instrumental in the continued viability of the individual and local populations as a whole.

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We know very little about bats, due mainly to their nocturnal habits. Their movements through the landscape are very difficult to record, despite modern radio tracking techniques. Most of our knowledge is gained from recording activities around known roost sites.

Research into bat behaviour and habitat use has shown that at least 12 of the 16 species, breeding in the UK, use tree roost sites, while 8 are known to do so regularly. The species that have been found roosting in trees are:

Barbastelle	(Barbastella barbastellus)
Whiskered	(Myotis mystacinus)
Bechstein's	(Myotis bechsteinii)
Brandt's	(Myotis brandtii)
Daubenton's	(Myotis daubentonii)
Natterer's	(Myotis nattereri)
Leisler's	(Nyctalus leisleri)
Noctule	(Nyctalus noctula)
Common pipistrelle	(Pipistrellus pipistrellus)
Soprano pipistrelle	(Pipistrellus pygmaeus)
Brown long-eared	(Plecotus auritus)
Grey long-eared	(Plecotus austriacus)

These species are generally distributed throughout Britain with the exception of Bechstein's bat and barbastelle, which are confined to central, southern England and some parts of Wales. Several species appear only rarely or as vagrants in Scotland, but this may change as our climate gets warmer and populations ranges shift and take advantage of new opportunities.



The Natterer's Bat (Myotis nattereri), commonly associated with woodland foraging areas, but most known roost sites are in old timber frame or stone barns and other farm buildings. This bat has a metal identification ring attached to it's forearm and is part of a long term research project, monitoring population movements. Photograph by John Altringham 2001

The remaining 4 UK species may not have been found roosting in trees, but there is a very high probability that they are using them and there are simply no records of occupation of such roost sites. These 4 species are:

Serotine	(Eptesicus serotinus)
Nathusius' pipistrelle	(Pipistrellus nathusii)
Lesser Horseshoe	(Rhinolophus ferrumequinum)
Greater Horseshoe	(Rhinolophus hipposideros)

It would not be unreasonable to say that all species of bat use tree roost sites, to a greater or lesser extent. In fact the use of manmade structures may simply be due to the lack of suitable tree roost. Because tree roosts are so difficult to locate it has always been very hard to record the bats use of the sites and their activities around them. This lack of accurate factual knowledge has lead to a lot of misleading generalisation and anecdotal information.

It is important to remember that each species of bat has adapted a different way of utilising the available habitat, and while there are some overlaps that result in similarities, there are also things that are unique to individuals, colonies and different species. A lack of knowledge promotes a tendency to generalise and there is a need to guard against the assumption that a conservation measure designed to improve the habitat for one species will be of benefit to all!

TREE FEATURES WHICH ARE USED BY BATS

Bats do not have the capacity to building nests or excavate a roost site in a decaying trunk. However, they are reliant on a divers range of appropriate places to use as roosting sites from a few hours when using it for feeding, to several weeks during

hibernation. An incredible variety of roost sites have been found, from high rot holes at the ends of branches, down to the cavities that are formed under buttress roots. Although, one aspect of these sites appears to be similar, where bats are found, they are squeezed into cracks and crevices, or tucked out of the way behind loose bark or ivy. Bats only very rarely hang free within a roost or out in the open.

The nocturnal life style of bats enables them to take advantage of a unique niche, allowing them to hunt insects under the cover of darkness. However, finding a safe roost site for the daylight hours is essential to avoid predation. This can often be difficult, especially in human dominated landscapes where natural habitats have been extensively cleared, fragmented or modified. This may be why some of the more adaptable species



This impressive slit in one of the major limbs of this oak tree has been a maternity roost, used by barbastelle bats, for several years, while a group of noctule bats were found hibernating in the top of the slit in November. Roost sites such as this represent a considerable problem for woodland managers, because they are valuable habitat for bats, but where they are close to areas with public access, there become a significant health and safety risk. Photograph taken at Horner woods, Summerset, by Andrew Cowan (2002), where the property is owned and managed by the National Trust, who have commissioned some comprehensive bats survey work undertaken by Geoff Billington of Greener Ecology Consultancy.

like the pipestrelles and brown long-eared bats, frequently turn up in roofs, while others like the greater and lesser horseshoe bats have become dependent on the availability of houses and barns for summer roost sites.

