A conservation plan for Irish vesper bats

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A conservation plan for Irish vesper bats

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Summary

- The way to realize bat conservation is four-fold, education, research, monitoring and site protection.

- A major educational programme is needed in order to increase public awareness about bats, because this group of animals still suffer from a negative image and remain surrounded by myth and superstition. A well-informed general public is desirable at any time, but in the event of a health issue arising in the future, it becomes a basic necessity. The most important elements of an educational programme are the production of attractive, varied and targeted material, the widespread and well-placed distribution of this, and the availability of a body of trained people, from both the professional and voluntary sectors, to deal with the interest that will follow.

- Because there is a limit to the human resources that can be devoted to bat conservation at present, the existing avenues that offer potential for promoting bat awareness need to be fully explored, and this could best be achieved by having a full-time bat officer, preferably based with BCIreland, for at least a three-year period. This person would liase with all the parties that currently have a role to play, including the NPWS, the Heritage Council and Heritage Officers, Biodiversity Officers, local authority planners, the building industry, the farming and forestry sectors and the media. Increasing the public profile of bats will hopefully encourage the development of a voluntary sector that will assist with bat conservation at a local level.

- Practical support is needed for householders with bats in their homes, ranging from information, advice, a house call, the provision of a water tank cover, up to providing alternative roosts when exclusion is absolutely necessary. Field trials are needed here of the heated bat houses being tested in Scotland.

- Gaps exist in our knowledge of the basic roosting and foraging needs of several Irish species, and these are currently making their monitoring impossible. Research is needed on whiskered/Brandt's and Natterer's bats. Other important areas that need to be addressed are the extent and impact of the use of timber treatment chemicals and antiparasitic drugs.

- Existing data on roosts of a number of species need to be reviewed in order to select sites worthy of NHA designation. Management agreements are considered a feasible means of protecting important colonies using occupied houses while full NHA designation is appropriate for other structures, as well as for suitable habitat in the vicinity of key roosts.

- Monitoring needs to be extended to all species and suggestions are made as to the most appropriate methods to be used. The work of bat monitoring needs to be given the same degree of priority extended in the past to other fauna, in that it is recognised as a long term exercise, that surveyors are adequately trained, and that data collected are processed and reports made available.

- There is currently adequate information available to address the loss of roosting sites in bridges. Local authorities should supply the NPWS with details of bridges scheduled for repair/maintenance work, so that these can be surveyed for bats and provision made to retain any bat roosting site.

1. Introduction

The first two-day meeting in Ireland devoted totally to bat issues took place in 1997, when up to 60 people gathered in the Burren to listen to nine oral papers, attend two workshops and go on a dusk bat detector walk. A number of biannual conferences have taken place since then, which have helped to keep bat conservation a current concern. In Galway in 2005, over 200 delegates from 30 countries attended the five-day Xth European Research Symposium, which had been preceded by a field craft workshop in Killarney, attended by 30 people from 12 countries.

The commissioning of this report comes at a time when our knowledge of the number of bat species occurring in Ireland has increased, as has the legal requirements for their protection. Although the work of bat conservation has not kept pace, partly because it has a very broad remit, there has probably never been a better time to build on what has been achieved and to take advantage of the opportunities that now exist to promote bats. This report was asked to focus on all Irish bats species, with the exception of the lesser horseshoe bat (*Rhinolophus hipposideros)*, in four ways: by describing the current state of knowledge for each species; by recommending suitable site based conservation measures for them; by advising on the most appropriate monitoring methodologies for them, and by making recommendations for the furtherance of public understanding and appreciation of bats. There are as many other important headings under which bat conservation could be discussed, but this report has essentially remained focussed on the four issues specified.

2. Species Descriptions

2.1 Introduction

There are currently nine vesper or evening bats in Ireland. These bats lack the complex nose-leaf that characterises the horseshoe bats, of which Ireland has one species, the lesser horseshoe (*Rhinolophus hipposideros).* All the vespertilionid bats have a tragus and are distributed throughout the country. Although maternity roosts of Nathusius' pipistrelle have so far only been confirmed in Northern Ireland, it is expected that these will be found in due course in the Republic, because its distinctive echolocation call has been recorded in several locations. It is now generally accepted that Brandt's bat occurs in Ireland, on the basis of identifications that have been made of hand-held specimens. DNA samples have been taken from bats caught in Wicklow and Kerry and it is hoped that these will confirm the field observations.

The whiskered and Natterer's bats are listed as '*Threatened in Ireland'*, while the other species are listed as '*Internationally Important'* in the Irish Red Data Book 2: Vertebrates (Whilde, 1993). The population status of both the whiskered and Natterer's bats was considered '*indeterminate'* because of the small numbers known of each, a few hundred and approximately a thousand respectively. Ireland is considered to be an international stronghold for Leisler's bat, whose global status is described as being at 'low risk, near threatened' (LR; nt) by the IUCN (Hutson, *et al.,* 2001). Near threatened status is applied to those taxa that are close to being listed as vulnerable (facing a high risk of extinction in the wild in the medium-term future on the basis of a range of criteria defined by the IUCN). Table 2.1 summarises the protection given to bats by national and international legislation and conventions.

This chapter provides an introduction to the nine vesper bats in Ireland, based primarily on data collected in Ireland. The descriptions of the common and soprano pipistrelles have been merged, as much of the data refer to the time before these bats were known to be separate species. Information on Brandt's bat has been included, but has been merged with that for the whiskered bat, because of their similarities. Table 2.2 summaries some of the main characteristics of the nine species. The wingspan measurements used are taken from '*A Guide to British Bats',* a laminated identification guide produced by the Field Studies Council and the Mammal Society (www.field-studies-council.org. & www.mammal.org.uk), and other biometric data used from Greenaway & Hutson (1990).

Legislation/Convention	Relevance to Irish vesper bats
Irish Wildlife Act (1976) & Irish Wildlife (Amendment) Act 2000.	It is an offence to wilfully interfere with or destroy the breeding or resting place of bats, (with some exemptions for certain kinds of construction development). Provides for the creation of NHAs.
EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Directive 92/43/EEC), commonly known as the 'Habitats Directive'.	Lists all the vesper bats in Annex IV as in need of strict protection and also encourages Member States to conserve landscape features such as river corridors, field boundaries, ponds and woodlands. It also requests that Member States establish a system to monitor the incidental capture and killing of the animals listed in Annex IV.
The Convention on the Conservation of European Wildlife and Natural Habitats, commonly known as the 'Berne Convention'.	It obliges states to protect and conserve animals and their habitats, especially those listed as endangered or vulnerable. Also obliges parties to promote national policies for the conservation of wild fauna and natural habitats.
The Convention on the Conservation of Migratory Species of Wild Animals, commonly known as the 'Bonn Convention'.	This led to the European Bats Agreement (EUROBATS), which lists a wide range of objectives, including promoting research programmes relating to the conservation and management of bats, promoting bat conservation and public awareness of bats, and identifying and protecting important feeding areas of bats from damage and disturbance.

Table 2.1. *Legislative protection for bats.*

2.2 Common pipistrelle *Pipistrellus pipistrellus* (Schreber, 1774) & Soprano pipistrellus *Pipistrellus pygmaeus* (Leach, 1825)

Introduction

There are three resident pipistrelle species in Ireland. The discovery that the species formerly known as the pipistrelle (*Pipistrellus pipistrellus*) was in fact two separate but cryptic species, the common pipistrelle and the soprano pipistrelle (*P. pygmaeus),* has been well documented (Barratt *et al.*, 1997; Barratt & Jones, 1999). Nathusius' pipistrelle (*P. nathusii*) is a relatively new arrival in Ireland (Russ *et al.*, 2001).

Distribution

All current distribution maps refer to pipistrelle rather than common and soprano pipistrelles. These bats occur sympatrically across much of Europe, although the common pipistrelle is more frequent at central latitudes while the soprano pipistrelle is reported to be associated more with Scandinavia and countries bordering the Mediterranean (Barratt *et al.*, 1997). Russ (1999) found that the common pipistrelle was the most abundant and widespread species in Northern Ireland, and although the soprano pipistrelle is both common and widespread, it was less regularly recorded than the common pipistrelle.

Recognition in the hand
Although there are differences in the biology and ecology of common and soprano pipistrelles, there is a great deal of overlap between them. There is no single feature in their dentition or biometric measurements that can be used to separate them. In addition, it is possible that the overall appearance of the two species may vary geographically, making them easier to separate in some areas than in others (H. Schofield, pers. comm.). In general, the common pipistrelle is said to have a jet-black face mask, ears and wing membrane, with at least two-tone fur, while the soprano has a brown or pinkish face, ears and wing membrane, with uniform fur colour.

The common and soprano pipistrelles are distinguished from Nathusius' pipistrelle by having a relatively short 5th finger and a tail membrane not covered with hairs up to centre on the dorsal side and along the lower legs on the ventral side (Schober & Grimmberger, 1989).

Recognition by flight and echolocation calls
Both species fly fast and erratically, 5-10 m above the ground and frequently follow fixed paths on foraging 'beats' (Russ, 1999). On a heterodyne detector the echolocation calls are heard at around 45 kHz for the common pipistrelle and at 55 kHz for the soprano pipistrelle and both sound like loud 'slaps', but develop into clicks if the detector is tuned upwards. The pulse repetition rate appears very fast and erratic. Social calls can commonly be heard during the mating season or when insect density is low; they are mainly heard at 22kHz and are reminiscent of a very loud and rapid grating sound. These calls are always produced during flight, never from a perch.

Population
O'Sullivan (1994) found 584 pipistrelle bat roosts during the National Bat Survey, the highest number for any species, and described it as the most abundant in Ireland and widely distributed. Both species are currently being monitored by means of the Irish Car-based Bat Monitoring Programme that began in 2003, and it is believed that sufficient data will be accumulated over an 11-year period to enable the detection of a 'Red Alert Population Decline' for both (the IUCN term to describe a 50% or greater decline in population within 25 years). On the basis of data collected in 2004, the common and soprano pipistrelles were the commonest and second commonest encountered species respectively (Roche *et al.*, 2004). It is believed that these results will be repeated for 2005 (N. Roche, pers. comm.).

Roosting behaviour
Common pipistrelles appear to form smaller colonies within buildings than soprano pipistrelles. Barlow & Jones (1999) found a median colony size of 76 (n = 33 roosts) for the common pipistrelle compared to 203 (n = 40 roosts) for the soprano pipistrelle. The National Bat Survey was undertaken before the separation of the species and the figure of 584 roosts must represent a mix of sites for both, although as many of the roosts found were large, it is possible that a large percentage were soprano pipistrelle roosts. In a survey of 100 houses by Bat Conservation Group Dublin (1999), the common pipistrelle was only the fourth commonest species encountered, present in only seven houses and in very small numbers, but the soprano pipistrelle was the most commonly encountered bat, present in 54 houses. Oakley & Jones (1998) found that there was significantly more water (especially that with woodland or hedgerow on banks), and continuous hedgerow with trees within 2 km of maternity roosts of the soprano pipistrelle than expected by chance. This supports the results of diet studies showing the importance of aquatic insects to this species.

O'Sullivan (1994) describes pipistrelle summer roosts in very confined spaces, such as behind window sashes, under tiles and weather-boards, behind fascia and soffits, and within the

cavities of flat roofs. Roche (1998) surveyed 42 churches in Cos. Laois, Kildare, Wicklow, Dublin, Westmeath, Meath and Louth, 27% of which had pipistrelle bats present, none identified as common pipistrelle. The bats were found in a variety of situations, in vestry and nave attics, crevices inside the nave and a small belfry. She also found two more pipistrelle roosts in other types of buildings, in the wall cavities and attic space of a rectory and under the flat roof of a pump house. Pipistrelles were the most abundant species recorded from churches in the UK National Bats in Churches Survey (Sargent, 1995).

McGuire (1998) found 21 roosts of pipistrelle bats during a survey for lesser horseshoe bats in Co. Clare;12 were located in dwelling houses, two in churches and the remainder in unoccupied structures such as sheds and garages. Roche (2001), in a similar search for lesser horseshoe roosts in Co. Limerick, found 11 pipistrelle roosts in primarily old, disused dwellings or large mansions. She comments that this is in contrast to the view that these bats prefer modern, well insulated or heated structures. In the UK, the average age of pipistrelle roosts has been estimated at 15.4 years (Wardhaugh, 1992). The Northern Ireland Bat Group has recorded 480 pipistrelle bat roosts (most not identified to either the soprano or common pipistrelle), all of which were located in buildings, the great majority in the eaves or the roof space (Allen *et al.*, 2000).

Feyerabend & Simon (2000) reported frequent roost switching by a common pipistrelle colony during the course of two summers in Germany, with eight different roosts being used. As householders often describe the presence of small numbers of small bats for short periods of time during the summer in Ireland, it is possible that this species also exhibits roost switching here (K. McAney, pers. obs.).

There are a few records of pipistrelle bats (species not identified) roosting under bridges. Smiddy (1991) found up to two bats under three bridges during his systematic search of 364 bridges in mid and east Co. Cork and west Co. Waterford. Shiel (1999) found only one pipistrelle under a bridge during her study in Cos. Leitrim and Sligo, although both the soprano and common pipistrelles were recorded regularly foraging over water during emergence watches conducted at bridges.

Little is known about where pipistrelle species hibernate. None were recorded during intensive winter surveys of a variety of underground sites along the west coast of Ireland (McAney, 1994 & 1997). It is assumed that pipistrelles hibernate in buildings and trees. The only reported hibernation record for Ireland is of several bats discovered in the crevices of a small stone building in the grounds of Connemara National Park during its demolition in January 1996 (G.O'Donnell, pers. comm.). It is possible that small numbers hibernate in underground sites but go unnoticed as they squeeze into tight spaces. A small group of pipistrelle bats was discovered in a crevice of a pillar of rock in a disused limestone mine in Scotland in March 1994 and again in March 1995(Herman & Smith, 1995). However, of the 3077 bats trapped swarming at underground sites in autumn in the UK, only 16 were identified as soprano or common pipistrelles (Parsons, *et al*., 2003).

