Scottish
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Introduction

Welcome to the fifth volume of *Scottish Bats*. It has been some time since the last volume but we hope that future issues will appear more frequently.

The big change is that we have moved into the electronic age, and this volume appears first of all on an internet web site, **scotbats.org.uk**, though a limited number of copies are printed on paper. Any income from sales of these printed copies is used solely for the production of *Scottish Bats*. Publishing on the World Wide Web should make the contents of the journal more widely and easily available. While the internet version is free, donations towards its production will be welcomed. The web site has been set up as a vehicle to publish *Scottish Bats* in the first place, but the site can develop to include other forms of bat information and news in Scotland.

Papers and articles concerning bat conservation and research can be published in scientific journals and regional journals of Natural History, however *Scottish Bats* is intended to complement these publications and to collect together information about bats in Scotland in a recognisable and easily accessible form. We particularly hope to encourage the publication of items which would otherwise remain within notebooks, computer files or peoples' heads. Without the stimulus to put this information down in publishable form, it can be lost, or at least never achieve a wide circulation.

The articles have been collected from the authors by the committee for South East Scotland Bat Groups. The opinions stated within the articles are those of the authors themselves, who also retain responsibility for the accuracy of the information contained therein. The editors only take responsibility for such essential changes as were necessary to provide clarity and consistency.

Thanks are extended to all those who provided the articles or other material for this volume. We are very grateful to Aberdeen University for hosting the internet address, and to Iain Mackie for the work required to convert this volume from print to internet format.

The cover illustration is by David McRae

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Maternity roost counts in Fife

Anne Kiggins

Background

Fife Bat Group was established in 1982 and since 1983 has kept records of emergence counts at maternity roosts carried out in June throughout Fife. These have been mainly of pipistrelle roosts.

The records can be separated into 4 sets:

1. 12 roosts counted regularly for between three and eight seasons from 1983 to 1992. These were all pipistrelle roosts except for one Natterer's bat roost.
2. 24 pipistrelle roosts counted only in 1993 and 1994 as part of the National Bat Colony Survey
3. 24 pipistrelle roosts counted once or twice, in various years from 1984 to 1993
4. 11 pipistrelle roosts, which are currently regularly counted.

It is this final set of records that are reported on here.

Introduction

The maternity roosts are counted by roost owners and members of Fife Bat Group. It is something that everyone can take part in without needing to hold a bat conservation licence, and gives the bat group a regular focused activity to co-ordinate and carry out each summer. In addition, regular contact with roost owners helps maintain their interest in their bat colony and provides an opportunity for discussion of any potential problems or concerns they may have about the roost.

Methods

The bats are counted one evening in mid-June from the start of their emergence period until no bats have emerged for 10 minutes, waiting until at least 1 hour after the first emergence. The number of bats emerging each minute is recorded on a form. Also recorded are details about the weather - cloud cover, wind strength and direction, temperature and whether it is raining. Any important changes to the roost or a change in owner are also noted.

Results

Data for the 11 pipistrelle roosts counted regularly since 1984 are given in Table 1 A blank means that no count was done that year, for unknown reasons. In 1994 only one roost was counted due to organisational changes within the bat group.

Discussion

The majority of the roosts regularly hold over 100 bats. The number of bats is relatively stable across the years although there have been fluctuations from year to

year. Roosts 5 and 6 have recorded fewer bats, with relatively large fluctuations from year to year.

Roost	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Type	**a**	**a**	**b**	**a**	**a**	**c**	**a**	**a**	**a**	**a**	**d**
Age	**1850**	**1541& 1740**	**1973**	**1800s**	**1500s**	**1986**	**pre-1900**	**1760**	**1760**	**pre-1900**	**1900s**
1984		158						145			
1985		173						133			
1986	494	120						142		354	
1987	629	158						159		738	
1988	246	108						196	202	656	
1989	328					82	323	197			226
1990	222	176					293		226		127
1991		135			28	21	115	254		255	
1992	324			391	12	79		33		309	331
1993	492	220	208	277	343	116	201	92	165		
1994	473										
1995	574	127	284	357		126		87	226		
1996	715		0	522		198					
1997	1018	177	248	379	7	0		109	183	408	
1998	971	205	0		16	65			145	1	
1999	771	240	218	597		107	289	163	250	0	0

Key to roost types:
a. Stone house, solid walls, slate roof
b. Harled brick house, cavity walls, concrete tiles
c. Flat roof extension to old stone house
d. Factory and office block, harled walls, flat roof

Table 1 Number of bats counted emerging in June at maternity roosts in Fife

Roosts 1, 2 and 8 are the most regularly counted. Roost 1 is the largest and most regularly counted roost, with a minimum of 222 bats recorded in 1990 (22 June) and a maximum of 1,018 in 1997 (28 June), with roost 4 the second largest roost.

Numbers recorded in roost 3 have twice fluctuated from over 200 bats to 0, which may indicate that the colony is mobile and has an alternative roost elsewhere in the village. It is a relatively modern house with harled brick cavity walls. This is an unusual roost type in this study as the majority of the roosts are in old, large, stone houses with solid walls and slate roofs.

Roost 10 has several blank years when the bats have returned in May, but moved on somewhere else by June, when the colony count is carried out. There is no obvious reason why the bats behave in this way.

Roost 11, a harled flat roofed building, seems to have fallen out of favour with the bats since roof repair work was carried out. The bats may return in the future.

Roost 7 was recorded in 1999 for the first time since 1993. The recorder noted that the roost had not been used for several years and that a few years ago he found a bat covered in mites, which subsequently died. It is thought that bats may move from a particular roost if the parasite load becomes too heavy in that location and that they stay away long enough for the parasites to die off before returning to the roost. This could be the situation at roost 7, but would be difficult to prove.