Woodland management practices will often remove a large number of trees which exhibit features that could be used by bats, while tree pruning work often selectively removes limbs and branches which contain potential roost sites. Detailed information on the roosting requirements of bats, especially in relation to trees, is essential to aid the conservation of this endangered group of mammals. Knowledge of the type of roost tree and roost site preferred by bats can help predict which trees are likely to contain bat roosts and to evaluate the availability of roosting habitat.

Bats use cracks, splits and cavities in trees for roosting throughout the year, as individuals or small groups, feeding or breeding and for periods of torpor. They spend over half of their lives subject to the selective pressures of their roosting environment, and are more likely to be adversely affected by reductions in abundance and quality of roost sites than any other animal. The shortage of potential roost sites is reduced further when taking into consideration the highly selective nature of some bat species. Therefore, a reduction in the availability of suitable roosts, which forces the use of less appropriate sites, is likely to have a significant impact on the reproductive success of bat populations and could affect their viability adversely.

Even in areas where the availability of roost sites is not limited, bats face considerable competition for their use. A number of bird species will selectively use tree cavities for nesting, often building several nests in a season and in different cavities. Some tree dwelling bat species have been known to actively compete for roost sites with birds as big as starlings. However, in most cases it is the bats that loose out. This competition can restrict the use of tree cavities to winter hibernation sites and may be why bats seam to prefer splits and crevices, that are less likely to be used by nesting birds, during the summer.

TORPOR

Bats, like several groups of mammals in the UK, have the ability to go into torpor. This involves a complex sequence of regulated adjustments controlled by the nervous system and stimulated by hormones. During this process of body cooling the heartbeat rate falls from a level of several hundred beats per minute to an erratic figure of around 5-20 in deep torpor.

During the winter hibernation period, torpor can last for a few weeks at a time. Stored body fat is gradually drawn upon to maintain vital body functions. However, bats will also use torpor to conserve energy during the summer months, if a prolonged period of bad weather reduces the availability of insect food, or makes hunting difficult.

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ROOST SELECTION

Roost selection can be influenced by a number of factors, not least of which is availability. Competition for suitable cavities, splits, and crevices can be fierce, with nesting birds, squirrels and various mice species all looking for suitable sites. This demand on what is very often a finite resource can mean that bats are forced into less desirable locations, while searching for sites where they are less likely to be disturbed. This may explain the use of what can sometimes be quite precarious tree features like split branches and behind loose bark.

Nothing is know for certain about how bats select their roost sites, and we can only make educated guesses made from observational research. For instance, it was thought once that bats needed a roost site that was at least 3m above ground level, so when they took to flight there was enough space for them to drop away from the exit point. (A bat's skeleton is very well adapted to flight with a fine membrane stretched between the thin bones of its legs, arms and fingers. The drawback to this is that they do not have the strength in their bones to support their own weight, standing up, so cannot take off like a bird.) However, more recent observations have shown that bats can take to flight quite capably, leaving a perch or roost site horizontally, and often flying up.

Tree roost sites are difficult to identify and are even harder to find without trapping and then marking the bat with a fluorescent tag or attaching a radio transmitter. By using such devices some research projects have found tree roost sites, and it has been possible to make some observational comments on their use at different times of year. Geoff Billington has radio tracked barbastelle bats around Horner Woods on the National Trust Holnicote Estate Somerset and some of the photographs that accompany this article are of roost sites which he has tracked bats to, in both winter and summer.

