

Ringling and marking

R. E. Stebbings

Recognition of individual animals plays an important part in much ecological research in many taxonomic groups. Marking can provide information about persistence and faithfulness to roosts, population dynamics, social behaviour, feeding ecology and almost every facet of bat ecology. Several techniques are available, few of them perfect, and the method used will depend on the species, duration and aims of the project. All methods of marking affect the subject to a greater or lesser extent, and research that requires individual recognition should not be undertaken without a careful appraisal of the risks involved and the potential harm to the bats. All marking methods require a specific SNCO licence. A Home Office licence is also required for activities involving invasion of the tissue of the bat. Further guidelines on marking are in preparation through the Agreement on the Conservation of Populations of European Bats (Eurobats).

6.1 Short-duration marks

For many projects it is sufficient to be able to recognise individuals or classes of individuals for periods of less than a year. Where circumstances permit, such temporary marks are generally preferable to permanent ones, because the potential for long-term damage is very slight.

6.1.1 Fur-clipping

Fur, usually dorsal, can be cut with scissors. Often up to four distinguishable patches can be cut. This is a useful and harmless technique for identifying an individual or group temporarily. No known inconvenience is caused to the bats, but the mark may grow out rapidly (in 2–3 weeks) when bats are moulting (see Chapter 5). Clipped fur is often visible without handling the bat.

6.1.2 Claw-clipping

The removal of toenails (not toe joints) has been used as a harmless and temporary method of marking juvenile bats while they are too small to accept a more permanent mark such as a ring. The method will also mark adults for a short period.

6.1.3 Colour-marking

Bats can be marked by gluing coloured tape to the fur in a variety of positions. These are mostly groomed off fairly quickly when the bat is active



Brown long-eared bat in a roof space. © Frank Greenaway

but may remain in position over long periods when the bat is hibernating. Reflective plastic tape, obtainable from cycle shops in white, yellow, orange, blue or red, can be stuck to the body using the sticky back or with additional non-toxic adhesive (e.g. tissue-bonding). The difference between white and yellow and red and orange is not always easy to distinguish and may depend on the type of lighting used. Blue reflective tape is the least easy to see. The fixing position depends on the species and situation: low-flying bats, such as Daubenton's, are best marked on the back, whereas high-fliers, such as the noctule, are better marked on the ventral surface. If the bat is marked with a forearm ring, it can be covered with a thin strip of tape. A thin coating of transparent glue helps prevent loss of the tape by grooming. The marked bats can be detected at distances up to 50 m and this technique has been used in studying the dispersal of bats from roosts and foraging behaviour.

Hibernating bats can be marked by gluing a small strip of tape or a plastic disk to the head of the bat. Plastic disks can carry a two-letter code, so that a few hundred individual markings are possible (Daan, 1969).

6.1.4 Lights

Two main types of light tag have been used. Betalights are small glass containers coated internally with phosphor and filled with tritium; the radioactive

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decay of tritium causes the phosphor to fluoresce. The apparent brightness depends on the colour, surface area and activity of the tritium. The most visible colour to the human eye is light green, which is the colour commonly supplied. The half-life of the devices is 15 years but they are groomed off by bats within a few days. Detectable range for lights small enough to be carried by bats (less than 5% of body weight) may be up to 100 metres when binoculars or an image intensifier are used. Betalights covered with an infra-red filter are also available and are detectable with an image intensifier.

Chemiluminescent tags can be produced by filling a capsule with the two liquids from a Cyalume tube (American Cyanamid Company: obtainable from camping shops or outdoor centres). The two liquids react when mixed, to produce a green chemiluminescence, the brightness and duration of which depend on the relative proportions of the chemicals. Equal proportions produce a very bright light for about 2 hours. The liquids can be sealed in glass spheres or tubes or, more conveniently, in short lengths of 6-mm diameter plastic tubing (as used for air hoses in fish tanks) with both ends sealed with disks of the same material cut out with a cork borer and superglued into place. The capsule is pierced with a syringe, squeezed to remove air then injected with the mixed fluids. The tag is stuck to the dorsal fur with non-toxic glue and the movements of the bat can be followed at distances of up to 200 m for several hours. The light will have failed by the time the bat returns to its roost and the tag will be groomed off in a day or two. The chemicals are reputed to be fairly harmless after mixing, but one contains a corrosive, so mixing should be carried out carefully, perhaps using syringes.

6.1.5 Radio-tracking

Radio-tracking is a successful way of locating bat roosts and tracking bats at night. As a rule, mammal researchers have tried to keep transmitter weights below 5% of the animal's weight. This means that a 0.35-g transmitter, the smallest that can reliably and repeatedly be produced and fitted, should be carried by no bat smaller than 7.0 g. However, bats have much greater natural variation in their body weights than other mammals and experience shows that species with low wing loadings can carry somewhere in the region of 10–12% of body weight without noticeable stress. Greater horseshoe

bats weighing as little as 16 g have been tracked successfully when carrying transmitters which weighed close to 2 g (when fitted), about 12% of body weight, though this is no longer recommended now that smaller and lighter transmitters are readily available. With the very smallest transmitters, it has proved possible to radiotrack the smallest species of bats (lesser horseshoes, whiskered and pipistrelle bats) without any apparent welfare problems. Whatever species is being tracked, catching and marking bats in late pregnancy and early lactation should be avoided because these are the times when energetic demands or wing loadings are highest.

Most biotelemetry and radio-tracking in the UK now operates on the 173.2 MHz and 173.7–174 MHz frequency allocations. The smallest are generally designed for a battery life of about 8–15 days and a line of sight range of 1–2 km. Range, pulse-rate and battery life are direct trade-offs. Tags are usually constructed with a short whip antenna and are glued to the bat's dorsal surface either by matting into the fur with a natural rubber adhesive (e.g. Skin-Bond by Smith & Nephew, available from most tag suppliers) or by gluing directly to the skin with Skin-Bond after trimming the fur. The weight of the tag should be close to the centre of gravity of the bat and the antenna should protrude towards the rear. Receiving systems usually consist of a purpose-built double-conversion superhet receiver with BFO and a directional antenna, most commonly a three-element Yagi.

6.2 Long-duration marks

6.2.1 Rings (bands)

Plastic or metal rings fixed over the forearm are the most widely used and successful long-duration marking method.

6.2.2 Metal rings

The only type of metal ring that is approved for use in the United Kingdom is a magnesium-aluminium flanged ring manufactured by Porzana Ltd and supplied by the Mammal Society. The design of this ring is the result of many years experimentation and is characterised by a lack of sharp edges or burrs. The ring carries a unique serial number and the inscription 'Lond Zoo'. (London Zoo has an arrangement with the Mammal Society to notify it

of any ring or number sent in. This occurs only a small number of times each year.)

Bats are generally very much more sensitive to ringing than birds, for two reasons. First, the sensitivity of bats to disturbance and the fact that the majority are taken at the roost mean that desertion of roosts can be caused by excessive disturbance or careless holding or handling techniques. Secondly, the ring is in contact with soft tissues, whereas bird rings are fitted to a hard and scaly leg. In the past, great damage has been caused to bat populations in a number of countries for both these reasons, so much so that ringing has been abandoned or severely curtailed.

Two sizes of ring, 2.9 mm and 4.2 mm, are currently supplied and should be used as in Table 6.1. It is important that the ring is fitted as loosely as possible so that it is free to slide up and down the forearm. If this is done correctly, the possibility of ring damage is minimised. The gap should be closed sufficiently, however, to prevent finger bones becoming trapped when the ring is closed. If a worn ring or any degree of tissue damage is encountered, the ring must be removed carefully and a new ring fitted to the opposite wing. Training is required in fitting the ring so that it remains circular and is closed to the correct gap.

A full record of all rings applied to bats should be maintained, including details of ring number, species, sex, date, place of ringing and ringer.

6.2.3 Plastic rings

Split plastic (celluloid) rings are available in a variety of colours and sizes with or without numbers from A. C. Hughes, 1 High Street, Hampton Hill, Greater London TW12 1NA or from the caged-bird section of large pet stores. As purchased, these are unsuitable for bats and must be carefully modified by filing the gap wider and smoothing and rounding the edges. As with metal rings, the gap should be as wide as possible so that the ring is free to slide on the forearm. Up to three rings can be carried by each bat, allowing a large number of colour combinations. These rings may remain on bats for up to a year, although some discoloration of the plastic occurs. Some damage can be caused by this technique, so constant monitoring of marked animals is necessary so that any damage caused by rings can be rectified.

Table 6.1 Ring (band) sizes for British bats^{1,2,3}

2.9 mm	4.2 mm
<i>Pipistrellus pipistrellus</i>	<i>Nyctalus noctula</i>
<i>Pipistrellus pygmaeus</i>	<i>Nyctalus leisleri</i>
<i>Pipistrellus nathusii</i>	<i>Eptesicus serotinus</i>
<i>Plecotus auritus</i>	<i>Myotis myotis</i>
<i>Plecotus austriacus</i>	<i>Rhinolophus ferrumequinum</i>
<i>Myotis bechsteinii</i>	
<i>Myotis brandtii</i>	
<i>Myotis daubentonii</i>	
<i>Myotis mystacinus</i>	
<i>Myotis nattereri</i>	
<i>Barbastella barbastellus</i>	
<i>Rhinolophus hipposideros</i> ⁴	

Notes

¹ A specific licence is required for all ringing.

² The ring sizes stated above refer to the approximate internal width when the gap is closed to 1mm. Other ring sizes are available for researchers working with non-British species

³ Bat rings of the appropriate size may be obtained through the Mammal Society.

⁴ *R. hipposideros* may be vulnerable to disturbance and ring damage.

6.2.4 Passive Integrated Transponder (PIT) tags

PIT tags, also known as microchips, consist of a small integrated circuit chip enclosed in a biologically inert glass capsule. When the microchip is interrogated by a reader placed close by, it responds by transmitting a unique serial number. The tag contains no power source of its own, but is powered by a signal emitted by the reader.

Tags are commonly 12 mm long and just under 2 mm in diameter. They are inserted under the skin using a 12 gauge needle. Alternatively, they can be glued to the dorsal fur of bats. If used in the latter way, no Home Office licence is required, because this is a recognised marking method, but a SNCO licence to mark protected species is essential.

Tagged animals can be detected at distances up to 150 mm and it is also possible to use a loop antenna, for example around a roost entrance or a bat box. Thus the system would appear to have potential for detailed studies of roost usage or emergence behaviour.

Tags have been used successfully on big brown bats *Eptesicus fuscus* in the USA (Barnard, 1989) and on pipistrelle bats in the UK. Tags and reading equipment are marketed by a number of companies in the UK, including Avid, Destron and Trovan. Avid and Destron equipment is cross-compatible, but Trovan is not.

References and further reading

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- KUNZ, T.H. (ed.). 1988. *Ecological and Behavioral Methods for the Study of Bats*. Smithsonian Institution Press, Washington & London. 533 pp. ISBN 0 87474 411 3.
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Handling, releasing and keeping bats

7.1 Handling

Bats, like all animals, suffer from a number of diseases and there is now a possibility that any bat may be infected with European Bat Lyssavirus (bat rabies), which can be fatal to humans (see Chapter 2). It is important to avoid being bitten and suitable gloves should be worn when handling bats. If you are bitten, you should wash the bite thoroughly with soap and water if possible, and seek immediate medical advice, even if you have had pre-exposure treatment. It is recommended that all bat handlers receive pre-exposure rabies vaccination. Guidance on suitable gloves for handling bats is available from the Bat Conservation Trust.

The recommended method of handling, which is suitable for all species, is to hold the bat loosely in the palm of a gloved hand with the fingers curled gently around the body. Depending on the part of the body to be examined, the bat may be held either with the head protruding between the thumb and forefinger, which can be used to keep the jaw shut (Figure 7.1a), or between the little finger and distal side of the palm (Figure 7.1b), in which case the pressure of the little finger will keep the jaw shut. This method of holding appears to minimise the stress caused to the bat and allows one wing to be opened by pulling the forearm between the palm and fingertips. The bat can be shifted to the other hand to examine the other wing. Wrapping the bat in a cloth can be a useful way of keeping it calm to allow the examination of individual limbs.

Other methods of handling such as that illustrated in Figures 7.1c, are also possible but tend to be more useful for the larger species or where the bat must be held still for detailed examination. For most purposes, the recommended method is to be preferred as bats are less likely to struggle.

Moribund or obviously sick bats need to be handled with particular caution, as there is a higher probability of disease being present, and the bat should not be given any opportunity to bite. See the sections on rabies in Chapters 2 and 9.

7.2 Releasing

Although bats have been known to home from considerable distances, it is always preferable to release them close to the point where they were found or captured. This ensures that the bat is in familiar territory and is able to locate suitable feeding areas and roost sites rapidly.



Members of Kent Bat Group showing bats to television crew.
© Neville Thompson

During the summer, bats which have been captured and held for a short time for identification or other purposes can be released simply by opening the bags in which they have been held and allowing the bats to fly. They should not be thrown into the air, but fast-flying bats such as noctules need to be held well clear of obstructions. If the bat is torpid and unwilling to fly, it should be warmed for a few minutes before release. In winter, bats should be replaced near where they were found, though most will arouse fully and probably fly.

The success with which bats can be returned to the wild may depend on the length of time for which they have been held captive and on other factors such as their flying ability. Bats are long-lived animals, so it seems reasonable to suppose that they have a good long-term memory for their home range. Bats that have been kept in captivity for months have subsequently been found in their original colonies after release. This means that keeping bats in captivity for a period may not disadvantage them significantly, though obviously the less time in captivity the better and bats should certainly not be taken captive without good reason. Bats born or raised in captivity may not be suitable for release to the wild for a number of reasons. For example their lack of contact with conspecifics, lack of detailed knowledge of any area, inability to forage successfully, lack of experience of dealing with many insects and inexperience in selecting suitable roost sites. For these reasons it has generally been considered that the survival rate of these bats would be low. However, there are examples of bats raised in captivity habituating to the wild (e.g. Devrient & Wohlgenuth, 1997) and further study is required.