Conclusion

It is generally thought that colonies in older, larger houses tend to be more stable and larger in size than those in newer roosts. In the older types of roost, colonies tend to be more distant from the roost owners and consequently there is less interaction between bat and man, leading to fewer problems. These roost types tend to be more regularly used by bats.

The data gathered from the maternity roost colony counts in Fife appears to follow this theory. Observations can be made, but general conclusions cannot be drawn from it because the sample size and variety of roost types are not large and varied enough to allow statistical analyses to be made.

Future

Fife Bat Group intends to continue co-ordinating these colony counts, and hopes to include more roosts in the study. It would be interesting to return to the roosts counted in the other datasets to determine if the bats are still present. The counts serve a number of useful purposes. They help to stimulate interest in bats in Fife amongst bat group members, roost owners and the general public. Long-term colony counts may give an indication of the status of the pipistrelle bat population in Fife. They also help to further the conservation of bats in Fife, and contribute to the Bat Conservation Trust's national monitoring programmes.

Acknowledgements

I have done the easy bit in writing up the results of the roost counts. Thanks are due to many other people including the roost owners, roost counters, the count co-ordinators, and Fife Bat Group members.

A long term study of bat hibernacula in the Lothians

Stuart Smith

Members of Lothians Bat Group began their study of bat hibernacula in southern Scotland in 1987. At that time we looked for disused mine workings which might still be open, by consulting geological literature (eg Robertson *et al* 1949), geologists and cavers and published references to hibernating bats (Placido 1972 ; Harvey 1973). The results of this initial survey of sites, and of revisits in subsequent years, were reported in 1992 (Herman and Smith).

We have returned to many of these sites since that time to re-count bat numbers, and also to train bat workers to survey for and identify the hibernating bats where those sites are outwith the Lothians. However most of our survey work has concentrated on three of the six limestone mines in the Lothians which were included in the previous report (Herman and Smith 1992). Of the other three, one quarry is at present being used as a landfill site; the second is still worked from time to time, restricting our access; the third appears unsafe to survey apart from within about 20m from the entrances which remain open.

The three mines which we have regularly surveyed are mine A, in Midlothian, mine B (Fig. 2.1) and mine C (Fig. 2.2), both in West Lothian. The results of all the surveys undertaken are shown in Tables 2.1 – 2.3.

Date	Natterer's bat	Daubenton's bat	long-eared bat	Unidentified
22/1/89	4	-	-	-
22/1/90	20	3	-	1 myotid
25/2/90	8	1	1	-
10/2/91	5	1	1	1 myotid
14/2/93	12	4	1	-
5/3/94	10	1	-	-
10/12/95	5	2	1	1
7/4/96	6	1	-	-
23/3/97	9	3	-	-
25/1/98	8	2	4	1 myotid
22/2/98	8	4	5	1 myotid
6/2/00	7	4	-	1 myotid
26/2/00	8	2	1	1 myotid + 1*

* = probable pipistrelle seen close to main entrance .

Table 2.1 Numbers of each bat species found during surveys of mine A

Date	Natterer's bat	Daubenton's bat	long-eared bat	Unidentified
19/2/87	9	1	-	
6/3/88	11	-	-	
21/1/89	2	-	-	
11/3/89	6	-	-	
4/2/90	2	1	-	
13/1/91	2	-	-	
7/2/93	11	1	1	
6/2/94	4	3	-	
19/3/95	19	3	-	
24/3/96	38	4	1	
19/1/97	4	-	-	1 myotid
23/2/97	9	2	-	1 myotid
18/1/98	2	-	-	1 myotid
15/2/98	11	3	-	
22/3/98	8	1	-	2 myotids
30/1/99	10	1 (?)	1	2 myotids
28/2/99	12	-	-	2 myotids
23/1/00	5	1	-	
19/2/00	8	2	-	2 myotids

Table 2.2 Numbers of each bat species found during surveys of mine B

Date	Natterer's bat	Daubenton's bat	long-eared bat	Unidentified
17/02/87	1	-	-	
17/12/87	-	-	2	
24/01/88	-	-	1	
5/3/88	-	-	2	
4/2/89	2	-	1	
7/1/90	-	-	2	
18/3/90	-	-	-	
13/1/91	2	-	2	
1/2/92	-	-	3	1 myotid
31/1/93	1	-	2	
12/12/93	-	1	2	1 myotid
19/3/95	-	-	2	
21/1/96	4	-	1	1 myotid
22/12/96	-	-	1	
2/3/97	1	-	1	
1/2/98	-	1	5	
1/3/98	3	2	3	
24/1/99	1	1	2	
21/2/99	1	1	1	
30/1/00	-	-	1	
27/2/00	-	1	3	1

Table 2.3 Numbers of each bat species found during surveys of mine C

The timing of the surveys during the winter months was random in nature until 1998 and based on convenience for the available survey team. Since 1998 however, we have based our surveys on the timetable according to the Bat Conservation Trust *National Bat Monitoring Programme* (NBMP) hibernacula survey project. Unfortunately we were unable to survey mine A in 1999, as neither of our 2 batworkers licensed for hibernacula surveys were available between the designated dates.