In the summer female bats will group together to form maternity colonies which tend to select roost sites high in the tree canopy often at the edge of a clearing. The young develop faster in the warm conditions of a roost, which is in the sun for much of the day. While the adult females may choose to roost in a cooler place lower in the tree canopy, returning to feed their infants at night. Male bats have a more solitary life style choosing roost sites in splits and crevices, or behind ivy, and also tend to prefer colder locations low in the tree canopy.

Bats use torpor to conserve energy during periods when insects may be in short supply, the reduction in body temperature during inactivity greatly reduces metabolic demands and thus the individuals' food requirements. Hibernation is a prolonged period of torpor which bats use to survive though winter months. However, unlike many other mammals that use torpor in this way, bats will fly occasionally, to switch roosts or to snack on winter flying moths, while taking the opportunity to dispose of body wastes.

Knowledge about hibernation roosts is extremely limited because bats are active for such a short period over the winter months, trapping and tracking them is almost impossible. While it has been know for a long time that the Myotis spp. (many of which roost in trees during the summer) make use of underground sites like caves and disused mines. The other tree dwellers like noctule, barbastelle, Leisler's bat and both species of pipistrelle, are only very rarely recorded and very little is know about their habits.

Observations of bat hibernation sites, seams to indicate that they prefer cool damp places with a stable temperature around 1-6 degrees above freezing. So it has been assumed that the bats hibernating in trees, use large cavities deep in the trunk or at the base of the main stem. However,



This photograph shows the corner post of a timber frame barn. At the top of the picture a gap is visible on the under side of a mortice and tennon joint, which Natterer's bats are using as a roost site. This species of bat is commonly associated with old farm buildings and is one of the species most threatened by conversion of these buildings to residential dwellings. Note the droppings that have been court in the spider's web at the bottom of the picture. The presence of droppings is often the only clue to the location of a roost site. Photograph by Andrew Cowan 2002

Geoff Billington has managed to make some records during his survey work at Horner Woods and his findings have been quite surprising. He found two barbastelle bats on different occasions behind loose bark not far from ground level, while a group of noctule bats were found hibernating at the top of a split limb, over 10 m up an oak tree (see photographs).

INTERNATIONAL CONVENTIONS, DIRECTIVES AND AGREEMENTS

The precarious existence of bats is recognised in Europe where they are protected under a number of international Conventions, Directives and Agreements. Individual countries have ratified these into their national policy and legislation.

The Bonn Convention on the Conservation of Migratory Species; arose in 1972 from a recommendation by the United Nations, and entered into force in November 1983. There are currently 79 parties (as of 1st Feb 2002) to the Convention, which include most countries in Europe. In addition to the member of the European Union, many African states and a growing presence in South America, Asia and Oceania have also committed to the convention. The United Kingdom ratified the Convention in July 1985 and it entered into force on 1st October 1985.

The Bonn Convention aims to improve the status of all threatened migratory species through national action and international Agreements between range states of particular groups of species. These are covered by Articles II, III and IV. An Article IV Agreement has been concluded as a self-standing international legal instrument for the Conservation of Bats in Europe.

The Berne Convention on the Conservation of European Wildlife and Natural Habitats; was opened for signatures in 1979, and was ratified by the United Kingdom in 1982.

Its principal aims are:

- To ensure conservation and protection of all wild plants and animal species
- To increase co-operation between States in these areas



Geoff Billington can be seen here checking behind some loose bark using and fibrescope. Geoff has radio tracked a barbastelle bat to this site, where it was recorded hibernating over winter, even down to temperatures around freezing, when there was frost on the ground. Photograph by Andrew Cowan 2002

• To afford special protection to the most vulnerable of threatened species (including migratory species)

The Convention thus protects over 500 wild plants species and more than 1000 wild animal species. It is open – that is not limited to Europe – and is now in force in 45 member states. It is the inspiration for the EC Habitats and Wild Birds Directives and had a direct influence on the UK's main conservation legislation, the Wildlife and Countryside Act 1981 (as amended).

The European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora 92/43/EEC 1992, identifies habitats and species of special interest within the European Community, and legislates for the notification of Special Areas of Conservation (SACs).