Pipistrelle bats (species not always identified) were amongst the first bats, along with brown long-eareds, to begin roosting in Schwegler bat boxes erected in two woodlands in Co. Galway in March 1999 (K. McAney, pers. obs.). Pipistrelle bats were present by May 1999 and have been recorded during 63 out of 68 visits that have been made since. The bats roost singly and in groups, the latter varying in size from two to three to approximately 25.

Diet and foraging behaviour

Two studies have been undertaken on the diet of pipistrelle bats in Ireland (species not identified) and both point to an aerial hunting strategy of insects associated with aquatic or damp habitats. Sullivan *et al*. (1993) analysed 160 droppings from a roost in a house near the River Slaney and found 46% of the diet comprised insects associated with aquatic habitats (30% midges, 16% caddis flies), with other flies making up 36% of the remainder of the diet. Guillot (2003) analysed 202 droppings collected from Schwegler bat boxes during the summer months in 1999 and 2000 in three woodlands in Co. Galway; Knockma Wood (without a water body nearby), Portumna Wood (on the shores of Lough Derg) and Coole/Garryland Wood (an area with turloughs). She found that thread-horned flies comprised 85.5%, 82% and 60% of the diet in each of the woods respectively. Window midges were the most frequently taken thread-horned flies in Knockma Wood, followed by midges, whereas the opposite case pertained in Portumna Wood, but window midges, craneflies and midges, were almost equally represented in the droppings from Coole/Garryland. Much of the remainder of the diet in Coole/Garryland was made up of caddis flies, beetles, the wasp-waisted insects and harvestmen. Barlow (1997) studied the diet of the two species and found a greater range of prey in the droppings of the common pipistrelle (non-biting midges, biting midges and dung flies) than those of the soprano pipistrelle (non-biting midges).

Shiel (1999) observed both the soprano and common pipistrelles regularly foraging over water during emergence watches conducted at bridges. Russ (1999) reports that the common pipistrelle is very general in its habitat preference, foraging in woodland/riparian/parkland, along linear features in farmland, and in towns and cities. Russ & Montgomery (2003) studied the seasonal pattern in activity and habitat use of common and soprano pipistrelles in general in Northern Ireland from April to October 1998 using a car-driven transect. They found that there was significant variation in habitat use by the pipistrelles, with more bats found along roads with tree lines, cut hedges and deciduous woodlands. In the UK Davidson-Watts & Jones (2006) radio tracked both species to investigate whether there were any differences in foraging behaviour between them during summer. Their results suggest that the common pipistrelle makes more flights to a greater number of foraging locations than the soprano pipistrelle, and that these locations are closer to the day roosts. In contrast, the soprano pipistrelle spends less time flying, makes fewer foraging trips but travels farther, suggesting that it is selecting specific foraging habitats.

Conservation Recommendations

- As these bats are most frequently found in occupied dwellings, they give rise to enquiries from the general public, some of whom do not wish to keep the bats. The most important conservation measures to encourage householders to keep their bat colonies are easy and sustained access to information, advice and practical help. Practical assistance is extremely important in alleviating problems caused by the bats in the form of droppings, urine or noise. Even if the problems cannot be completely eliminated, the householder may be willing to keep the bats if some outside assistance is available. Although these bats are considered common at present, the current rate of building renovation is undoubtedly leading to loss of roost sites, therefore every attempt should be made to persuade householders to retain their bat colonies. Details on the information, advice and practical support intended for the householder are discussed in Chapter 5 of this report.

- It is recommended that a number of field trials of the experimental heated bat house currently being tested in Scotland should take place in Ireland (S. Swift, pers. comm.).

The heated bat house is an initiative based on an American bat house design, which incorporates an integral heating system. The structure is either mounted on an outside wall of a building or on a pole. Power for the unit is supplied by the mains system of the host building. There is a roosting chamber divided into crevices, while the heaters and temperature control circuit are housed in side chambers to which bats have no access. Temperature inside the bat house is controlled by means of a solid-state circuit with its sensor embedded in the roosting chamber. Trials in Scotland have shown that the boxes maintained a temperature consistently 10-12^0 C above ambient, up to pre-set temperature of 27-28^0 C, above which the heaters switched off. Pipistrelles successfully bred in two of the three boxes under trial during 2005.

- Creating an awareness of the conservation needs of these two species amongst those who encounter bats within buildings during the course of their work, such as builders, surveyors, and architects, is discussed in Chapter 5 of this report.

- The priority habitats for these bats that should be protected are watercourses, particularly those with vegetative cover, deciduous woodland and linear landscape features, such as hedgerows with trees.

2.3 Nathusius' pipistrelle *Pipistrellus nathusii* (Keyserling & Blasius, 1839)

Introduction
The Nathusius' pipistrelle is one of three resident pipistrelle species in Ireland. Nathusius' pipistrelle is recognised as a resident bat species in Ireland following the discovery in 1997 of a maternity colony of 150 bats in Co. Antrim, Northern Ireland (Russ *et al.*, 1998). Up to then it was described as a migrant species in the British Isles based on a number of autumn and spring records during the 1980s and 1990s (Russ *et al.*, 2001). The first bat detector record in Northern Ireland was made at Londonderry in August 1996, with detector records from Dublin in July 1997 and from Co. Laois in August 1998, (Russ *et al.*, 2001). Fairley (2001) describes how L. Rendle & A. Ross identified the first live specimen in Belfast in September 1996. He also makes a strong case for Nathusius' pipistrelle being a recent arrival in Ireland, as opposed to it having been previously overlooked. A website has been set up to aid the identification of this species in Britain and Ireland and to collect records (www.nathusius.org.uk).

Distribution
Little can be said as yet about this species' distribution in the Republic of Ireland, but there are bat detector records from Cos.Wicklow (I. Ahlen & H. Baggoe, pers. comm.), Cavan, Longford and Tipperary (B. Keeley, pers. comm.), Westmeath (Roche, 1998), Dublin and Laois (Russ *et al.*, 2001), and Kerry (Kelleher, 2005). The species was detected during the Irish car-based bat monitoring programme for the first time in July 2005 from an area covering parts of Cos. Louth and Monaghan (N. Roche, pers. comm.). This species is widely distributed throughout Europe, where it is highly migratory, with most migrations in a NE-SW direction as bats leave areas with severe winters in the autumn, returning in spring to rear young.

Recognition in the hand
It is essentially similar to the other two pipistrelle species in Ireland, but may be distinguished by its long shaggy fur, with light tips on the back giving a frosted appearance, and the ventral fur which is distinctly lighter than the dorsal fur (Stebbings, 1986). However, this differentiation is not always that clear. The dorsal surface of the tail membrane is hairy and the

fur on the underside of the wing sometimes extends along the forearm to the wrist (Greenaway & Hutson, 1990). A less subjective feature is that the first upper premolar (p^3) is large and not hidden by the canine tooth and the incisors are noticeably tall and thin (Yalden, 1985). Stebbings (1970) recommends measuring the length of the fifth digit from wrist to tip and dividing this by the length of the forearm; the resulting figure is >1.25 mm for Nathusius' pipistrelle.

Recognition by flight and echolocation calls
This species flies faster than the other pipistrelle species, often with deep wing beats when flying in straight line. It flies 4-15 m above the ground (Russ, 1999). The echolocation calls, as heard on a heterodyne detector, are very similar to the other pipistrelle bats, but the loud 'slaps' occur at 39-40 kHz. The pulse repetition rate is slower and more regular than the common or soprano pipistrelles. Social calls are similar to the common pipistrelle, but are followed by a 'trill', and are best heard at 20 kHz. Nathusius' pipistrelle often emits mating calls from trees or buildings, but also sometimes in flight.

Population
Little can be said about this at this time.

Roosting behaviour
In Europe it uses hollow trees, bat and bird boxes, wooden churches and buildings during summer and crevices in cliffs, hollow trees and buildings in winter. In Northern Ireland it was found roosting in a mid-19th century farm stable block and storehouses that had undergone extensive renovation. The bats were using crevices in stone and brickwork, as opposed to roof spaces. The property was situated 50 m from a river.

Diet and foraging behaviour
No dietary analysis has yet been conducted in Ireland. Vaughan (1997) reports that it feeds on insects associated with water, such as non-biting midges. Russ (1999) describes it as feeding along rides, paths, woodland edge (both deciduous and conifer), meadows, and water, but avoiding built up areas, such as towns, in contrast to the common and soprano pipistrelles.

Conservation Recommendations

- Until roosts are located and more field detector records are made, little can be said about the conservation needs of this species, but it is assumed that it would benefit from any conservation measures taken to protect other bat species.

2.4 Whiskered bat *Myotis mystacinus* (Kuhl, 1817) & Brandt's bat *Myotis brandtii* (Eversmann, 1845)

Introduction
The whiskered bat is one of four *Myotis* species found in Ireland. It has bristles on the lips, chin and forehead, which give it its name. It was classified as a threatened species in the *Irish Red Data Book 2: Vertebrates* (Whilde, 1993) based on the lack of records and the small numbers of bats known at that time. This situation has generally remained unchanged. The whiskered bat was separated from Brandt's bat in 1970 (Baggoe, 1973) and these two species have been described as cryptic, but a recent genetic study revealed that they had different

evolutionary histories and are more closely related to other *Myotis* species than to each other (Ruedi & Mayer, 2001).

Brandt's bat is the most recently discovered bat species in Ireland, with two records of single animals in 2003 from Wicklow National Park (E. Mullen, pers. comm.) and from Co. Meath (B. Keeley, pers. comm.). Three female bats were found in Co. Clare in 2004 (B. Keeley, pers. comm.). The most recent discovery was of a nulliparous adult female trapped in Killarney National Park in August 2005 during an international bat fieldcraft workshop (Kelleher, 2005). Brandt's bat holds the longevity record for a free-living animal, with a 41 year-old male recorded in Siberia (Podlutsky *et al.*, 2005).

Distribution
Although the whiskered bat is widely distributed throughout Ireland, there are relatively few records. It occurs throughout Europe, but is absent from northern Scotland and most of Denmark. Worldwide it is found in Korea, Japan, the western Himalayas and southern China (Mitchell-Jones *et al*., 1999). Brandt's bat has been recorded from Cos. Wicklow, Meath, Clare and Kerry. It occurs throughout northern and central Europe, is absent from south-western France, Spain and Portugal and the distribution extends to Korea and Japan (Mitchell-Jones *et al.*, 1999).

Recognition in the hand
Female whiskered and Brandt's bats are extremely difficult to tell apart, but the males can be separated on the basis of penis shape, which is slim and parallel sided in the former, and bulbous in the latter. The whiskered bat has a black-brown face, ears and flight membranes and shaggy fur. Brandt's bat is slightly larger than the whiskered bat. Its face is rather blunt, reddish brown to black, and hairy. The ears are well separated and often pink at the base, but usually dark and splayed. In both species the ears are medium length; the tragus is about half the length of the ear and about three times as long as broad (Greenaway & Huston, 1990).

These bats can be distinguished from the pipistrelles by not having a post calcarial lobe, from Natterer's by having a the tail margin that is fairly straight and without an obvious fringe of hairs, and from Daubenton's by having smaller feet.

Recognition by flight and echolocation calls
In a recent study of a colony in Co. Cork, Buckley (2005) described the whiskered bat as flying at a constant height close to vegetation and never in the open. Russ (1999) describes it flying 1.5 – 6 m above the ground, with a rapid, agile and weaving flight while Briggs & King (1998) report it flying in a horizontal plane when hunting, flying back and forth repeatedly. Its echolocation call as heard on a heterodyne bat detector set at 55kHz consists of a series of 'dry' clicks, without the tonal quality of a pipistrelle call when the detector is tuned downwards. Briggs & King (1998) describe the whiskered call as having a very regular rhythm, louder and less sharp than that of a Natterer's, but with a repetition rate slower than either Natterer's or Daubenton's bat.

Russ (1999) describes Brandt's bat as a fast and agile flyer making quick turns, but it does not appear to be as agile as the whiskered bat in confined spaces. Its echolocation call, when heard on a heterodyne bat detector set at 55kHz, consists of a series of 'dry' clicks. However it is notoriously difficult to separate the *Myotis* species as they all produce very similar calls. Russ (1999) suggests that in all cases the identification of these species' should be based mainly on the observation of the bats in flight and foraging behaviour.

Population
Whilde (1993) reported the Irish whiskered population to be in the low hundreds. It is described as rare in southern Europe and Ireland (Mitchell-Jones *et al*., 1999). O'Sullivan (1994) reported only 34 roosts during the National Bat Survey, with 22 having less than five bats though he did comment that it was the only species found roosting regularly with other species and hence may be overlooked. N. Roche (pers. comm.) states that the Irish Car-based Bat Monitoring Programme cannot monitor this species, primarily because its echolocation calls are more quickly attenuated compared to those of pipistrelles and Leisler's bats. A few individuals were caught during mist netting studies near Lough Corrib in June 1997 and in Portumna Wood in 1998 (K. McAney, pers. obs.) and five were caught in Killarney National Park during a bat detector workshop in August 2005 (Kelleher, 2005). Nothing can yet be said about Brandt's.

Roosting behaviour
Whiskered bats are found in houses during the summer, roosting in small numbers in the roof space, often between the rafters and felt or in narrow slits where timbers meet, where they are difficult to observe (O'Sullivan 1994). All eight known roost sites in Northern Ireland were in the roof spaces of dwellings, five in houses dating from the late 18th to 19th centuries (Allen *et al*., 2000). Buckley (2005) studied a maternity colony of 45 whiskered bats from July to October 2004. The roost was located in a 100-year old house and the bats roosted in the attic, between the eaves and the chimney column. The roost was only discovered in June 2004, so no information was available on when the bats took up residence, but they abandoned the building in October 2004. Emergence was observed on seven nights, giving a mean emergence time of 34.7 minutes after sunset.

