Irish Bat Monitoring Programme

Brown long-eared Bat *Plecotus auritus* Roost Monitoring 2007

2007 Report

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2007 Report

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Comhshaol, Oidhreacht agus Rialtas Áitiúil
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EXECUTIVE SUMMARY

Monitoring protocols for bat populations is essential due to the paucity of information on the present distribution of many of Ireland's resident bat species. Without such protocols, it is difficult to compile any comprehensive review of the current status of bat populations. Monitoring trends of bat populations also addresses obligations under the EU Habitats Directive and the EUROBATS Agreement.

In 2007, 35 volunteers participated in the brown long-eared bat roost monitoring and completed 30 individual surveys which amount to approximately 111 hours of surveying (on average 3 ½ hours per survey). In addition one volunteer participated in bat box inspections of the VWT Bat Box Schemes in Garryland.

Data is presented for eighteen brown long-eared roosts and the VWT Bat Box Schemes of Portumna Forest Park and Garryland Woods, County Galway. The eighteen brown long-eared roosts monitored are located across the country in eleven counties. Of the eighteen buildings/structures monitored, twelve (67%) are deemed suitable to continue to monitor as part of an annual monitoring programme.

1. INTRODUCTION

1.1 Why monitor the brown long-eared bat *Plecotus auritus*?

Bats constitute a large proportion of the mammalian biodiversity in Ireland. Ten species of bat are known to occur in Ireland and form almost one third of Ireland's land mammal fauna. Bats are a species rich group widely distributed throughout the range of habitat types in the Irish landscape. Due to their reliance on insect populations, specialist feeding behaviour and habitat requirements, they are considered to be valuable environmental indicators of the wider countryside (Walsh *et al.,* 2001).

Irish bats, including the brown long-eared bat, are protected under Irish and EU legislation. Under the Wildlife Act (1976) and Wildlife (Amendment) Act 2000, it is an offence to intentionally harm a bat or disturb its resting place.

The EU Directive (92/43/EEC) on the Conservation of Natural and Semi-natural Habitats and of Wild Flora and Fauna (The Habitats Directive) lists all Irish bats species, including the brown long-eared bat, in Annex IV while the lesser horseshoe bat *Rhinolophus hipposideros* is also further listed in Annex II. Member states must maintain or restore 'Favourable Conservation Status' of species listed in Annex II, IV and V. Favourable conservation status is defined as 'the sum of the influences acting on the species concerned that may affect long-term distribution and abundance'. Article 11 of the Directive requires 'Member States to undertake surveillance of the conservation status of all bat species.

Ireland is also a signatory to a number of conservation agreements pertaining to bats including the Bern and Bonn Conventions. Under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979), Ireland is a signatory of the European Bats Agreement (EUROBATS). This agreement recognises that endangered migratory species can only be fully protected if their migratory range is protected. Under this agreement, strategies for monitoring bat populations of selected species are part of its Conservation and Management Plan. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, works to conserve all species and their habitats.

To fulfil international obligations under the Convention on Biological Diversity and Agenda 21 agreed in 1992 Local Biodiversity Plans must be devised. The 1992 global agreement requires signatory parties to "identify components of biodiversity … and monitor, through sampling and other techniques, the components of biological diversity identified" (Article 7).

The Irish Red Data Book of vertebrates (Whilde, 1993) lists the populations of all Irish bats species that were known to occur at the time of publication as Internationally Important.

Rates of population change are regularly used as indicators of the conservation status of species e.g. the conservation alerts defined by The British Trust for Ornithology (BTO). The BTO has developed Alert Levels based on IUCN-developed criteria for measured population declines. Species are considered of high conservation priority (i.e. Red Alert) if their population declines by 50% or more over a 25-year period. Species are considered of medium conservation priority (i.e. Amber Alert) if there is a decline of 25-49% over 25 years. A 50% and 25% decline over 25 years translates into an annual decline of 2.73% or 1.14% respectively. Thus if a 1.14% decline rate is observed in less than 25 years, then the species is given Amber Alert status. These

Alerts are based on evidence of declines that have already occurred or can be predicted to occur based on statistically robust monitoring data that is sensitive enough to meet Alert Levels.

Recent EU Habitats Directive Guidelines for assessing conservation status have suggested that a population decline of >1% per annum would constitute a Red Alert decline.

The paucity of information on the present distribution of many of Ireland's resident bat species means that it is difficult to compile any comprehensive review of the current status of bat populations. Until the mid 2000's, detailed population statistics were only available for the lesser horseshoe bat. Since then, monitoring programmes for some of the more common bat species have been piloted and begun.

The Car-based Bat Monitoring Protocol for the Republic of Ireland, in operation since 2003, (Catto & Russ 2004) provides a method of monitoring bat species that utilise habitats along road networks i.e. Leisler's bat *Nyctalus leisleri*, common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *P. pygmaeus*. The All-Ireland Daubenton's Bat Waterway Survey addresses the requirement to monitor the Daubenton's bat *Myotis daubentonii* (Aughney *et al*., 2007). Both of these schemes are managed by Bat Conservation Ireland (BCIreland).

1.2 Brown long-eared bat *Plecotus auritus*: a brief species profile

1.2.1 DISTRIBUTION & BIOLOGY

The brown long-eared bat belongs to the Family Vespertilionidae and is found throughout Europe with a patchy distribution east to Japan (Altringham, 2003). It is widely distributed in Ireland (O'Sullivan, 1994).

Brown long-eared bats cannot be visually confused with other Irish bat species as this medium sized bat has enormous ears measuring 29-41 mm in length. In addition the inner margins of the ears meet in the middle of the forehead and the tragi are long and prominent. At rest, the ears fold into the shape of ram's horns and can be tucked under the wings when sleeping leaving the long slender tragus visible. It has a mass of 6-12g, a wingspan of 230-285mm and a forearm length of 34-42mm. In general, it has light brown to yellow dorsal fur with pale ventral fur. The eyes are proportionally larger compared to those of other Irish bat species and the muzzle is usually bare and pink (Altringham, 2003).

This species is considered by Swift & Racey (1983) to be strongly associated with woodland and it often forages in parkland and urban areas with large tracts of mature trees (Altringham, 2003 and Racey & Speakman, 1996). Roost sites are often close to woodland areas to reduce travel time between sites.

Brown long-eared bats have a low wing-loading (weight/wing area) and medium aspect ratio (A dimensionless measure of wing shape and is calculated by wing span^2/wing area) (Jones, 1993). This means that their short, broad wings allow for slow, manoeuvrable flight suitable for hawking and gleaning insect prey from vegetation (Norberg, 1976). Brown long-eared bats are also adept at hovering (Norberg, 1976).

This species is often known as the 'whispering bat' because its sensitive hearing enables it to locate prey by passive listening (Anderson & Racey, 1993). As a consequence, its echolocation calls are of low intensity (Russ, 1999). Its large eyes also suggest that sight may also be important in locating prey.

Factors potentially affecting the Irish population of brown long-eared bats could include a dramatic decline in the number of moths, equivalent to the decline that has been reported in Britain (Conrad *et al,* 2006). Moths

are the brown long-eared bat's primary prey item (Swift & Racey, 1983). Degradation of foraging habitats (e.g. woodland) could also impact this species' population. Factors that reduce roosts, both summer and hibernation, will also impact on this species (Walsh *et al.,* 2001).