The Directive (92/43/EEC) requires Member States to designate certain sites as SACs. From these national lists, Member States and the Commission will agree the Sites of Community Importance, which will become designated SACs.

The UK has now forwarded 331 sites to Brussels as Sites of Community Importance or Candidate Special Areas of Conservation (cSACs). Together with Special Protection Areas classified under the council Directive on the conservation of wild birds (79/409/EEC), SACs will constitute the European Union's Natura 2000 network. The habitat types and species which require site designations are listed in Annexes I and II of the Directive. Annex III gives criteria for the selection of sites. 75 habitat types and 40 species are proposed for site designation in the UK. A document, 'Selection of Special Areas of Conservation in the UK', setting out in detail the rationale for site selection was published by the Joint Nature Conservation Committee in October 1997.

In all the above, bats benefit from their inclusion within protected species list or where their habitat is given special consideration. However, their importance has been acknowledge specifically in The Agreement on the Conservation of Bats in Europe (1994) known as EUROBAT (www.eurobat.org). The Agreement was set up under The Convention on the Conservation of Migratory Species of Wild Animals, which recognises that endangered migratory-species can only be properly protected if activities are carried out over the entire migratory range of the species. To date twenty-six European range states, from North, South, East and West, are signatories to this Agreement.

The aims of the Bat Agreement are to protect all 37 species of bats identified in Europe, through legislation, education, conservation measures and international co-operation with Agreement members and with those who have not yet joined.

IMPLICATIONS FOR TREE WORK IN THE UK

Bats also enjoy legal protection in the UK through the Wildlife and Countryside Act 1981 (as amended), the Wildlife (Northern Ireland) Order 1985 and on the Isle of Man by the Wildlife Act 1990. Further protection is provided by the Conservation (Natural Habitats, &c.) Regulations 1994, the equivalents, in Northern Ireland, is the Northern Ireland Regulations 1995, these are commonly referred to as the Habitats Regs.

In 2001 the Countryside and Rights of Way Act 2000 came into force, in England and Wales, and included amendments to the Wildlife and Countryside Act. These strengthen the protection for species within the Schedules 1 & 5 of the Act, while equivalent legislation is under consideration in Scotland, at the time of writing no alternative protection is available in Northern Ireland.

The UK Biodiversity Action Plan (UKBAP) published in 1995, also includes targets and guidelines for the protection of bats and their habitat, while Local Authority Biodiversity Action Plans (LABAPs) may also include locally important bat species and habitat areas.

The introduction of the CRoW Act (Countryside and Rights of Way Act 2000) last year, meant that; considering the potential a tree has to contain a bat roost, or form part of essential foraging areas around a roost, has become an important part of our pre-work job assessment. As professionals, working in arboriculture, horticulture or forestry, we could be seen as reckless if we did not consider the potential and take appropriate action where necessary.

The Conservation (Natural Habitats, &c) Regulations 1994 (known as the Habitats Regulations), provided protection not only for the bat and it's roost site (whether occupied or not), they also cover the habitat used by bats both for roosting and foraging. Where bats are concerned this also included the flight lines they use between favoured roost sites and good foraging areas. This becomes an essential consideration when there is a proposal to reduce or remove an old hedgerow, or where clear felling sections of woodland is proposed. The preservation of a connective landscape is incredibly important.

Where bats are present in a tree, or if the tree is a known roost, then consultation with the Statutory Nature Conservation Organisation (SNCO)

This area of loose bark, which is less than 1.5 m above ground level, shows just how exposed some of the tree roost sites can be. During his radio tracking work around Hornor Woods, Geoff Billington recorded a barbastelle bat using this site as a

hibernation roost. Photographed by Andrew Cowan 2002

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must be undertaken prior to commencement of work. If bats are disturbed during tree pruning or felling then all work must stop immediately and the SNCO contacted. The SNCO will advice on the best action to take, including if, how and when work can continue.