Smiddy (1991) found two female and one male whiskered bats roosting under bridges during a survey in mid and east Co. Cork during 1988 and 1989. One of the females was heavily infested with a flea species new to Ireland and this may have accounted for her being found roosting in the open as opposed to tucked away in a crevice. Shiel (1999) found three whiskered bats in crevices of three different masonry arch bridges in Co. Leitrim in September, October and November 1998.

Four of the five Irish Brandt's records have been in houses. Summer roosts are nearly always in buildings but it is also found in bird and bat boxes (Mitchell-Jones *et al.*, 1999). Only nine maternity colonies of whiskered/Brandt's bats are known in England (L. Berge, pers. comm.). One female whiskered/Brandt's bat was found in a Schwegler bat box in Garryland Nature Reserve in May 2000 (K. McAney, pers. obs.).

Whiskered bats hibernate in a range of underground sites in winter. One was found hibernating in a cave in Co. Galway in 1994 (McAney, 1994.) and in a cave in Co. Kilkenny in 1997 (McAney, 1997). Whiskered and Brandt's bats were the third and fourth commonest species respectively recorded swarming in late summer and autumn at underground sites in the UK, yet only small numbers of either species are ever seen hibernating at these same sites (Parsons, *et al*., 2003).

Diet and foraging behaviour
Nothing is currently known about the diet of either species in Ireland, as no faecal analysis has been undertaken. In a study of the diet of whiskered and Brandt's bats from southern England, while there were many prey in common, there were significant differences in the percentages of prey items eaten by two species, with window midges comprising 30% of the diet of the whiskered bats but only 15% of Brandt's (L. Berge, pers. comm.).

Due to the difficulty in distinguishing *Myotis* species in the field, little is known about the flight or foraging behaviour. However, Buckley (2005) used a bat detector set to 45kHz to pick up the echolocation calls of this and other species along a transect through a variety of habitats in a 2 km square adjacent to a known whiskered bat maternity roost over 10 nights between July and September 2004. He found that 12.7% of the bat passes recorded were from whiskered bats, and that this species used a narrow range of habitats, with tree lines, the centres of broadleaf woods, mixed woodland edges and rivers the most important. The bats avoided conifer woodlands, intensively managed grasslands and lakes. L. Berge (pers. comm.) radio tracked a number of whiskered bats in southern England and found they foraged in different types of grassland (improved, semi-improved and semi-natural) surrounded by hedgerows. These areas were often used as horse or cattle pastures. Russ (1999) describes whiskered bat habitat as parkland, meadows, flowing water, woodland and gardens.

L. Berge (pers. comm.) radio tracked a number of Brandt's bats in southern England and found they foraged in woodland and along woodland edge, often in close proximity to water.

Conservation Recommendations

- Until research is conducted on roosting behaviour and radio tracking undertaken to determine the habitat needs, little can be said about the specific conservation needs of these species.

- All known whiskered roosts should be revisited to determine the possible presence of Brandt's bat.

- Every attempt should be made to conserve all confirmed roosts of both species and these should be monitored to gain information on roosting behaviour.

- Radio tracking needs to be conducted on both species from a number of confirmed roosts to determine the commuting and foraging needs over at least one season, backed up by dietary analysis.

- Mist netting and harp trapping are needed in suitable habitat to determine countrywide distribution.

- Broad leaved woodland and hedgerows in the vicinity of key maternity roosts should be considered for NHA designation to ensure correct woodland management practices such as the retention of broad leaved woodland.

2.5 Brown long-eared bat *Plecotus auritus* (Linnaeus, 1758)

Introduction
The brown long-eared bat is the only member of the Genus *Plecotus* in Ireland and offers the non-specialist no difficulty with identification.

Distribution
Widespread throughout Ireland (Richardson, 2000). It has also been recorded on several islands off the coast of Cos. Donegal, Mayo and Kerry, and at Tuskar Lighthouse, Co.

Wexford (Fairley, 2001). It is widespread in Europe and found across Asia (Mitchell-Jones *et al*., 1999).

Recognition in the hand
The brown long-eared bat is one of the easiest species to identify in the hand due to its very long ears that are almost as long the body. The ears are often curved outwards when the bat is resting, giving the appearance of rams horns, while in torpor they are folded back along the body, often tucked in under the wings, leaving just the long tragus exposed.

Recognition by flight and echolocation calls
Brown long-eared bats fly in a similar way to Natterer's bats, low and slow, with the ability to hover; they are very agile in confined spaces. The echolocation call, as heard on a heterodyne detector, is very quiet and can only be heard at a distance of less than 5m (Russ, 1999). The peak frequency is 39-40 kHz.

Population
O'Sullivan (1994) describes the brown long-eared bat as the second most abundant bat species in Ireland and widely distributed; 294 roosts were recorded during the National Bat Survey although most contained less than 50 bats. In Northern Ireland, most of the 77 nursery roost sites of this species discovered there since 1985 contained around 20 bats. In a survey of 100 houses by the Bat Conservation Group Dublin (1999), the brown long-eared bat was also considered widespread but forming small colonies. Roche *et al.* (2004) states that the Irish Car-based Bat Monitoring Programme cannot monitor this species, primarily because of its weak echolocation calls, and proposes that field catching methods may be needed to assess future abundance. A few individuals were caught during mist netting studies in Portumna Wood in 1998 (K. McAney, pers. obs.). Eight bats were caught in Killarney National Park during a bat field craft workshop in August 2005 (Kelleher, 2005).

Roosting behaviour
In Ireland, roosts in large open attics, where the bats cluster together, often in the angle created by the rafters where they join the ridge beam (K. McAney, pers. obs). Entwistle *et al*. (1997) found that tree holes and farm buildings were used as temporary roosts at times when food was in short supply and bats became torpid to save energy, but nursery roosts were almost always in houses. Brown long-eared bats show a high degree of fidelity to nursery roosts and they have been shown to be selective in picking houses in which to roost.

Brown long-eared bats were amongst the first, along with pipistrelles, to begin roosting in Schwegler bat boxes erected in two woodlands in Co. Galway in March 1999 (K. McAney, pers. obs.). The long-eared bats were present by May 1999, and have been recorded during 66 out of 68 visits that have been made since. The bats generally roost in groups varying in number from five to ten, with singletons found less frequently.

Only four long-eared bats were recorded during a hibernating survey in west and south west Ireland, two from caves and two from ruined buildings (McAney, 1994, 1997).

Diet and foraging behaviour
Shiel *et al*. (1991) studied the diet in Ireland from droppings collected in Co. Clare and found that the main prey items belonged to four categories: flies (craneflies and window-midges) comprising 30.4%; moths (26.5%); caddis flies (11%); and earwigs, centipedes and harvestmen (16.8%). The latter three categories represent non-flying arthropods and support the view that the brown long-eared bat often gleans its prey from foliage.

Entwistle *et al.* (1996) found that it is strongly associated with tree cover and selects roosts within 0.5 km of deciduous woodland but also uses a variety of habitats such as birch scrub, gardens with large trees, scattered woodland, orchards and parkland among meadows.

Conservation recommendations

- Many householders play host unwittingly to colonies of brown long-eared bats but because they form small and quiet colonies within buildings, their presence tends to go unnoticed. If they are discovered, the same approach is recommended as for pipistrelles, that of providing the householder with easy and sustained access to information, advice and practical help.
- Due to the loyalty shown towards roosting sites, every attempt should be made to prevent bats being disturbed or excluded from existing roosts, as a colony may not have an alternative roost.
- Erecting bat boxes in woodland, particularly in conifer plantations, would provide greater access to roost sites.
- In the UK, brown long-eared bats are considered to be particularly vulnerable to the chemicals used in timber treatment, because of their habit of roosting in close proximity to the timber, but no information is available for Ireland. Research on possible impacts of timber treatment is needed.
- The priority habitat of this species, deciduous woodland, particularly that close to key maternity roosts, should be considered for NHA designation to ensure correct woodland management practices. In addition, tree lines, hedgerows and other liner landscape features in the vicinity of the roost should be included in the designation.

2.6 Natterer's bat *Myotis nattereri* (Kuhl, 1817)

Introduction
Natterer's bat is one of four *Myotis* bat species to occur in Ireland. It was classified as a threatened species in the *Irish Red Data Book 2: Vertebrates* (Whilde, 1993) based on the lack of records and the small numbers of bats found at that time. Little has changed in the interim.

Distribution
Although this species is widely distributed throughout Ireland, it is one of the least recorded bat species. It occurs throughout Europe and worldwide it is found in the Urals, the Near East, Turkmenia and north western Africa (Mitchell-Jones *et al.*, 1999).

Recognition in the hand
Natterer's bat is characterised by a row of very obvious bristly hairs along the edge of the tail membrane between the tip of the calcar (which is distinctly S-shaped) and the foot. The ears are quite long and the tragus is two-thirds the length of the ear, nearly four times as long as wide, and finely pointed (Greenaway & Huston, 1990). The ventral fur is noticeably lighter than the dorsal fur, with an obvious boundary between the two.

Recognition by flight and echolocation calls
It specialises in hunting in confined spaces, is adept at making very narrow turns and is also able to hover for short periods. It flies slow and low above ground level (1-6m) (Russ, 1999). The echolocation calls, as heard on a heterodyne detector, are very short with a peak frequency

at about 50kHz. This bat is generally much quieter than the other *Myotis* species. Its fast pulse repetition rate has been likened to the fine crackle of burning stubble. It feeds higher over water than Daubenton's bat and is more often at smaller water bodies and over riffled patches of water (Briggs & King, 1998). Russ (1999) suggests that the identification of Natterer's bat should be based mainly on the observation of the bat's flight and foraging behaviour, due to the difficulty in separating the four *Myotis* species using echolocation calls.

Population

Whilde (1993) reported that the Irish Natterer's bat population was estimated to be around 1,000 bats. O'Sullivan (1994) found only 44 roosts during the National Bat Survey, with 20 containing single bats, and only seven with more than 50 bats. A number of authors have reported the difficulty in making accurate counts when it emerges from a roost site, primarily because it leaves relatively late after sunset and also because it can make return flights back into the roost or fly repeatedly outside, making it difficult to establish actual numbers leaving (Haddow, 1995; Ahlen *et al*., 2000). N. Roche (pers. comm.) states that the Irish Car-based Bat Monitoring Programme cannot monitor this species, primarily because its echolocation calls are more quickly attenuated compared to those of the pipistrelle species and Leisler's bats, and proposes that field catching methods may need to be employed to assess abundance. Four males were caught in Killarney National Park during a bat field craft workshop in August 2005 (Kelleher, 2005).

Roosting behaviour

It is found in buildings during the summer, roosting in small numbers in the roof space, often between the rafters and felt, or in narrow slits where timbers meet, and where they are difficult to observe (O'Sullivan 1994). Only one roost was found during a survey of 100 houses by the Bat Conservation Group Dublin (1999). A number of large (>50 bats) colonies have been recorded in Church of Ireland churches and other old buildings in Cos. Galway, Limerick and Cavan (K. McAney, pers. obs.). All eight known roost sites in Northern Ireland were in the roof spaces of dwellings, five in houses dating from the late 18th to 19th centuries (Allen *et al*., 2000).

Smiddy (1991) found four single bats in four bridges during a survey in mid and east Co. Cork and west Co. Waterford during 1988 and 1989. It was the second most frequently encountered during a bridge survey of Co. Leitrim, when 66 individuals were recorded in 31 bridges (Shiel, 1999). It has not yet been recorded from bat boxes that have been in place in three woodlands in Co. Galway since 1999 (K. McAney, pers. obs.), although it is found in boxes in the UK (Mortimer, 2005; C. Morris, per. comm.).

Smith & Racey (2005) used the term 'itinerant' to describe the roosting behaviour of Natterer's bat arising from the results of their radio tracking study on the borders of England and Wales. Two maternity colonies studied each used between 21 and 31 roosting locations distributed across 15 to 25 roost sites. Temperature was considered to be the most important factor determining the use of roost sites, with the bats appearing to need access to a large number of roosts offering a range of temperatures. Although a variety of day roost sites were located within buildings, trees comprised 67% of all roost sites. Mortimer (2005) found this species using natural cavities in predominantly mature Corsican pines, the first record of Natterer's bats using commercial conifer plantations for roost sites.

Only 14 Natterer's bats were recorded during hibernation surveys in west and south west Ireland; 10 in caves, two in ruined buildings and one each in a mine and bridge (McAney, 1994, 1997). In all cases the bats were tucked away in crevices and required careful searching

to discover them. This species was the commonest recorded swarming in late summer and autumn at underground sites in the UK, but, because of its habit of concealment in cracks and crevices, only small numbers were ever seen hibernating at these sites (Parsons *et al*., 2003).

Diet and foraging behaviour

Shiel *et al.* (1991) analysed droppings from a Natterer's colony in Co. Limerick and found that 68% of the prey eaten consisted of diurnal insects, insects which rarely fly, and non-flying arthropods. These results support the general view that this bat gleans or removes most of its prey from foliage or other surfaces, rather than catching it in the air.

Smith (2000) discovered by radio tracking this species that it selected semi-natural broad leaved woodland and tree-lined river corridors, ponds and grassland. However, a more recent study has shown that Corsican pines (*Pinus nigra)* were the most preferred foraging habitat for this species in Scotland (Mortimer, 2005).

Conservation Considerations

- Until research is conducted on roosting behaviour and radio tracking undertaken to determine the habitat needs of this species, little can be said about the conservation needs of this species in this country.

- All known roosts should be revisited to determine their status. Every attempt should be made to conserve all confirmed roosts and these should be monitored to gain information on roosting behaviour.

- Radio tracking needs to be conducted on bats from a number of roosts to determine the commuting and foraging needs over at least one season and this should be backed up by dietary analysis. This may lead to the discovery of new roost sites, as Richardson (2000) points to the success in finding this species when a special effort is made, as in the targeted searches for roosts in Hertfordshire and Wales. A targeted roost search of old buildings in the vicinity of broad-leaved woodlands should be undertaken, with very careful examination of timber crevices and mortises, wall cavities and the tops of gable walls.