There is increasing evidence (but as yet unverified) that healthy wild bats held in captivity for long periods and then released can successfully return to their original roosts / foraging areas.

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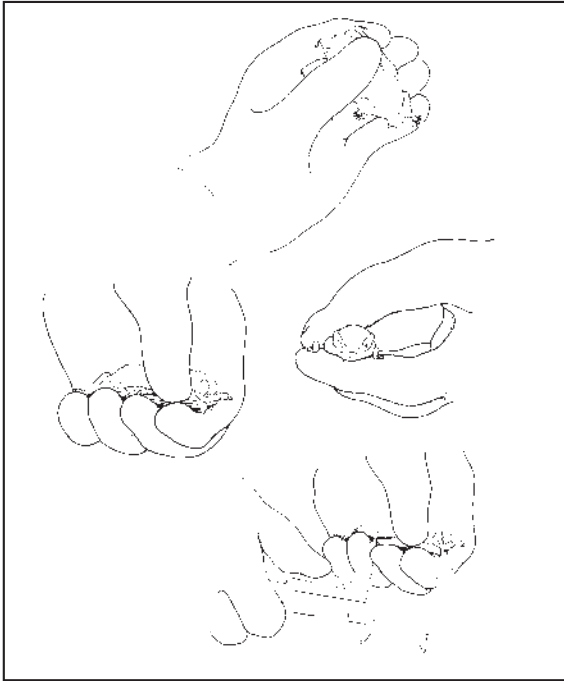


Figure 7.1a
Handling and measuring bats. The palm grip is suitable for all species and bats will often cease struggling when cradled securely in the palm. Right-handed workers find it most convenient to hold bats in the left hand.

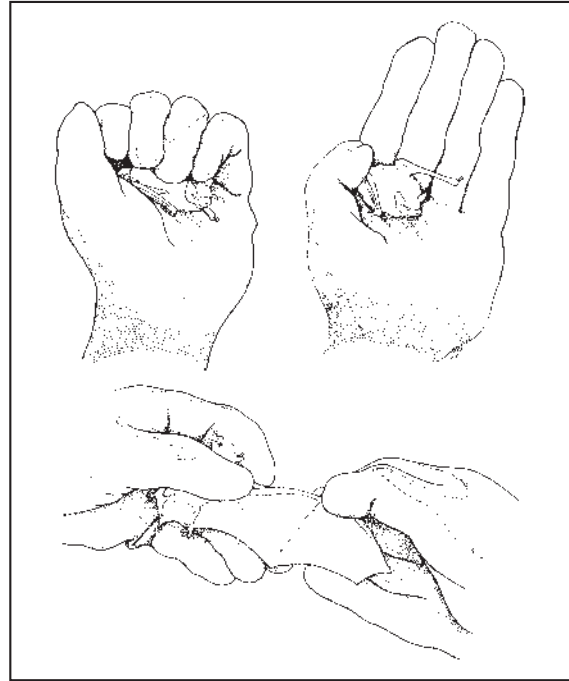


Figure 7.1b
Handling bats. Variations on the recommended method and extending a wing for examination.

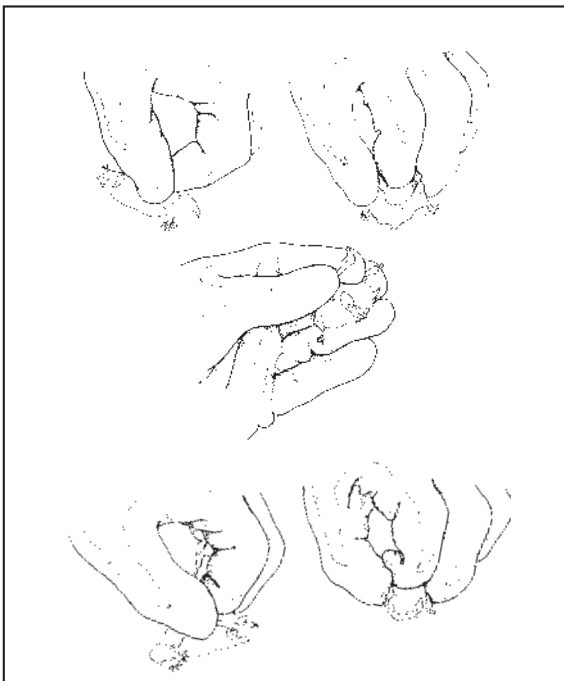


Figure 7.1c
Handling bats. This grip is useful when the bat needs to be examined closely, but appears to cause more distress than the palm grip. Great care must be taken not to strain the forearms or flight muscles.

7.3. Keeping

7.3.1. General environmental conditions

Bats of temperate latitudes are able to lower their body temperature at any time of the year in adverse environmental conditions. Torpid bats can, however, be awakened by handling and exposure to warmth, though they require several minutes to become fully active. They can be kept in a wide range of environmental temperatures from those found in a roof space during summer (15-50°C) to those that simulate hibernacula at 5-10°C, depending on circumstances. To be able to keep hibernating bats successfully it is essential that the natural environment be simulated as closely as possible. Any unheated, poorly lit room will serve, provided that the winter temperature is in the range 5-10°C depending on the species. If females are kept too warm during the second half of winter they may ovulate early and become pregnant. If deprived of food in a cold environment, bats will become torpid but will arouse when restored to more equable conditions. If the bats are healthy they should suffer no apparent ill effects from this. If a bat is sick or injured or is an abandoned juvenile a

Bat Conservation Trust - guidelines on bats in captivity

Members of the public bring to bat workers many bats with injuries or weaknesses, and those abandoned when young. These guidelines are designed to help bat workers to reach difficult decisions. Information on housing and feeding bats is dealt with elsewhere.

ADULTS

Temporary debility or injury likely to heal

Bats likely to recover fully should be isolated from other bats, kept in conditions that will encourage rapid recovery, handled just sufficiently so as to achieve this, but otherwise kept in a state as close to that of the wild as possible. They should not be tamed.

Before release they should be of good body weight (refer to *Handbook of British Mammals*, ed. Corbet and Harris), in good condition and be able to fly continuously for many minutes (test the latter on at least one occasion in a large, closed room or corridor).

They should be released at the site of origin. If this is not known then release should be in the general area of origin. Release should occur as soon as possible, preferably at dusk and not in extreme conditions of weather.

On the rare occasions where a bat fully recovers after a prolonged period in captivity, (eg two months or more), then it should be released next to an active roost in the area of origin.

In winter, release should not occur in extreme weather conditions and only when the bats have sufficient extra body weight for hibernation.

Permanent captives

Any bat with injuries that prevent grooming, feeding, reasonable mobility or roosting should be subjected to euthanasia. Bats with a single wing seem to cope well, provided the thumb is still present, but other amputations are not acceptable.

Bats of a species generally do best when caged together, but males should be segregated from females during the mating season (which may get out of phase in captivity) to prevent more captive bats being produced. Those wishing to undertake captive breeding programmes should do so under licence.

Bats should be given regular exercise. If the captives can fly then they should be given that opportunity each evening in a large, closed room. Bats can cope without hibernating, and seem to show no ill effects. If facilities for ensuring safe hibernation are not available, the captive should be kept warm and regularly fed. If a bat shows signs of wishing to hibernate, then reduce handling and feeding and keep at a lower temperature than normal. This will allow longer periods of torpor.

Educational use

The educational value of permanent captives is high, but it is important to tame the bat as much as possible. Recently

'grounded' bats should not be shown in public for at least two months in case of the onset of rabies. Bats should look acceptable so not be bald or have unsightly injuries.

Lack of a wing invokes sympathy and the inability to fly may be reassuring to those trying to overcome a fear.

Always explain how the bats come to be in captivity and the legal position concerning such bats.

Never allow a bat to fly at public showings.

It is unwise to advertise the fact that live bats will be on show, and the showing of bats should only be a minor or secondary part of the talk (see Zoo Licensing Act 1981).

The handling and showing of captive bats should vary with situations, and the good sense of the handler (who will know the foibles of each 'pet' bat) is paramount.

The public should not be allowed to touch or handle the bat.

YOUNG BATS

Abandoned baby bats should always be rescued - it is important for public relations and may lead to the discovery of new roosts. Great effort should be made to locate the roost and try to return the babies on two or three consecutive nights.

If babies are taken into captivity then the adult roost sites should be regularly checked and if the bats reappear, the babies should be returned immediately to the roost.

Babies abandoned completely, if reared in captivity should not be released into the wild.

Bats born in captivity should not be released into the wild unless accompanied by the mother when she has fully recovered or unless they are carefully habituated.

LEGAL ASPECTS

Legal implications regarding holding native bats in captivity have not been tested, but we should discourage untrained people from keeping sick, injured or abandoned bats. Sick bats should be tended by those expert in such matters.

A full record must be kept of each animal, detailing the origin and circumstances as to why it is in captivity (see The Veterinary Surgeons Act 1966, The Abandonment of Animals Act 1969, The Wildlife and Countryside Act 1981). The BCT can supply suitable recording forms.

MORAL CONSIDERATIONS

The natural distaste of seeing wild animals in cages can be offset by the beneficial educational effect to the public of seeing a captive bat, providing that these guidelines are adhered to.

GENERAL

Before taking any bat into captivity, carefully consider its likely fate. The welfare of the bat is paramount and this relates to the availability of sufficiently skilled keepers in an area. Like all guidelines, borderline cases will arise where difficult decisions will need to be taken. Do not let your heart rule your head.

cold environment may be harmful and for this reason the keeping of live bats in a domestic refrigerator is not recommended.

Bats live naturally in a wide range of light intensities. The effect of natural day length in the timing of activity is now well known and is exemplified by the emergence of bats to forage at dusk. Many bats prefer to roost in darkness in caves and in the roof spaces of buildings. In captivity all bats should be given the opportunity of selecting a roost where light intensity is low. However, captive bats rapidly become conditioned to the time of feeding, and this, rather than changes in light intensity, becomes the most important factor governing activity patterns.

In winter, most bats seek hibernacula where the relative humidity is at or closely approaches saturation, so that water may condense on their fur. Failure to provide similar conditions in artificial hibernacula may lead to desiccation and death of some species, and relative humidity below about 80% is fatal to hibernating *Myotis* species and below about 90% to *Rhinolophus* species. *Pipistrellus* and *Eptesicus* are more tolerant of low humidity. Soaked cotton wool can be used to achieve high humidity. Horseshoe bats prefer a saturated atmosphere during hibernation, but most vespertilionids will live throughout the year in a humidity of about 80%. A drier atmosphere appears to be deleterious to the wing membranes and one which is too wet may lead to fungal and bacterial diseases affecting the wing membranes. Access to clean water is most important for all bats. Most British species have been kept in captivity for long periods, but lesser horseshoe bats are particularly difficult to keep and captivity is not recommended.

7.3.2. Caging

Two types of cage are widely used. Perhaps the most widely used type is a wooden cage divided into a roost box and feeding area, which can be separated (Figure 7.2). Although such division is not essential, this gives a choice of roosting conditions. Dishes containing food are placed in the feeding area, the floor of which is covered with absorbent paper for ease of cleaning. A thick polythene sheet on the floor can also help to make cleaning easier. More recently plastic pet carriers have been used successfully and have the advantage of being easy to clean, cheap and readily available in pet stores. Additional materials with a rough surface may need to be placed in the

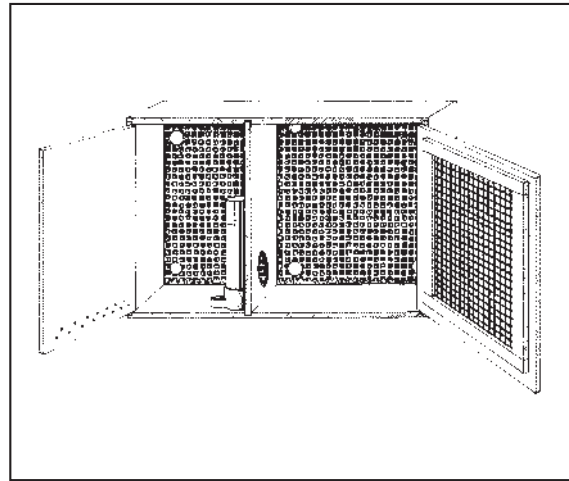


Figure 7.2

Keeping cage. The roost box is partially lined with semi-rigid plastic netting, which provides an ideal surface for the bats to grip. Bats almost invariably roost head down in the top corner of the box or behind plastic foam if this is provided.

box to provide a secure surface for the bats to roost on. Wicker baskets or walk-in net cages are increasingly used to house bats. Whatever sort of cage is used, it should provide a dark area for the bats during the day.

Several species of vespertilionid seek contact on both dorsal and ventral surfaces and will thus squeeze into narrow crevices. Cages can be modified slightly to provide for this crevice-seeking habit by pinning thin sheets of plastic foam to the walls. Grooved plywood or semi-rigid plastic netting will support the normal movements of bats, but during parturition, when the bats hang in more awkward positions, plastic foam also provides additional support. Some bats will also use secured, upright hollow log sections.

7.3.3 Exercise

Daily exercise is essential if bats are to be kept healthy. All species should be allowed free flight daily where possible and appropriate. Horseshoe bats deprived of exercise develop swollen wrist joints in a few days and make frantic attempts to escape from small cages, often causing themselves injury.

Bats have been kept successfully in a large outdoor flight cage (2.5m x 2.5m x 5m) containing a removable roosting box (30 cm x 30 cm x 12.5 cm). The cage was made from 5 x 10 cm timbers bolted

together and covered with wire mesh large enough to allow ingress of insects but small enough to prevent the escape of bats (Figure 7.3). Two ultraviolet lights in standard fluorescent tube fittings were hung from the roof of the cage, separated by a reflecting cloth, and these attracted enough insects to satisfy the needs of small numbers of bats. When large numbers of bats (40-50) were maintained in this cage, however, it was necessary to provide mealworms. Water was provided in a large trough placed on the floor of the cage, and bats occasionally swam in this. If using a large trough it is important to provide a rough timber ramp at a shallow angle to permit bats to climb out of the water.