As can be seen from the tables, the total number of bats recorded at any given site on a visit has varied considerably for mine B with a range of 2 - 43 (mean 11.0 ± 9.3 SD), but much less so for the other two mines with ranges of 4 - 24 (mean 12.7 ± 5.2 SD) and 0 - 8 (mean 3.0 ± 2.0 SD) respectively. The reasons for these variations are unknown but could be influenced by several factors either singly or in combination. These are listed and discussed below, in no particular order;

1. *Size and complexity of site*. Mines A and B are large complex sites, which for reasons of safety and time we are unable to survey completely. Since we first surveyed these sites and are now familiar with their layouts, the area surveyed is much the same on each visit which should minimise recording variability. Mine C is much smaller and we are able to survey it reasonably thoroughly. All the mines contain differing amounts of 'backfill' and rubble in the areas which we do survey. We don't know whether the hibernating bats are hidden from view in such areas or not, but since most bats that we do find are tucked away in crevices the likelihood is that there are many more in the deeper crevices which we are unable to inspect. Stebbings(1992) also suggests that this is the case, since whilst counting hibernating bats in the Greywell Tunnel he observed 'rows of feet of hibernating bats' on the inside of the brick lining to the tunnel which otherwise are completely hidden from view. We do know that some bats either move location or enter the mine during the survey period (Fig. 3) so it is therefore inevitable that we are only counting a fraction of bats resident at any one time.
2. *Skill and number of surveyors*. The number of surveyors present on a survey is usually three or four, for reasons of group safety underground. One is always an experienced batworker licensed for hibernacula visits, accompanied by others who have often assisted with these surveys in the past. We do encourage newer bat group members who are keen to help with these surveys and the possibility is that they miss more bats than the more experienced surveyors. We have only kept concise records of the numbers and experience of the surveyors involved since the surveys were included in the NBMP hibernacula surveys over the last three years, so it would be difficult to determine whether these factors are influencing the results or not.
3. *Weather conditions and mine temperature during the hibernation period*. We have only made accurate temperature records at the time of mine visits during the last three years so any influence of weather and temperature are not known but are likely to be complex and possibly linked to other factors.
4. *Date of survey*. Since 1987 we have undertaken surveys as early as the 10th December, with most surveys during January and February (NBMP survey window), some in March and one survey as late as the 7th April. There appears to be no significant correlation between numbers of bats seen and the length of time in hibernation. The maximum counts for two of the sites were recorded in March and may be linked to an increase in bat activity resulting in their moving to more exposed locations within the mine prior to emergence from hibernation.
5. *Disturbance during hibernation*. We have no knowledge of the frequency or the scale of casual disturbance at these sites but can only estimate their extent by noting

the occurrence of new rubbish and vandalism during surveys. This varies from the odd beer can to the ash from substantial fires, the effects of which on hibernating bats can only be guessed at. From these observations it is evident that the frequency and the scale of casual disturbance is much greater at mines B and C than at mine A. In the case of mines A and B this may be reflected in the similar mean number of bats recorded with a higher SD at mine B

Stebbings (1992), referring to the Greywell Tunnel in Hampshire, gives a more detailed discussion of the factors likely to influence the number of bats counted in a hibernaculum and the relationship of this number to the actual number of bats using the site.

In all three of the mines we have recorded the three bat species most commonly found in hibernacula throughout Britain, excluding south-west England and Wales where the two horseshoe bat species are also resident. Natterer's bat was nearly always the most numerous in the two mines where the largest numbers of bats were found, but not in the third site where the total number of bats found was generally low (mean = 3). The reason for this is unknown but may be due to the differences in local populations of these species or the availability of alternative more suitable hibernacula.

The total of 43 bats found in mine B on 24th March 1996 is the largest number recorded in an underground hibernaculum in Scotland and at that time the number of Natterer's bats seen (38) placed this site in the 'top 10' hibernacula for this species in the UK (Mitchell-Jones, *pers. com*.). In addition, it was the only one of these ten sites north of a line drawn between the Severn estuary and The Wash and it should therefore be considered of national importance.

The discovery of a pipistrelle in the most recent survey at mine A is perhaps surprising, as they have rarely been found in underground sites in Britain (Greenaway and Hutson 1990), but is not unique for Scotland (Mortimer 1995; Herman and Smith 1995).

The regular occurrence of bats in all three of these mines demonstrates their importance during the hibernation period. We have no knowledge at present of the percentage of the species' local populations using these sites, but a study of swarming behaviour by ringing bats captured at the main entrance of mine A which began in September 1999 may give us more information on this subject. If this study suggests that these sites are more important to an even larger number of bats than our winter surveys have revealed, it may be necessary to take steps to protect the sites from loss or damage, and the bats from the resulting displacement or disturbance.

Acknowledgements

I am grateful to the many members of Lothians Bat Group, past and present, who have helped in any way with these surveys. I would also like to thank the landowners or their agents for allowing us access to the mines in order to conduct the surveys.

References

Greenaway, F. and A.M. Hutson (1990) *A Field Guide to British Bats.* London: Bruce Coleman Books.

Harvey, W.S. (1973) Notes on two winter roosts of Daubenton's bats near Wanlockhead, Dumfriesshire. *Western Naturalist* **2**, 46-52.

Herman, J.S. and S.K. Smith (1992) Hibernating bats in underground sites in Scotland. *Scottish Bats* **1**, 30-37.

Herman, J.S. and S.K. Smith (1995) Pipistrelles hibernating in an underground site in Dumfriesshire. *Scottish Bats* **3**, 18.

Mortimer, N. (1995) Pipistrelles in a sea cave. *Scottish Bats* **3**, 17.

Placido, C. (1972) New records of Natterer's bat *Myotis nattereri* in Scotland. *Western Naturalist* **1**, 59-62.

Robertson, T, Simpson, J.B. and J.G.C.Anderson (1949) *Reports on the Mineral Resources of Great Britain* **35**.

Stebbings, R. E. (1992). Bats in Greywell Tunnel, Basingstoke Canal ; a report for South Region, English Nature. The Robert Stebbings Consultancy Ltd.

Figure 2.1 One of the four entrances to mine B, a moorland site at an altitude of 325m.

Figure 2.2 One of the three entrances to mine C at an altitude of 200m, a site bordered by hawthorn scrub woodland and unimproved pasture.