- Broad leaved woodland and hedgerows in the vicinity of key maternity roosts should be considered for NHA designation to ensure correct woodland management practices such as the retention of broad leaved woodland. More specific recommendations are described by Smith & Racey (2002).

- Mist netting and harp trapping are needed in suitable habitat to determine countrywide distribution.

- Smith & Racey (2005) propose using bat boxes and bat houses as alternative roosting sites, as these have been used by maternity colonies in southern England, Scotland and Germany. Although it has not been recorded from bat boxes already in place in two woodlands in Ireland, these woodlands may not be suitable foraging habitats for Natterer's bats and should not prevent new studies being undertaken.

- Although few underground roost sites are known in Ireland, swarming studies should be undertaken at these using mist nets and harp traps in the autumn. Should these prove to be as important as those described for the UK, strict protection should be put in

place to prevent future disturbance of these sites. Parsons & Jones (2003) stress the importance of swarming sites for bats from large populations over wide areas, as these sites may well function in maintaining genetic variability in populations, which in turn is linked to increased survival at an individual level (Rossiter *et al.*, 2001).

2.7 Daubenton's bat *Myotis daubentonii* (Kuhl, 1817)

Introduction
Daubenton's bat is one of four *Myotis* species found in Ireland, but is probably the easiest to recognise in flight due to its habit of flying just a few inches above the surface of water when feeding.

Distribution
Widely distributed throughout Ireland (Richardson, 2000). It occurs throughout Europe, although scarce in the southwest and is absent from northern Scandinavia (Mitchell-Jones *et al.*, 1999).

Recognition in the hand
Daubenton's bat is characterised by noticeably large feet (about half as long as the shin) that are free from the wing membrane, a pinkish face, short, rounded ears that are often held outwards from the head when disturbed, and a long calcar (more than half the length of the tail membrane). The tragus is bluntly pointed and convexly curved on the outer edge (Yalden, 1985). Although the tail membrane bears a fringe of fine hairs along its length, this is easy to distinguish from the fringe of stiff bristles on the tail membrane of Natterer's bat.

Recognition by flight and echolocation calls
Easily recognised when flying over water as it flies just above the surface, making relatively wide turns. The echolocation calls, as heard on a heterodyne detector, are strong, fast, 'dry clicks', best heard at around 45kHz (Briggs & King, 1998). It has the most regular pulse repetition rate of the *Myotis* bats (Russ, 1999).

Population
Daubenton's bat was the second commonest species recorded during the National Bat Survey; 213 roosts were discovered, the majority in bridges with only one to ten individuals present (O'Sullivan, 1994). There is little information on numbers at nursery roosts as these are rarely discovered. It is regularly recorded using bat detectors in the field but these records are of individual bats. Due to its preference for feeding over water, this species cannot be monitored by the Irish Car-based Bat Monitoring Programme, but it is currently the subject of a pilot scheme whereby a 1 km stretch of river or canal is walked after sunset in August and the number of bat passes heard during a 40 minute period is recorded (Bat Conservation Ireland, 2005). Hopefully this will enable some estimate to be made of future population trends.

Elsewhere in Europe, Daubenton's bat is considered to be one of the most abundant species, with populations showing an increase in several locations (Mitchell-Jones *et al.,* 1999). Kokurewicz (1995) suggested that the observed increase in the Polish population could be attributed to eutrophication, which resulted in an increase in non-biting midges, a major prey item. It has been recorded in mist nets set up close to the shores of Lough Corrib in Co. Galway; 11 bats were caught in June 1997, and five and three were caught in June 1997 and September 2000 respectively (K.McAney, pers. obs.).

Roosting behaviour

Most of the published information on the roosting behaviour in Ireland relates to roosts in bridges. In addition to the bridge roosts discovered during the National Bat Survey, two other surveys have shown that it is the commonest species using bridges. Smiddy (1991) found Daubenton's bats at 38 bridges in mid and east Co. Cork and west Co. Waterford, although only a mean number of 1.76 bats per bridge. The largest number recorded at one site was seven, although it was suggested that bats may use bridges as hibernation sites, as a single torpid bat was found at a bridge in December. Shiel (1999) recorded 180 Daubenton's bats in bridges in Cos. Leitrim and Sligo between late April and mid November 1998. While most bridges held small numbers of bats, two different bridges each had approximately 20 bats using one crevice - these were thought to be nursery colonies due to the presence of young.

It is found in buildings during the summer, generally those located close to water. Fairley (2001) cites just one nursery roost of more than 100 in Co. Waterford. There are a number of unpublished records of bats using crevices in the walls of large, usually unoccupied or partially occupied, buildings such as castles and mansions during the summer months, although there is one colony roosting near heating pipes in the cellar of a busy West of Ireland hotel (K. McAney, pers.obs.). Only three roosts were found during a survey of 100 houses by the Bat Conservation Group Dublin (1999); all were in old buildings located close to water. This group believe that Daubenton's bat is rarely found in modern buildings and hence is under reported. All eight known roost sites in Northern Ireland were in the roof spaces of dwellings, of which five were in houses dating from the late 18th to 19th century (Allen *et al*., 2000).

Elsewhere in Europe, Daubenton's bat is considered to be a woodland species, using tree roosts as nursery sites (Schober & Grimmberger, 1989). In a Dutch study, it was found to prefer natural cavities in oak trees, close to the edge of woodland (Boonman, 2000). However, it is extremely difficult to survey trees for roosting bats, although the use of radio tracking has proved very useful, as in the study of Natterer's bats by Smith & Racey (2005). Daubenton's bats began to occupy Schwegler bat boxes in deciduous woodland in Co. Galway in 2002; three years after the boxes were erected, and continue to do so. A colony was also found roosting in an old beech tree close to water in east Galway during summer 2005 (K. McAney, pers. obs.).

Only one Daubenton's bat was recorded during a hibernation survey of the west and south west of Ireland, but as it roosts in cracks and crevices, it is undoubtedly overlooked (McAney, 1994, 1997). Two Daubenton's bats were recorded from caves in the northwest of Ireland (Hopkirk, 1996). This species was the second commonest recorded swarming in late summer and autumn at underground sites in the UK, yet only small numbers were ever seen hibernating at these sites (Parsons *et al.*, 2003).

Diet and foraging behaviour

Two dietary studies have been undertaken in Ireland, both expressing results as percentage frequency. Sullivan *et al*. (1993) analysed droppings from a colony using a dry arch of a bridge in Co. Galway. The diet consisted primarily of insects associated with water, with 33% caddis flies and 33% thread-horned flies, mainly midges. Flavin *et al.* (2001) obtained similar results in their study; 24% of the diet consisted of midges and 26% caddis flies. In the latter study, pre-adult forms of the insects were discovered in the diet. A quarter of the diet was deemed to have been caught from the water's surface. These results support the general view that Daubenton's bats gaff insects from the water or catch them in the air using the tail membrane. Shiel (1999) ran a statistical test on data from her bridge survey to see if there were any significant associations between a particular habitat and the species of bat found in a bridge,

either Daubenton's or Natterer's. There was a significant positive association between the presence of Daubenton's bats and the presence of slow-flowing water/pools. This was also found to be the case in a UK study by Warren *et al.* (2000), who found that Daubenton's bats also preferred sections of river with trees on both banks. However, although strongly associated with water, Daubenton's bat can also forage in other habitats, such as woodland (Russ, 1999).

Conservation Recommendations

- All known Daubenton's roosts in buildings should be revisited to determine their status.

- Every attempt should be made to conserve all confirmed roosts and these should be monitored to gain information on roosting behaviour. Where the sites are also inhabited human dwellings, particular effort should be made to provide the householder with easy and sustained access to information, advice and practical help.

- Bridges are a very important roost sites for this species and Shiel (1999) sets out a list of recommendations for the conservation of bridge roost sites. Local authorities are responsible for bridge maintenance, but as the NPWS comes under the same government department, there appears to plenty of scope to extend conservation measures to bridges. Existing bridge data should be studied to determine the important river systems along which this species has been recorded and these should be considered for NHA designation to ensure correct management practices, such as the retention of riparian vegetation. This issue is discussed in more detail in Chapter 3.

- Although few underground roost sites are known in Ireland, swarming studies should be undertaken in the autumn using mist nets and harp traps. Should these sites prove to be as important as those described for the UK, strict protection should be put in place to prevent future disturbance. Parsons & Jones (2003) stress the importance of swarming sites for bats from large populations over wide areas, as these sites may well function in maintaining genetic variability in populations, which in turn is linked to increased survival at an individual level (Rossiter *et al.*, 2001).

2.8 Leisler's bat *Nyctalus leisleri* (Kuhl, 1817)

Introduction

Leisler's bat is the only member of the Genus *Nyctalus* in Ireland. It has been described as a 'typically Irish bat' (Fairley, 2001) due to its abundance in Ireland compared to the rest of the Europe, where is considered to be vulnerable (Mitchell-Jones *et al.*, 1999). Its abundance in Ireland has been attributed to the absence of larger competing species, such as the closely related noctule *Nyctalus noctula*. It is the only vespertilionid bat species that has been studied in detail, with seven published papers on varying aspects of its ecology in southern Ireland. In Northern Ireland its pre-hibernal and hibernation behaviour has been studied (Hopkirk & Russ, 2004) and there is ongoing research into its roosting behaviour (I. Forsyth, pers. comm.) and molecular ecology and conservation genetics (E. Boston, pers. comm.).

Distribution
Found throughout Ireland (Richardson, 2000). It is also recorded from Western Europe to south western Asia, north western Africa and east to India (Mitchell-Jones *et al.*, 1999).

Recognition in the hand
It is easily distinguished from all other Irish species on the basis of body size and shape of the tragus. The ears are short, broad and rounded and the tragus is mushroom-shaped, being broad with a rounded tip. Fur colour is dark golden or rufous brown, with individual hairs much darker at the base than at the tip. Ventrally the hair extends onto the wing and forearm, giving rise to the earlier name of 'hairy-armed bat'. It has a post-calcarial lobe, a feature shared with the pipistrelles, but the shape of the tragus and the obvious size differences between pipistrelles and Leisler's bat prevents confusion.

Recognition by flight and echolocation calls
Leisler's bat is one of the few Irish species that can be identified easily in flight. It flies fast and straight, high above the ground (~10 m to 70 m), making fast turns and dives. Its echolocation call, as heard on a heterodyne detector, is very loud and best heard at around 25 kHz; if the detector is tuned upwards, dry clicks will be heard. This bat produces two types of calls that sound like a 'chip' and a 'chop' and may be produced in sequence. The calls are emitted slowly and at irregular intervals (Russ, 1999).

Population
It is impossible at present to estimate the population in Ireland, although this country is generally considered to be the world stronghold for this species, and at one time held the largest known summer colony (O'Sullivan, 1994). It is currently being monitored by means of the Irish Car-based Bat Monitoring Programme that began in 2003 and it is believed that sufficient data will be accumulated by this method over a 14-year period to enable the detection of a 'Red Alert Population Decline' for this species (the IUCN term to describe a 50% or greater decline in population within 25 years). On the basis of data collected in 2004, Leisler's bat is the third most commonly encountered species (Roche *et al.*, 2004). It is believed that this result will be repeated for 2005 (N. Roche, pers. comm.).

Roosting behaviour
In Ireland, Leisler's bats form nursery colonies in buildings (many inhabited) during the summer. O'Sullivan (1994) recorded 71 roosts in buildings and Allen *et al.* (2000) 106. Fourteen roosts were recorded during a survey of 100 houses by the Bat Conservation Group Dublin (1999). However, roost records from Europe indicate that trees are preferred, particularly holes created by woodpeckers (Ohlendorf, in press). A few tree roosts have been found in Ireland, some of which have been described by Fairley (2001). A group of juvenile Leisler's bats were found in a beech tree in Co. Galway in July 1996 (K. McAney, pers. obs.) and two tree roosts were reported by Allen *et al*. (2000), in an oak and an ash. Singletons and small groups of bats are regularly recorded during the summer from Schwegler bat boxes in woods at three locations in Co. Galway (K. McAney, pers. obs.). This species has also been found using Schwegler bat boxes erected as part of mitigation measures following tree removal during a road improvement scheme in Co. Mayo (T. Aughney, pers. comm.).

Nursery roosts begin to form in April, the young are born in June and are on the wing a month later. There is a dramatic decrease in the number of bats at the nursery roost once the young are independent, as the adult females leave at this time, followed some weeks later by the juveniles (Shiel & Fairley, 2000). Leisler's bats emerge early in the evening, often leaving the roosts before sunset; they emerge earlier on overcast nights (McAney & Fairley, 1990; Shiel &

Fairley, 2000). Forsyth (I. Forysyth, pers. comm.), in a study of a maternity roost in the Lagan Valley in Northern Ireland using passive identification transponders and an infrared video camera found that females moved between 20 roost sites a total of 120 times during a 6-year period; also, up to a quarter of the bats using the roost would often not emerge on a given night.

Little is known about where Leisler's bats hibernate. Two bats were found under roof slates during repair work in Connemara National Park in February 1994 (S. Hassett, pers. comm.) and one bat was found on roof beams of an old building being demolished, also in the National Park, in January 1996 (G. O'Donnell, pers. comm.).

Hopkirk & Russ (2004) studied pre-hibernation and hibernation behaviour in Northern Ireland by fitting small temperature sensitive radio transmitters to 29 bats. These bats were subsequently tracked from July – November in 2002 and from August 2002 - January 2003. Harems (consisting of a lone male and several females) were found in bat boxes up to mid-October. Both trees and buildings were used from August until the beginning of November and after that, only trees. The most important tree species used were oaks and beeches. All the roosts used were within 200m of a path or a forest edge. Bats became torpid once ambient temperature dropped below 6^0 C and there was evidence to suggest that some males migrated to the coast in October. Shiel & Fairley (1998) also suggested that Leisler's bats in Wexford migrated, in this case from the coast to inland areas, as bats was never detected at known summer foraging sites during the winter. Ohlendorf *et al.* (2000) reported the discovery of a female Leisler's bat ringed in Germany in May 1998, recaptured in May 1999, and subsequently found 1,567 km away in Spain in September of that year.