7.3.4 Feeding

Insects and substitutes

Insectivorous bats eat mostly insects within certain size ranges, but in captivity most species will accept a diet of mealworms (*Tenebrio molitor* larvae or other stages). These can either be purchased from local pet shops or cultured. Bats may also eat waxmoth larvae, blowfly larvae and pupae (from fishing shops), chopped liver or cat or dog food. These are a cheaper, but less preferred, source of food. The larger species will also take the early instars of many Orthoptera, the most commonly cultured of which are locusts and crickets. Cockroaches (Dictyoptera) may also be cultured and used as food.

In the wild, bats usually catch their insect prey in free flight, though some species such as long-eared bats and Natterer's glean a proportion of their food from foliage. In captivity, where food is provided in dishes, they require some training. A decapitated mealworm held in gloved fingers or forceps is offered to the hand-held bat and the viscera applied to its lips. After it has licked the viscera, the bat is encouraged to chew the chitinous exoskeleton, which is pushed into its mouth. While it is chewing, the bat's nose is brought into contact with a dish of mealworms and frequently it will start snapping and eating. Mealworms can then be left in dishes in the cage for the animals to eat as required. This procedure is the most crucial and time-consuming stage in adapting bats to captivity. The success of training depends largely on the skills and efforts of the trainer: some bats may require little training but others require several sessions. With time, all common species can be trained satisfactorily.

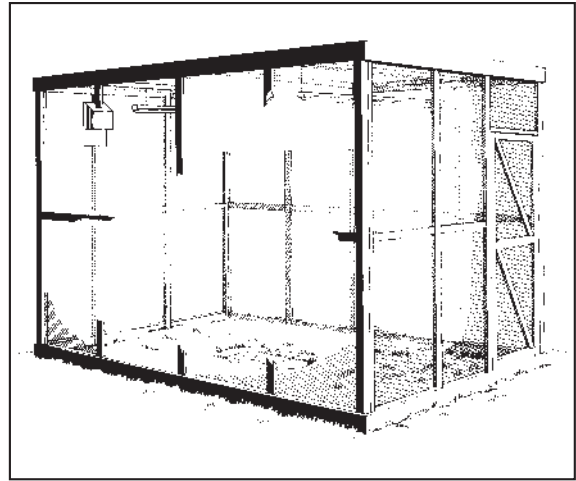


Figure 7.3

Flight cage. Standard bat boxes provide a choice of suitable roosts. Ultraviolet fluorescent lights, separated by reflective cloth, attract insects into the cage.

Although mealworms are the most convenient food for insectivorous bats, they are becoming increasingly expensive and several workers have used compound diets. These consist basically of cottage cheese, banana, hard-boiled egg and vitamins mixed in a blender to a firm, crumbly consistency. Canned cat or dog food can be incorporated into the mixture. Mealworms can be added to such diets, as chitin (roughage) appears to be necessary for alimentary health. This artificial diet, often known as 'bat glop' is very much a second choice, and every effort should be made to provide live food.

If available, insect traps may be used to provide some variety in the diet. Light traps, which are now relatively cheap, are a good way of providing food for long-eared bats.

In captivity, there is a tendency for bats to overeat, and this, if combined with a reduction in exercise, can result in obesity unless intake is controlled. Long-term captives should be checked weekly and their food regulated in order to follow the annual cycle of loss and gain. For example, noctules and serotines weighing 25-40g need about 40-58 (8g) mealworms per day during the summer but only the same number per week during the winter. A pipistrelle needs about 8-10 mealworms per day during the summer (depending on size). These quantities should be doubled for lactating animals.

The extent to which bats are fed during winter will depend on the facilities available for simulating a

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hibernaculum. Noctules have been kept for several months in a cold room at temperatures of 4-10°C without food, even though they were disturbed because the cold room door was repeatedly slammed. Without a cold room it proved impossible to keep the laboratory breeding colonies of noctules and pipistrelles at low enough temperatures during winter for hibernation to be maintained and they aroused frequently. However, such arousals use up fat reserves and so the bats were fed twice weekly.

Water

Water should be freely available. All bats will drink from a shallow dish and some will drink from the nozzles of inverted water bottles or plastic dispensers used for small cage birds. Vespertilionids will also lap water from saturated cotton wool, and this is a useful way of providing water when it is likely to spill, as during transport. However, be aware that loose wool fibres can be a problem to bats (particularly juveniles) if ingested or they get into the eyes. Water holding polymers are coming onto the market which may prove suitable as a means of dispensing water.

Vitamins and minerals

It is difficult to provide bats in captivity with all the foods they eat in the wild and attempts should be made to replace natural sources of vitamins and minerals with substitutes. The health of bats whose diets are supplemented is generally better than those which do not receive such supplements, but even so conditions such as alopecia, which may be the result of deficiencies in the diet, still occur. Veterinarians have generally recommended Nutrobal (produced by Vetarks) as an excellent general vitamin and mineral supplement. Bats are unable to synthesise ascorbic acid and it should be borne in mind that this vitamin is often omitted from dietary supplements. It is also particularly important to use supplements with your mealworms when feeding lactating bats.

Mealworms have traditionally been fed on wheat bran. If fed only on bran the worms end up nutritionally inadequate having calcium levels which are too low and phosphorus levels which are too high. A pinch of Nutrobal added to a tub of mealworms provides the necessary supplementation. The mealworm diet can also be supplemented with vegetables rich in ascorbic acid (such as cabbage),

with white flour or bread (which may contain added calcium) or even with vitamin powder to increase their nutrient value. Some bats have refused to take mealworms which have been fed on cabbage so it may be worth trying other fruits and vegetables. Alternatively, diets formulated for laboratory species can be added to the mealworm culture medium. One veterinarian feeds pelleted dog food (Pedigree Adult Formula) to his mealworms. The rationale is that this food is better quality than bran and that the dog food will be in the gastro-intestinal tract of the mealworm when being eaten, thereby elevating the nutritional value of the worm.

Bat workers keeping captive bats will find the quarterly newsletter 'Bat Care News' a useful source of information about feeding and caring for bats (see Appendix 5, Section D).

Weaning and rearing orphaned bats

Rearing orphaned bats is difficult, time-consuming and often disappointing. Cross-fostering is rarely successful, so the baby must be hand-fed on some form of milk or milk substitute. Small bats have been reared successfully either on fresh goats milk or on powdered skimmed milk (Lactol) with a 1-2% fat content, perhaps with added glucose. However, more recently other milk replacements have come on to the market, the most widely used of which is Esbilac. For the time being Esbilac is the recommended choice of substitute for insectivorous bat milk although some users have reported problems with bloat. The West Yorkshire Bat Hospital can provide Esbilac. They recommend that young bats are fed only on one type of milk (i.e. do not mix milks or change the type being used) and that bats should be kept warm after feeding (25-28°C) to encourage digestion. Feeding may be required up to eight times per day for naked pups although it could be as few as four if using Esbilac and the bat is furred.

Baby bats do not need cleaning or grooming unless large amounts of milk are spilt during feeding. Gently massaging the stomach may be of assistance if the bat develops digestion problems.

The small physical size of young babies presents its own problems and a very fine pipette or possibly a small catheter which can be attached to a syringe is needed. A local veterinary surgery may be able to provide something suitable. Frequent handling of

baby bats or even carrying them about may help with success, perhaps by providing the warmth and physical contact that are normally provided by the colony. However, if the juvenile is a short term captive and the intention is to release it then handling should be reduced to the minimum.

Bats are not known to bring back food to their young, so the babies exist purely on a milk diet until they are able to fly and feed for themselves. Captive young grow more slowly than in the wild, so the time to begin weaning must be judged by the size of the bat and the fusion of its phalangeal epiphyses rather than by its age. Once the bat appears willing to fly, weaning can begin, either by presenting it with soft food such as the squeezed-out insides of mealworms or by adding fragments of mealworm to its milk. Both methods have been used successfully, but this is a critical time for the bat and so its progress and growth should be monitored carefully. Some orphans appear to be most unwilling to move on to a solid diet, and great persistence may be required.

7.3.5 Release of juveniles

Once the bat has been weaned successfully, the problem arises of what to do with it. Bats have a complex social life and are believed to rely on learned behaviour to a considerable extent, so it is generally considered that bats reared in captivity should not be released into the wild, as their chances of survival will be small. However, the subject has been little studied and it may be that rehabilitation is possible in some cases, particularly if they can first be released into a flight cage so they can learn to catch wild food whilst still having mealworms available.

7.3.6 Transportation

Recently-captured bats are best transported in cloth bags such as those sold by the British Trust for Ornithology for birds. Cotton bags are preferable to artificial fabrics, and seams should be on the outside. Bats which have been held in captivity may be transported in small cages fitted with a suitable substrate for the bat to cling to. A bag hanging in a car is also a safe method for transporting bats. Water should be provided on all journeys.

7.3.7 Euthanasia

Bats which are severely injured or ill and are not likely to recover may legally be killed. This is best done by a vet, who may use an injection of sodium pentobarbitone or apply an overdose of a conventional volatile anaesthetic in an anaesthetic induction chamber. If a vet is not available, alternative methods of euthanasia include dislocation of the neck and compression of the chest between thumb and forefinger to prevent breathing and possibly stopping the heart. Both these methods are quick and humane provided that they are carried out with determination. See the BCT's leaflet 'Information for Vets' for more details.

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Barbastelle bat. © Frank Greenaway

The role of a Bat Group

G. Hinchcliffe

8.1 Introduction

Much of the grass-roots bat conservation work is carried out by voluntary bat workers operating from within the structure of local bat groups.

Approximately 95 groups exist in the British Isles at present, many of which cover whole counties. Larger counties may be sub-divided, while other groups cover an individual town or city and its environs. Some groups are associated to The Bat Conservation Trust or local wildlife trust. Although the internal structure and the objectives of individual groups can vary enormously, the ultimate goal of conserving bats and their roosts involves most groups in:

- recording, reporting and monitoring roost sites and feeding areas;
- dealing with bat-related enquiries from members of the public;
- investigating and advising upon (via English Nature, SNH, CCW or EHS) enquiries relating to bats and their roosts;
- providing an informal information service to members of the public and a wide range of organisations;
- improving the public image and understanding of bats through planned educational and promotional events;
- raising funds for conservation projects.



Bat workers beginning hibernation visit to Dene Hole.
© Shirley Thompson

So, most bat groups combine the roles of a biological recording and monitoring unit with those of a public information and advisory service. This leads to a wealth of diverse activities (see Section 8.4) but, whichever a group pursues, if it is to function effectively it needs some form of internal organisation and a number of clearly defined aims, which its members understand and can contribute to, if they wish.

The Bat Conservation Trust

The Bat Conservation Trust is the national organisation dedicated to the conservation of bats and their habitats. It is a charity with a membership of about 4000. The Trust aims to stop further declines in bat populations and aid the recovery of threatened species. The BCT is the umbrella group for the local bat groups, providing support, information, resources, training and advice.

Each bat group elects a representative to attend regional meetings and to receive and disseminate information to the group. The BCT sends a regular information mailing to these bat group contacts which includes BCT's newsletters, Bat News and Young Batworker, and information of interest to bat groups, including new resources and details of training courses. Bat group members are invited to contribute to the volunteers' newsletter, which keeps people abreast of news and developments in bat conservation. An elected Regional Representative represents bat groups at the meetings of the Bat Groups Forum. The meetings are also attended by other organisations with an interest in bats and provide an opportunity for exchange of information.

The BCT holds an annual weekend conference of talks, workshops and exhibitions at the beginning of September. There are also regional meetings held for bat groups to attend. Their

Website (www.bats.org.uk) provides information on bats, legislation, bat groups, BCT and access to some of its leaflet resources.

Junior members of BCT belong to the Young Bat Workers Club and receive Young Bat Worker each quarter.

The BCT acts as a national voice for matters of concern and provides a link with similar organisations abroad (especially Europe). It lobbies at a national level for improved legislation affecting bats and to raise the profile among the public and professions of bats and their protected status. It organises national or county projects of conservation importance, including projects that allow local bat group participation, ranging from publicity campaigns, such as National Bat Week, to research projects, such as the Bats in Churches project and the National Bat Monitoring Programme. It runs the National Bat Helpline, which receives about 6000 inquiries per year. The Helpline gives advice and information to bat workers, members of the public, professionals and others about many aspects of bats.

The BCT maintains an insurance scheme, which provides public liability cover for its associated bat groups while they are carrying out bat group activities.

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8.2 Starting up

The Bat Conservation Trust can provide specific help and advice to anyone considering starting up a bat group in a new area, or re-launching an existing one.

8.3 Running the group

8.3.1 Officers and organisation

Bat groups have developed into many different forms and the changing nature of both the membership and the demands placed upon it mean that most groups are continually evolving. However, certain jobs do need to be done, and most formalised groups have a number of officers such as Chairperson, Secretary, Treasurer, Enquiries Co-ordinator and Records Officer. Larger groups have found the need for named members to co-ordinate such areas as newsletters, press and publicity, sales goods, education, bat box schemes and church liaison. Specific projects or surveys may also need a co-ordinator. Subgroups may also form on a geographical basis, particularly in large counties, enabling enquiries to be dealt with more efficiently.

8.3.2 Meetings

Groups of any kind need to meet on a regular basis. The regularity of meetings is probably more important than the frequency – so that members know whether to expect some form of group activity once a month or once a year. It is probably best to seek members' views as to how often meetings should be held and what their main function should be. The section on bat group activities includes many ideas that could form the basis of meetings but the underlying reason for them – be it business, social, educational or a combination of these, needs to be clear, especially to those who are expected to organise them. While the group co-ordinator or secretary is often the one who plans and leads meetings, asking different people or small groups of members to take on non-business meetings may both share the load and lead to greater variety. Many formal groups have now developed a programme of indoor winter meetings and summer field outings, the details of which are circulated by newsletter or events list.