1.2.2 SURVEYING BROWN LONG-EARED BATS

Brown long-eared bats rely heavily on sinanthropic (artificial) roosts (Swift, 1998). The natural summer roosts of this species are generally tree holes. However, artificial roosts such as attic spaces have replaced many natural structures and in some ways may even be more beneficial than natural tree holes. Attics can provide the more stable thermal conditions necessary for maternity roosts while allowing young bats to practice flying safely before leaving the roost. This species is described as a 'fissure rooster' maintaining constant contact with roof beams on both sides. As a result, brown long-eared bats are more frequently found roosting in the apex of the roof, in the angle between the ridge beam and the rafters or at the gable ends between stone walls and wooden beams.

1.2.2.1 Emergence behaviour of brown long-eared bats during summer months

Emergence times differ between species but brown long-eared bats have been recorded emerging only when it is fully dark. Racey & Speakman (1996) reported that the average time for emergence varied between roost sites and that there was a high correlation with distance from the roost to the closest woodland. Brown long-eared bats tend to follow treelines, hedgerows and other linear features when travelling between roosts and foraging habitats and consequently travel greater distances rather than following a more direct route between sites. The main prey items for this species are Lepidopterans and this prey tends to be available later in the night. Therefore, an early emergence is not of great benefit for this species.

In addition, emergence is delayed during inclement weather with rain inhibiting flight (Racey & Speakman, 1996).

1.2.2.2 Feeding behaviour of brown long-eared bats during summer months

The slow flight of brown long-eared bats may limit the distance that this species can travel at night-time. However the manoeuvrability of this species means that it can access cluttered habitats. Racey & Speakman, (1996) reported that 92% of bats within their study area spent most of their time within 1.5km of the roost while the greatest distance flown by an individual (male bat) was 2.8km from the main roost.

1.2.2.3 Echolocation calls and foraging style of brown long-eared bats

Exploitation of insect prey populations and orientation during the darkened hours means that bats rely on vocalisation or echolocation when commuting and foraging. Echolocation calls of a bat species is related to the foraging habitat, the shape of the wings and time of emergence (Russ, 1999). Brown long-eared bats typically produce short duration (2ms) frequency modulated (FM) echolocation calls (2ms) and frequency modulated (FM) sweeping from about 80 to 20 kHz with a prominent second harmonic (Ahlen, 1981). These echolocation calls usually have a low intensity and FM pulses are usually used by bats in cluttered environments. However, the low intensity calls means that the detection of such calls by bat detectors is limited to a distance of approximately 0.7m and the main axis of sound emitted by the bat is directed within approximately 120^{o} of the front of the receiving microphone of the bat detector (Anderson & Racey, 1991). Such low intensity echolocation calls are commonly associated with gleaning species and are considered to be

an evolved counter measure to detection by tympanate moths.

While echolocation is used by insectivorous bats to locate aerial insect prey, the brown log-eared bat demonstrates that it is not the ideal method for gleaning insects off vegetation and other surfaces. Non-flying prey (e.g. spiders), gleaned from vegetation has been found to constitute a large proportion of the brown long-eared's daily intake of food (Rydell, 1989 and Swift & Racey, 1983). Such gleaning relies also on hearing and vision rather than solely on echolocation. Anderson & Racey (1991) suggest that brown long-eared bats locate moths by listening to their fluttering wings which is supported by the fact that this species has very sensitive hearing in the frequency range of 5-15 kHz. The characteristic head movements of brown long-eared bats are associated with listening to such low frequency sounds (Anderson, 1989). Brown long-eared bats are attracted by moving prey items and will often use their tail membranes to scoop insects from the air or use their wings to draw prey in laterally and in both cases transferring the caught prey to the mouth (Anderson & Racey, 1991).

1.2.2.4 Identifying the brown long-eared bat using bat detectors

Much of bat monitoring relies on the use of bat detectors (heterodyne/frequency division/time expansion) to identify the characteristic echolocation call of bat species. Bat detectors are required because the human ear is sensitive to sound frequencies from approximately 40Hz to 20,000Hz (20kHz). As a result, the echolocation calls of bats tend to be outside the human hearing range. Bat detectors convert the echolocation calls of bats into sounds that are audible to humans (Elliott, 1998). The most commonly used bat detector type is the heterodyne bat detector. Other frequently used methods are Frequency Division and Time Expansion.

Heterodyne bat detectors tend to be tuneable so the frequency, to which the detector is set, is subtracted from the incoming frequency. Therefore if the detector is tuned to 50 kHz and the incoming bat call is at 55 kHz then the resultant output sound is at 5 kHz (Elliot, 1998). The main advantage of this type of detector is that the resultant sound has tonal qualities (e.g. clicks and smacks) and allows determination of the pulse repetition rate that, when combined, will aid identification (Russ, 1999). To discriminate fully between certain species, a combination of visual observations in relation to habitat type, bat flight pattern and detector noise output is used.

Brown long-eared bats, echolocation on a heterodyne bat detector is often described as sounding like burning stubble. The actual echolocation call is a very quiet FM call (Russ, 1999). Social calls are occasionally heard as very soft chirps. Due to these quiet calls, this species is often seen before it is heard on the bat detector. Therefore, relying on bat detectors to monitor hunting brown long-eared bats is problematic.

1.2.2.5 Roost monitoring: a tool for surveying brown long-eared bats

Brown long-eared bats show a high degree of roost fidelity and will often use traditional roosts in the long-term (Entwistle *et al,* 2000). This, coupled with the fact that the species roosts within the attics spaces of buildings, provides a potential means of monitoring populations by counting emerging bats at traditional roosts.

However reliance on emergence counts to determine the colony size has proven unsuccessful in the past due to the low level of light at the time of emergence (Entwistle *et al,* 2000) and due to poor detection of echolocation calls on a bat detector. Therefore, buildings need to be assessed to determine the most appropriate method to undertake a reliable count of the colony.

The Bat Conservation Trust (UK) believes that it is feasible to make reliable summer maternity colony counts for this species. The National Bat Monitoring Programme UK has been monitoring brown long-eared bat maternity colonies since 2001 with a total of 117 roosts monitored at least once during 2001-2005.

The BCT considers that the main sources of variability in the counting of emerging bats are:

- the emergence behaviour of bats
- contribution of surveyors and
- survey dates/environmental conditions.

In relation to brown long-eared bats, it is known that not all individuals leave the roost site every night, especially during poor weather conditions. To increase the likelihood of individuals leaving the roost, surveying should be undertaken in fine weather conditions. However, the brown long-eared bat tend to be a difficult species to count while emerging from a roost due to the fact that it often uses multiple exit points, it is difficult to detect by bat detector and that it emerges late after sunset making it more difficult to be observed visually in low light conditions. This species also tends to choose roosting sites with large open voids and such voids often have blow fly, spider and harvestmen populations which brown long-eared will glean from surfaces. The presence of such prey items can often provide enough sustenance for individuals to remain in the roost. Therefore, internal validation of roosting individuals may provide additional information in relation to roosting numbers for this particular species.

2. THE BROWN LONG-EARED BAT *PLECOTUS AURITUS* ROOST MONITORING 2007: AIMS AND METHODS

BCIreland piloted the Brown long-eared Bat *Plecotus auritus* Roost Monitoring in the Republic of Ireland in 2007.

2.1 Aims of report

This report is an essential instrument to present the results gathered by the large number of diligent volunteers who participated in this scheme. In addition, the report will act as a reference source for policy makers in relation to future management of brown long-eared bat populations.

Information collated from the first year of monitoring will provide data on the distribution of this bat species in the sites surveyed. Population trends cannot be determined from one year's data.

2.2 Methods

In order to determine the most feasible approach to monitoring brown long-eared roosts, BCIreland investigated other methods of recording brown long-eared bats to compliment a dusk emergence count of maternity roosts.