Diet and foraging behaviour

Although the largest bat species in Ireland, its prey is composed primarily of small to medium-sized insects, many of which form swarms. Both Sullivan *et al*. (1993) and Shiel *et al*. (1998) found that the major prey items were true flies, moths and caddis flies. Of the flies eaten, small insects such as midges were eaten more than larger insects such as craneflies, and the yellow dung fly was also important. The only other food item of significance was beetles, mainly scarabids.

Foraging behaviour has been studied using bat detectors and radio tracking (Shiel & Fairley, 1998; Shiel *et al.*, 1999). The detector study revealed little indication of habitat preference, although bats were found in a wide variety of habitats, including canals, estuary/open water, roadsides, street lamps, orchards, mature trees, pasture, farmland, railway embankments and streams. However, the radio tracking study revealed that two thirds of the recorded foraging time was over pasture or drainage canals, while foraging in other habitats, particularly lakes and conifer forests, was greatest before the bats gave birth. Bats commuted directly from the day roosts to foraging sites up to 13.4 km away at speeds often exceeding 40 km per hour. Except during lactation, individuals sometimes day-roosted in buildings or hollow trees away from the nursery roost. These alternative day roosts were also sometimes used as night roosts, especially during rain, which also caused the bats to return to the day roost. Most activity was observed during the early part of the night and, on most nights, the first flight lasted the longest.

Conservation Recommendations

Ireland continues to be the European stronghold for this species and so has an added responsibility to put protection measures in place. Leisler's bats are most frequently found in occupied dwellings, often in large numbers and thus give rise to a large number of enquiries

from the general public, some of whom do not wish to keep the bats. The most important conservation measures to encourage householders to keep their bat colonies are easy and sustained access to information, advice and practical help. Practical assistance is extremely important in alleviating problems caused by the bat droppings, urine or noise. Even if the problems cannot be completely eliminated, the householder may be willing to keep the bats if some outside assistance is available. Although this species is considered common at present, the current rate of building renovation is undoubtedly leading to loss of roost sites, therefore every attempt should be made to persuade householders to retain their bat colonies. Details on the information, advice and practical support intended for the householder are discussed in Chapter 3 of this report.

- A section of an attic used by more than 250 Leisler's bats in Co. Donegal was modified in 1998 to alleviate problems caused by urine staining and noise (K. McAney, pers. obs.). This involved closing off the section used by the bats by constructing an eaves bat box within the attic, the design adapted from guidelines prepared for Scottish Natural Heritage (1998). This was successful at the time, although little information about the status of the colony is available currently. The householder continued to complain about an odour and regularly opened a large roof trapdoor during warm weather, which allowed bats to enter other parts of the attic and give rise to problems that could not be contained. This site should be monitored carefully in the future to assess its status.

- It is recommended that a number of field trials of the experimental heated bat house currently being tested in Scotland should take place in Ireland (S. Swift, pers. comm.). Although this system in Scotland is being tested to provide alternative roosts for pipistrelles, because Leisler's bat uses houses in Ireland, it should be tested here. The heated bat house is an initiative based on an American bat house design, which incorporates an integral heating system. The structure is either mounted on an outside wall of a building or on a pole. Power for the unit is supplied by the mains system of the host building. There is a roosting chamber divided into crevices, while the heaters and temperature control circuit are housed in side chambers to which bats have no access. Temperature inside the bat house is controlled by means of a solid-state circuit with its sensor embedded in the roosting chamber. Trials in Scotland have shown that the boxes maintained a temperature consistently 10-12^0 C above ambient, up to pre-set temperature of 27-28^0 C, above which the heaters switched off. Pipistrelles successfully bred in two of the three boxes under trial during 2005.

- There is a need to create an awareness of the conservation needs of Leisler's bats amongst those who encounter bats within buildings during the course of their work, such as builders, surveyors and architects. This is discussed in Chapter 5 of this report.

- This species uses a wide range of habitats and is able to fly across open areas. It is therefore less vulnerable to habitat fragmentation than other species. However, the increasing knowledge of its use of trees in Ireland indicates that woodland management, particularly the retention of old trees, is important, as has been recorded elsewhere (Ruczynski & Ruczynska, 2000).

- The use of antiparasitic drugs in cattle and sheep, the residues of which have harmful effects upon insects that breed in dung, may have conservation implications for Leisler's bat, which has a major pastoral prey component in its diet, therefore this issue should be investigated.

- Due to the important role Ireland plays within Europe for this species, some research is needed to see if there is any migration of Leisler's bats from Ireland to mainland Europe. This could be done using stable isotopes.

Species	**Size**	**Roosts & Foraging habitats**
Common & Soprano pipistrelles	Wt. 4.0-8.0 gms Wingspan: 19.0-25.0 cm Head &Body: 33.0-48.0 mm	Buildings: aquatic places, woodland edge, tree lines, farmland, hedges, gardens, urban areas.
Nathusius' pipistrelle	Wt. 6.00-15.0 gms Wingspan: 19.0-25.0 cm Head &Body: 46.0-55.0 mm	Buildings: Aquatic places, along rides, paths, woodland edge, meadows, avoids urban areas.
Whiskered	Wt. 4.0-8.0 gms Wingspan: 19.0-25.0 cm Head &Body: 35.0-48.0 mm	Buildings, bridges and underground sites: Along tree lines, centres of broad leaved woodland, edges of mixed woodland, rivers.
Brandt's	Wt. 4.5-9.5 gms Wingspan: 19.0-25.0 cm Head &Body: 38.0-50.0 mm	Buildings: Woodland and along woodland edge with water.
Brown long-eared	Wt. 6.0-12.0 gms Wingspan: 25.0-33.0 cm Head &Body: 37.0-52.0 mm	Buildings: Woodland, birch scrub, gardens with large trees, orchards, parkland with meadows.
Natterer's	Wt. 6.5-12.0 gms Wingspan: 25.0-33.0 cm Head &Body: 38.0-50.0 mm	Buildings and underground sites: Semi-natural broad leaved woodland, tree-lined rivers, grassland.
Daubenton's	Wt. 6.0-12.0 gms Wingspan: 19.0-25.0 cm Head &Body: 45.0-55.0 mm	Buildings, bridges & trees: Rivers with slow moving water and bankside vegetation, also woodland.
Leisler's	Wt. 11.0-20.0 gms Wingspan: 25.0-33.0 cm Head &Body: 50.0-68.0 mm	Buildings and trees: Pasture, drainage canals, over lakes and conifer forests.

Table 2.2. *Descriptions of the nine vesper bats in Ireland*

3. Site based conservation measures

3.1 Introduction

The Republic of Ireland is required under both Irish and European law to conserve habitats and species by designating conservation areas. The Irish Wildlife (Amendment) Act 2000 provides the mechanism to protect areas considered important with respect to natural heritage. Article 12 of the EU Habitats Directive (92/43/EEC) requests that member states shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV (a) in their natural range, prohibiting deterioration or destruction of breeding sites or resting places. All Irish bat species are covered under Annex IV (a).

Under the Irish Wildlife (Amendment) Act 2000, protected areas are known as 'Natural Heritage Areas'. The operation of such a designation is fairly straightforward when considering a blanket bog or a turlough, as much experience has been gained through the process of setting up SACs under the Habitats Directive. Although many SACs have been designated for one bat species, the lesser horseshoe (*Rhinolophus hipposideros),* that process provides little guidance for the setting up of NHAs for the vespertilionid bat species for a number of reasons. Firstly, a large percentage of the lesser horseshoe bat SACs are in unoccupied structures, such as abandoned period dwellings, cottages, outbuildings and caves, in contrast to many of the bat sites under consideration as NHAs. Secondly, the lesser horseshoe bat is particularly faithful to its roosting sites and, in the absence of disturbance, generations of bats will use a site for decades (K. McAney, pers. obs.), in a sense providing a long-term return for its designation. Although sites of other bat species have not been routinely monitored, it appears that these bats change roosts more regularly, even in the absence of direct disturbance. Thirdly, the issues of incentives, compensation and objection have not been tested. Finally, the case of the owner of one occupied period dwelling who was extremely unhappy with its designation as a lesser horseshoe bat SAC serves as a reminder that particular care needs to be taken in considering site-based conservation measures for bats. This chapter does not provide definitive answers to the questions raised by the implementation of such measures, but rather seeks to set out the possible options available.

3.2 Number of possible NHAs

Forty sites are currently listed as proposed bat NHAs, covering roosts of brown long-eared, Natterer's, Daubenton's, whiskered and Leisler's bats. However, this information dates back to the mid 1990s and all 40 sites need to be reassessed before any steps toward designation begins, as at least one of these sites has been lost because the bats were excluded (K. McAney, pers. obs.), and additional sites of national importance have been discovered in the interim. Also, there are no bridges or trees, or pipistrelle bat sites, currently listed.

The breakdown by site type is as follows:

- Private dwellings – 14
- Churches – 7
- School/Convent – 5
- Castle/Ice house – 4
- Outbuildings – 3

- Cave – 2
- Hostel – 1
- Other/unknown – 4

Table 3.1 shows the range of sites used by the vespertilionid bats and the importance of each for the different species. Unlike many other forms of wild fauna, bats occupy a myriad of structures during the course of a year, many of which bring them into contact with humans whose actions, either deliberate or accidental, can often directly harm or kill them or reduce their long term chance of survival through destruction of breeding and hibernation roosts. Such threats have led to the listing of all bats under the Irish Wildlife Acts (1976 and 2000). However, implementing conservation measures for bats is challenging as much still needs to be learned about their ecology in Ireland, and because they still suffer from a negative public image. Nevertheless, action must be taken and some recommendations are outlined below.

Species	**Building**	**Outbuilding**	**Church**	**Castle/ Ice House**	**Bridge**	**Tree**
Common & soprano pipistrelle	High	Low	High	Medium	N/S	?
Nathusius' pipistrelle	?	?	?	?	?	?
Brown long-eared	High	Medium	High	High	N/S	?
Leisler's	High	Medium	N/S	Medium	N/S	?
Daubenton's	High	Low	Low	High	High	?
Natterer's	High	High	High	?	High	?
Whiskered/Brandt's	High	High	Low	?	Low	?

Table 3.1. *Range of sites used by bats and their dependence on these. N/S = not considered to be significant. ? = no information available at present.*

3.3 Roosts in buildings

All vespertilionid bats in Ireland use buildings for a range of purposes, but the most common use is for giving birth during the summer, a crucial time in their life cycle. While rearing the young and at other times of the year, the bats use a wide range of buildings and locations within them. What is most relevant is the actual presence of a nationally important colony of bats within a site and how that site can be protected from disturbance and deterioration to ensure its favourable conservation status as a bat roost. Different approaches may need to be taken depending on whether the building is a private dwelling or fulfils a public function, for example, a church, a school, a site of historical or amenity value, or a hotel/hostel. Also, some structures may contain more than one species, but in small numbers. In such cases, the presence of several species is a valid reason for designation, rather than on the usual criterion of a high number of bats.

3.3.1 Private dwellings

There are obvious problems in placing a conservation designation on a privately owned family dwelling, even if the owner has been happy in the past having the bats present. Some of these could include how the designation would be notified to the owner and if this becomes public

knowledge, how data about the house are stored and who has access to these, and how such a designation would affect the perceived value of the house. Add to this list an owner who is not 'pro-bat', and the situation becomes even more difficult. The risk of such a householder taking steps to exclude a colony before or because of notification is high. Therefore, it is recommended that some other form of site based conservation measure be considered for this category of building.

Proposed bat roost agreement

The fact that a bat colony of national importance is present in a house illustrates that the building already provides the conditions needed by the bats. In essence what is required is the cooperation of the house owner and (where appropriate) their family to ensure that these conditions remain favourable. Gaining and maintaining this cooperation will vary from site to site, simply because peoples attitudes vary greatly, but the following is a suggested starting point for setting up an agreement between the householder and NPWS to ensure the continued safety of the bats at the site. Where there is a cost incurred in implementing some of the following, this should be borne by NPWS in the form of a grant to the householder.

- Removing droppings at the end of a season where these are accessible.
- Fitting structures underneath a roost exit to prevent droppings falling onto window ledges, paths or patios, if these are a problem.
- Providing a water tank cover.
- Providing sound proofing, if the bats can be heard in the living space of the house.
- Providing odour neutralisers, if odour from droppings is an issue.
- Providing a sign near the entrance to the attic or at the bat access point to warn workmen of the presence of the bats.
- Providing a pack to the householder containing information about the bat species using the house, the time of year the bats are likely to be present, advice on what to do if a bat enters the living area of the house, contact numbers for the local Conservation Ranger and District Conservation Officer, advice on when repair work can be undertaken and how this can be done.
- Ensuring the planning office in the local authority is aware of the colony so that this will be taken into consideration during a planning application.
- Ensuring that all repair/renovation work that may affect the bats is supervised.
- Ensuring that the site is carefully monitored each year and the results notified to the householder.
- Ensuring that builders and other professionals are aware of their legal responsibilities in relation to bat protection when carrying out work at the building.

As there may well be other issues that need to be addressed in addition to those listed above, it is recommended that representatives from both NPWS and BCIreland meet to decide the format of a general management agreement. The experience gained by the Heritage Council from its 'Buildings at Risk' scheme could have relevance here also. This general agreement could then be tailored to suit the particular site and presented to the householder for comment. Copies of the final agreed text should be retained by both the householder and in the local NPWS office. There are numerous householders with large bat colonies who are quite happy to have the bats in their homes and this fact should be promoted (C. Kelleher, pers. comm.). Although this approach does not confer the same degree of protection in legal terms as a full NHA designation, it could well confer greater protection in a practical sense.