8.3.3 Recruiting/maintaining group members

This is probably the most difficult area on which to give advice with guaranteed results. What actually constitutes 'membership' varies enormously from group to group. It may be over a hundred annual subscribers, perhaps many bat supporters rather than active workers, or just a handful of keen, and probably licensed, enthusiasts. Whatever the size, the amount of potential bat work usually exceeds the time that a bat group's members have available and many groups are keen to attract new active workers.

In reality, one can rarely predict where the keen newcomer will be found. Membership of the 'subscriber' type can be promoted at walks, talks and countryside events but someone who is prepared to become seriously involved can just as easily turn up 'out of the blue'. Opportunities to watch out for include new intakes on environmental courses at local colleges and related adult education groups. Bat groups can even run their own course or contribute lectures within larger programmes. Displays and posters asking for volunteer help (in the usual places – natural history museums, libraries, visitor centres, local vets etc) may stimulate interest. Members of natural history organisations, wildlife trusts or bird clubs can also be approached. Another possibility is to cultivate the interests of positive roost owners. They may be able to do more than keep an eye on their own bats. Whatever the source of potential recruits, success depends on how welcome they feel within an existing group, how interesting and enjoyable the activities they participate in are, and, very importantly, whether their own skills and interests are utilised within the group.

The long-term maintenance of an established group involves similar considerations – with some new activities each year but also some old favourites, such as bat walks at regular venues. However, at this stage, the key to keeping active members is ensuring that the workload of individual bat workers remains within their capabilities while not letting the overall 'background' workload prevent the introduction of new ideas and stimulating projects. Whether the group is a new one or well established, those actively involved need to agree upon the group's priorities, be they roost monitoring, finding new sites, surveys and projects or education. It may be helpful to set objectives and deadlines. Certainly, areas of responsibility must be clearly defined, preferably for

fixed periods of time, so that people know what they are expected to do and for how long. A formal group might wish to produce a development plan. An informal group should at least find the time to air ideas and discuss possibilities.

8.3.4 Training

The details of which bat worker activities require licensing and how training for these may be obtained are dealt with in Chapter 1, but several general points should be borne in mind. A great number of the possible activities (some of these being the most enjoyable) do not require formal licensing and hence require no formal training. However, many activities do require some prior experience, which will normally be gained through participating in group events or accompanying more experienced bat workers. A group tackling a new project or survey technique could learn from a more experienced group elsewhere, seek out a relevant course or a workshop at the annual conference or seek help from organisations outside bat work but carrying out studies with similar requirements. The Bat Conservation Trust organises training courses from time to time and there are usually a number of weekend training courses at Field Studies Council centres each year. The BCT also runs a number of courses for professional consultants. Participation in the BCT's National Bat Monitoring Programme and other national surveys can provide valuable experience and training. Bat detector workshops are held regularly, usually in collaboration with bat groups and bat workers.

In training bat workers for Statutory Nature Conservation Organisation (SNCO) licences, groups could consider keeping their trainer free from other official roles, thus reducing their workload. A log book could be maintained by trainees in which they record experience gained with other bat workers, which can then be taken into account as formal training progresses. As with all roles and responsibilities, it is important that both trainer and trainee have a clear understanding of mutual expectations in terms of time commitment, practical skills, baseline knowledge and long-term goals. Of course training does not finish with the acquisition of a licence. There are many opportunities to develop skills and knowledge further, at every level of experience. Dissemination of information from conferences and training courses is important for those who are unable to attend and could form the basis of an indoor group meeting.

8.3.5 Finance and equipment

Most groups operate a bank account with income originating from annual subscriptions, sales goods, fees or donations from bat talks and guided walks, occasional grants and specific fund-raising. Regular expenditure includes mailing, copying, printing and other membership-related maintenance costs. Excess funds or specific fund-raising may be used to purchase group equipment – typically more costly items such as ladders, rechargeable lamps, helmets and other safety equipment, catching and handling apparatus and bat detectors. Organisations such as BCT and the SNCOs may be approached for financial support towards the purchase of survey equipment or help with special projects, particularly those of a practical conservation nature. Bat groups in England and Wales should be aware that, because they have usually been set up for a purpose accepted by the law as charitable, there is a legal requirement to register as a charity if the group has a total income from all sources of more than £1000 per year. Individual bat groups are not covered by the Bat Conservation Trust registration because they are not subgroups of BCT. More information about this can be sought from either BCT or the Charities Commission. Groups operating as a specialist group of their county wildlife trust could be covered by the charitable status of the parent organisation. Groups would be well advised to determine their status and responsibilities, obtaining advice from the Charity Commissioners if needed. In Scotland and Northern Ireland the law is different, with charities registering with the Inland Revenue.

8.4 Bat group activities

The enthusiasm and inventiveness of the bat worker knows no limits. Thus, the activities outlined here are only an amalgamation of what many bat groups have already tried, not an exhaustive list. The activities are aimed at different audiences and each needs to be tailored to give those involved (both audience-member and bat worker) a positive experience. Group members should be encouraged to initiate or participate in activities whenever possible, while avoiding making others feel left out. Individual activities should be enjoyable rather than a chore, larger projects achievable rather than over-ambitious. The Bat Conservation Trust has a range of resources available to bat groups involved with organising events.

8.4.1 Roost recording and monitoring

Techniques for recording roost information and monitoring any subsequent change are discussed elsewhere (Chapter 3), but each group needs to decide upon methods that are manageable for themselves while allowing the transfer of information to other organisations, if required. In terms of group organisation it is important that the owner of each known roost has someone they can contact for further information or in an emergency. A useful way of doing this is to assign specific roosts to each bat group member who then reports to the Records Officer at the end of each season. A personal visit or a brief phone call or letter shows that the group is interested and organised enough to keep a check on significant sites. This is one of the keys to long-term conservation of roosts, particularly in people's homes. Positive roost owners should be encouraged to monitor colony size and arrival/departure dates themselves, perhaps using pre-stamped self-monitoring cards or by telephoning in dates and counts, or getting them involved with BCT's National Bat Monitoring Programme. One method of obtaining colony counts, which has been used successfully in recent years, is organising a co-ordinated count, where roost owners and volunteers all count their bats on a given evening. The idea of contributing to a mass effort has proved quite motivating and, in some areas, this has become an annual event.

The designated 'roost monitor' concept reduces the risk of duplication or confusion should different members of a group be arranging roost visits, training exercises or other activities. Liaison between neighbouring groups is also important for sites close to county or other geographical boundaries.

8.4.2 Other contact with roost owners

Maintaining contact with roost owners, particularly during winter months, can also be achieved through postal channels – sending Christmas cards, organising a competition or sending out a newsletter, or by social events, such as a roost owner's evening, with personal invitations and a programme of talks, activities and displays. A social event in the summer could also be promoted, such as a special roost owners bat walk or a barbecue and bat watch.

8.4.3 Gathering roost information

Information about existing or potential roosts may be acquired through a variety of means – posters,

leaflet drops, questionnaires, press releases and so on. Much roost information reaches bat groups as a result of telephone enquiries. These may be of a general or problem nature, (sometimes via the SNCOs), or in response to walks and talks or other promotional activities. A system for logging incoming information and recording the initial action taken and by whom is essential. Distribution of roost enquiries or other information requiring urgent attention may be done on a geographical basis or a rota system.

8.4.4 Surveys

Bat groups and many individual bat workers together collect vast amounts of information on bat behaviour, roosts and feeding areas each year. Some groups specialise or concentrate their efforts into identifiable surveys or projects, others contribute data to regional or nation-wide schemes. Some of those aimed primarily at roost location have included systematic surveys of sites in churches, bridges, barns and other farm buildings, caves, mines, tunnels and various types of historic property. Attempts at 'whole-village' surveys have also been made. The recent developments in bat detector survey techniques have led to a more holistic approach where, combined with other methods, information about how bats use a given area includes feeding habitats and flight routes as well as roost sites. Subsequently many groups are now surveying specified areas of woodland, wetland, farmland and so on. Survey projects in conjunction with such organisations as the Bat Conservation Trust, National Trust, English Heritage, Forestry Authorities and the Ministry of Defence can also be very productive, yielding information which is useful to both parties. As with all survey work, it is vital that results, especially any roosts found, are notified to those responsible for them as quickly as possible. Some groups also carry out bat surveys that contribute to Environmental Assessments.

8.4.5 Research projects

Projects that look in more detail at certain aspects of bat behaviour or ecology may be seen as the realm of university departments or professional biologists, but many valuable contributions to our understanding of bats' requirements have been as the result of bat volunteers' work. A group, or an individual, needs to establish clear aims and

time-scales for such a project and, where appropriate seek comment and discussion with other bat workers or relevant authorities at an early stage. The likelihood of special licensing, should additional disturbance to bats or roosts be created, must always be considered. Subjects that have been tackled by bat groups include studies of diet from feeding remains and faecal analysis, bat movements and roost fidelity by ringing, chemi-luminescent tagging and radio-tracking, and bat parasites, to name but a few.

8.4.6 Roost improvement and creation

There are many fine examples of groups' efforts to maintain, improve and create roosting opportunities for bats. Larger projects sometimes involve seeking grant aid, sponsorship (in the form of materials as well as money) and liaison with numerous authorities. At the other end of the scale, the offer of a little practical help from the bat group can lead to the maintenance of a roost site, which otherwise might be lost.

Many groups are involved in the creation and monitoring of artificial roosts through bat box schemes. They also improve known or potential sites, particularly hibernacula, by creating crevices and cavities with hanging boards or bat bricks, and grilling entrances to prevent disturbance. Members of groups regularly offer practical advice to builders, roofers and design engineers on maintaining and creating roosting opportunities within structures they are working on – houses, bridges, tunnels etc. Probably the most ambitious roost-creation projects are those where groups have built artificial hibernacula, either by modifying existing structures or designing and constructing entirely new ones.

8.4.7 Producing reports and publishing findings

Some groups produce reports on an annual basis, others occasionally. Summaries of a bat group's work can reach a wider audience through articles in the local press or wildlife trust magazines. However, interesting findings from completed research projects or analyses of specified survey results should be made available to other bat workers through publication in the BCT's Bat News or presentation at the annual bat workers' conference.

8.4.8 Dealing with enquiries from the public

Enquiries that result in survey of a potential roost site, dealing with stray or injured bats or necessitate advice on a bat problem are dealt with elsewhere. However, dealing with general enquiries about bats takes up a great deal of group members' time, especially in the summer months, and many bat workers are now experts in assessing exactly what the enquirer actually wants. 'Time-saving' ideas for dealing with general queries include lists of regularly used telephone numbers posted near the phone, information packs on popular subjects (school projects, building bat boxes etc.) made up ready in stamped envelopes and pre-prepared record sheets for incoming telephone information. The Bat Conservation Trust has a national help line, which all members of the public, professions and bat workers may call for general advice on bats (see Appendix 6).

8.4.9 Displays and countryside events

Static displays can be put up in libraries, museums, visitor centres and other high profile sites. The county or regional library service may be able to circulate a display around its branches, given a pre-arranged route and dates. This could make full use of a group's resources during the quieter winter months.

Groups receive many requests to attend countryside events during the spring and summer months – wildlife fairs, nature reserve open days, county shows and so on. Small groups may need to prioritise their commitments. Active participation in something will have more of an impact than just looking at the display. Brief guided walks (how bats could use the immediate area), bat box building or children's activities are worth considering.

The Bat Conservation Trust can loan display materials and resources to bat groups for events.

8.4.10 Bat talks and walks

The growth of public interest in bats and their conservation has led to a great demand for talks or slide shows and opportunities to watch bats in the wild. For an indoor talk the length of presentation, depth of information given and previous experience of the speaker needs to be carefully matched to the age and knowledge of the audience. While not all

members of a group will be happy or competent to speak to an audience, it is well worth 'training up' and offering opportunities to those who are interested in order to build up a pool of presenters within the group. Thus requests should not have to be turned down due to lack of time or previous bookings. Make sure full details of venue, start time, expected size of audience and so on are confirmed in writing, also what equipment is available at the venue. For a children's talk or if the audience may include families with young children, consider a shorter talk followed by an activity for youngsters or have children's activities running alongside the adult's talk, if there are sufficient helpers and facilities.

Bat walks or watches can be one of the most effective and enjoyable ways of introducing bats to the public, given the right venue, timing and weather. Such events are often organised in

conjunction with a local wildlife trust, council or other authority. In these cases they will usually advertise the event and send along someone to help with 'crowd control'. Consider a numbers restriction, through advance booking, if any of the sites you are visiting have limited space and ensure that appropriate safety precautions are taken (see Chapter 2) for all walks. Variations on the 'bat watch' theme include dawn, rather than dusk walks, and events designed for those with special needs. For example, a wheelchair route or a bat 'listen' for those with impaired sight. If the host authority is levying a charge, the bat group might expect payment for their services or a share of the income. The standard of bat talks and bat watches is now so high that a donation to group funds, if not a fee, seems reasonable in most circumstances. (For further ideas see BCT Guidelines for giving talks and lectures and for organising and leading a batwalk).

Bats on the internet

Bat groups and individual bat workers can now reach a world-wide audience through the internet. Some British bat groups have already established their own websites. Check out the local groups using search engines, or alternatively try some of the links and discussion forum on the BCT's website.

Both bat groups and batworkers will find the internet of use in a number of ways:

- searching for information on the web about bats worldwide;
- communicating with other bat workers by e-mail;
- posting and replying to messages in newsgroups;
- subscribing to automatic mailing lists;
- publishing their own information about bats on the internet;

- downloading useful programs, e.g. sound analysis software, photographs of bats;
- searching university libraries for books and published papers on bats.

The following list of internet addresses will get you 'surfing' some of the main bat sites around the world. More sites are listed in Appendix 6. You can also use a 'search engine' to locate other sites of interest by typing in keywords such as 'bats', 'bat box', 'Chiroptera' etc.