Trained volunteers undertook an investigation of the roosts to be monitored using a combination of the following methods:

- Interior daytime count of roost numbers (Method A);
- Exterior dusk emergence count with simultaneous interior roost observation (Method B) and
- Interior, post-emergence count of roost numbers remaining (Method C).

Due to the fact that this species relies heavily on roosts to provide warmth and protection, the characteristics of the roost structure are

important. Studies have shown that this species selects roosts for specific physical characteristics and for their location and surrounding habitat (Swift, 1998). Therefore, as part of the methodology, the following information was also gathered, where possible:

1. Internal dimensions and description of attic space
2. Internal temperatures during roost counts
3. Description and dimensions of exit points

2.3 Volunteer uptake and participation

BCIreland recruited volunteers from county bat groups and volunteers already participating in the All Ireland Daubenton's Bat Waterway Survey. An on-line registration system was also set up on the BCIreland website to facilitate volunteer participation.

3. RESULTS

3.1 Volunteer participation in 2007

A total of 35 volunteers participated in the monitoring programme. The Cork County Bat Group was allocated 4 roosts within the county for monitoring. All other roosts monitored were co-ordinated through BCIreland. Bat detectors and, where possible, night vision equipment was provided for monitoring teams. A minimum of two people were required to monitor a roost but more often, a greater numbers of volunteers were present at individual roosts.

Thirty surveys were completed by BCIreland volunteers, equating to approximately 111 hours of surveying (on average 3 ½ hours per survey). In addition, one volunteer assisted with two bat box scheme inspections in Garryland Woods.

3.2 Roosts monitored in 2007

A total of 18 brown long-eared roosts were monitored in 2007. In addition, data was gathered from the Vincent Wildlife Trust Bat Box Schemes located in Portumna Forest Park and Garryland Woods in Co. Galway.

3.3 Number of completed surveys in 2007

In 2007, 30 individual surveys of eighteen buildings/structures were completed. In addition, one BCIreland volunteer assisted with two bat box inspections in Garryland Woods.

3.4 Case Studies

Data collected from each roost is presented below as an individual case study. Where available, historical records, photographs and schematic diagrams of roosting areas are presented along with results of individual surveys.

Each roost is coded with a four figure number indicating that the monitored sites are part of the Brown long-eared Bat Roost Monitoring Scheme (i.e. all sites begin with the figure 2). All waterway sites surveyed under the All Ireland Daubenton's Bat Waterway Survey sites begin with figure 1 (e.g. Slane Bridge Site Code 1001). Name, addresses, and grid references of roosts are not provided as some of the roosts are private dwellings. Such data will be kept on file on the BCIreland Database but will not be available in the public domain.

3.4.1 Roost A (BCIreland Site Code 2001)

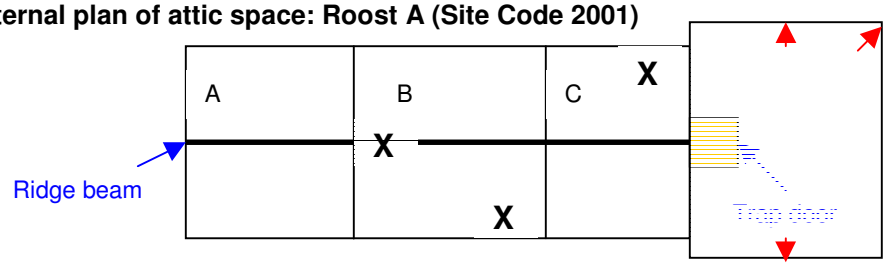
Location:	County Cavan
Building type:	Cathedral, Church of Ireland
Location of roost:	Loft room (3 compartments) accessible via bell tower
Bat access points:	Three points, missing panes of glass in three windows located in bell tower and stairwell.
Historical records:	Building surveyed in October 2005 as part of the Heritage Council's Buildings at Risk Grant during which a large collection of brown long-eared droppings noted within loft room and bell tower. Additional visit made in June 2006 estimated roost size at 25-30 individuals).

Plates 1 & 2: Side view of Roost A (BCIreland Site Code 2001) and adjoining bell tower (Red arrows indicate 2 of the 3 exit points used by roosting brown long-eared bats).

3.4.1.2 Roost Visit

Roost visit was undertaken on 30/5/07. An internal inspection of attic was completed followed by an emergence count (22:00 to 23:15 hrs). Twenty four individuals were counted internally. Two of the three exit points were monitored and only 2 bats were detected exiting. Internal count at 23:30 hrs noted only 2 bats remaining in roost (implying that 20 bats emerge via third and unmonitored exit point). An additional internal count was undertaken on 5/9/07 and 27 brown long-eared bats were recorded. Emergence count was not completed due to poor weather conditions.

Internal plan of attic space: Roost A (Site Code 2001)



X: marks the location of visible bats
Bat droppings scattered throughout the three compartments of loft.
Trap leads into bell tower. **Red arrows** mark exit points.

Building Features
Stone
Mortised joints
Slate roof
Roof felt
Compartments
Bat Evidence
Droppings
Visible bats
Urine staining
Insect remains

3.4.2 Roost B (BCIreland Site Code 2002)

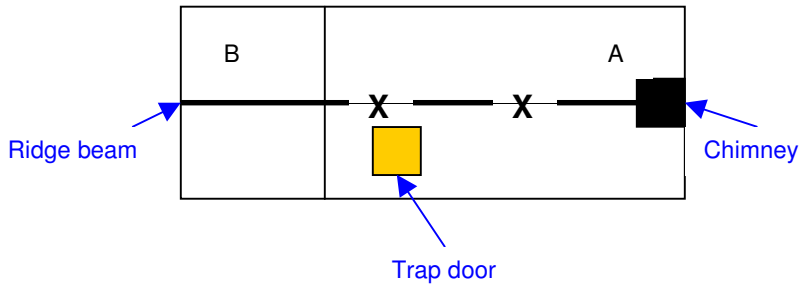
Location:	County Meath
Building type:	Bungalow, private dwelling
Location of roost:	Attic space (2 compartments)
Bat access points:	Gap in lead flashing at base of chimney adjacent to ridge tiles.
Historical records:	Building surveyed in May 2007 by NPWS Conservation Ranger and roost estimated to contain 15-20 individuals. BCIreland was then contacted via Batline in relation to undertaking a roost visit.

Plate 3: Front view of Roost B (BCIreland Site Code 2002) with red arrow indicating exit point and direction of flight lines along hedgerow.

3.4.2.1 Roost Visit

Roost visit was undertaken on 27/6/07. An internal inspection of the attic was completed followed by an emergence count (22:45 to 00:00 hrs). Seventeen individuals were counted internally while a total of 13 individual brown long-eared bats were recorded emerging.

Internal plan of attic space: Roost B (Site Code 2002)



X: marks the location of visible bats
Bat droppings scattered throughout the two compartments of attic

Building Features
Cavity block
Roof felt
Compartments
Chimney breast
Bat Evidence
Bat droppings
Visible Bats

3.4.3 Roost C (BCIreland Site Code 2003)

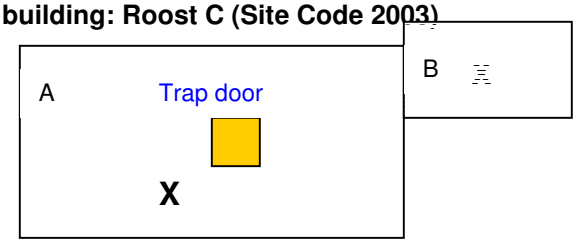
Location:	County Wicklow
Building type:	Historical building
Location of roost:	Loft room (1 compartment)
Bat access points:	Open trap door leading to open doorway and windows (multiple exits).
Historical records:	Building was surveyed by NPWS regional staff of Wicklow Mountains National Park in September 2006 (5 brown long-eared bats recorded). Roost estimated to contain 5-10 individuals.