Figure 2.3 Three Natterer's bats seen in a crevice in mine B during the second of the two visits for the NBMP hibernacula surveys on 15th February 1998. At the time of the first visit only one Natterer's bat was present in the crevice.

Ecology and conservation of bats and hibernacula

Kirsty Park

Introduction

Torpor and hibernation. In temperate regions low ambient temperatures and a lack of food during winter make it hard for small mammals to maintain their high body temperatures. Most mammals maintain a high body temperature all the time, but some species of bat (and also some rodents, insectivores and marsupials) are able to regulate their body temperature in order to minimise energy expenditure, a mechanism known as torpor. These species can do this at any time of year and will often enter torpor for short periods of time in response to adverse environmental conditions. Whilst entering torpor there is a large drop in body temperature accompanied by a decrease in metabolism and heart rate. Hibernation can be thought of as a form of torpor occurring on a seasonal basis, and temperate bats can spend up to six or seven months of the year hibernating, although they will arouse periodically throughout winter. Hibernation used to be thought a primitive feature of mammals and due to an inefficient heat-regulating mechanism, but is now recognised as a highly adaptive feature which is actively controlled by the animal and not by environmental factors.

Hibernation sites. As temperate bats spend such a high proportion of the year hibernating and are particularly sensitive to disturbance during winter, protection of hibernation sites is extremely important, and bats and bat roosts are protected by law. Most species of bat, however, are very hard to find while hibernating. Accurate counts of hibernating bats during surveys of hibernacula can only really be made for the two species of horseshoe bat as they hang in the open and are easily visible. Other species tuck themselves away in crevices and are much harder to find. Underground surveys may, therefore, underestimate or even overlook these species. As a result, many potential hibernacula are not currently considered to be important to bats. In comparison with maternity roosts, very few hibernation sites are known for most species of bat in Britain and this is especially true in Scotland, which means that for six months of the year little is known about the whereabouts or behaviour of these animals. Typical hibernation sites are caves and mines, with man-made structures such as castles and cellars also adopted. Some species will hibernate in tree holes and there have even been reports of bats found in the soil and leaf litter around tree roots (Altringham 1996). Scotland has few natural caves, although there are large areas that have been mined leaving extensive mineral workings (Clackmannanshire Field Studies Society Research Group 1994) which may be used by bats as hibernacula (Herman and Smith 1992). Four species of bat are known to hibernate in Doune Castle near Stirling (Haddow 1992), and there are many other castles and buildings which are potentially suitable hibernacula and need to be investigated.

Swarming activity. The main mating period for temperate bats is August to October, and research in North America has shown that caves and mines function as mating sites in the pre-hibernation period and later in the season (Fenton 1969). Flight activity at such sites during this period is known as “swarming”. Large numbers of bats have been found at UK hibernacula as early as August so it is likely they are also used as mating sites. The surrounding habitat may, therefore, be important for feeding in the pre-hibernation period (and possibly during arousals from hibernation over winter). Swarming behaviour has not yet been documented in Scotland, and if suitable

hibernacula are scarce bats may travel long distances to get to these sites from extensive catchment areas.

Harp trapping. Over the last three years a few UK researchers have been using harp traps (Fig. 3.1) to catch bats around cave and mine entrances in late summer/autumn. A harp trap is a free-standing trap consisting of a square frame within which two offset vertical layers of fine nylon strings hang. Bats fly through the first layer of strings but are stopped by the second and fall into a cloth bag attached to the bottom of the frame and can then be removed for examination. This work has revealed many more bats using these sites, both in terms of numbers and species, than previously suspected. Using this trapping method large numbers of bats, some extremely rare in Britain, have been found at several locations in England in August and September (J.D. Altringham, unpublished; G. Jones, K.N. Parsons & F. Greenaway, unpublished). Subsequent visits to sites in North Yorkshire in October and November confirmed that swarming activity in autumn is followed by hibernation later in the season. It appears, therefore, that these sites are important both before and during hibernation.

Hibernation project

Over the last winter (1999 – 2000) I have been examining known and potential hibernation sites in Scotland for swarming activity. The original plan was to focus on Central Scotland but I have now extended the study to sites in Fife, Lothian and Borders regions. My main aims were to:

1. identify swarming and hibernation sites, and establish the numbers and species of bats using these sites
2. determine the degree of interchange between sites
3. assess the roosting requirements of different species during the pre-hibernation and hibernation period
4. establish the importance of the surrounding habitat in the period leading up to, and possibly during hibernation.

With the help of John Haddow (Central Scotland Bat Group), Stuart Smith and Jerry Herman (Lothians Bat Group) and Keith Cohen (Fife Bat Group) I drew up a list of sites to survey based on characteristics of underground sites, the structure of buildings and past records of bat use.

At each site a harp trap was set up outside the entrance and all bats caught were identified, sexed, weighed, measured and one of their forearms ringed with an aluminium bat ring (Mammal Society). Each ring has a unique code which allows me to identify individual bats and to ascertain the numbers and species of bats active at each site over the night. As ringing was only carried out on active bats flying around the site, this work did not involve any disturbance to hibernating bats.

Miniature temperature loggers were left in two of the sites over the entire winter in order to determine the temperature regime experienced by bats during the pre-hibernation and hibernation period. The loggers were programmed to record temperatures every hour and were placed approximately 30m from the mine entrance and 1.5m high in crevices typical of those used by bats found during previous surveys.

Figure 3.1 A harp trap in position at Mine A railway

Transects of 1km were surveyed using time-expanding ultrasound detectors to record the echolocation calls of bats flying within the surrounding habitat. Transects were started one hour after sunset so most of the bats recorded could be considered foraging bats as opposed to bats commuting from roosting sites to feeding sites. Walking speed on transects was standardised to 3 km per hour so that each took 20 minutes to complete. Sound analysis techniques enabled me to quantify the amount of activity and to identify different bat species groups or bat species.