The Bat Conservation Trust <http://www.bats.org.uk/>
 Bat Conservation International <http://www.batcon.org/>
 Bat Ecology and
 Bioacoustics Laboratory <http://www.bio.bris.ac.uk/research/bats/>

8.4.11 Running educational courses

Many opportunities for educating people about bats have been mentioned in earlier sections. Bat groups can organise their own seminars or short courses for other bat workers, for the general public (through environmental centres, local colleges or adult education groups) and for groups of professionals who might encounter bats during their work (for example 'Bats in Buildings' and 'Bats in Bridges' seminars). A lecture or field trip may be a welcome addition to a university or college course at any level.

8.4.12 Activities for children

The interest shown in bats by young people is remarkable and can only bode well for bats residing with these householders of the future. A wide range of imaginative and enjoyable children's activities has been developed, and are available from BCT and in published project books. Activities offered at public events or to accompany talks to children's groups should be short and simple, for example cut-out bats, masks, posters or quick quizzes. Never underestimate the number of helpers needed, or the amount of resources required, particularly for younger children. Older groups may be able to take on a more lengthy project or help with survey work such as roost counts or locating bat feeding areas.

Bats have been used as a school topic from primary to sixth-form level. They offer a fascinating context in which sections of the National Curriculum programmes of study can be delivered in England and Wales and the 5–14 Development Programme in Scotland. Seminars offered directly to groups of teachers enable them to pass on greater knowledge and enthusiasm to their classes and ‘cascade’ information efficiently. Individual workers should be aware of any Local Authority restrictions concerning taking captive wild animals into schools. (See also BCT Guidelines for activities with children and accompanying resource list).

A Scottish Education Pack on bats has been published by BCT which includes activities, slides, tape and games linked to the Scottish Curriculum and which has also been modified for use with the English National Curriculum (see Thompson 1997, 1998, Appendix 5).

8.5 Links with other bodies

It is essential that bat groups liaise with other organisations whose interests or responsibilities include bats. Groups should have a policy about which bodies receive information concerning bat roosts and other records and to which organisations data can be made available upon request.

8.5.1 English Nature, Scottish Natural Heritage, Countryside Council for Wales and Environment and Heritage Service (Northern Ireland)

Bat groups will be in regular contact with their area’s Conservation/Area Officer who will be involved in any situation where bats are creating problems or disturbance is likely. Travelling expenses for registered volunteers will be paid by the SNCO for roost visits made at their request.

8.5.2 Local Wildlife Trusts

Many bat groups are affiliated to or are a subgroup of their local wildlife trust. Members of the public often seek advice from such trusts and bat enquiries will be passed on to local bat workers. Wildlife trusts may seek information about bat records when commenting on local development issues or monitoring planning applications.

8.5.3 Neighbouring Bat Groups

It is important for neighbouring groups to keep in contact, as they may be useful to each other in providing extra skills, equipment, people, advice and moral support.

8.5.4 Others

The RSPCA, SSPCA and local police should be provided with contact points for active bat workers. Making contact with Local Authority Environmental Health Officers, Local Authority Planning Officers and local pest control companies can also be useful. Developing and maintaining good relationships with any local caving group may bring benefits to bats.

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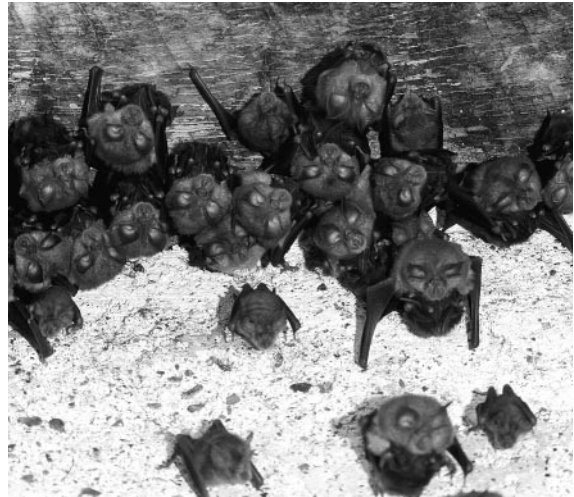
Bechstein's bat. © Frank Greenaway

Public relations

A. J. Mitchell-Jones

9.1 Bat enquiries and visits to roosts

This section covers all those occasions when a request for advice about bats is received by any conservation organisation. Requests can arrive in many forms but can be split essentially into two types – those where bats have been discovered in a building, usually a house, and are causing concern and those where some action, such as development or repair work, is intended, which might affect bats or their roosts. In some cases a desire to get rid of the bats is expressed when advice is sought about some action that might affect them: these should be treated initially as of the second type.



Lesser horseshoe bats may be located in roofs of old buildings.
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Emergencies

Although it is recommended that advice about bats is sought well before any proposed building work and it is normally possible to persuade the majority of householders to leave their bats to disperse naturally, there will, inevitably, be times when rapid action is required to save bats or their roosts. Serious problems are, fortunately, rare, but the following situations may be among the more frequently encountered:

- smell – householders can no longer tolerate it (see this Chapter);
- noise – householders can no longer tolerate it (see this Chapter);
- phobia – householder insists on immediate exclusion (see this Chapter);
- roof repairs – bats found after work has started (see Chapter 10);
- timber treatment – bats appear after spraying has begun (see Chapter 10).

Such situations may be divided into two broad classes. For the first three situations, any action may be covered by the defence in the Wildlife & Countryside Act or the Habitats Regulations that the action took place within a dwelling house. This covers the damage, destruction or obstruction of roosts and the disturbance of roosting bats, but not killing, injuring or taking. For the latter two, the potential damage to the bats or their roosts may also be covered by the 'incidental result of a lawful operation and could not reasonably have been avoided' clause in the legislation.

This covers intentional/deliberate killing, injuring or taking as well as the damage, destruction or obstruction of roosts and the disturbance of bats. In addition, the availability of licences under the Habitats Regulations must also be taken into account. The legal position in these sorts of situations is complex and, as always, it is best to try and resolve the situation by persuasion and common sense rather than involving the law, which, in practice, is severely weakened by the defences referred to above as well as by the

difficulties of proving intent. This applies particularly to the first three situations, where, in a tiny number of cases per year, bat noise or smell may be quite intolerable. In such situations, a heavy-handed approach may well act against our long-term goal of improving the public's acceptance of bats in their houses.

The requirement to notify the appropriate statutory nature conservation organisations (English Nature, Scottish Natural Heritage, Countryside Council for Wales or Environment & Heritage Service) is, in essence, a consultation about the applicability of the defences in the Act/Regulations. Clearly, the SNCOs cannot advise on a course of action that would result in the law being broken, but they can advise about what they would consider 'reasonable' and they can also provide advice on how operations can be carried out with the minimum damage to the nature conservation interest.

Because of the complexity of many of these situations, it is impossible to give a simple set of rules that can be applied firmly and inflexibly in each case; each problem must be approached with an open mind and the various options assessed. The goals of any action that is taken should be, in order of importance:

- to ensure that bats are not killed or injured;
- to ensure that the roost is not damaged or destroyed;
- to ensure that the roost is left for the breeding season;
- to ensure that the roost is left for the future.

Sometimes, it may be advantageous to compromise one goal to achieve another. For example, it may be possible to persuade a colony of bats to use another entrance hole to a roost if this ensures that the roost will otherwise be left undisturbed. Or if a building is being re-roofed, it may be advantageous to accept a degree of disturbance in one season if this ensures, through maintaining the goodwill of the owner, that access will be left for the future.

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9.1.1 Bats discovered and advice sought

The majority of callers in this category begin by stating that they have discovered bats roosting in their house and enquiring what should be done about them. Concealed within this introduction is a whole spectrum of attitudes ranging from those who know absolutely nothing about bats but have a vague feeling that they are not something one should have in one's house to those who are absolutely unshakeable in their conviction that they will not share their house with bats. Survey results show that about half these people can be persuaded to leave the bats undisturbed permanently and that almost all the others can be persuaded to leave the roost undisturbed until the bats disperse naturally. Even in this group, only about half will then take action, as advised, to prevent the bats returning.

Whatever the reason for the advice being sought, there is always a role in these cases for the Bat Group or bat enthusiast. This may range from the provision of advice on how to improve a roost for bats to persuasion about leaving the bats undisturbed. If persuasion is unsuccessful and action against the bats or their roost is intended, even in the future, the SNCO must become involved. Many enquiries in this category are received directly by the SNCO and, if the enquirer remains unconvinced about leaving the bats alone, it is likely that a local Bat Group volunteer will be asked to visit the site, assess the situation and send in a report.

Dealing with bat enquiries where an element of persuasion is required really requires a greater knowledge of people than of bats. Generally, it will be the conviction with which the case for bat conservation is made that will be the decisive factor rather than the ability to answer questions on the more obscure aspects of bat biology. Some people are naturally persuasive and, with a reasonable grounding in bat biology, will soon achieve a good success rate in persuading members of the public to tolerate or even to like their bats. Others find this role more difficult and may need extensive training to gain the confidence and experience to put the case for bats convincingly. A few may realise that they are temperamentally unsuited to such work and are better employed on some other aspect of bat conservation work; this is in no sense an admission of failure.

Enquirers who have discovered bats roosting in their house or other building but are quite happy to leave them undisturbed present no problems. Often the report of the roost will be accompanied by a request for factual information, which can be provided by leaflets or booklets. In other cases, a visit by the Bat Group might be welcomed to identify and count the bats, and many will be pleased to take part in the National Bat Monitoring Programme (see Appendix 4 for details) or join The Bat Conservation Trust.

Persuasion is a powerful weapon and must be used with care and respect for people's fears and beliefs, however strange these may be. The law appears to give bats considerable protection, but ultimately the existence of a roost in a private house depends both legally and practically on the continuing goodwill of the householder. Conservation should be based on understanding and co-operation rather than on a fear of the law or of public condemnation. In dealing with enquiries of this type, bat workers should rarely need to spell out the law, although they may perhaps make a passing reference to why bats are protected. There is no legal obligation on householders to have bats roosting in their house if they clearly do not want them.

Many enquirers will have had no previous direct contact with 'conservationists' and may well have no further contact in the future, so answering a bat enquiry gives an opportunity for the bat worker to present not only the case for bats but also, by inference, the case for conservation in general. If the conservationist viewpoint is presented carefully and with tact, then, even if the roost is lost, the enquirer may at least be left with a more enlightened attitude towards conservation generally.

Many people are unable to give a logical reason why they wish to get rid of their bats, but others will find some aspect of the bats' occupation objectionable. Table 9.1 presents an analysis of the reasons given; see also Moore *et al.* (2003). Despite all the publicity over the past few years, some people still think of bats as pests, which are infesting their house and which need controlling like mice. It is often a good starting point to explain that in most cases bats are only seasonal visitors to houses and use them for roosting in much the same way as swallows or house martins.

Table 9.1 Reasons given by a sample of 100 householders for wishing to be rid of bats roosting in their house (from Mitchell-Jones *et al.*, 1986)

Reason	Number of households
Droppings outside the property	23
Droppings inside the property	20
Bats flying or crawling in the house	16
General fear of bats	15
Concern that bats are causing damage	11
Fear of numbers increasing greatly	5
Noise	4
Smell	3
Fear of transmission of disease to humans	3

Droppings

Droppings are the major cause of complaint, although in many cases they may form an obvious focal point for more general fears. Often the bats' roost entrance will be above a window, so that the glass becomes streaked with droppings and urine. This can be a cause of great concern to the house-proud, some of whom find any level of mess unacceptable. In other cases, droppings can fall on stored goods, patios, cars or doorsteps. In most circumstances some remedial action is possible, but this may not appear adequate or be acceptable to some people. On stored goods in lofts or other areas used for storage, plastic or cloth sheeting provides a

cheap and easy method of protection. Plastic sheeting should be avoided where there is a risk of condensation. In many cases, especially where there are numerous entry points for the bats, the use of plastic sheeting is undoubtedly the most cost-effective solution to what is usually a seasonal problem. Where the enquirer remains unconvinced, an offer by the Bat Group to supply and fit plastic sheeting can often prove the decisive factor. In churches too, the use of dust-sheeting is often the most cost-effective solution to the perennial problem of droppings on the pews, altar or floor.

On the exterior of buildings, deflector boards fitted some way below the roost entrance can prove helpful in diverting droppings away from sensitive areas. Some examples and applications are shown in Figure 9.1. The boards, usually made of wood, can be fitted to masonry or wooden window frames with screws and brackets. Some roosts have a number of separate entrances or entry is possible anywhere along an opening, for example where a soffit adjoins a wall. If droppings beneath one particular area are a nuisance, it may be possible to close the offending access point and force the bats to use an alternative. This would require consultation with the SNCO. In a few cases, little can be done to alleviate the problem and so one will have to stress the seasonal nature of the bat colony and the harmlessness of the droppings. Success depends on the tolerance of the householder and the bat worker's persuasive ability.

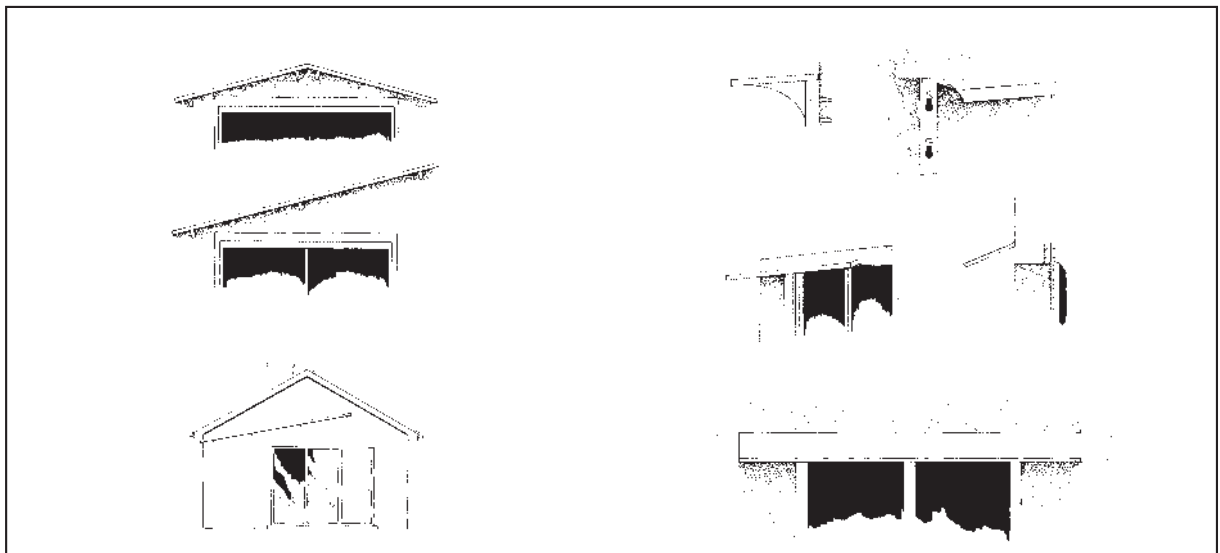


Figure 9.1

Deflector boards. These are most frequently screwed to masonry using plugs, or to the wooden window frame. Plastic guttering on standard brackets is also a possibility. If removable brackets, as illustrated, are used, the board need only be put up while the bats are in residence.