3.3.2 Public buildings

It is considered feasible that buildings already owned or managed by the state, or fulfilling a public function, could be designated as NHAs and doing so would illustrate the important heritage value attached to the presence of bats in a structure. Nevertheless, the procedure for designation should be approached with great sensitivity and the concerns of the custodians should be considered. It may be possible to use some of the procedures involved in designating other forms of NHAs here, but as with private dwellings, issues specific to the conservation of bats within a structure must be identified and become part of the conservation measures operating at the site. Once again, this process would benefit from a joint NPWS, BCIreland and Heritage Council approach.

3.4 Bridges

Bridge bat roosts are at risk from repair, maintenance, strengthening and demolition work and little regard has hitherto been given to the conservation of bats using bridges in Ireland. Therefore it is considered essential that bridges should be designated as NHAs, not however as isolated features on the landscape, but in terms of an entire river catchment area, where all suitable bridges associated with a river system are identified and brought within the terms of the designation, in addition to the riparian vegetation adjacent to those bridges and along the course of the river. This last point is important, as several studies have shown the significance of this habitat to Daubenton's and the soprano bat in particular. It is possible that some of the riparian habitats important for this species come within designated SACs, already proposed NHAs or under the REPS scheme. However, it is important to determine the extent of this, to recognise where there is scope for protecting more, and to establish if specific actions in relation to bats are needed.

The approach being proposed here would be in accord with that adopted for the implementation of the EU Water Framework Directive where the main activities relating to this directive in Ireland are being taken at the River Basin District (RBD) level (www.wfdireland.ie). One of the aims of this directive is to protect the physical and biological integrity of water systems, which could certainly be interpreted in terms of the aquatic prey of Daubenton's and soprano pipistrelle bats.

Returning to the issue of actual roosts in bridges, there are hundreds of records of Daubenton's bats as well as Natterer's bats within bridges in Ireland, and these could form the basis for identifying those systems that should be designated. Although few large colonies, such as breeding colonies, are found under bridges, these structures are important resting places for bats throughout the year, and may well be the most important roosting sites for male Daubenton's and Natterer's bats, as well as serving as summer night roosts for both males and females. Shiel (1999) set out a list of recommendations for the conservation of bat rooting sites in bridges, and these should form the starting point for a discussion on bridge NHAs. Also, a number of measures have been tried recently to retain known roosts sites in bridges and also to attract bats to new ones and if these are successful, they could become important conservation proposals (C. Shiel, pers. comm.). Considering that the NPWS is the body responsible for designating NHAs, and most bridges come under the management of local authorities, and both parties belong to the same government department, there appears to be plenty of scope to extend conservation measures to these structures.

3.5 Trees

It is not considered feasible to consider designating individual trees as bat NHAs at present, due to the lack of information about tree roosts in Ireland. But, it is possible that future research will reveal important tree roosts or indeed woodlands for certain species, which would then warrant designation. Again, as with riparian vegetation, there may be some overlap with already existing designations and REPS plans that would enable additional measures for bats to be considered. The practice of felling non-native species, particularly Beech (*Fagus sylvatica*), and especially along river and lake edges, should be reviewed as such trees could well provide bat roosts. Certainly no mature tree should be felled without a bat survey being conducted. Finally, the proposed reintroduction of the great spotted woodpecker (*Dendrocopus major*) could be seen as a way to increase the availability of tree roosting sites (C. Kelleher, pers. comm.).

3.6 Caves

As a number of caves have successfully been designated as SACs for the lesser horseshoe bat, there is no reason why caves used by vespertilionid bats should not be designated as NHAs. The main conservation issues in relation to bats roosting in caves are that the public are not permitted access to those sites when the bats are present, that dumping at/in the site is prohibited, that large machinery does not operate close to the entrance, and that surrounding vegetation is not removed. Although only two cave sites are currently listed as proposed NHAs, at least one other is known (K.McAney, pers. obs.). It is essential that research is conducted to determine if the bats present at these three sites represent breeding colonies or non-breeding groups, and if these sites are important for swarming, as each of these uses require different conservation measures. However, in all cases, care must be taken before grilles are installed as these can have adverse effects on bats. A thorough review of the effect of gating caves and mines and the use of automated systems to monitor bats at these sites is being prepared for the Countryside Council of Wales and should be consulted when it is published (Glover & Altringham).

3.7 Summary

Just as the creation of SACs and SPAs form a network of protected habitats and species across the European Union, so the setting up of NHAs provides the potential for a network of protected sites within Ireland for the vespertilionid bats. The exact location of all NHAs should be provided to the local authorities for overlay on their GIS systems, so that any future development adjacent to the sites can be highlighted and the possible effects investigated before permission is granted. Table 3.2 gives a summary of the above recommendations.

Structure	NHA designation appropriate	Site management priorities
Private occupied dwellings	No	Detailed agreement to protect the site against disturbance with practical and financial backup for householder.
Public structures	Yes	Practical backup.
Bridges and river systems	Yes	Close liaison with engineers in local authority.
Trees and woodland	Yes	Close liaison with landowner to implement best management practices.
Caves	Yes	Close liaison with landowner, financial support and advice on grilling if necessary.

Table 3.2. *Summary of the main recommendations for site based conservation measures*.

4. Recommended Monitoring Methods

4.1 Introduction

Where once the desire to know where bats roosted and foraged was the exclusive pastime of Victorian gentlemen in Ireland, now national and international bodies seek this knowledge for the purpose of guaranteeing viable bat populations into the future. The decline in the populations of certain bat species in Europe during the last century means that information on current populations must be gathered to serve as early warning signals, so that further declines or even extinctions can be prevented. Ireland is a signatory to several international conventions, agreements and directives that require bat populations be monitored, so that effective action can be taken to conserve them.

A pan-European publication providing guidelines for monitoring bat populations in order to assess population trends at different levels is currently being prepared as an action of the Advisory Committee for *The Agreement on the Conservation of Populations of European Bats* (EUROBATS) (J. Battersby, pers. comm.). This publication will recommend best practice for monitoring methods, so that a consistent approach to assessing bat populations can be developed within and between participating states in Europe.

The purpose of this chapter is to present recommendations on monitoring the nine bat species covered here within an Irish context. Exact instructions as to how to conduct this monitoring work, such as the setting up of mist nets and subsequent handling of bats captured, is not described, as this information will be provided by the EUROBATS publication, and it is assumed that anyone undertaking such survey work will adhere to the EUROBATS guidelines.

4.2 Existing Irish bat monitoring programme

In 2003, the UK-based Bat Conservation Trust (BCT) conducted a pilot monitoring programme for certain Irish bat species in the Republic of Ireland, with grant funding from The Heritage Council. This monitoring continued in 2004 and 2005, when it was co-ordinated by BCIreland, in partnership with BCT, and with funding from The Heritage Council and NPWS. The basis for this monitoring programme is a car-based bat detector survey of randomly generated 30 km^2 squares in which 20 transects of 1.609 km (separated by 3.2 km) are driven at 24 km per hour and the ultrasonic calls of bats detected are recorded onto minidiscs for subsequent computer analysis. Details of the methodology used and results obtained for 2003 and 2004 have been published (Catto *et al.*, 2004; Roche *et al*, 2005), and results for 2005 are currently being prepared (N. Roche, pers. comm.).

So far this method has proved successful in detecting common and soprano pipistrelles and Leisler's bat, but is not considered suitable for monitoring the *Myotis* bat species or the brown long-eared bat. However, a pilot water-based survey for one of the *Myotis* bats, Daubenton's bat, was undertaken in 2005 and is believed to be a relatively simple and cost effective method for monitoring this species in future years. This method requires the surveyor to walk 1 km transects along a river bank, stopping every 100m to listen for the species with a detector set to 40 kHz. A torch is also used at this stop to scan the water surface to confirm this species' characteristic flight pattern. This species could also be monitored as part of a study of autumn swarming behaviour at underground sites used by Natterer's bat.

The 2004 results of the car-based survey, when 2033 bat encounters were recorded, reveal that the common pipistrelle was the most commonly encountered species, followed by the soprano pipistrelle and then Leisler's bat. The mean encounter rates per km for each species/species group were: common pipistrelle (13); soprano pipistrelle (4.7); Leisler's bat (3.5) and *Myotis* spp. (0.3). Although it is far too early to be able to make any definitive statements about relative abundance of different species, it appears that this monitoring approach will provide sufficient data to identify a 50% or greater decline over a 25 year period for the common pipistrelle, soprano pipistrelle and Leisler's bats if 11, 11 and 14 years monitoring respectively is successfully completed, where 10 squares (each with 20 transects) are surveyed twice annually.

As the *Myotis* bats, the brown long-eared bat and Nathusius' pipistrelle were rarely detected by this method, other monitoring techniques will need to be employed for these species and these are discussed below. In the case of Nathusius' pipistrelle, the first confirmed recording of this species using the car-based system was made in Cos. Louth and Monaghan in July 2005, but the detection rate was very low (one encounter in 1,500). However, as this species was only discovered in Northern Ireland as recently as 1998, and might be assumed to be now only spreading southwards, this low encounter rate might be anticipated. It might also reflect low activity along road systems and/or an overall low abundance in the Republic of Ireland.

4.3 The UK National Bat Monitoring Programme

In December 1995, The Department of Environment, Food and Rural Affairs in the UK commissioned the BCT to carry out a programme of research with the overall goal of developing an effective monitoring strategy for resident species of bat in the UK. A report on the years 1997-2004 is currently in preparation, but a summary for 2004 shows that 11 out of 17 species are currently being monitored using field and waterway surveys, summer colony counts and hibernation counts. Certain species are being monitored in the same way in both the UK and Ireland, for example, field detector surveys for the pipistrelle bats and Daubenton's bats. But it is not possible to monitor Daubenton's, Natterer's and whiskered/Brandt's bats at hibernation sites in Ireland, as is the case in the UK. Nevertheless, many of the issues discussed under the UK Nat Bat Monitoring Programme are relevant to current and future monitoring initiatives in Ireland.

4.4 Future monitoring of other bat species

Bats are a particularly difficult group of animals to study, being small, nocturnal and fast flying. Until the introduction of bat detectors, knowledge of the distribution and abundance of species was based on direct observations of the numbers present at roost sites, such as maternity roosts or hibernacula. The use of bat detectors enabled information to be gathered on bats as they flew away from and back to day roosts (commuting flights) and as they hunted (foraging flights). But as yet, there is no one method of monitoring that can be successfully applied to all nine Irish species under consideration. Site based monitoring is only possible with those species that return to the same roosting sites each year and that are easily observed at those sites (e.g. the lesser horseshoe bat). Detector studies are most successful with those species that produce loud, relatively low frequency calls that travel some distance (e.g. Leisler's bat), or produce calls that are not easily confused with the calls of other species (e.g. the pipistrelle bats), or fly in a distinctive way in a well defined geographical landscape (e.g.

Daubenton's bat). For the remaining species, other approaches must be taken in order to determine their abundance. The monitoring methods suggested do not, in their present form, provide the basis for a statistically robust method for assessing population trends, but they offer a beginning in the process of finding such a method.

4.4.1 The brown long-eared bat

A field-based detector study is not a reliable method because of the low intensity echolocation calls. Unfortunately, it is difficult to count long-eared bats when they emerge because they do so in very low light conditions. For these reasons, Swift (1998) states that counts of animals within roosts are the only practical way to monitor long-eared bat populations, although such counts frequently underestimate actual colony size because the bats can retreat from view. However, the degree of disturbance caused by counting within a roost over a long period of time must be taken into consideration.

Nevertheless, counts within previously known roosts in order to assess if these sites are still in use is a necessary starting point for setting up a monitoring programme for this species. Basic information on 295 sites was collated during the joint VWT-OPW Bat Project during the 1990's (K. McAney, pers. obs.) and additional, more recent information, is undoubtedly held by Conservation Rangers, bat consultants, BCIreland members, and other interested individuals. Once all of these sites have been revisited, a selection of those containing nursery colonies should be chosen for long-term monitoring, preferably by conducting emergence counts before the females give birth using a digital video camera recorder with night viewing functions. If a suitable geographical spread is not obtained by this method, or more sites are required to improve its reliability, then searches should be made for new roosts based on the knowledge that long-eared bats select sites that are within 0.5 km of woodland (Swift, 1998).

A more thorough but labour intensive approach would be that adopted by Speakman *et al.* (1991) in north-east Scotland where an intensive poster and newspaper campaign was run over four years asking members of the public to report the presence of these easily recognizable bats from their attics. A total of 34 roosts were found in an area of 3200 km^2, containing a total of 706 bats.

4.4.2 Natterer's bat

This species cannot be monitored using bat detectors, this time because of the continuing difficulty in separating its calls from those of other *Myotis* bat species that also feed in woodland. Also, it is difficult to assess numbers at roosts using emergence counts as this species emerges late in the evening.

Therefore, a site based monitoring approach, like that proposed for the brown long-eared bat, would still seem to be most appropriate. Unfortunately, few roosts are known; only 66 were documented during the joint VWT/OPW project, with only 17 containing 10 or more bats (K. McAney, pers. obs.). Undoubtedly, Conservation Rangers, bat consultants, BCIreland members and other interested individuals hold more recent data. All known sites should be revisited to assess their status; it is already known that one large site containing 150 bats in Co. Kerry, was lost during the late 1990's because of renovation (M O'Sullivan, pers. comm.). Additional fieldwork is necessary to locate more roosts before any long-term monitoring can begin. Roche (1998) undertook a survey of Church of Ireland churches located in rural areas specifically to find this species, but failed to find any and concluded that this method was

labour intensive with little return. Her observations were confirmed by Smith (2002), who described Natterer's bats as elusive animals, and even when known to be present in a building, are hard to locate. She proposed that mist-netting studies in suitable habitats combined with radio tracking would prove more successful in locating new roosts.