Exemptions can be granted from the protection afforded to bats under the Habitat Regulations, by means of a EPS (European Protected Species) Habitats Regulations licences. The Department for Environment, Food and Rural Affairs (DEFRA) has the authority, in England, to provide applicants with a licence for work that is likely to affect a protected species.

Similar arrangements apply in Scotland where the Scottish Natural Heritage (SNH) has a power to grant licenses for scientific, educational or conservation purposes. It cannot grant licenses for the purposes of protecting public health and safety, allowing a development or building project to proceed, or preventing agricultural damage. In these cases the Scottish Executive is the competent licensing authority.

In Wales the National Assembly for Wales (NAW) has the responsibility for EPS Habitats Regulations Licences, while in Northern Ireland they have the Department of Environment (Northern Ireland) (DoE NI).

A 'EPS Habitats Regulations Licence' could be required for:

- engineering work like bridge building or repair
- road building or widening
- · woodland operations like thinning or clear felling
- demolition of a building prior to development of a site, residential or commercial
- tree felling during site clearance work
- tree pruning and felling in residential gardens and parks

There are three tests, which must be satisfied, before a licence can be issued to permit otherwise prohibited acts;

1 Regulation 44(2)(e) states that licences may be granted to "preserve public health, or public safety or other imperative reason of overriding public interest including those of a social or economic nature, and beneficial consequences of primary importance for the environment"



A barbastelle bat was radio tracked, in early winter, to this impressive split in a low horizontal limb of an oak tree in Hornor Woods, by Geoff Billington as part of his survey work for the National Trust. Photographed by Andrew Cowan 2002

2 Regulation 44(3)(a) states that a licence may not be granted unless the licensing authority (e.g. DEFRA) is satisfied that "there is no satisfactory alternative"

3 Regulation 44(3)(b) states that a licence cannot be issued unless the licensing authority (e.g. DEFRA) is satisfied that the action proposed 'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.'

All three of test described above must be satisfied before a licence can be granted by the licensing authority. If an application for a licence is turned down this could mean that proceeding with work on site, even where planning permission has been granted, may be considered an offence. Deciding when a EPS Licence is needed to carry out work on a tree, or fell it completely, is not a straightforward thing to do, and unfortunately there is currently no official guidance. This issue will always stimulate heated debate between, even the most experienced, ecologists and conservationists. It is important to remember that the legislation has been written to protect bats and preserve their habitat, and not to prevent good tree management.

INSPECTING TREES FOR BATS

With consideration to the number and divers size of tree features that bats could possibly make use of, it is almost impossible to say whether or not a particular tree(s) contains a bat roost. This represents a considerable problem when considering tree pruning or felling work, on what ever scale.

It is therefore important that there is a procedure in place that shows that the potential a tree has to contain a bat roost (or whether it forms part of a landscape feature used by bats) has been considered at an early stage. This means that the tree or trees should be assessed for this potential as part of the initial site inspection. It would be possible for instance to included this with the site risk assessment.

Where a tree or group of trees may be thought to have potential, then further advice should be obtained from a private consultant or the local SNCO.

If it is then considered that a EPS Habitats Regulations Licence is required an application will be needed to the licensing department (see contact details below). A EPS Habitats Regulations Licence will only be given to a suitably qualified and



One of the biggest and perhaps the most important tasks that faces us now, is satisfying the need for training, and the dissemination of knowledge about bat behaviour. Geoff Billington has established a successful course for arboricultural and silvacultural contractors and consultants (see left), based at Hornor Woods, in Somerset, while the Bat Conservation Trust are working with the Arboricultural Association to set up an accredited training scheme for Arboricultural Contractors. c GB

licensed individual who will be acting on behalf of the applicant as their consultant. The appointed consultant will then be responsible and will be expected to ensure that the terms are complied with, in full, throughout the period of the licence and where appropriate the monitoring of any mitigation.

WHAT TO LOOK FOR?

An assessment of the potential a tree has to support bats should form a routine element of all tree surveys. Then, if certain features (listed below) are identified, a closer inspection may need to be considered, that could involve climbing the tree to check potential roost sites, and the use of a fibrescope to examine individual cavities or splits.