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Bats in the living area

Bats flying or crawling in the living area of the house, the second most common cause of complaint, are generally soluble problems, though some detective work may be needed. Householders should be warned not to handle bats because of the risk of disease (see Chapter 2: Advice on bats and rabies).

The most common source of bats in the inhabited parts of a building is through some connection with an area habitually used by bats. In modern houses, such connections are common where pipes, such as sink waste pipes, pass through a cavity wall. The brickwork is rarely a perfect fit in such places and small gaps are often left. If bats are roosting at the gable apex, they can generally gain access to the wall cavity and may emerge many metres away, often in bathrooms or kitchens. If bats use the roof void, they may enter through gaps around pipes through the ceiling, especially in airing cupboards, or through badly-fitting loft hatches. In older houses particularly, there is a wide range of possible entry points such as between floor joists, around window frames where there is a gap between the wood and brick or stone, through gaps in corners of ceilings or skirting, through ventilators or through any other connecting hole or crack. Usually the householder will seek advice as soon as one or two bats have been found. As these may well have been found in different rooms, they may give little clue to the whereabouts of the connection, so it is probably best to begin by looking at pipes in the bathroom, kitchen and airing cupboard. In older buildings with solid walls the search may actually be easier, as the opportunity for the bats to travel away from their roosting area is more limited. Generally the difficulty of finding the access point is proportional to the size of the building.

Any gap wider than about 8 mm must be regarded as a potential bat entry point. Householders, who almost invariably overestimate the size of bats, generally overlook gaps of this size. Once discovered, the gaps should be carefully sealed, either temporarily with newspapers or rags or more permanently with plaster-based filler, expanded foam, wooden battens or other suitable material. Ventilators with bat-sized holes will need to be covered with a fine mesh less than 8 mm in diameter. Usually it is impossible to be absolutely certain that all potential entry points have been

found on the first visit, so it is unwise to give absolute guarantees of immediate success; credibility suffers when the next bat is found.

Less commonly, bats will fly through open windows, particularly those that are hinged at the top. This may be an isolated incident, with no evidence that there is a roost, but usually the bats will have come from a nearby colony. The problem is most common when young bats are learning to fly or when the roost entrance is close to a window. The simplest advice is to keep the window shut during the sensitive time of the year, usually mid-July to mid-August. If the householder does not wish to keep the window closed during what is generally the hottest time of the year, a net curtain stretched across the window is an alternative. In some cases it may be possible to persuade the bats to use a more remote entrance, as was described in the previous section. Cats may also bring in live bats.

General fear of bats

General fear of bats is more common than its position in Table 9.1 would suggest, because many enquirers with a general fear try to present a more definite reason for wanting to be rid of the bats. The strength of such fears should not be underestimated; although the majority are based on ignorance and superstition (most people have never seen a bat at close quarters), a few are genuine phobias where the presence of the bats can cause real mental distress. Pressurising such people into leaving the bats undisturbed wins no friends for the conservation cause, and the public image of the conservation organisations is better served by the prompt provision of advice and even of practical help. The skill lies in assessing the extent of people's fears and knowing when to give in gracefully.

One of the most frequent expressions of a general fear of bats is the belief that bats in the roof are a permanent infestation, like mice. Many householders find it extremely comforting to be told that the bats are only resident seasonally and will move elsewhere once they have finished breeding. Although this may not always be strictly true, especially for species such as the long-eared bat, the bats will certainly not be obvious during the winter and will apparently have disappeared.

Other common fears are that bats are generally like mice, that they will become entangled in hair, that

they will crawl into the house at night, that they will bring in lots of nesting material and that they are about the size of sparrows, starlings or possibly even pigeons. Such fears can often be calmed by the provision of factual information and showing them a real bat, but irrational fears are, by definition, not founded on fact. Children are more easily convinced than their parents, who, seeing their children's change in attitude may rapidly alter their views.

Damage to buildings

Concern that bats may be causing damage is common but almost entirely groundless. Many such fears stem from the belief that bats are similar to rodents in their ability to gnaw and construct their own entrances, runways and nests. Bats are often accused of dislodging hanging tiles, moving loft insulation or even bending lead flashing to gain access. Such accusations are completely groundless and can be countered with complete conviction by a description of the small size of bats and their lack of suitable teeth for gnawing. In very rare cases, bats can be implicated in minor damage to buildings through scrabbling claws or the accumulation of large quantities of droppings. The latter cases are generally associated with other building defects, which allow the droppings to become wet and thus act as a source of moisture, which can mark ceilings or walls or, in extreme cases, cause ceilings to collapse. However, it must be emphasised that such cases are very rare and that, provided that a building is structurally sound, the droppings present no danger at all.

In certain circumstances, particularly in churches, damage to valued items can occasionally be caused by bat urine or droppings. The droppings are most often noticed and constitute a nuisance in large numbers but it is likely that urine is more damaging because it contains ammonia, which is corrosive. Urine can leave a pale stain on surfaces such as polished wood, marble and brass. Droppings and urine may damage wall paintings. A project conducted by the Bat Conservation Trust (Bats in Churches) surveyed a random sample of 538 churches in England and reports were produced, which included some solutions to problems caused by bats and guidelines on the management of bats in churches. Revised guidance with respect to works of art can be found in Paine (undated).

The first approach to solving bat-related problems should be to attempt methods that do not disturb bats or their roosts and, hence, do not require consultation with the SNCOs. These include adjusting cleaning rotas so that the church is cleaned just before services and moving sensitive objects if they are kept under a roost. Covers of various types can be effective, elegant and easy to clean. They can take the form of hoods, drapes or canopies designed to cover a range of items such as candlesticks, textiles, statues or the pulpit. Covers can be removed before services and need only be used during the period when bats are present and active. Wax furniture polishes, applied regularly to wood, can provide some protection against damage caused by bat urine. Urine etches brass and bronze and, if the use of covers is not practical, both can be protected by a layer of strippable lacquer followed by a coating of micro-crystalline wax. A conservator should ideally apply these. Wall paintings in churches may be particularly susceptible to damage and protection methods described above may not be applicable. Attempts to dissuade bats from flying near wall paintings, such as the provision of time-switch operated lighting and side baffles should only be planned in collaboration with wall painting conservators. Some measures employed to alleviate problems may disturb bats or their roosting sites. In these situations the advice of the relevant SNCO must be sought. Positioning of devices such as canopies or deflector boards below roosts would require careful positioning to avoid disturbing access to the roost. The use of deterrents such as lighting, screening materials to protect specific areas of the church etc. should be discussed with the SNCO. There is no evidence to suggest that bats are affected in the long term by incense, ultrasonic devices or model predators such as owls. If a roost is in a particularly sensitive area, such as above the altar, it may be possible, after consultation with the SNCO, to relocate the roost within the church by blocking access to the original roost and, if necessary, providing an alternative roosting location within the building. In a minority of cases the presence of bats may be perceived as intolerable and the parochial church council may apply to the SNCO for exclusion. As exclusion involves blocking all holes that allow bats access to the interior these operations tend to be time-consuming and expensive. A crevice 1 cm wide will allow access to a pipistrelle so it is difficult to ensure that all potential access points are blocked. It should also be borne in mind that such an operation might restrict ventilation. Although there is

no guarantee that bats can successfully relocate to another roost, preventing re-entry is considered less disruptive than disturbing already roosting bats. Finally, it is important to be aware that the timing of bat occupation of churches is often at variance with the timing of maternity roosts in other types of building (e.g. Battersby, 1995).

Numbers increasing

Worries about the numbers of bats increasing greatly arise largely from the belief that bats are present all year and breed like mice, but are compounded by the way in which large numbers of bats can suddenly appear. Also, the numbers at a roost may build up as bats gather from other sites, such as in spring. Even in mid-summer the numbers can suddenly increase as bats move in from other sites, then just as rapidly decrease as the roost moves to other locations. Such fears can usually be allayed by an account of the seasonal and temporary nature of bat colonies, the fact that most colonies consist only of females, which have gathered to give birth and rear their single young, and the slow potential growth rate of the colony. Even if every bat survived, the colony could increase by only 50% a year (half the young being males), and in reality rates of increase are very much lower (<10%). The maximum size of colonies is very variable but the average is about 50 for common pipistrelles (larger for *P. pygmaeus*, especially in Scotland), 20–30 for long-eared bats and perhaps 20 for serotines.

Noise

Noise from bat colonies can be a temporary but annoying problem during the summer, particularly with pipistrelle colonies in modern houses, where walls are thin and sound-insulation is poor. Noise is usually most noticeable at dusk and on hot days. The problem can be particularly acute in houses with hanging tiles pinned directly onto blockwork walls. Serotines can also be noisy during the spring and autumn. Often, there is little to be done to reduce the problem, and one must stress the seasonal nature of the problem (only a few weeks a year except in cold wet summers when the breeding season is prolonged) and, if appropriate, suggest that other bedrooms are used temporarily. In a few cases it may be possible to install additional insulation or prevent the bats using the part of the roof that is the source of the problem. Cases of this

sort often need a careful and sympathetic approach, particularly where the noise is heard in bedrooms used by children or where the householder is suffering from lack of sleep. It may sometimes be necessary to try to persuade the bats to move elsewhere either by exposing their roost area or by restricting their access or by other suitable means. This would require consultation with the SNCO.

Smell

Genuine complaints about smell from droppings are relatively uncommon but can sometimes be well founded. Problems usually arise either where a building defect allows droppings to get wet or where large quantities of droppings are accumulating rapidly in a poorly ventilated area. When dealing with such cases, it is most important that these factors are investigated thoroughly so that the problem can be attributed to the correct cause. A satisfactory remedy may necessitate structural repairs or alterations to prevent a recurrence of the problem. Simply excluding the bats is unlikely to be satisfactory because the droppings and any moisture will still be present. In extreme cases, it may be necessary for the accumulated droppings to be exposed and removed before a satisfactory solution is reached. Building regulations now require roofs to be much better ventilated than formerly, and this should mean fewer complaints about smell. Some bats, for example soprano pipistrelles, have a particularly strong batty smell, and draughts through a house may draw in air over the roosting bats and downstairs, such as when a front door is opened. Keeping internal doors closed and sealed can alleviate this problem.

Transmission of disease

Fears are often expressed about the possibility of disease being spread by bat droppings or urine. Such fears are quite understandable in view of the number of diseases that can be spread by the excreta of other species, including domestic pets. In Britain, there is no evidence that bats can spread disease via their droppings or urine. However, one should not encourage close contact with either bats or their accumulated droppings.

In some parts of the world the fungal disease histoplasmosis (caused by *Histoplasma capsulatum*) has been associated with large accumulations of bat droppings. However, histoplasmosis is a very rare

Interior design for a huge roost of (smelly) bats

In a cottage on the National Trust's Attingham Park Estate in Shropshire, smells and stains from a huge bat roost had, by 1995, made an attic bedroom uninhabitable, and the ground floor dining room also suffered from the odour. Accumulated droppings and urine from the bats caused staining on the ceiling and an unacceptably strong smell of ammonia, which literally brought tears to the eyes. The problem was exacerbated by lack of access to the roof void, so that droppings could not be removed, and poor ventilation. Action had to be taken if the goodwill of the occupiers was to be maintained.

Some years ago, following a fire, a new roof was built on to one half of the house and an attic was converted into a bedroom. The bats may have been present before this work but the new roof clearly provided good roosting habitat because over the years an extremely large maternity roost (sometimes in excess of 1600 adult females) of soprano pipistrelles (*P. pygmaeus*) developed.

We needed to contain the smell, stop the staining and retain the roost. In discussions between the National Trust and English Nature it was agreed that the priority was removal of the accumulated droppings. A loft access was cut into the ceiling, through which several bin liners of droppings and soiled insulation were removed. In winter 1996/97 we agreed that the existing ceiling would be stripped out and replaced with a vapour barrier between the bats and the ceiling. New insulation, additional ventilation on ridge and eaves, hinged soffits to allow droppings to be removed and wooden rakes between the rafters with which droppings could be removed were also installed.

The usual advice would be to carry out such works outside the May to September breeding season when the bats are not present. However in January bats were found hibernating in remnants of insulation in the bays between the rafters. These had to be excluded for works to proceed and be completed before May when the maternity roost would, it was hoped, return.

During a warm period in March, lights were installed in the roof void and the insulation removed. No bats were found at a this time and it is likely that those present earlier in the year had already moved on. On subsequent nights the householder blocked the access points after dark and opened them the following morning, thereby progressively excluding any bats still using the roof void. He reported seeing no bats leaving and so after a week of blocking in this way the holes were left blocked to stop bats returning and to allow work to proceed.

In early April the ceiling was stripped, with bat workers on hand to deal with any bats (there were none). Removing the ceiling boards revealed that, in the bay used as the main entrance to the roost, the bats had reduced the scrim (cloth) lining of the felt to tatters. The soffit boards, also removed at this time, were so solidly packed with droppings that thick cakings of them stayed in place when they were removed. The soffits were probably the original roost site but as droppings accumulated the bats were progressively excluded and forced to use the main roof void, often roosting several metres from the access hole.