Results

To date nine sites have been visited at least once, and two have been visited three or four times (Fig. 3.2, Table 3.1). Two of these sites have two entrances which were both surveyed. In addition, John Haddow left a bat detector connected to a tape recorder on voice activation at one site (mine D) overnight to assess its potential for bat activity.

Date	Site	Site no. (Fig. 3.2) and region	*M.nattereri*		*M. daubentonii*		*P. auritus*		Total bats
			Male	Female	Male	Female	Male	Female	
14/09/99	Mine A (E1)	1 (Fife)	20	12	2	3	0	0	37
24/09/99	Mine B	2 (Lothian)	21	9	1	0	0	0	31
29/09/99	Mine A (E2)	1 (Fife)	9	1	2	0	4	0	16
30/09/99	Castle X	3 (Borders)	13	8	4	2	2	6	35
14/10/99	Mine B (E1)	2 (Lothian)	14	6	1	0	1	0	22
14/10/99	Mine B (E1)	2 (Lothian)	1	0	0	0	0	0	1
05/10/99	Mine A (E1)	1 (Fife)	10	2	0	0	0	0	12
13/10/99	Mine A railway	4 (Fife)	0	1	0	0	0	0	1
15/10/99	Mine C	5 (Central)	0	0	0	0	0	0	0
19/10/99	Mine D	6 (Central)	0	0	0	0	0	0	0
26/10/99	Mine E	7 (Central)	0	0	0	0	0	0	0
27/10/99	Castle Y	8 (Borders)	5	0	0	0	1	0	6
28/10/99	Mine A (E1)	1 (Fife)	1	0	0	0	0	0	1
28/10/99	Mine A limekilns	9 (Fife)	0	0	0	0	0	0	0
10/04/00	Mine B	2 (Lothian)	1	1	1	1	0	0	4
Total bats captured			95	40	11	6	8	6	166

Table 3.1 Details of sites visited with number, species and sex of bats caught.

Date	Site	Site no. (Fig. 3.2) and region	Bat passes km^{-1}	Bat species				Social calls	Species
				P. pipistrellus	*P. pygmaeus*	*Myotis* sp.	Not ID		
29/09/99	Mine A	1 (Fife)	12	7	4	1	0	1	P.pyg.
05/10/99	Mine A	1 (Fife)	33	12	19	0	2	3	P.pyg.
13/10/99	Mine A railway	4 (Fife)	0	0	0	0	0	1	P.pip.
15/10/99	Mine C	5 (Central)	4	3	1	0	0	0	
19/10/99	Mine D	6 (Central)	1	0	1	0	0	0	
26/10/99	Mine E	7(Central)	0	0	0	0	0	0	
27/10/99	Castle Y	8 (Borders)	0	0	0	0	0	0	
28/10/99	Mine A	1 (Fife)	14	0	14	0	0	0	
Total bat passes			64	22	39	1	2	5	

Table 3.2 Bat passes recorded on transects during site visits

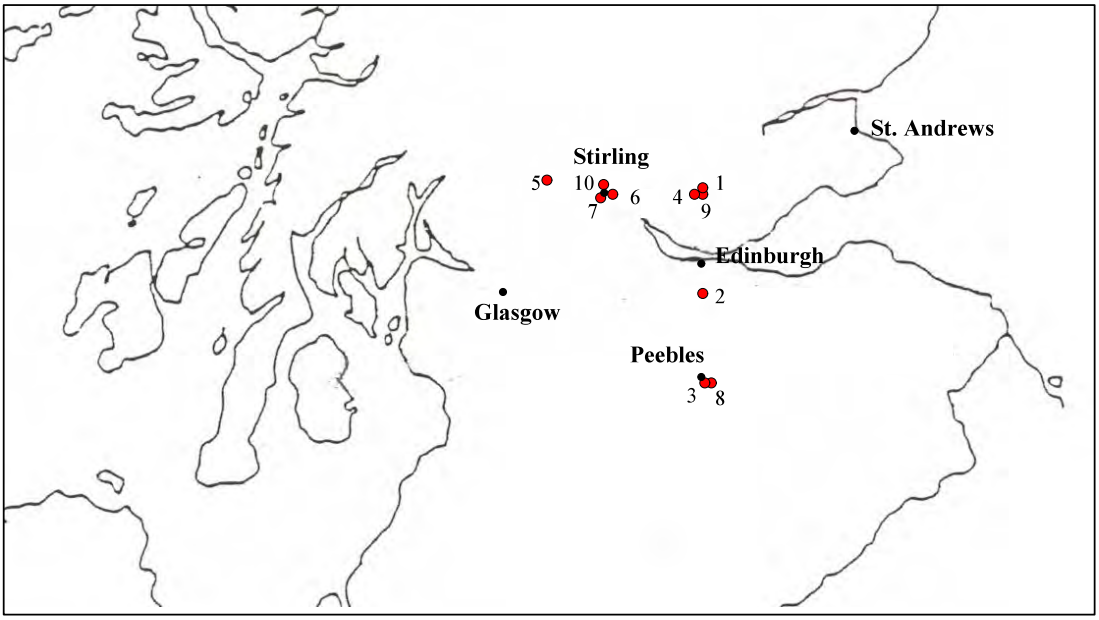


Fig. 3.2 Sites visited during winter 1999/2000. The numbers are referred to in the tables

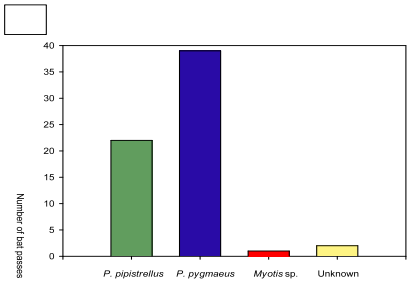


Fig. 3.3 Total numbers of bat passes recorded on transects within 1 km of the sites