Bats utilise trees for different purposes at different times; it is important to be aware that untenanted roosts enjoy legal protection.

Roosts may occur in the following features:

- frost cracks
- woodpecker holes
- hollow sections of trunk, branches and roots
- cavities beneath old root buttresses and coppice stools
- behind dense ivy

- trunk and branch splits
- rot holes where branches have been removed
- beneath loose bark
- in dense epicormic growth
- in bat or bird boxes

Veteran trees typically exhibit many of these features and should usually be regarded as sites with clear potential, but any tree which possesses one or more such feature, may host bats.

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Signs of roosting bats may be indicated by:

- staining around a feature (cavity or split) caused by the natural oils in bat fur
- scratch marks around a feature (cavity or split) caused by bat claws, rarely visible
- bat droppings beneath a hole (these resemble rodent droppings but crumble to dust when rubbed between finger and thumb)
- urine stains below the entrance or end of split
- audible squeaking from within the feature (cavity or split) especially on hot days or at dusk
- large roosts or regularly used sites may produce an odour
- flies around the entrance, attracted by the smell of guano

Roost sites may be very small and not visible from the ground and with no obvious signs of bats. If in doubt contact the SNCO for advice.

Where a site exhibits significant potential it might be useful to visit the area at dusk to see if any bats can be seen leaving their roosts. Dawn surveys can also be useful, because bats tend to fly around their favoured sites, often in groups and sometimes large swarms, depending on the time of year and the nature of the roost. This behaviour can be seen in the hour or so before the sun rises in the morning and can be used as a good indication of whether a tree is currently being used as a roost site or not.

TIMING, WHEN TO SURVEY

Visual inspections to assess the potential a tree or group of trees has to provide roosting sites can be completed at almost any time of year, although it may be more difficult to spot all possible features during the summer when trees are in leaf. However, when a more detailed activity survey is needed to establish how bats are using the area and if possible identify which species, it is important that this is done when they are likely to be most active i.e. during the summer months.

Activity surveys can only be completed competently by experienced bat workers or consultants with the appropriate bat detection equipment and preferably with a scientific licence from an SNCO. Although this type of work is unlikely to be completed by



BAT CENTRAL

At this road junction, just north of Horner Somerset, there are a number of roost sites. A Barbastelle (Barbasella barbasellus) was radio tacked to a roost site in the old walnut tree, while a Serotine (Eptesicus serotinus) roost was discovered in the house opposite and a Pipistrelle (Pipistrellus pipistrellus) roost was found in the adjacent farm barn. Photograph by Andrew Cowan 2002 the contractor or site manager, it is important to be aware of the time constraints involved and the influence of seasonal variations in weather and how they affect the bat life cycle.

In large scale projects it is essential that adequate time is allowed for a bat activity survey. What is involved in such a survey will depend to a great extent on how the site is likely to be affected by the proposed work and how the bats are thought to use the area around it.

OTHER BACKGROUND INFORMATION

If the survey involves contact with an owner or site manager it is always useful to ask if bats have been seen. The presence of signs, or reliable testimony, necessitates consultation with the SNCO before any tree work can be done. If no work is required then the potential roost should

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be identified to the local bat group. It is important that potential roosts are recorded within an arboricultural database, and that roosts are made known to all relevant organisations.

Local bat groups hold records of known roost sites in their area and will provide this information (at a charge) to interested individuals and organisations. It is usual for the bat groups to confirm existence of roosts within a certain radius of a site, but not exact locations. However, this is generally sufficient information to establish what activity is likely to be recorded around a given area.

Aerial photographs can be useful to provide some overview of an area and give a reasonable indication of potential foraging areas and flight lines.