By the end of April the works had been completed. It could only be hoped that the bats would return. By mid-May the occupier reported counting 500+ bats leaving the roost and a count on 4 June revealed 769+ and by the end of June c. 1000. Importantly, 6 months after the works the bedroom had neither 'bat' smells nor 'bat' stains and was habitable! In subsequent years, the number of bats in this roost has declined steadily, but there is no apparent reason for this.

Close co-operation at every stage between the National Trust, English Nature and the householder was essential. The total capital cost of the works, including a grant for the hinged soffits from English Nature, was c. £6,000 (which at c. £6 per adult female bat seemed good value).

Source: The National Trust/English Nature, pers. com.

disease in Britain (all occurrences are of foreign origin) and there is no evidence that the fungus occurs naturally in this country. The climate is also generally unsuitable for this fungus, which requires a temperature of 20–35°C and a high relative humidity to flourish.

Concerns may be expressed about a form of rabies that may now be present in bats in the UK. In the past decade, rabies-like viruses, now characterised as European Bat Lyssavirus (EBL), have been found in bats in north-western continental Europe. One type (EBL1) appears to be endemic in serotines, and another type (EBL2) has been recorded, though rarely, from the pond bat *Myotis dasycneme* and Daubenton's bat *Myotis daubentonii*.

These viruses are serologically distinct from the 'classical' or sylvatic rabies virus (serotype 1), which is typically spread by terrestrial carnivores, and all the evidence suggests that there is no significant interchange of the bat virus with other wild mammals, although the virus can be transferred to other mammals under laboratory conditions. In 1996, a Daubenton's bat picked up close to the south coast of England, was found to be infected with EBL2 (Whitby *et al.*, 1996) and a further individual was recorded in Lancashire in 2002 (Johnson *et al.*, 2003). Later that year, a batworker in Scotland died from EBL2 infection (Fooks *et al.*, in press a). It is known that he had been bitten by bats and the assumption is that he acquired the disease by that route.

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Smell, noise and phobias – emergencies

Legal position (simplified)

If action is taken against bats because of smell or noise problems or because they are not liked, the intentional killing, injuring or taking of bats is illegal. Disturbing bats or damaging or destroying roosts within dwelling-houses is covered by a defence in the Wildlife & Countryside Act/Habitats Regulations, but this cannot be relied on unless the SNCO had been consulted. Thus, if people take action against bats and deliberately kill or injure them, this would be illegal. However, if they disturb them or damage or destroy their roosts without first consulting the SNCO, this would probably be illegal, but only a court could decide.

Advice

Problems involving smell or noise are amongst the most acute that batworkers are likely to encounter. In a few cases per year, householders are faced with a situation, which they find intolerable and which they insist must be resolved at once. Unfortunately, such problems tend to become acute during the short period (about 4 weeks) when the bats have dependent young and when a straightforward solution is most difficult.

At this point, the law is of limited relevance, particularly as public sympathy (and often that of the bat worker) lies with the householder. In such instances, which amount to probably no more than five cases a year, bat conservation is probably best served by the provision of prompt advice on how to solve the problem with the least damage to the bats. This would normally mean the exclusion of the colony, followed, in some cases by subsequent remedial works. Wherever possible, the SNCO should be involved as early as possible, so that they can make the decision as to whether advice about immediate exclusion is appropriate.

Outside the breeding season (mid-August – mid-May)

Bats can be excluded by fitting a one-way bat excluder or blocking their access holes over three nights once they have left in the evening (see section on exclusion techniques in this chapter). Alternatively, the roost area could be exposed (preferably towards dusk), so persuading the bats to move on.

During the breeding season

No dependent young

If the bats have no dependent young, they can be excluded as described above, even if they are pregnant. Hopefully, the bats will know of alternative roosts nearby.

Dependent young

Attempting to move bats with dependent young carries a high probability of bats being killed, mainly through the abandonment of young, and must be advised against by the SNCO. However, if there are overriding reasons for attempting to move the bats, for example under a licence issued on public health grounds, action should be taken in such a way that casualties are kept to a minimum. The aim here should be to persuade the bats to move to a different roost during the night. Provided they are not panicked, they should carry their young with them. Persuasion can be achieved by partially exposing the roosting area, for example by removing a soffit board or an area of hanging tiles. This should be done during the early evening if possible. Part of the roost area can be exposed the first night, followed by more on subsequent nights until the colony moves. If dependent young are abandoned, these would have to be raised by hand or euthanasia could be considered. Note that adults may return to collect young up to two or more days after abandonment.

If action by the householder results in bats (adults and young) having to be rescued from a roof, these should be kept together if possible and placed in a bat-box located not too far from the original roost. The entrance to the box should be sealed up until all the bats have been rescued (provided this is not more than a day) and then opened at dusk to allow the bats to move on.

Illegal action

Occasionally householders will feel unable to wait while attempts are made to move the colony and will start to open up the roosting area. Such action, which would probably involve killing or injuring bats, would be illegal and the SNCO and the police should be informed immediately.

Although the outcome of being bitten by a bat carrying EBL2 may be a fatal disease, this is not considered to be a significant public health risk in the UK. This is because:

- The level of infection in bats seems to be very low. More than 3200 bats have been tested in the UK since 1986, with only two Daubenton's bats being found to be positive (see Table 9.2). Recent limited testing of live Daubenton's bats suggests exposure to EBL2 may be more widespread.
- Pipistrelles and long-eared bats, the species most commonly found in houses, have never been found to have the type of virus (EBL2) found in Daubenton's bats.
- Daubenton's bats are not strongly associated with houses. Out of 23,896 enquiries recorded by NCC/English Nature between 1982 and 1992 only 58 (0.24%) involved Daubenton's bat in domestic properties (see Table 9.3).
- EBLs can be passed on only through a bite or by contact between bat saliva and mucous

membranes, so the risk can be eliminated by not handling bats.

- Contacts between bats and the public, even those with bats living in their house roof, are relatively rare. Bat-workers are the only group at higher risk because they may handle bats more frequently.
- Post-exposure vaccine is available and appears to be effective. Nobody who has been bitten by a bat and received this vaccine has died.

Foreigners, particularly Americans, and people who have lived abroad are often horrified at the thought of bats with rabies. This very strong reaction is because ‘classical’ rabies is endemic in the New World. Although the main vectors are terrestrial carnivores (skunks, racoons and foxes), it is known to occur at a low incidence in bats throughout the USA. There have been about 22 human cases in the USA in the last 22 years resulting from contact with bats. Such fears can be calmed very considerably by the knowledge that the situation in the UK is very different and that rabies is not present in terrestrial carnivores. There have been one or two cases in the USA where people are believed to have contracted rabies after visiting caves inhabited by huge numbers (millions) of active bats. Conditions

in the UK are very different and visiting bats roosts of any sort in the UK is not considered to present any rabies health risk to humans.

Concerns may be raised that cats that catch bats may become infected with EBL. There are no recorded instances of this happening, although one wild animal, a stone marten in Germany has been recorded with EBL1. Given the apparently low incidence of EBL and the lack of any recorded transmission to domestic pets, owners can be reassured that the risk to their pets is very low. If they remain concerned, suggest that they have their pet vaccinated against rabies.

Further advice about the health implications of EBLs can be found in Chapter 2. Updated information is available from the SNCOs, the BCT or the Health Protection Agency/Scottish Centre for Infection and Environmental Health and a leaflet ‘Bats and human health’ is available from the SNCOs. A review of EBLs can be found in Fooks *et al.* (in press b) and a review of the incidence and distribution of rabies and rabies-related viruses in bats (by A. M. Hutson) and their epidemiology (by S. M. Brookes) is included in a report compiled for Scottish Natural Heritage.

Table 9.2 UK bat rabies surveillance 1986-2002. Bats found dead were tested at the Veterinary Laboratories Agency (the positive Daubenton’s bats were both found alive).

Species	Number tested	% of sample	Number with EBL
<i>Rhinolophus ferrumequinum</i>	3	0.09	0
<i>Rhinolophus hipposideros</i>	11	0.34	0
<i>Myotis daubentonii</i>	51	1.57	2
<i>Myotis brandtii</i>	27	0.83	0
<i>Myotis mystacinus</i>	83	2.56	0
<i>Myotis mystacinus/brandtii</i>	5	0.15	0
<i>Myotis nattereri</i>	83	2.56	0
<i>Myotis bechsteinii</i>	2	0.06	0
<i>Myotis myotis</i>	1	0.03	0
<i>Eptesicus serotinus</i>	69	2.13	0
<i>Pipistrellus pipistrellus/pygmaeus</i>	2202	67.90	0
<i>Pipistrellus nathusii</i>	38	1.17	0
<i>Nyctalus leisleri</i>	4	0.12	0
<i>Nyctalus noctula</i>	39	1.20	0
<i>Plecotus auritus</i>	532	16.40	0
<i>Plecotus austriacus</i>	8	0.25	0
<i>Barbastella barbastellus</i>	4	0.12	0
Other ¹	47	1.45	0
Unidentified ²	34	1.05	0
Total	3243		2

¹ includes European species not normally found in UK (e.g. *E. nilssonii*, *P. kuhlii*, *P. savii*, *V. murinus*) and imports from elsewhere (e.g. *M. lucifugus*, *L. noctivagans*, *E. fuscus*, *T. brasiliensis*, some fruit bats and other exotics).

² includes specimens not present in sample examined for verification of identification, or insufficient material for identification (e.g. brain only).

Table 9.3 The occurrence of bat species in buildings. The frequency with which each species of bat was recorded in buildings from a sample of 1807 roosts where the species was identified.

Species	Number of roosts	%
Pipistrelle <i>Pipistrellus</i> spp.	992	54.9
Long-eared bat <i>Plecotus</i> spp.	548	30.3
Serotine <i>Eptesicus serotinus</i>	85	4.7
Whiskered/Brandts' bat <i>Myotis mystacinus/ brandtii</i>	61	3.4
Lesser horseshoe <i>Rhinolophus hipposideros</i>	39	2.1
Natterer's bat <i>Myotis nattereri</i>	32	1.7
Noctule <i>Nyctalus noctula</i>	21	1.2
Daubenton's bat <i>Myotis daubentonii</i>	18	0.9
Greater horseshoe <i>Rhinolophus ferrumequinum</i>	8	0.4
Leisler's bat <i>Nyctalus leisleri</i>	2	0.1
Bechstein's bat <i>Myotis bechsteinii</i>	1	0.05
Total	1807	

Note. These data were collected from a sample of bat enquiries in the 1980s where the bats were identified. Long-eared bats are probably over-represented because they are most frequently seen in roofs and are easy to identify.

Insects in droppings

Very occasionally large accumulations of droppings may contain small insects, either as adults or as larvae. The most common are the larvae of small moths such as the common clothes moth *Tineola bisselliella*. Numbers of these larvae are generally low and never warrant the application of any control measures. A few cases have been recorded of spider beetles, most often the Australian spider beetle *Ptinus tectus*, being associated with accumulations of droppings. The adult beetles are 2.4–4 mm long and are covered in brown or golden-brown hairs. They are nocturnal, spending the day in cracks and crevices and emerging at night to feed, when they will feign death if disturbed. The beetles are widely distributed throughout the UK and are often found in old birds' nests. In the roofs of domestic premises, the beetles are of no economic significance, though they may be a nuisance. They may be controlled by removing the bat droppings and any other organic debris and treating the area with a pyrethroid-based spray at a time when no bats are present. Another group of small insects that are occasionally associated with bat droppings are beetles of the family Dermestidae, such as the carpet beetle *Anthrenus verbasci* or the hide beetle *Dermestes maculatus*. Like the spider beetles, these are general detritus-feeders and, in roofs, are most often associated with old birds' nests or dried animal remains. The larvae, known as woolly bears, are more commonly encountered than the adults. In the unlikely event of control measures being required, they may be

treated in the same way as spider beetles. The largest insect that is ever found in bat droppings in the UK is the mealworm (*Tenebrio molitor* larva). This is indicative of long-established bat roosts (see also Chapter 5 – Guano dwellers).

As the visit draws to a close it is often wise to introduce a cautionary note by explaining that there are many aspects of bat behaviour that are still not well understood and that any suggestions or interpretations made are based on the most likely behaviour of the bats. Ask the householders to contact you again if the advice proves unsatisfactory or the bats do not behave as expected so that further investigations can be made. This helps with your credibility and ensures that the householder is not left feeling dissatisfied with the advice he or she has been given.

9.1.2 Exclusion of bat colonies

If it becomes apparent that the householder is not going to be persuaded to leave the bats undisturbed and does not want them in the roost, it will be necessary to provide advice on how to rid the building of bats. This advice would be given under Section 10(5) of the Wildlife & Countryside Act or Regulation 40(4) of the Conservation (Natural Habitats &c.) Regulations and should be given or confirmed by the SNCO.