Information from the UK on the habitat preferences of this species shows that it prefers mature, semi-natural broad leaved woodlands, tree-lined river corridors and ponds (Smith 2002). In Ireland, NPWS is currently undertaking a national survey of native woodlands. Much of the information being gathered is of direct relevance to bats, including an estimate of the extent of this habitat, its precise location, a species list, description of stand structure, age of trees and amount of dead wood (J. Cross, pers. comm.). By using Geographical Information System (GIS) predictive mapping techniques (F. Greenaway, pers. comm.), such information could be used to select the most suitable areas for mist netting or harp trapping woodland bats, such as Natterer's. A number of the adult female bats thus captured should then be radio tracked, so that their roosting sites can be located. Although this species uses a large number of roost sites during the summer (including trees), from late May to mid-July roosts are predominantly in attics of houses (Smith, 2002). Mist netting or harp trapping should be carried out from late May, but cease as pregnancy advances. Once nursery roosts are found, these sites should form the basis of a site based monitoring programme similar to that described for the brown long-eared bat.

Although mist-netting bats within woodlands is difficult, Natterer's bats have been caught in mist nets on several occasions in the past (K. McAney pers. obs.; Kelleher, 2005). However, the recent development of an acoustic lure for surveying bats in woodlands in Britain has the potential to greatly increase capture rates of bats in nets in this habitat (Hill & Greenaway, 2005).

In addition to finding and monitoring summer roost sites of Natterer's bat, its presence in autumn at underground sites (those in which it has been recorded hibernating) should be assessed to see if it displays swarming behaviour (flying at and in hibernacula in late autumn), as has been observed in the UK and elsewhere. Parsons *et al*. (2003) found that Natterer's bats, particularly males, were the commonest recorded species captured while swarming at eight cave, mine and tunnel sites in southern England over six years (1995-2000), with Daubenton's bat the second commonest. Rivers *et al.* (in press) described swarming behaviour by Natterer's bats at four caves in the north of England, where bats were also ringed. Subsequent recaptures at summer nursery sites located 60 km from the caves proved that this species was undertaking seasonal migration. If swarming behaviour is confirmed at Irish underground sites, then swarming season surveys of these underground sites should be included in the monitoring programme, as this will give information on the population of male Natterer's bats. Also, a radio tracking study should be undertaken on some of the bats captured to help determine the catchment area for the site, and possibly lead to the discovery of additional roosting sites.

4.4.3 The whiskered bat

The draft EUROBATS guideline on the monitoring of this species is a regular winter census of hibernacula where these contain hundreds of individuals, as is the case at some cave sites in mainland Europe (J. Battersby, pers.comm.). It has already been noted that this is the current monitoring method in the UK, although smaller numbers are recorded. But, this is not an option in Ireland, where only single individuals have ever been found during winter. Site based counts at summer roosts for the purpose of long term monitoring are also not currently an

option due to the scarcity of such sites: only 45 roosts were documented during the joint VWT/OPW project, with 10 containing 10 or more bats (K. McAney, pers. obs.). It is possible that Conservation Rangers, bat consultants, BCIreland members, and other interested individuals hold more recent data and these should be accessed. Subsequently, all known sites should be revisited to determine their status. In addition, bats should be captured and carefully examined to check for the presence of Brandt's bat, with DNA samples taken where identification is in doubt. A number of confirmed whiskered roosts should then be chosen and observed in order to gain basic information on when the bats are present, in what numbers, the social makeup of the colony, and what form their emergence behaviour takes. As no dietary analysis has been conducted on this species in Ireland, such a study should be undertaken at a number of sites throughout the country to provide basic information on the foraging needs of this species.

A programme of research centred on woodlands (identical to that for Natterer's bat and using nets, harp traps and radio tracking) should also be followed in the case of the whiskered bat in order to determine its foraging needs and discover new roosts. Until such time as a reliable bat detector monitoring survey can be undertaken for this species, if ever, a site based monitoring programme similar to that described for the brown long-eared bat should be put in place.

It is possible that this species swarms at underground sites in Ireland as it does in the UK (Parsons *et al.* 2003), so additional information about it may be gained from swarming studies of Natterer's bat.

4.4.4 Brandt's bat

This species was recognised for the first time in Ireland in 2003, although final genetic confirmation is still awaited (E. Mullen, pers. comm.). However, as so few records exist, this species cannot be included in any monitoring programme at present, although some may result from studies on whiskered roosts. Also, it is possible that it may be captured during mist netting or harp trapping exercises for other species and consideration should be given as to whether such individuals could be radio tracked.

4.4.5 Nathusius' bat

Due to the scarcity of records for this species, it cannot be considered in any monitoring programme at present. However, it may be recorded during the course of the Daubenton's water-based detector survey, as it has been reported to feed on insects associated with water (Vaughan, 1997). Should sufficient Nathusius' bat calls be detected over time during this survey, this species could then be included in the Daubenton's monitoring programme. It is possible that it may be captured during mist netting or harp trapping exercises for other species and consideration should be given as to whether such individuals could be radio tracked.

But, attempts should be made in the interim to locate actual roosting sites and to monitor these. This species has been found roosting in gaps in the stonework of a mid-19th century farm stable block and storehouse, close to water in Northern Ireland (Russ *et al.,* 1998). A number of similar sites in the Republic should be checked with bat detectors in the autumn to determine its presence. Male Nathusius' pipistrelles establish mating territories immediately prior to the mating period (Gerell-Lundberg & Gerell, 1994) and can be recognised at these by their distinctive calls and flight behaviour (Barlow & Jones, 1996).

4.4.6 Summary of monitoring recommendations for all nine species

It is important that the current car-based and waterways monitoring programmes are continued. The value of these schemes relies on the accumulation of long-term trend data and ideally both the Heritage Council and NPWS should commit to the continued support of these programmes for at least the next five to ten year period. Table 4 gives a summary of the current monitoring situation for the vespertilionid bats in Ireland and recommendations for the additional work that is needed in order to extend monitoring to all the species. One further exercise that should be undertaken and which could inform future monitoring is a review of all bat records found during EIAs. Data on roost sites and detector records contained within these reports should be analysed to see how they contribute to our knowledge of the distribution of bats in Ireland.

Biological monitoring is a labour intensive exercise and that relating to bats is made more demanding by involving night work. There may be scope in the future for deploying automatic logging systems at sites or in habitats overnight whereby information on bat activity is stored for later analysis. In this way one person can monitor a number of sites simultaneously, without the need to be up all night. One of these systems enables the recording of bat calls of all bat species at a number of locations at half hour intervals up to three hours after dusk (R. Ransome, pers. comm.). Glover & Altringham (in prep.) review some of the other systems currently in use.

Species	**Current method**	**Additional action**	**Baseline study**
Common & soprano pipistrelles	Car survey	None at present.	None needed.
Nathusius' pipistrelle	None	Water-based survey. Autumn mating survey.	Locate roosts.
Leisler's	Car survey	Autumn mating survey.	None needed.
Daubenton's	Water-based survey	Autumn swarming survey.	Trap at underground sites.
Brown long-eared	None	Summer site colony counts.	Revisit all known sites to assess status.
Natterer's	None	Summer site colony counts. Autumn swarming survey.	Revisit all known sites to assess status. Trap in woodland and radio track.
Whiskered & Brandt's	None	Summer site colony counts. Autumn swarming survey.	Revisit all known sites to assess status. Trap in woodland and radio track Trap at underground sites.

Table 4. *A summary of the current and proposed monitoring of Irish bats.*

5. Recommendations for the furtherance of public understanding

5.1 Introduction

Generally, the first contact a member of the public has with bats is when they encounter them in a building. Despite all the initiatives to promote a better understanding of bats that have taken place since the mid 1980s, when Paddy O'Sullivan (Research Section) and other staff within the National Parks and Wildlife Service first highlighted the need to protect them, the following statements are still regularly uttered as reasons why bats are not welcome in a structure:

They are just mice with wings, dirty and fast breeding.
They become entangled in your hair.
They contribute nothing to nature.

They give rise to a smell.
They cause damage.
Their droppings are a nuisance.
They make their way into the living area of a house.
They carry disease.
They create noise.
They prevent renovation work by their presence in a building.

They are ugly creatures.

Of all these, unfortunately only the first three can be completely refuted, while the last is a purely subjective issue. Even though the word 'rarely' could be strategically placed into all of the remaining statements, the task of creating a positive attitude towards and an appreciation of bats is still a huge challenge. A properly funded, broad based and sustained approach is the only way to address this. The problems facing the nine bat species and our international obligations give us no option.

This chapter provides a framework for this approach, first by describing the main organisations already involved with bats, with an assessment of their success or otherwise, and then by making recommendations, based on these assessments. Although the suggestions made here are essentially the outcome of one person's review of the past 20 years of bat work in Ireland, it was informed by consultation with people whose work involves bats, both directly and indirectly.

5.2 National Parks and Wildlife Service

The National Parks and Wildlife Service - NPWS (formerly the Forest and Wildlife Service, now of the Department of the Environment, Heritage and Local Government) is the body responsible for the provision of advice on bat conservation and management, and the body that polices both national and international legislation protecting all Irish bat species (Table 2.1). It supervises the issuing of licences for research, conservation work and for exclusion of bat colonies, and represents Ireland at EUROBATS. The following are specific actions that the NPWS has/is undertaking:

5.2.1 National Bat Survey 1985-1988

Scientists representing 16 European countries met in Bonn in 1981 to discuss the rapid decline of bat populations in some parts of Europe and passed a resolution calling on European governments to provide immediate protection for bat roosts. This prompted the Forest and Wildlife Service to undertake a National Bat Survey in 1984 to assess the status and distribution of Irish bats. The results for the years 1985 –1988 have already been presented in Chapter 2. During the first year, only foresters and rangers were asked to conduct the fieldwork, but the general public were invited to contribute in subsequent years in order to improve coverage. While a great deal of information was gained about bat roosts, this survey also served as an important vehicle for publicising bats, because requests for assistance were sought through several radio interviews, a television appearance and numerous newspaper articles and public lectures, particularly during 1985. An Irish bat leaflet was produced around this time. All pest control agencies were contacted and asked to supply records of bats in buildings, and it was noted that all agencies responded favourably, in particular Rentokil, the largest pest control group. Surveyors were encouraged to give talks to schools and other interested groups, and were provided with slide packs and lecture notes for this purpose.

Assessment
In terms of raising the profile of bats for the general public, the survey was a huge success. During 1984 and 1985, nine out of ten queries were concerned with getting rid of the animals, but this situation was completely reversed in 1986. There were also many requests for information from school children seeking to do projects on bats and from people wanting to erect bat boxes. It created a platform for similar work during the 1990's.

In terms of a distribution survey, it was an important baseline study, although certain areas of the country were poorly covered because of lack of personnel.

5.2.2 Conservation rangers

Those rangers with lesser horseshoe bats in their areas have played a very important part in the SAC designation process and continue to play key roles in the monitoring and protection of these sites. Other bat related work undertaken by these and all other rangers is as follows:

- Dealing with queries from the general public, schools, churches, hospitals, businesses, consultants, etc.
- Making house visits where possible to deal with grounded bats, complaints of smell, fearful owners, etc.
- Conducting bat walks during the year, particularly on European Bat Night and during Heritage Week.
- Commenting on and investigating objections to planning applications.
- Giving talks in schools.
- Enforcing the law, for example, investigating the sale of dead bats, blocked roosts, etc.
- Examining EISs for large projects and commenting on the methods used, the likely impacts and mitigation measures proposed.
- Commenting on bat handling licence requests.
- Survey work, such as the car-based bat monitoring programme.

Assessment
Many rangers, including those involved with the 1980s survey or employed since then, continue to monitor important roosts and are committed to bat conservation. In the absence of a large and widespread voluntary base, they are the most important first line of contact for anyone seeking advice on bats, and for law enforcement. However, undertaking this work is made difficult by the following:

- Bat work has never been given the same priority as during the years of the National Bat Survey.
- Rangers can find it difficult to schedule time to visit bat roosts in the evenings (when bats are active) due to pressure of other work or because householders are only available outside normal office hours, such as evenings or weekends.
- Certain sites may require the rangers to use ladders to enter attics and this gives rise to health and safety concerns.
- Recent changes to the wildlife legislation have left some confusion about when licences are required and how these should be issued.
- Some rangers find it difficult to comment on the results of EISs without knowledge of the methodologies employed by the consultants during the survey.
- There is no mechanism whereby all the data collected by the rangers on site visits can be centrally processed and reported back.
- There is little educational material for them to distribute on house calls or during public events.

5.2.3 Bat training courses

Since 1993 the NPWS has funded several bat training courses for its rangers, covering basic bat biology, species identification, using detectors, mist nets and dealing with the public. Rangers have also been funded to attend courses run by BCIreland.

Assessment
These courses have been very successful, particularly those tailored to the work needs of the rangers. These courses were also an opportunity for rangers to share their own experiences and to discuss different solutions to problems. However, as few rangers had access to bat detectors following the earlier courses, they had little opportunity to build on the knowledge gained; all rangers now have access to bat detectors. However, the most recently recruited rangers have not yet received any formal bat training.

5.2.4 Support for conferences and BCIreland

NPWS has co-funded, with the Heritage Council, all the Irish biannual bat conferences, the first of which was held in 1997, and the Xth European Bat Research Symposium, which took place in Galway in August 2005. In addition, NPWS staff contributed papers at these meetings and organised fieldtrips. It funded one bat worker to attend an international detector workshop in France in 2003. It fully financed the Bat Fieldcraft Workshop, held in Killarney National Park, which preceded the European symposium. Its support for BCIreland, both financial and in the form of meetings, has been important in helping this new conservation group become established. It co-funded, with the Heritage Council, the National Bat Monitoring Programme in 2004 and 2005.

Assessment
Funding the conferences has enabled these meetings to play a central role in progressing bat conservation in Ireland and Europe. The Fieldcraft Workshop was an outstanding success with tutors and participants from 12 countries, not only because it highlighted recent advances in the study of bats, but because it also facilitated an exchange of views by bat workers from varied backgrounds. One new bat species was confirmed for Co. Kerry, Nathusius' pipistrelle, while the discovery of Brandt's bat is awaiting confirmation by DNA analysis.