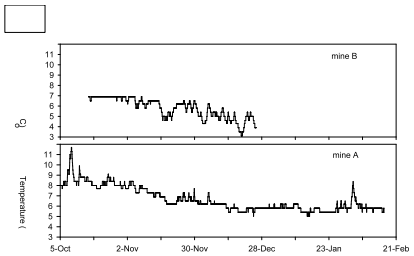


Fig. 3.4 Temperature profiles of mine B (Lothian) and mine A (Fife) from October 1999 to February 2000

A total of 129 bats have been ringed (Table 3.1). The first visit to Mine A (Fife) was made before the rings had arrived so the 37 bats caught on this trip were marked by fur-clipping. During subsequent visits to this mine only one fur-clipped was recaptured, bringing the number of bats caught to a total of 165. By far the most common species to be caught was the Natterer's bat *Myotis nattereri*, followed by Daubenton's bat *M. daubentonii* and brown long-eared bat *Plecotus auritus*. Approximately 70% of the Natterer's bats caught were male. There was also a bias towards male Daubenton's and brown long-eared bats but the sample sizes were far smaller so we cannot be as confident that this reflects the true sex ratio of these species using the sites. With the exception of the fur-clipped bat from the first visit, of the two sites which were visited repeatedly (mines A and B), no bat caught in the harp trap was ever recaptured, although Stuart Smith and Jerry Herman have reported that ringed bats have been seen hibernating during winter surveys of mine A and castle X.

Of eight transects carried out, bats were recorded on five. Average bat passes per site ranged from 1 – 20 passes per km. A total of 64 bat passes were recorded (Fig. 3.3; Table 3.2), and all but one of these calls were from pipistrelles *Pipistrellus pipistrellus* and *P.pygmaeus*, the other being a from *Myotis* species. Transects were carried out in a variety of habitats, generally mixed woodland but also some open agricultural land. There are not enough data as yet to investigate the influence of habitat on foraging activity and/or swarming activity.

Ambient temperatures in mine A were generally between 8 and 9^{o}C, although there were two peaks of 10 and 12^{o}C in early October. Over November temperatures fell to approximately 6^{o}C and, except for a brief peak of 8.5^{o}C in late January remained fairly stable to the end of February (Fig. 3.4). The temperatures in mine B were generally

lower than those in mine A, starting from 7°C in October and falling to between 4.5 and 6°C during November and December. The lowest temperatures recorded were in the last two weeks of December: In mine A it was 5.4°C, whereas in mine B it was 3.1°C. Unfortunately the temperature data collected between December and February for mine B was lost as the data logger was apparently viewed as a rare delicacy for one of the local rats living around the mine!

Conclusions

There are several tentative conclusions that we can draw from work carried out so far:

1. The bias towards catching male bats has also been found at a number of sites in England. This is likely be to related to the purpose of swarming - these sites may function as some sort of meeting place to allow some sort of social and/or mating activity.

2. The lack of recaptures also reflects results from previous studies. This is unlikely to be due to adverse effects of ringing as studies of maternity roosts (Ransome 1990) and bat box populations (Park, Masters and Altringham 1998) regularly recapture ringed bats. Whether the lack of recapture is due to the sheer number of bats at these sites or individual bats only visiting these sites for short periods is not known. It does, however, suggest that bats caught at these sites are part of a large, possibly transient population.

3. There was an average of 20 bat passes per km (3 transects) at mine A. This compares very well with the average from the National Bat Habitat survey carried out from 1989 to 1992 over a wide range of habitats which found an average of 4 – 9 passes per km, indicating that the habitat around mine A is especially good for foraging bats. Most of the bats detected on these transects, however, were pipistrelles. It is unlikely that brown long-eared bats would be detected on a transect as their calls are so quiet, and it is well known that Daubenton's bats concentrate their feeding over water. A large proportion of the bats caught, however, were Natterer's bats, a species often found foraging in woodland (Vaughan, Jones and Harris 1997), where most of the transects in this study were carried out. There is, therefore, no evidence that the species using these sites are also using the immediate surrounding habitat for feeding.

4. No bat ringed has been found at more than one site although some sites are reasonably close to one another. However, the number of bats ringed and sites visited are far too low as yet to be able to draw any conclusions from this. I will be able to look at degree of interchange between sites when a higher proportion of bats are ringed and more sites have been visited.

5. Hibernation sites may not always be swarming sites but so far it appears that swarming sites are later used as hibernation sites. Therefore one practical benefit of harp trapping during autumn is that it may be easier to identify hibernation sites by determining whether swarming occurs there or not.

6. Winter surveys of mine A in Fife and mine B in Lothian typically find between 9 and 12 bats per visit, with a maximum of 23 found in mine B. In four visits to mine A a total of 65 bats have been caught and at mine B (3 visits), 58 bats. Similarly at castle X in the Borders, 35 bats were caught on just one visit, far more than are seen during

surveys. This difference in numbers is partly due to the bats being hard to find, but also to the bats' use of the site. Bats using these sites as swarming sites, but not for roosting, can only be detected by evening visits. This indicates that known hibernation sites in Scotland may be more important, both for hibernating and swarming bats than currently considered.

Future plans

I plan to visit more sites this year (2000/2001), and am in the process of drawing up a new list of sites to visit as well as continued monitoring of those sites surveyed last year. If anyone knows of any sites that might be suitable for harp trapping, I would be glad to hear from them.

References

Altringham, J.D. (1996*) Bats: biology and behaviour*. Oxford: OUP.