Plate 4 & 5: Front and side view of Roost C (BCIreland Site Code 2003)

3.4.3.1 Roost visit

Roost visit was undertaken on 31/5/07. An internal inspection of loft room was not completed as loft is inaccessible. An emergence count (20:00 to 23:30 hrs) noted five individual brown long-eared bats exiting.

Internal plan of building: Roost C (Site Code 2003)



X: marks the location of visible bats in ground floor rooms of building during emergence count. Bats not visible in loft room and loft room is not accessible. Bat droppings occasionally recorded on ground floor.

Building Features
Stone
Mortised joints
Compartment
Corballed roof
Bat Evidence
Droppings
Visible bats
Insect remains

3.4.4 Roost D (BCIreland Site Code 2004)

Location:	County Cork
Building type:	Church, Church of Ireland
Location of roost:	Loft room (1 compartment) visible via derelict ceiling
Bat access points:	Three exit points, via missing panes of glass and open doorway
Historical records:	Building known as brown long-eared roost by Cork County Bat Group.


Plates 6 & 7: Side view of Roost D (BCIreland Site Code 2004) and example of exit point used by roosting brown long-eared bats.

3.4.4.1 Roost visit

Roost visit was undertaken on 7/6/07 and 23/7/07. An internal inspection of loft room was not completed as ceiling is unstable. However, prior to emergence, individual bats cluster above the altar in full view allowing an internal count to be completed. An emergence count (22:17 to 23:57 hrs) was undertaken on 7/6/07 by three surveyors while one surveyor remained within the roost to observe clustering bats. A maximum of ten individual brown long-eared bats were recorded clustering above the altar while a total of eighteen bats were recorded emerging. At the end of the emergence survey, two individuals remained in the roost. During roost visit on 23/7/07 only two individuals were recorded clustering above the altar while a maximum of six individuals were detected entering/exiting the church during emergence survey (22:10 to 23:45 hrs).

Internal plan of attic space: Roost D (Site Code 2004)

X: marks the location of visible bats above the altar.
Bat droppings and insect remains scattered below **X** and on ground floor.
Red arrows indicate exit points.

Building Features
Stone
Mortised joints
Compartment
Slate roof
Bat Evidence
Droppings
Visible bats
Insect remains

3.4.5 Roost E (BCIreland Site Code 2005)

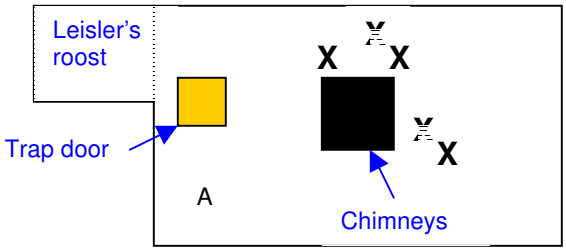
Location:	County Cork
Building type:	Georgian Mansion, private dwelling
Location of roost:	Roof space, large square attic with chimney breasts located centrally.
Bat access points:	Gaps in lead flashing around chimneys.
Historical records:	Building known as a Leisler's bat roost by Cork County Bat Group. Brown long-eared bat droppings recorded during surveys and roost estimated to consist of approximately 30 individuals.

Plate 8: Side view of Roost E (BCIreland Site Code 2005) depicting treelines located within grounds of house.

3.4.5.1 Roost visit

Roost visit was undertaken on 1/7/07 and 2/8/07. An internal inspection of roof space was undertaken during the first roost visit followed by an emergence count (22:20 to 23:50 hrs). A total of 35 individuals were counted internally while only 15 individuals were detected emerging. An emergence counted was completed on the second roost visit and 19 individuals were detected exiting.

Internal plan of attic space: Roost E (Site Code 2005)



X: marks the location of visible bats within roof space.

Bat droppings and insect remains scattered throughout roof space

Building Features
Stone
Roof felt
Compartment
Slate roof
Bat Evidence
Droppings
Visible bats
Insect Remains
Urine staining

3.4.6 Roost F (BCIreland Site Code 2006)

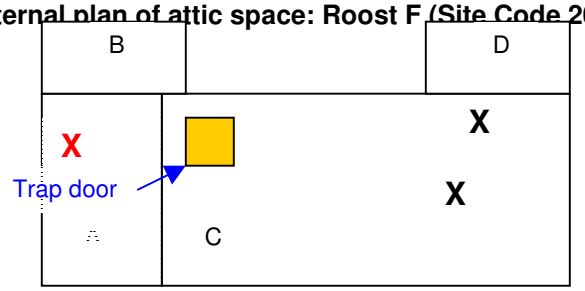
Location:	County Cork
Building type:	Georgian Mansion, private dwelling
Location of roost:	Roof space, large C-shaped attic with spray foam insulation.
Bat access points:	Gaps in lead flashing around chimneys.
Historical records:	Building known as a brown long-eared bat roost by Cork County Bat Group.

Plate 9: View of roof of Roost E (BCIreland Site Code 2005) with **red arrow** depicting possible location of exit point.

3.4.6.1 Roost visit

Roost visit was undertaken on 10/6/07, 2/7/07 and 15/8/07. An internal inspection of roof space was undertaken during the first roost visit followed by an emergence count (22:30 to 23:45 hrs). A total of 6 individuals were counted within the roof space while fifteen individuals were detected emerging. An emergence count was completed on the second (22:40 to 23:30 hrs) and third (21:40 to 22:40 hrs) roost visits and twenty two individuals and zero individuals were detected emerging respectively.

Internal plan of attic space: Roost F (Site Code 2006)



X: marks the location of visible bats within roof space.

X: marks the location of main roost within cavity between walls.

Bat droppings and insect remains scattered throughout attic space

Building Features
Stone
Foam insulation
Compartments
Slate roof
Bat Evidence
Droppings
Visible bats
Insect remains
Urine staining

3.4.7 Roost G (BCIreland Site Code 2007)

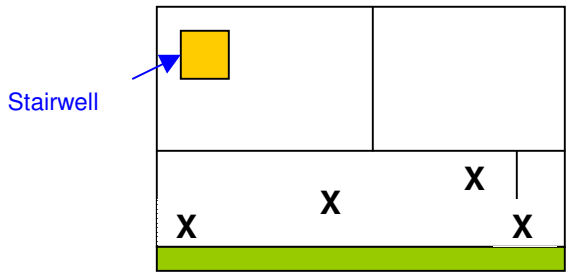
Location:	County Cork
Building type:	Modern building, commercial business
Location of roost:	Basement
Bat access points:	Gaps along steel beam between basement and ground floor
Historical records:	Building known as a brown long-eared bat roost by Cork County Bat Group. Roost estimated to consist of approximately 20 individuals.

Plate 10: Rear view of building and of Roost G (BCIreland Site Code 2007) with **red arrows** depicting location of exit points.

3.4.7.1 Roost visit

Roost visit was undertaken on 7/6/07 and 16/8/07. An internal inspection of the basement was undertaken during the first roost visit followed by an emergence count (22:10 to 23:45 hrs). No bats were visible within the basement during inspection. However fresh bat droppings and urine was recorded. A total of 5 individuals were detected emerging. An emergence counted was completed on the second (22:40 to 23:30 hrs) roost visit and six individuals were detected emerging.