There are only two successful and approved ways of dealing with an unwanted colony, neither of

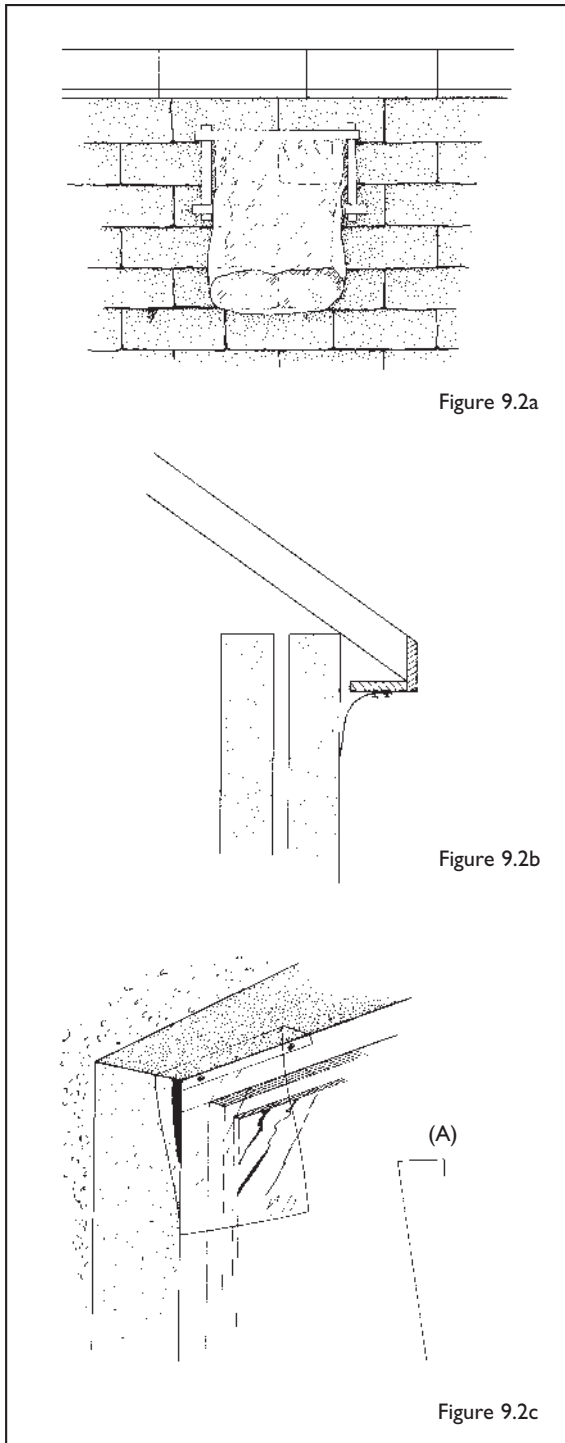


Figure 9.2

- a** Plastic bag with bottom cut off fixed over roost entrance. The bag can be taped over the entrance.
- b** A sheet of acetate or similar stiff plastic pinned under the soffit. The plastic should be flexible enough to allow the bats to push past it, but be stiff enough to spring back into place.
- c** An A4 sheet of acetate bent to profile (A) then taped or pinned along its short edge to the top of the window frame adjacent to the roost entrance.

which should be used while there is the possibility of non-flying young being present.

The first is to install a one way door or valve (sometimes known after its inventor as a Constantine device) which allows bats to exit the roost but not re-enter. This method is now widely used in the USA. Because of its simplicity, exclusions in the UK should be carried out with this method where possible as any bats remaining inside the roost still have the opportunity to leave following installation of the device. The valve-like device is essentially a collapsible plastic tube, sometimes attached to a solid section of tube, fitted over the roost entrance (Figure 9.2a). The collapsible section allows bats to push past it but ensures they cannot re-enter once they have left the roost. Where the roost entrance is between a soffit and wall, a length of acetate sheet or heavy duty polythene attached to the soffit can perform the same function (Figure 9.2b) and this method can be adapted to other situations (Figure 9.2c). To install these devices, all secondary entrances to the roost should be sealed. The device can then be installed over the main exit, permitting bats to leave at dusk but not re-enter. Once in place, the device can be left for an extended period to ensure that no bats are left inside the roost. For late autumn or winter exclusions, it may be best to leave the device until the following spring to eliminate any possibility of hibernating bats being trapped.

The second method is to exclude the bats from their roost sites by blocking the entrances once the bats have left the roost, either for the night or for the season. This method carries the danger that not all the bats may leave. During the winter, bats may remain torpid for long periods, so this method should not be used after the weather turns cool in September.

In the great majority of cases the householder can be persuaded to leave the bats to disperse naturally before installing the device or blocking the access holes, but occasionally it will be necessary to provide advice on how to exclude bats that are still using the building on a daily basis. No action to exclude bats should be taken between mid-May and mid-August because dependent young may be present at that time.

The first step in any exclusion operation is to locate the access holes used by the bats. In many cases

they will be obvious, but in others it may be necessary to watch the building at dusk on one or two nights. Bats may emerge from more than one hole or may emerge from one hole but know of others that can be used if their main exit is obstructed, so the locating of exit holes must be done carefully and thoroughly if the exclusion operation is to be successful. There is also the possibility that bats excluded from a roost in one part of a building will simply move to another part of the same building, so it is always prudent to provide advice on bat-proofing the whole building even if the householder declines to carry out the recommended works.

If the householder can be persuaded to leave the bats to disperse naturally, advice should be provided on how to check whether bats are still present. This will include such techniques as looking for fresh droppings beneath the access hole (having swept up the old ones), listening for bats on a warm day or evening and watching for emerging bats at dusk. In winter bats hibernate so, unless it is known that bats are absent, blocking operations should be done in spring or autumn.

If, for any reason the one-way valve method cannot be employed to exclude bats while they are using a roost, the secondary exclusion technique can be applied, although it is a little more time-consuming and requires action over a 2–3-day period. During the first day any little-used access holes should be sealed permanently, leaving only the main hole open. The same evening the bats should be watched as they emerge to forage and, when no bats have emerged for more than 10 minutes, rags should be pushed into the hole to prevent their return. Early the

following evening, well before dusk, the rags should be removed and any further bats allowed to escape before the hole is once again sealed temporarily. If there seems any possibility of bats still being present, the process should be repeated for a third night; otherwise the temporary blockage can be replaced with a permanent one. A careful watch must be kept on the building while the bats emerge to ensure that the temporary blockage is in place before bats begin to return. These blocking operations are best done in warm weather, when a high proportion of the colony will emerge to feed each night; in cool, wet or windy weather few bats may emerge.

There are many methods and materials suitable for blocking bat access holes and the choice of method may often be left to the householder. For access points between soffits and walls, wooden battens fixed either to the soffit or to the wall are a common choice. Holes in brick or stonework or around window frames may need repointing with mortar or filling with mastic; larger holes can be filled with crumpled wire netting or expanding polyurethane foam (from DIY shops). Gaps in lead flashing can often be closed simply by bending the lead, though in some cases extra flashing may be required. Some roosts have a very large number of entrances, often under loose tiles (both roof and hanging) or between weatherboarding. Blocking individual holes may not be practicable and covering the whole area with 1 cm galvanised wire mesh may be required.

Whatever method of excluding bats is chosen, it is important to emphasise that all roofs require adequate ventilation to prevent the build-up of moisture and that provision should be made for this in whatever works are proposed.

Summary – visit to householders who have discovered bats

- Make an appointment for the visit. Don't turn up with a crowd of people.
- Listen carefully. Try to discover what is really worrying the householder and how he or she perceives the problem.
- Present the case for bats by showing knowledge, understanding and enthusiasm. Counter arguments logically. Respect true phobias.
- Advise on any measures that may be taken to abate any perceived problems.
- Take along leaflets and other information relevant to the visit/problem
- If exclusion will be required, explain carefully what is involved and the logic behind the process. Try to persuade the householder to wait until the bats have left. Liaise with the SNCO.

- Fill in a Bat Roost Visit Report Form and return it to the SNCO representative who requested the visit. If the request originated elsewhere, return the form to your SNCO contact with a clear indication if action is required.

Summary – exclusion of bats

- Ensure that advice is provided or confirmed by the SNCO.
- If bats may be present, adopt the appropriate exclusion technique (usually a one-way valve).
- If bats are known to be absent, block holes when convenient but before the following spring.
- Advise on ways of blocking holes but emphasise the requirement for ventilation.
- Advise on bat-proofing the whole building so that bats do not return to a different part of it.

Security alarm systems in buildings

Bats have been known or suspected to trigger burglar alarms in buildings. If it is confirmed that bats are the cause there are two courses of action.

First, the relevant SNCO can be contacted with a view to excluding bats from the space in question. This may be neither successful nor reliable.

Second, the alarm systems can be altered to make them less susceptible to bat-generated false alarms. The installers of the alarm should be consulted and the local Bat Group may be able to help.

Types of alarm

Light beam detectors – a transmitter sends out an active infra-red beam that is received by a receiver (e.g. across a window). The alarm is set off when the beam is broken.

Such systems can be modified to prevent false alarms by installing two parallel beams, one 50 cm vertically above the other, wired so as both must be broken before the alarm is signalled.

Ultrasonic movement detectors – they emit ultrasound and receive an echo of the room that they get accustomed to. When the echo is altered by a person or animal entering the room, the alarm is set off.

Microwave movement detectors – are similar to ultrasonic detectors but emit much higher frequency waves.

Passive infra-red detectors – detect changes in radiant heat.

These last three types of detector can be re-located so that there is little chance of a bat flying close to them, i.e. as low as possible and away from corners. However, the detectors should not be mounted lower than 2.0 m to 2.5 m, in accordance with manufacturers instructions. Also, two detectors of the same technology, i.e. passive infra-red, can be mounted at opposite ends of the room, each covering the whole room, and connected in a series configuration. Both would be triggered by a large object in their common field of view, but a bat should not be large enough to trigger both at the same time.

Source: The National Trust, pers. com.

9.1.3 Activities that might incidentally affect bats or their roosts

Many enquirers request advice about the possible effects of repairs, alterations or remedial work on bats and their roosts. Such operations may be covered by the ‘incidental result’ or ‘dwelling-house’ defences in the Act/Regulations (see Chapter 1) and so will require advice from the SNCO. In such situations, the role of the batworker is more investigative than persuasive, and the SNCO will provide advice based on information supplied by the batworker. In making such investigations the batworker is acting, to some extent, as the SNCO’s agent, but he or she is not empowered to give advice on behalf of the SNCO. This is because the nature conservation agencies are mentioned by name in the legislation as the organisations whose advice must be sought. This can easily lead to confusion, but it is essential that the correct procedure is followed if the enquirer is to be given the protection provided in the Act. Less experienced batworkers should make it clear that they are visiting only to collect information and that nothing should be done until advice has been received from the SNCO; more experienced batworkers may wish to predict what advice will be given but point out that action should not be taken until official confirmation is received.

A frequent type of enquiry in this group concerns remedial timber treatment. This is covered in detail in

Chapter 10 but the most common situations are summarised below.

Infestations of ‘woodworm’ or common furniture beetle *Anobium punctatum* may be dealt with by a spray application of a suitable treatment fluid at a time of year when no bats are present. Solvent or emulsion formulations may be used, because both are effective, but emulsions have the advantage of lower solvent toxicity.

Death-watch beetle *Xestobium rufovillosum* infestations may be treated with a spray application of a suitable fluid supplemented by pressure injection or paste application to particularly heavily infested areas. Permethrin-based products for the latter purposes are widely available. If pastes are used, they should be kept as far as possible from bat roosting areas and, if the treatment of roosting areas is essential, attempts should be made to prevent bats coming into contact with treated surfaces.

Dry rot is relatively uncommon in roofs. It needs to be treated by cutting out and replacing damaged timbers. Cut ends of beams may be treated by pressure injection or paste application as for death-watch beetle, and the same remarks apply.

Other common problems, also dealt with in Chapter 10, include re-roofing, loft conversions, demolition of buildings, removal of dead trees, capping of

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mineshfts and destruction of caves. Some of these situations may fall within the scope of the licensing arrangements under the Habitats Regulations, but in others the SNCO may have to provide advice. Here, the role of the batworker is largely one of collecting information and, perhaps, suggesting possible solutions to the problem.

9.2 The media

Over the past few years there has been a considerable interest in bats from the press, radio and television. On the whole, bats have received fairly sympathetic treatment, perhaps because the ‘conservationists’ are the main source of information, although most reporters seem unable to resist the old clichés of vampires, Dracula etc. For the amateur bat-worker, most dealings with the media can be through the local bat groups (see Chapter 8), but some guidance bears repetition here.

The most easily handled form of contact with the media is positive publicity where the conservation organisation or individual makes an approach with what is believed to be a good story. For such an approach to succeed, the story must be well thought out beforehand and ‘newsworthy’. Generally, the local press and radio are much more receptive than the nationals, especially if you catch them on a slack day, and will often run quite small stories if these have a local angle and, for newspapers, are accompanied by a photograph or two. If you do agree to be interviewed for television or radio, try to get the reporter to take a positive line about how nice bats are rather than the more typical, ‘Bats are horrid, aren’t they?’; this gets the interview off on a much better footing.

Reactive publicity, where the media already have the bones of a story, is much more common and can be more difficult to handle, because the reporter will generally be working to a deadline and may already have spoken to the ‘opposition’. In such cases, one may feel on the defensive from the start. When one is approached, the first decisions, which must be made rapidly, are whether one is competent to answer the enquiry and whether one is being consulted personally or as the representative of an organisation. In some cases it may seem most sensible to hand the enquiry on to someone who is more in touch with the story, but beware of giving the reporter the run-around; this does not help to gain a sympathetic hearing. The Bat Conservation

Trust can give advice or recommend bat experts in your area who have experience of dealing with the media. Television companies are showing a growing interest in covering bats and bat group activities and BCT can provide advice and, if required, help negotiate fees for the bat group.

- Answering enquiries from the press is largely a matter of common sense and experience, but it is worth bearing in mind a few basic rules.
- Ensure your facts are correct. If you don’t know, say so or offer to find out later.
- Always respond in a friendly and helpful manner. This will help to ensure a fair hearing.
- Respond as quickly as possible. The media are inevitably ruled by deadlines and, if necessary, may run a story without your comments.
- Remember the press are not experts on bats. Keep it as simple as possible.
- Make it clear if you do not wish to be quoted, although making ‘off the record’ remarks can be a dangerous practice.
- Don’t tell lies. It will severely damage your credibility if you’re found out.
- Think carefully before replying. Don’t be rushed into making unconsidered statements and remember that long pauses will be edited out of television and radio recordings.
- Don’t be rude or sarcastic or make jokes. These often come across rather differently from how you intended.
- Avoid jargon and acronyms.
- Don’t say ‘no comment’. This can be interpreted in a number of unflattering ways.

Guidelines on writing a press release are available from The Bat Conservation Trust.

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Brown long-eared bat hovering. © Frank Greenaway