Clackmannanshire Field Studies Society Research Group (1994*) Mines and minerals of the Ochils* 2nd edition (eds. Dickie, D.M. & Forster, C.W.). Alloa: Clackmannanshire Field Studies Society.

Fenton, M.B. (1969) Summer activity of *Myotis lucifugus* (Chiroptera: Vespertilionidae) at hibernacula in Ontario and Quebec*. Canadian Journal of Zoology* **47**, 597-602.

Haddow, J.F. (1992) Annual roost patterns of bats in Doune Castle. *Scottish Bats* **1**, 25-29.

Herman, J.S. and S.K. Smith (1992) Hibernating bats in underground sites in Scotland. *Scottish Bats* **1**, 30-37.

Park, K.J., Masters, E. and J.D. Altringham (1998) Social structure of three sympatric bat species (Vespertilionidae). *Journal of Zoology, London* **244**, 379 - 389.

Ransome, R.D. (1990) *The natural history of hibernating bats*. Christopher Helm: London.

Vaughan, N., Jones, G. and S. Harris (1997) Habitat use by bats (Chiroptera) assessed by means of a broad-band acoustic method. *Journal of Applied Ecology* **34**, 716 - 730.

Acknowledgements

This study was funded by a British Ecological Society small project grant and a Mammal Conservation Trust bursary. I would like to thank Alasdair Sherman and Matthew Evans at Stirling University for the harp trap. I am also very grateful to bat group members especially John Haddow, Stuart Smith, Jerry Herman and Keith Cohen for helping me with the project.

Observations on the behaviour of Natterer's bats in a flight room

Susan M. Swift

Natterer's bat, *Myotis nattereri*, is one of the less researched Scottish species, and data on its behaviour are still scarce. Although disabled or injured Natterer's survive well in captivity and may live as "pets" for a number of years, there have been few, if any, reports dealing with the viability of healthy specimens brought into captivity and kept under experimental conditions. The following behavioural observations, made during a recent study of gleaning by this species in a flight room, may therefore be of interest.

Flight room and equipment

The flight room, in a stone-built outhouse, measures 4m x 4m x 3.5m and receives natural light from a south-facing window, the inside of which is covered with fine (1mm) nylon mesh to prevent bats from injuring themselves by flying into the glass. The bats roosted in two untreated wooden bat boxes nailed to the wall at a height of 2.5m, and rough wooden perches were also attached to the walls. The room was heated on a daily cycle which resembled that in a natural bat roost; the heating was switched on at 1000h and warmed the room to a maximum of around 25^{o}C at 1600-1700h, when it was switched off. Fresh water was always available in two shallow plastic trays (maximum depth 1cm to avoid any danger of bats drowning) on horizontal surfaces, one 1m and one 0.5m above the floor. Mealworms, sprinkled with vitamin supplement (*Nutrobal; Vetark, Winchester*) were supplied daily in smooth plastic feeding trays.

Successive groups of six Natterer's bats were caught, under SNH licence, at summer roosts and kept in the flight room for up to four weeks. Their first week was spent in becoming acclimatised to the flight room and learning to feed in captivity, but for the rest of the time they were largely undisturbed. At the end of their period of captivity, all bats were released at their point of capture.

Observations were made, in darkness, using either a Night Vision System (*Omega II; Omega Night Vision Systems, Godalming*) or an IR-sensitive video camera, with IR source, linked to a VCR and monitor in an adjacent room.

Observations

Reaction to an observer: Bats reacted to torchlight by retreating immediately to the roost box and staying there until the light was switched off. However, they showed no such reaction to infra-red and my presence with the NVS had no apparent effect, provided I kept still and quiet. Bats even appeared curious about me on occasions, flying within a few centimetres and, once, perching on my shoulder for about ten seconds. Similarly, the IR light source for the video camera had no apparent effect and did not prevent bats from flying or feeding.

Activity pattern: Bats took up residence in one of the wooden boxes during their first night following release into the flight room, and they quickly established an activity pattern similar to that recorded for the species in the wild (Swift 1997). They emerged from the box at around 2245-2300h and were then intermittently active until an hour before dawn. As in the wild, groups changed roost boxes every few days, and all individuals roosted together in the same box. During the first few nights of captivity,

bats were observed landing on the floor of the flight room and scurrying around in mouse-like fashion. They investigated any small holes, such as a narrow crack under the door, and appeared to be looking for an escape route. They were adept at this quadripedal locomotion and also took flight from a standstill, apparently without difficulty. The behaviour became much less common after 4-5 days.

Drinking: Bats found the water troughs during their first night and drank from them immediately. It was obvious that they learned to drink before they learned to feed under flight room conditions, since individuals required additional hand feeding for up to a week but all refused hand-administered water within 2-3 days. They drank immediately on emerging from the roost box and always drank before beginning to feed. They used two different drinking techniques:-
1) flying low over the trough, hovering briefly and then dipping into the water and scooping some up in the mouth while remaining in flight. The wings (and possibly also the tail membrane) broke the surface and caused splashing as the bat swooped over the trough.
2) landing beside the edge of the trough, leaning in and lapping the water like a dog, before taking off vertically and resuming flight.

Grooming: Periodically during the night, bats stopped flying and groomed themselves. No individuals ever alighted on the wooden perches provided for them; instead they used the window mesh or, in most cases, the strip light on the ceiling, and they spent around ten minutes in every hour grooming. At times they hung by one foot and used the claws of the other to comb and scratch the fur on their backs and heads. At others, they hung by both feet and used tongue and teeth to groom the wings and ventral fur. Ears were cleaned with hind claws and also by rubbing them against the forearms. Wings were stretched in turn and licked thoroughly. During grooming, ears remained upright and bats appeared to be continually alert for danger.