Ground floor plan of basement: Roost G (Site Code 2007)



X: marks the location of bat droppings and urine staining.

Green Block: marks the location of main roost within cavity between walls. Bat droppings were located along the length of the rear wall

Building Features
Concrete block
Slate roof
Bat Evidence
Droppings
Insect Remains
Urine staining

3.4.7.2 Additional Roosts

Both common and soprano pipistrelles were recorded emerging from the roof space during the first survey.

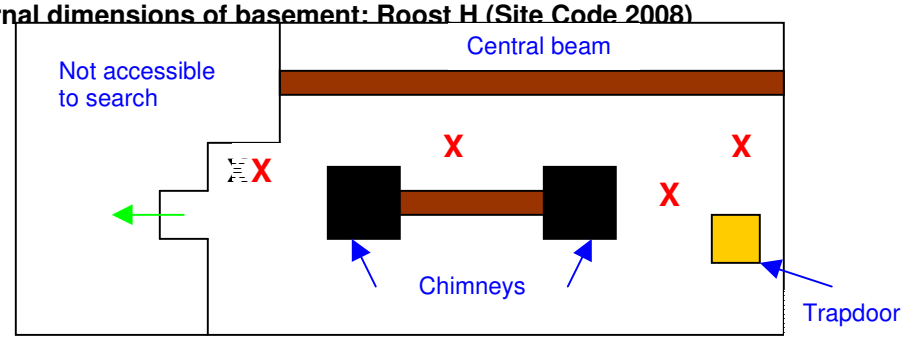
3.4.8 Roost H (BCIreland Site Code 2008)

Location:	County Galway
Building type:	Castle, private dwelling
Location of roost:	Roof space
Bat access points:	Unknown
Historical records:	Building known as a brown long-eared bat roost as a result of EIS surveys. A cluster of bats of approximately 40 individuals was recorded in June 2001.

3.4.8.1 Roost visit

Roost visit was undertaken on 15/6/07 during which an internal inspection of the roof space was carried out. One bat was visible flying within the roof space but this individual flew into an inaccessible section, which prevented further observation. Fresh bat droppings were recorded and a total of four corpses were collected. An emergence count was not completed due to the complex roof structure and size of the building.

Internal dimensions of basement: Roost H (Site Code 2008)



X: marks the location of bat cluster recorded in 2001.
Green arrow: flight path of brown long-eared bat recorded during roost visit
X: marks the location of bat droppings and corpses recorded during roost visit

Building Features
Stone
Slate roof
Mortised joints
Compartments
Bat Evidence
Droppings
Insect remains
Urine staining
Visible bat
Corpses

3.4.8.2 Additional Roosts

Building has been recorded as a soprano pipistrelle (at least 50 individuals) and lesser horseshoe roost hibernation roost (medieval tower). In addition, a Leisler's maternity roost (at least 30 individuals) and numerous lesser horseshoe night roosts are located in additional buildings within the estate grounds.

3.4.9 Roost I (BCIreland Site Code 2009)

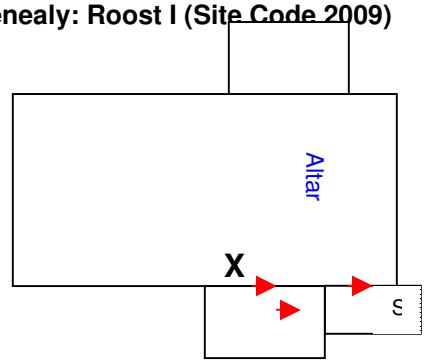
Location:	County Wicklow
Building type:	Church, Roman Catholic
Location of roost:	Roof space
Bat access points:	Unknown
Historical records:	Building known as a brown long-eared bat roost by NPWS regional staff.

3.4.9.1 Roost visit

Roost visit was undertaken on 6/7/07. An internal inspection of the roof space was not carried out as it was inaccessible. An emergence counted (22:08 to 23:50 hrs) was completed and a total of twenty brown long-eared bats were recorded emerging from the gutter/drain pipe section of the roof over the sacristy. At least three bats were visible in the church where the southern transept joined the main body of the building. These then flew around within the main body of the church itself.

Internal plan of Church, Glenealy: Roost I (Site Code 2009)

X: marks the location of visible bats above the transept.
S: marks sacristy.
Red arrows indicate exit points.



Building Features
Stone
Mortised joints
Compartment
Slate roof
Bat Evidence
Droppings
Visible bats
Insect remains

Plate 11: Brown long-eared bats roosting in rafters

Plate 12: insect remains typically discarded by brown long-eared bats

3.4.10 Roost J (BCIreland Site Code 2010)

Location:	County Dublin
Building type:	Mansion
Location of roost:	Roof space
Bat access points:	Unknown
Historical records:	Building known as a brown long-eared bat roost by BCIreland. Roost estimated to consist of approximately 30 individuals.


Plates 13 & 14: Front and rear views of Roost J (BCIreland Site Code 2010) with **red arrow** depicting typical emergence flight path.

3.4.10.1 Roost visit

Roost visit was undertaken on 26/6/07 and 12/7/07. An internal inspection of the roof space was not completed. During the former an emergence counted (22:45 to 23:55 hrs) was completed by seven volunteers to determine the flight lines of emerging brown long-eared bats and a total of thirty-four individuals were recorded emerging from the general vicinity of the red arrow in Plate 12. During the latter, an emergence count (22:25 to 23:25 hrs) was undertaken with surveyors located to the rear of the building. Fifteen brown long-eared bats were recorded exiting during this visit.

3.4.11 Roost K (BCIreland Site Code 2011)

Location:	County Galway
Building type:	2-storey farm house, private dwelling
Location of roost:	Roof space
Bat access points:	Facia board
Historical records:	Building known as a brown long-eared bat roost by BCIreland. Approximately 20 individuals counted in 2006.

3.4.11.1 Roost visit

An internal inspection of the roof space was undertaken and no bats were recorded within. An emergence count was completed and zero bats were detected emerging. Recent roof repairs may have disturbed the roost in 2007. A single bat was recorded hibernating behind facia board in September 2007. Monitoring will continue to determine whether bats return.

3.4.12 Roost L (BCIreland Site Code 2012)

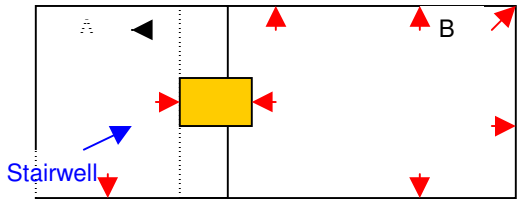
Location:	County Galway
Building type:	Medieval Tower/Castle
Location of roost:	Wattle roof of 1st and 2nd floors
Bat access points:	Open windows (multiple exits)
Historical records:	Building known as a brown long-eared bat roost by BCIreland as a result of EIS surveys. Roost counted on numerous dates in 2005/06 where approximately 30 individuals were counted.

Plate 15: View of Roost L (BCIreland Site Code 2012) and adjacent scrub habitat.

3.4.12.1 Roost visit

Roost visit was undertaken on 15/6/07 and 25/7/07. During the first survey date, an internal inspection of the castle was undertaken followed by an emergence count (22:15 to 23:56 hrs). A total of 12 individuals were counted within the 1st floor room while 19 individuals were recorded within the 2nd floor area. An emergence count was not completed due to poor weather conditions and from past experience, this roost is best observed as bats emerge from wattle ceiling and before leaving the structure due to large number of potential exit points. During second visit, a total of 14 bats were counted (3 in 1st floor room and 11 in 2nd floor room).