TREE SURVEY: 3 STEPS TO GOOD PRACTICE

Is work required?
Are there signs of bats? (Consult SNCO)
Is there roost potential? (Survey)

For further information you may wish to visit the arborecology website: www.arborecology.co.uk

Andrew Cowan N.D.Arb. is Director of ArborEcology Ltd. Having worked in Arboriculture since 1986, establishing a contracting business in 1990 (Tree Craft Ltd), he became licensed by English Nature in 2001 and now provides advice on a range of issues relating to both bats and trees. He is also author of the Arboricultural Associations Guidance Note 1 - Trees and Bats, and provides 'training' and advice on a range of issues relating to both trees and bats

FEEDING TECHNIQUES & FORAGING HABITAT

Navigation and finding food in the dark are problems common to all bats. Individual species have subtle variations in methodology but the underlying theme is similar. All the British species utilise echolocation for both navigation and to capture prey. Some species add varying degrees of eyesight to aid navigation whilst others such as the long-eared bats use passive listening to aid prey capture.

Echolocation techniques vary between species depending on their favoured hunting style and habitat. Only a small number of bats are adapted to flight in open spaces, for the remaining species a framework of landscape features such as hedges, woodland edges and rivers are essential to form flyways between the main foraging areas.

At dusk or on moonlit nights high hedges and woodland edges also provide some protection from predators. While on dark nights most bats will have less hesitation in crossing big open fields, the shelter that hedges and woodland provide also benefits the insects on which they feed.

A connective landscape, with high hedges and tree lined waterways linking blocks of woodland and unimproved grassland, is incredibly important to the sustainability of any bat population. Where a large road scheme, new bypass or carriageway widening is likely to separate two or more forage areas likely to be used by bats, this could have potentially devastating results on the bat feeding success

GOVERNMENT DEPARTMENTS - EPS LICENSING AUTHORITIES

Department of Environment, Food and Rural Affairs, Licensing Manager, DEFRA, European Wildlife Division, Room 1/08, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6EB. 0117-372-8291 Web site: www.defra.gov.uk

Scottish Executive Rural Affairs Department, The Scottish Executive, Room 440, Pentland House, 47 Robbs Loan, Edinburgh EH14 1TY. Tel: 0131 244 6023 Email: ceu@scotland.gov.uk

National Assembly for Wales (NAW), Cathays Park, Cardiff CF10 3NQ. 029-2082-5111

Department of Environment, (Northern Ireland) - DoE-NI, Environment and Heritage Service, Commonwelth House, 35 Castle Street, Belfast BT1 1GU. Tel 02890-251-477

STATUTORY NATURE CONSERVATION ORGANISATIONS (SNCOS)

English Nature, Enquiry Service, Northminster House, Peterborough PE1 1UA. Tel: 01733 455101. Email: enquiries@englishnature.org.uk Website: www.english-nature.org.uk

Countryside Council for Wales, Plas Penrhos, Penrhos Road, Bangor, Gwynedd LL57 2LQ. Tel: 01248 385732 Website: www.ccw.gov.uk

Scottish Natural Heritage, Bonnington Bond, 2/5 Anderson Place, Edinburgh EH6 5NP

Email: enquiries@snh.gov.uk Website: www.snh.org.uk

Environment and Heritage Service (NI), Natural Heritage, Commonwealth House, 35 Castle Street, Belfast BT1 1GU Tel 02890-251-477 Fax 02890-546-660

CONSERVATION ORGANISATION

The Bat Conservation Trust, 15 Cloisters House, 8 Battersea Park Road, London SW8 4BG, Tel: 020 7627 2629, Email: enquiries@bats.org.uk Website: www.bats.org.uk

The Wildlife Trusts, The Kiln, Mather Road, Newark, Nottinghamshire NG24 1WT. Tel: 01636 677711 Email: info@wildlifetrusts.cix.co.uk Website: www.wildlifetrusts.org/

Arboricultural Association. 01794 368 717.

Ampfield House, Ampfield, Romsey, Hampshire SO51 9AZ

Geoff Billington, Greena Ecological Consultancy. Phone 01823 680450 Fax 01823 681429 Email geoff@npennines.fsnet.co.uk

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