5.2.5 Joint VWT-OPW Bat Project

In July 1991, The Vincent Wildlife Trust (a UK wildlife charity), in partnership with the National Parks and Wildlife Service (then within the OPW), appointed a full-time Bat Conservation Officer in Ireland for a three and half year term. Following a series of meetings, attended by representatives from both conservation bodies, the following primary objectives were identified for this position:

- To continue the National Bat Survey.
- To arrange protection for sites under threat.
- To educate the various groups who encounter bats during the course of their work or leisure.
- To respond to queries from the public.
- To promote a greater awareness in society of the importance and need for bat conservation.
- To encourage voluntary bat groups.
- To meet National and International Obligations.

Assessment
Most of the objectives were met, primarily because of the widespread support for the project by Conservation Rangers. The main failure was in the area of setting up new bat groups.

- National Bat Survey: number of bat roosts visited rose from 127 in 1990 to 929 by December 1993; major nursery roosts were discovered for all but one species; intensive bridge survey in the north-west and south-west; first hibernation survey in 1994; regular visits and telephone contact maintained with 38 rangers; results of survey work prepared and distributed to all rangers and some other staff in the service - in 1993 alone, information on 1200 roosts was processed.

- Site Protection: 86 sites prepared and proposed as NHAs; most northerly maternity and hibernation site of the lesser horseshoe saved; lesser horseshoe nursery site reroofed in Kerry; large Natterer's maternity site protected despite major renovation; lesser horseshoe hibernation sites grilled.

- Education**:** 5000 copies of the *Bats in Buildings Pack* distributed; special display titled 'Bats in Buildings' designed and exhibited for six days in 1994 at the National Brighter Homes and DIY Exhibition in Dublin, and subsequently at shows in Cork, Galway and Belfast; a booklet, *The Importance of Bridges to Bats* was written and circulated to all local authorities; articles written for specialist magazines and newsletters and lectures given specialist conferences and national parks; information provided for the *Irish Red Data Book 2: Vertebrates*.

- Queries: 1,000 queries from the general public were handled.

- Promotion of bats: an Irish bats poster was produced and distributed; hundreds of copies of the existing Irish bats leaflet were distributed; a leaflet for ENFO was written; many radio interviews given and bats featured in four television programmes; stands taken at 20 summer shows; 40 public lectures given.

- Encouraging bat groups: regular contact was maintained with the Dublin and Galway groups and funding arranged for them; a draft licence for voluntary bat workers was drafted; training courses were conducted throughout the country.

When this project finished on December 31st, 1994, a major co-ordinating function was lost.

5.3 The Heritage Council

The Heritage Council was established under the Heritage Act, 1995, and was launched in October 1997. At the outset, it identified three key themes as its objectives, to collect data on, promote pride in, and propose policies for Ireland's heritage. It has assisted bat conservation under all three headings in the following ways:

- Providing grant aid for the design of an internet-based database by BCIreland.
- Providing funding for a pilot National Bat Monitoring Programme in 2003, and its continuation in 2004 and 2005.
- Establishing a network of Heritage Officers within the local authorities who produced the *Conserving Bats* booklet and who promote bats generally during the course of their work.
- Placing a number of bat experts on the panel for the *Heritage in Schools* Scheme
- Ensuring that a bat survey is conducted on all buildings seeking grants from the Council for restoration work
- Providing grants for research, one-off surveys and conferences, and speaking at the latter
- Providing a grant for BCIreland's Batline during 2004 and 2005

Assessment
The Heritage Council's contribution to the promotion and understanding of bats has been significant.

- The bat database has the potential to be an invaluable tool to inform conservation polices and population monitoring and to engage the general public in recording information about bats within a community context.
- Although the National Monitoring Programme is at a very early stage, it too has the potential to deliver its objectives for at least four species.
- Heritage Officers have ensured that bat issues have been included in county heritage plans, local biodiversity plans, and at a wide range of heritage events. The booklet and talks in schools have facilitated the promotion of bats in the wider community.
- Requesting bat surveys of buildings early in the renovation process has highlighted the obvious need for this practice and brought bats to the attention of the professionals whose actions influence bat roosts, such as architects, surveyors and builders.

- Co-funding of the four National Irish bat conferences has enabled these meetings to play a central role in progressing bat conservation in Ireland.
- The success of the Batline is described below.

5.4 BCIreland

BCIreland is Ireland's only organization solely devoted to the conservation of bats and their habitats. It is an umbrella group for all bat groups in Ireland, some of which have been in existence since the 1980s and have played an important role in public awareness. BCIreland is currently involved in the following activities:

- Advising and educating the general public and professionals who encounter bats.
- Campaigning to protect important roosts.
- Lobbying to have bats considered during developments and road building.
- Developing policies, and ensuring laws to protect bats are enforced.
- Liaising with other bat workers throughout the world to develop conservation strategies and necessary action.
- Organizing public events such as conferences, workshops and walks.
- Developing and supporting county based bat groups.
- Organizing surveys and monitoring projects.
- Recording bat distribution on the island of Ireland.

Assessment
Although only in existence since 2002, BCIreland has already established itself as a reputable conservation organisation. Its major achievements are as follows:

- It has played the lead role in the operation of the National Bat Monitoring Programme and in developing a bat database.
- It has a good working relationship with the NPWS and the Heritage Council.
- It is becoming more widely known to the general public and other interest groups by organising public events, radio interviews and newspaper articles.
- Since 2003 it has operated the Batline (a phone help line) during the summer to deal with queries from the general public. A total of 412 calls were dealt in a ten-month period in 2004/2005 and 110 information packs were posted out to those callers who requested additional material. Prior to 2003, Bat Conservation Group – Dublin Bat Group operated the Batline.
- Approximately 30 bat talks and walks were conducted in 2004 and 2005, some in conjunction with Waterways Ireland, which provided financial assistance.
- It has organised bat detector training courses in various parts of the country.
- Around 10,000 miles have been covered, visiting roosts and travelling to public events.
- A number of information leaflets were designed for distribution in information packs, and a newsletter is sent out regularly to its 70 members.

These achievements reflect the commitment of those currently involved, but it is questionable how long the organization can remain working at this level. Its current profile has led to high expectations, which cannot be realistically achieved in its present state. Many of the committee members are full time professionals working in bat consultancy, which leaves little time for

developing BCIreland. At present it suffers from both a lack of active support from amateurs, and the absence of full-time paid officers.

5.5 Recommendations for the future

As seen from earlier chapters, the lifestyles of bats bring them into contact with humans in many ways. Some people share their homes or places of work, education, worship or healing with them, others encounter them through their work, while most people are only vaguely aware about their occurrence in this country. In the minority, but hopefully with scope to increase, are those who are already interested in bats and committed to bat conservation.

Access to educational material is the key to increasing public understanding and appreciation of bats in Ireland. While there is some material available at present, this needs to be enhanced to meet current and future needs. Table 5 lists the range of material considered necessary and other measures that will assist in the distribution of this material.

It is obvious that the availability of and access to educational material must be matched by the availability of and access to trained educators. Many of those currently providing the general public with advice have received training, including Conservation Rangers, bat consultants, members of bat groups and others who have attended workshops organised by BCIreland since its inception. But there is a growing need for accredited training courses to be put in place for both bat consultants and members of the general public who wish to become involved in protecting bats. Conservation Rangers need initial training and then refresher courses every couple of years to keep up with species identification, using bat detectors, new ways of dealing with problems at roosts, etc. They might also benefit from seeing the way bat consultants conduct EIAs by accompanying them during this work.

Although all bat species in Ireland are protected under the Wildlife Act 1976 and the Wildlife (Amendment) Act 2000, there appears to be no reference to this on the website of the DEHLG, particularly under the most appropriate 'Development and Planning Section', which most professional bodies would consult.

In a two-year investigation by the BCT and the RSPB into bat crime in the UK (Childs, 2003), 144 bat offences were identified, with the true extent considered to be much greater. 67% of these offences were committed within the building trade. The report highlighted the urgent need to target educational resources towards this industry and the whole planning process to ensure greater compliance with legislation. There is no information on the extent of this crime in Ireland, but considering the ongoing boom in the development of old buildings, it is fair to assume that bat roosts are being destroyed and possibly bats killed. Childs (2003) makes a number of recommendations as to how the situation in the UK can be addressed, some of which are applicable here including:

- targeting a major educational campaign at the building industry
- ensuring there are comprehensive legal guidelines, and training, for NPWS staff dealing with bat issues,
- adopting a consistent approach to derogations under the Habitats Directive and providing adequate training for all who administer them.

Recommended Actions	Additional Comment
A range of leaflets on each of the Irish species, giving contact numbers and website addresses.	• Information arising from Irish studies should be highlighted. • The folded A4 format used by BCT is worth considering. • This could be undertaken as a joint project with DoENI. • There should be a public launch of this series of leaflets, involving radio and print media.
A general leaflet on Bats in Ireland	This could be undertaken as a joint project with the DoENI.
A leaflet on Bats in Buildings.	• This should be launched at a construction industry fair. • Copies should be inserted in all trade magazines.
A leaflet on Bat Habitats.	• There should be a public launch of this, possibly linked in with a major conference on farming, forestry or the environment, or at the Ploughing Championship. • The *Managing River Valleys for Bats* leaflet produced by the Hampshire and Isle of Wight Wildlife Trust and the Environment Agency England and Wales is worth consulting. • This could be undertaken as a joint project with DoENI.
A laminated species identification guide and car sticker.	These could be sold at public events
An Irish bats poster for sale and car sticker, giving contact numbers and website addresses.	A public launch by a well known personality at an annual bat conference
Educational material for primary schools, either in the form of a pack, CD-rom or PowerPoint Presentation	• The Heritage Council's *Heritage in Schools* project has been very successful, showing the need for this type of material and providing an existing line of communication that could be used. • A launch to coincide with some other educational event, such as the establishment of educational staff within the NPWS or the local authorities.
A special section on bats on the NPWS website with links to other sites.	• At the moment there is little information on bats relevant to Ireland, with the exception of BCIreland's site. • Access to such information is essential at weekends or in the evenings, especially when a grounded bat is found.

Table 5. *Recommendations to promote public awareness of bats*.

Recommended Actions	Additional Comment
Regular contributions to the RTE radio programme *Mooney Goes Wild on One* to give seasonal updates on what is happening in the lives of bats, promoting public events, dealing with queries.	This programme is important for disseminating information and promoting events.
The telephone number of at least one experienced bat worker should be given to each local or community radio station so that they can be contacted to deal with queries raised during the course of broadcasts.	Spurious information is broadcast every year about bats through this forum leading to extra work load for those involved in bat conservation, and quite possibly the loss of bats and/or their roosting sites
Continuation of Batline	This needs to be a permanent aspect of bat conservation, better publicised and a FREEPHONE number.
Organising public events such as a National Colony Roost Count, as took place during European Nature Conservation Year in 1995 when participants received a certificate.	These events generate interest amongst the media, thereby enabling information on bats to reach a wide audience.
A documentary on Irish bats.	• TV is a main source of information on heritage (Heritage Council Report 2000) • This would get more coverage if screened at Halloween and in a prime slot.
A series of postage stamps for bats.	This could be timed to coincide with another event to maximise media attention.
An annual Irish Bat Conference.	This would become a focal point in the year for bat conservation.
The appointment of a full time bat officer for BCIreland.	To act as a coordinator for the implementation of many of the above recommendations, to link in with relevant personnel in government departments, local authorities, other statutory bodies and non-governmental organisations.

Table 5 contd. *Recommendations to promote public awareness of bats.*

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8. Glossary & Abbreviations

Glossary

Bat box: an artificial roosting site for a bat that can be placed on a tree, fitted to a bridge, or placed within or on the outside of a building.

Calcar: The long, thin projection of cartilage from the foot of a bat towards its tail, lying along the outer edge of the tail membrane

Cryptic species: species that look similar but are in fact separate species

Heterodyne detector: a bat detector that converts the ultrasonic sounds of bats into audible sounds for the purpose of species identification.

Harp trap: a device for catching bats consisting of a rectangular aluminium frame with a double layer of vertical lines tautly strung across it, with a catching bag at the bottom into which the bats fall.

Mist net: a net of very fine nylon supported by poles that is placed along a flight path to catch flying bats.

Nulliparous: a female bat that has not yet produced young.

Passive identification transponders: This is an electronic identification system consisting of a glass encapsulated tag, with a unique identification code, that has been inserted under the skin between the scapulas of a bat, and which will then be detected by means of a radio signal every time the PIT comes into contact with the signal, for example, at roost exit point.

Pre-parturition: the time period prior to female bats giving birth.

Post-calcarial lobe: a small flap of skin that projects beyond the calcar in some bats.

Radio tracking: Using small radio transmitters attached to the bats to determine their movements.

Schwegler bat box: a German-made bat box, made of a mix of wood sawdust, concrete and clay.

Spot-sample bat detector study: a method of surveying by recording activity heard on a bat detector for a defined time period at a number of points in area, as opposed to following a linear transect.

Swarming: the gathering of large numbers of flying bats at underground sites in late summer and early autumn, or of smaller numbers at dawn around the access point to a day roost.

Tragus: the cartilaginous lobe inside the ear of many bats.

Abbreviations

NPWS:	National Parks and Wildlife Service
VWT:	The Vincent Wildlife Trust
BCIreland:	Bat Conservation Ireland
NHA:	Natural Heritage Area
ENFO:	Public environmental information service of the DOEHLG
SAC:	Special Areas of Conservation
SPA:	Special Protection Area
DoENI:	Department of the Environment, Northern Ireland
DoEHLG:	Department of the Environment, Heritage and Local Government
EIA:	Environmental Impact Asessement
EIS:	Environmental Impact Statement
BCT:	Bat Conservation Trust
OPW:	Office of Public Works:
GIS:	Geographical Information System

9. Further Reading

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