Internal plan of castle rooms: Roost L (Site Code 20



Bat droppings and insect remains scattered throughout floors of both rooms.

Bats emerge from wattle ceilings and hang prior to leaving the castle.

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Red Arrows: exit points

Building Features
Stone
2 rooms
Wattle ceiling
Bat Evidence
Droppings
Visible bats
Insect remains

3.4.13 Roost M (BCIreland Site Code 2013)

Location:	County Kilkenny
Building type:	Church, Church of Ireland
Location of roost:	Roof space
Bat access points:	Bell tower (3 exits)
Historical records:	Building known as a brown long-eared bat roost by BCIreland.


Plates 16 & 17: Front and rear views of Roost M (BCIreland Site Code 2013).

3.4.13.1 Roost visit

Roost visit was undertaken on 26/7/07. An internal inspection of the roof space was not undertaken but droppings were recorded within the church. An emergence count (22:00 to 23:00 hrs) was undertaken and a total of 48 individuals were counted emerging from the bell tower points).

3.4.14 Roost N (BCIreland Site Code 2014)

Location:	County Wexford
Building type:	Church, Church of Ireland
Location of roost:	Roof space
Bat access points:	Bell Tower (4 exits)
Historical records:	Building known as a brown long-eared roost bat by BCIreland.

3.4.14.1 Roost visit

Roost visit was undertaken on 9/8/07. An internal inspection of the roof space was not undertaken due to it being inaccessible. An emergence count (21:00 to 22:00 hrs) was undertaken and a total of 30 individuals were counted emerging from the bell tower.

Plate 18: Front view of Roost N (BCIreland Site Code 2014).

3.4.15 Roost O (BCIreland Site Code 2015)

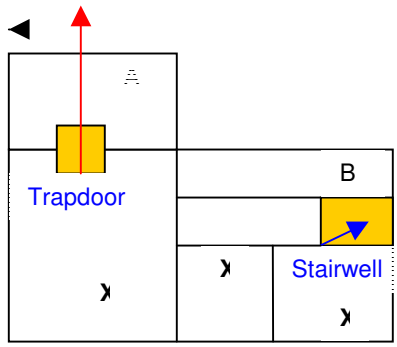
Location:	County Mayo
Building type:	Georgian mansion, private dwelling
Location of roost:	Roof space
Bat access points:	Tower extension
Historical records:	Building surveyed in October 2005 for the Heritage Council's Buildings at Risk Grant Scheme during which a large collection of droppings were noted in the attic while two individual bats were visible within rafters.

Plates 19 & 20: Front and side views of Roost O (BCIreland Site Code 2015). Red Arrow indicates exit point – windows on tower extension.

3.4.15.1 Roost visit

Roost visit was undertaken on 6/7/07. An internal inspection of the roof space was undertaken and large accumulations of brown long-eared bat droppings were recorded. However, no bats were visible. An emergence count was not undertaken as previous work has shown that emergence count is very difficult to complete with this site.

Internal plan of castle rooms: Roost O (Site Code 2015)



Bat droppings and insect remains scattered (**X**) throughout floors of Attic B (this section is comprised of a series of open rooms and cupboards) .

No floor in Tower (Attic A) to inspect.

Building Features
Stone
2 attics
Slate
Roof felt
Bat Evidence
Droppings
Insect remains

3.4.16 Roost P (BCIreland Site Code 2016)

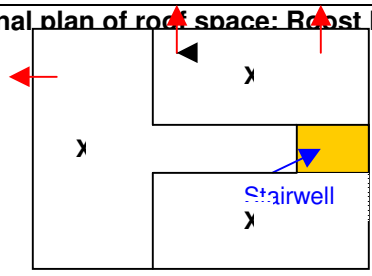
Location:	County Limerick
Building type:	Georgian mansion, private dwelling
Location of roost:	Roof space and basement
Bat access points:	Open windows
Historical records:	Building surveyed in 2007 for the Heritage Council's Buildings at Risk Grant and known to BCIreland as brown long-eared roost.


Plates 21 & 22: Front and side views of Roost O (BCIreland Site Code 2015). Red Arrow indicates exit point – windows on tower extension.

3.4.16.1 Roost visit

Roost visit was undertaken on 22/10/07. A full internal inspection of the roof space was not undertaken due to unstable flooring. However, a scattering of droppings was present. An inspection of loft rooms recorded brown long-eared bat droppings throughout the loft. An internal emergence count (18:45 to 22:30 hrs) was undertaken due to poor weather conditions. At 21:30 hrs, a total of ten individuals were recorded within the loft rooms hanging in rafters. In addition, one individual was roosting in basement.

Internal plan of roof space: Roost P (Site Code 2016)



Bat droppings and insect remains scattered (**X**) throughout floors of attic.

Red Arrows: exit points via open windows.

Building Features
Stone
Attic & loft rooms
Slate
Roof purging
Bat Evidence
Droppings
Insect remains
Visible bats

3.4.16.2 Additional Roosts

Soprano pipistrelles, lesser horseshoe bats and *Myotis* species were also recorded roosting within this building.

Plate 19: Brown long-eared bat roosting in stone crevice above door frame in basement

3.4.17 Roost Q (BCIreland Site Code 2017)

Location:	County Sligo
Building type:	Georgian mansion, commercial
Location of roost:	Roof space and basement
Bat access points:	Open windows
Historical records:	Building known as a brown long-eared roost to BCIreland.

Plate 23: Front and side view of Roost Q (BCIreland Site Code 2017).

3.4.17.1 Roost visit

Roost visit was undertaken on 21/10/07. A full internal inspection of the roof space was not undertaken due to unstable flooring. However, a scattering of droppings was present and five individual brown long-eared bats were recorded hanging from the rafters. An emergence count (18:30 to 22:30 hrs) recorded only two individuals emerging due to poor weather conditions.

3.4.18 Roost R (BCIreland Site Code 2018)

Location:	County Dublin
Building type:	Old college building
Location of roost:	Attic space
Bat access points:	Unknown
Historical records:	Building known as a brown long-eared roost to BCIreland.

3.4.18.1 Roost visit

Roost visit was undertaken on four dates. An internal inspection of the roof space was undertaken on the dates 11/6/07, 20/7/07, 25/7/07 and 9/10/07 and the following numbers of bats were counted, respectively, 11 individuals, 12 individuals, 18 individuals and 12 individuals. An emergence count was undertaken on the 11/6/07 but due to the height of the building, this proved impossible.

Plate 24: Photograph of roosting brown long-eared bats

3.4.19 VWT Bat Box Schemes

In 1998 the Vincent Wildlife Trust (VWT) set up a bat box scheme as a means to investigate if the barbastelle bat *Barbastella barbastellus* occurred in Ireland. This distinctive bat prefers wooded countryside. Consequently, bat boxes were erected in two wooded areas: Portumna Forest Park and Garryland Woods - both in County Galway. In Portumna, 62 bat boxes (30 x 1FF, 30 x 2FN and 2 x hibernation – all *Schwegler* woodcrete designs) were erected in 3 locations. In Garryland 48 2FN bat boxes are erected on 24 mature trees. These two bat box schemes are inspected 3 to 4 times annually between the months of April and October. Bats residing in the boxes are not removed but visually identified and counted with minimum disturbance.

Over the years of monitoring, Leisler's, pipistrelle, Daubenton's, and brown long-eared bats have been recorded using the boxes. In 2007, the number of brown long-eared bats was submitted for inclusion as part of this study. In Portumna, the number of brown long-eared bats recorded ranged from 30 individuals in April (in 2 boxes) to 65 individuals in July (in four boxes). In Garryland, the maximum number of brown long-eared bats recorded was 13 individuals in one box in May. Data collated from the schemes in 2007 are presented in Table 1 below.

Table 1: Portumna and Garryland Bat Box Schemes, 2007 results.

Inspection Date	**No. of bats**	**No. of boxes**	**Inspection Date**	**No. of bats**	**No. of boxes**
Portumna Forest Park			***Garryland Woods***		
April 2007	30	2	April 2007	1	1
July 2007	65	4	May 2007	13	1
September 2007	42	3	July 2007	2	2
October 2007	46	4	September 2007	0	0

3.5 Summary of Results

3.5.1 Timing of surveys in 2007

Maternity colonies tend to be established by the month of May. Therefore, roosts counts of building/structure were undertaken from May onwards. Depending on the type of building/structure, this bat species may occupy roosts during the autumn and winter months. However, the number of bats remaining in the building/structure after the maternity season is completed, tends to be a more reduced number compared to numbers present during the maternity season. In relation to the eighteen buildings/structures surveyed, the majority of surveys were undertaken in June (n=8) and July (n=11) 2007 (see Table 2 below). Both bat box schemes were inspected on four occasions over the course of the field season (April to October).

Table 2: Timing of brown long-eared surveys completed in 2007

Roost Code	Month of Surveying (April to October) A	M	J	J	A	S	O
2001		Y				Y	
2002			Y				
2003		Y					
2004			Y	Y			
2005				Y	Y		
2006			Y	Y	Y		
2007			Y		Y		
2008			Y				
2009				Y			
2010			Y	Y			
2011			Y	Y			
2012				Y		Y	
2013				Y			
2014					Y		
2015				Y			
2016							Y
2017							Y
2018			Y	Y(2)			Y
Bat Box A	Y			Y		Y	Y
Bat Box B	Y	Y		Y		Y	

Bat Box A: Portumna Bat Box Scheme
Bat Box B: Garryland Bat Box Scheme

Due to poor weather conditions and seasonal constraints, nine roosts were only visited once in 2007. Other roosts (n=3) scheduled for investigation were not visited also due to poor weather conditions on scheduled survey nights.

3.5.2 Number of brown long-eared bats recorded at individual roosts

The total number of individuals counted during completed surveys is present in Table 3 below. The number of bats counted in buildings/structures ranged from 0 to 48 individuals. In Portumna Bat Box Scheme, the maximum number of brown long-eared bats recorded was 65 individuals in July. In Garryland Bat Box Scheme, the maximum number of brown long-eared bats recorded was 13 individuals.

Table 3: The maximum number of brown long-eared bats counted during completed surveys at individual roosts monitored in 2007.

Roost Code	Month of Surveying (April to October) A	M	J	J	A	S	O
2001		24				27	
2002			17				
2003		5					
2004			18	6			
2005				35	19		
2006			15	22	0		
2007			5		6		
2008			1				
2009				20			
2010			34	15			
2011			0			1	
2012			31	14			
2013				48			
2014					30		
2015				0			
2016							11
2017							5
2018			11	12/18			12
Bat Box A	30			65		42	46
Bat Box B	1	13		2		0	

Bat Box A: Portumna Bat Box Scheme
Bat Box B: Garryland Bat Box Scheme

3.5.3 Number of volunteers enlisted for surveys of individual roosts

The number of volunteers enlisted per roost varied greatly, depending upon the number of potential exit points. For many of the roosts investigated, information on exit points was unknown prior to 2007 monitoring. Therefore, a larger number of volunteers participated at some roosts in order to gather such information. In general for safety reasons, emergence counts were undertaken by a minimum of two people. Internal inspections were often undertaken by one licensed bat worker.

Table 4: Total number of volunteers that participated during each completed survey at individual roosts monitored in 2007.

Roost Code	Month of Surveying (April to October) A	M	J	J	A	S	O
2001		2				2	
2002			2				
2003		4					
2004			3	5			
2005				4	4		
2006			6	5	5		
2007			4		3		
2008			1				
2009				4			
2010			6	4			
2011			1			1	
2012			4		4		
2013				2			
2014					2		
2015				1			
2016							2
2017							2
2018			2	1/1			1
Bat Box A	2			2		2	2
Bat Box B	2	2		2		2	

Bat Box A: Portumna Bat Box Scheme
Bat Box B: Garryland Bat Box Scheme

3.5.4 Survey strategies

Useful data on roost counting strategies was collected during the pilot study. For each individual roost, the most suitable method of monitoring was determined from the data collected and presented in the table below (Table 1). For those roosts where more than one method is suitable, the method indicated in 'Bold' is deemed as the most suitable method to follow for future monitoring.

Five (28%) of the buildings/structures monitored was successfully monitored by day-time internal counts while 8 (44%) were monitored successfully by emergence counts. Four (22%) roosts were successfully monitored by internal counts during emergence or post-emergence. Overall, 12 (67%) of the buildings/structures were deemed suitable for monitoring purposes.

Table 5: Monitoring methods recommended for listed brown long-eared roosts.

Roost Code	Recommended Method A	B	C
2001	Yes	Difficult	No
2002	**Yes**	Yes	Yes
2003	No	Difficult	No
2004	No	Yes	**Yes**
2005	**Yes**	Yes	No
2006	No	Yes	No
2007	No	No	No
2008	No	No	No
2009	No	Yes	No
2010	*	Yes	*
2011	*	*	*
2012	No	No	Yes
2013	No	Yes	No
2014	No	Yes	No
2015	No	No	No
2016	No	*	Yes
2017	No	No	No
2018	Yes	No	*
Bat Boxes	Yes	No	No

Method A: Daytime internal count
Method B: Dusk emergence count
Method C: Emergence/Post-emergence internal count
** Will require further investigation*

4. DISCUSSION

In 2007, eighteen buildings and known brown long-eared roosts were investigated as roosts suitable for monitoring. Twelve (67%) brown long-eared roosts monitored in 2007 are deemed suitable for future monitoring by trained volunteers. To successfully monitor certain roosts by Dusk Emergence Counts (Method B), night-vision equipment is recommended (e.g. Roost Code 2006). In addition, red-filter flash lights were also considered by volunteers to be useful for Dusk Emergence Counts and for use within attic/roof spaces during internal counts. Training and equipment is essential for volunteers to allow them to confidently survey roosts.

The Bat Conservation Trust (UK) considered that it is feasible to make reliable summer maternity colony counts for this species. The National Bat Monitoring Programme UK has been monitoring brown long-eared bat maternity colonies since 2001 with a total of 117 roosts monitored at least once during 2001-2005. BCIreland sought advice about the monitoring of roosts and number required to monitor on a yearly basis. A minimum of 30 roosts are required per year to undertake statistical analysis (Steve Langton *pers comm.*). Considering the large survey effort required to locate and to investigate suitable brown long-eared roosts and considering that only 67% of roosts investigated in 2007 were deemed suitable for monitoring, a total of 25-30 roosts should be investigated per year. Therefore, after a three year period, potential 50-60 roosts will be identified for monitoring. However, the roosts investigate in 2007 were known as potentially good candidate roosts and therefore the rate of identifying suitable roosts maybe lower in future years.

BCIreland recommends collating a total 50 suitable roosts for monitoring. From this pool of suitable roosts, a minimum 30 roosts should be monitored per year by a minimum of two roosts counts. Timing of survey should be one count pre-birth of the young (May to Mid-June) and one count post-birth of the young (mid-July-September). The majority of surveys were undertaken in June and July of 2007 and these counts tended to yield the higher number of individuals in the roost. However, there is great variation in the number of individuals counted for individual roosts. Therefore, this requires further investigation but, in general, roosts counts should be undertaken during the months of May to September.

Data from the two bat box schemes have been collected since 1998 and it is considered that longevity of *Schwegler* woodcrete bat boxes (approximately 25 years) means that local bat populations utilise such spaces as part of their annual cycle. It is also considered that large number of brown long-eared bats in a single box during the summer months represents a maternity colony (*pers comm.* Dr Kate McAney). Indeed, during bat box inspections of bat boxes in Garryland in April 2007, a colony of 50+ individuals of soprano pipistrelle bats (including one baby) and a colony of 20+ individuals of Daubenton's bats were also recorded in two bat boxes.

Plate 24: Daubenton's bats roosting in a 2FN *Schwegler* woodcrete bat box in Garryland Woods, Co. Galway. April 2007.

Therefore, these bat boxes are established brown long-eared roosts and represent examples of alternative roosting sites for this bat and suitable to be included in the Brown Long-eared Bat Roost Monitoring Scheme. Therefore, VWT should be approached to determine whether annual data can be included in the monitoring scheme and other established bat box schemes should be investigated especially those located close to known brown long-eared roosts.

5. RECOMMENDATIONS

Recommendation 1 Continue to survey those brown long-eared bat roosts identified in 2007 as suitable for monitoring using specified methodology.

Recommendation 2 Provide a 3-year monitoring proposal to identify 50 brown long-eared roosts suitable for monitoring by 2010 and such a monitoring programme should incorporate Recommendations 3-10.

Recommendation 3 To boost the number of sites, brown long-eared roosts identified in the 1980's NPWS Surveys (O'Sullivan 1994) should be re-surveyed to determine whether they are still in use and additional brown long-eared roost records on the BCIreland Database should be investigated. Roosts suitable for monitoring should be included in the monitoring scheme.

Recommendation 4 BCIreland shall aim to survey a minimum of 25-30 roosts per year over the next three years (i.e. 2008, 2009 and 2010), but the exact counting methodology will be based on the results of individual site investigations.

Recommendation 5 A minimum of two counts per year shall be carried out in each roost (pre- and post-birth during the months of May to September).

Recommendation 6 BCIreland shall provide training and equipment for volunteers, and co-ordinate with volunteers.

Recommendation 7 BCIreland shall manage the data gathered and undertake a risk assessment of all roosts proposed for investigation and/or monitoring during the 3-year programme.

Recommendation 9 BCIreland shall consider the invesitagtion of other bat box schemes for inclusion in monitoring programmes.

Recommendation 10 All data collated will be entered onto the BCIreland Database for inclusion in the BCIreland BATLAS 2010 programme.

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APPENDIX A: Data Recording Sheets

SHEET 1 Brown long-eared Data Sheet: Internal Examination of Roost

Grid reference of site:	Surveyor's name:
Roost name:	Surveyor's address:
Roost address:	Tel. no.: Email:
Roost owner/manager details:	Approx. age of building: Type of building:
Date of visit:	Roost temperature (indicating time):

Draw internal dimensions of roof space

Features	Tick
Brick	
Cavity block	
Stone	
Rubble fill	
Mortise joints	
Roof felt	
Compartments	
Chimney breast	
Sarking boards	

Notes

Characteristics	Tick	Details (mark on drawings where possible)
Droppings		
Urine staining		
Scratch marks		
Visible bats		Bats roosting individually or clustering?
Corpses		
Light gaps		
Insect remains		
Other		

SHEET 2 **Brown long-eared Data Sheet: External Examination of Roost**

Grid reference of site:	Surveyor's name:
Roost name:	Surveyor's address:
Date of visit:	Tel. no.: Email:

Draw roost building indicating exit points	**Exits**	**Facing**
	Notes	

Characteristics	**Tick**	**Details (mark on drawings where possible)**
Droppings		
Urine staining		

Habitat and Flyways within 500m radius of roost

Habitat	**% / m**	**Description**
Semi-natural woodland		
Semi-natural grassland		
Conifer plantations		
Mixed woodlands		
Linear woodland/scrub		
Scrub/transitional woodland		
Lakes/ponds/watercourse		
Buildings		
Other		
Linear features (stonewalls etc.)		

Notes

SHEET 3 **Brown long-eared Data Sheet: Emergence Count**

Grid reference of site:				Surveyor's name:		
Roost name:				Surveyor's address:		
Date of visit:				Tel. no.: Email:		
Cloud (circle one)	Clear (0-1/3) Patchy (1/3-2/3) Full (3/3)	**Wind** (circle one)	Calm Light Breezy	**Rain** (circle one)	Dry Drizzle Light rain	**Temp (°C)** (external) Start: Finish:

Internal Counts			**External Emergence Counts**	
30 mins before sunset Time:			**30 mins after sunset**	
Temp (°C)	**No. of bats**		**Start Time:**	**Finish Time:**
20 mins after sunset			**No. of exits:**	
Temp (°C)	**Start time:**		**No. of bats emerging at each exit monitored**	

Interval	**No. of bats exiting**	**No. of bats in roost**	**Exit 1**	
0-10 min			**Exit 2**	
11-20 min			**Exit 3**	
21-30 min			**Exit 4**	
31-40 min			Notes	
41-50 min				
51-60 min				
61-70 min				
71-80 min				
81-90 min				
91-100 min				
Temp (°C)	**Finish time:**		**Final Internal Count:**	

SHEET 4 **Brown long-eared Data Sheet: Emergence Count**

Grid reference of site:				Surveyor's name:		
Roost name:				Surveyor's address:		
Date of visit:				Tel. no.: Email:		
Cloud (circle one)	Clear (0-1/3) Patchy (1/3-2/3) Full (3/3)	**Wind** (circle one)	Calm Light Breezy	**Rain** (circle one)	Dry Drizzle Light rain	**Temp (°C)** (external) Start: Finish:

20 mins after sunset		
Temp (°C)		**Start time:**
Interval	**No. of bats exiting**	**Comments**
0-10 min		
11-20 min		
21-30 min		
31-40 min		
41-50 min		
51-60 min		
61-70 min		
71-80 min		
81-90 min		
91-100 min		
Temp (°C)		**Finish time:**

APPENDIX B: Buildings/structures monitored in 2007

Roost	County	Roost Code	Recommended Method		
			A	B	C
A	Cavan	2001	Yes	Difficult	No
B	Meath	2002	**Yes**	Yes	Yes
C	Wicklow	2003	No	Difficult	No
D	Cork	2004	No	Yes	**Yes**
E	Cork	2005	**Yes**	Yes	No
F	Cork	2006	No	Yes	No
G	Cork	2007	No	No	No
H	Galway	2008	No	No	No
I	Wicklow	2009	No	Yes	No
J	Dublin	2010	*	Yes	*
K	Galway	2011	*	*	*
L	Galway	2012	No	No	Yes
M	Kilkenny	2013	No	Yes	No
N	Wexford	2014	No	Yes	No
O	Mayo	2015	No	No	No
P	Limerick	2016	No	*	Yes
Q	Sligo	2017	No	No	No
R	Dublin	2018	?	?	?
	Galway	Bat Box	Yes	No	No

Method A: Daytime internal count
Method B: Dusk emergence count
Method C: Emergence/Post-emergence internal count

** Will require further investigation*