Night roosting and clustering: All individuals spent a part of each night inactive on the light or netting. Such periods of inactivity lasted for 10-20 minutes and frequently appeared to involve social facilitation, ie behaviour in which resting by one bat initiated resting by one or more others. Two or three inactive bats often clustered together, and when one of them resumed flight, the others usually followed it immediately. Such group behaviour involving social facilitation is similar to that recorded in *M.nattereri* in the wild (Swift 1997). Groups of up to six bats also spent time (up to 30 minutes) inside the bat boxes during the night, and these were presumed also to be night roosting.

Overall, the bats responded well to conditions in the flight room for the relatively short periods they were in captivity, at least partly because they were kept in as near natural conditions as possible. Body weights stabilised within a week and most individuals gained slightly over the whole period although, because they were able to fly, excessive weight gain was not the problem it can be with bats kept in more restricted conditions. There were no problems with swollen wing joints, again because bats were able to fly freely, and no symptoms of obvious nutrient deficiency, such as fur falling out.

Although behavioural observations made in captivity should be viewed with caution (bats in a flight room can never be given conditions identical to those in the wild and will therefore never behave identically), they can provide useful additional data to

those recorded in the wild. *M.nattereri* is a difficult species to study in its natural environment, and thus the above observations can make a useful contribution towards understanding its requirements for conservation.

Reference

Swift, S.M. (1997) Roosting and foraging behaviour of Natterer's bats (*Myotis nattereri*) close to the northern border of their distribution. *J.Zool. London* **242**, 375-384.

A built-in roof bat box in Aberfoyle

John F. Haddow

Introduction

Of the 16 species of bat resident in the UK, the majority have adapted to use houses and other human-built structures for roosts, particularly during the active part of the year, when warmth is important. This adaptation is shown to the greatest degree by the pipistrelles, which are crevice-seeking species. The wooden structures that are house roofs are "super" tree-holes - warmer, drier, more complex and generally safer than natural holes or crevices.

When asked to advise on roofs used by bats, a bat worker is often asked about the value of putting up bat boxes nearby. Often the question is directed at providing an alternative roost for a large summer colony. The advice is likely to be that boxes are useful as they may provide additional roosts for parts of the year, particularly in the late summer dispersal period or during autumn as a mating "harem" roost. They are unlikely however to provide the conditions that are demanded of a successful nursery roost, particularly for bats which form large colonies. Boxes are less likely to provide the stable temperature conditions or the choice of sites that roofs can supply.

A Scottish Natural Heritage publication (Simpson and Brown Architects 1996) provides guidance on constructing bat boxes within roofs. Since that was published there have been few situations where "roof bat boxes" have been constructed successfully. In Scotland a number of attempts have been made to contain large colonies of brown pipistrelles *Pipistrellus pygmaeus.* Pritchard (1993, 1995) described an early example. All "roof bat boxes" are experimental, individual designs. However, the exact needs of bats are not fully understood and exactly why one roof is favoured and not another is presumably due to several interacting factors. This article describes an attempt by bat-friendly householders to provide a pipistrelle roost site while renovating their house roof.

The built-in roof bat box

The original small cottage with a pitched roof has been extended, the extension having a flat roof edged with fascia boarding. The couple who own the cottage planned to extend the pitch of the roof, to reduce the area of flat roof, and so improve water run-off. It was only when part of the fascia was removed from near the front door, a part of the roof facing eastwards, that bats were discovered. The Stirling office of Scottish Natural Heritage was contacted for advice and I was asked to visit and assess the situation. When I examined the roof, the bats had moved away from the exposed area and relocated to the opposite (west facing) roof edge. The bats emerging from the roof were bandit pipistrelles *Pipistrellus pipistrellus*. Since this species forms small nursery colonies, normally only 10-40 individuals, it is possible that the bats had roosted here in previous years without being noticed by the owners.

The advice given to the owners was to provide some access for bats in an area of the roof close to the disturbed site when it was being reconstructed. A bat box could be formed by providing access to the space between two rafters. A wooden board could

be attached to the brick wall to form a better back surface for the box as well as sealing the gap at the top of the wall to prevent the bats squeezing into the main roof space.

The photos (Figures 5.1 to 5.4) show construction in progress, and the finished appearance. Two boxes were constructed by using the spaces between three joist ends. Some of the climbing plants were removed from the upper wall to improve access for the bats. This side of the roof was completed in early summer 1999. Two nursery seasons have now passed and unfortunately the carefully constructed roost sites have not yet been occupied by bats. Neither have bats used the other side of the roof. However the householders will welcome the bats presence if and when they do move in.

This type of roof alteration is relatively simple and since the "soffit/fascia box" roost site is a common one for pipistrelles, it is hoped that other householders will follow the example of this bat-friendly couple.

Acknowledgements
Thanks are due to Graeme Fleming and Joyce Bishop for being so concerned for the bats roosting in their roof. The photographs (Figs. 5.1 to 5.4) were taken by Graeme

References

Pritchard, J.S. (1993) Keeping the bats in Battleby. *Scottish Bats* **2**, 39-42.

Pritchard, J.S. (1995) Bats at Battleby – an update. *Scottish Bats* **3**, 16.

Simpson and Brown Architects (editors) (1996) The design and construction of bat boxes in houses. Scottish Natural Heritage.

Fig. 5.1 The exposed roof edge showing the joist ends

Fig. 5.2 A partly constructed bat box

Fig. 5.3 The entrances to the completed boxes

Fig. 5.4 The box entrances and the completed roof work.

An observation of a Brown long-eared bat amongst cobwebs

David C. McRae

Brown long-eared bats *Plecotus auritus* are more often associated with roosts devoid of cobwebs. However, a bat taking shelter behind a cluster of spiders' webs provided an interesting finale to the survey of an old farm steading.

A bat survey of a steading in Kinnordy, Angus, was carried out on the 5th and 10th July 1998. The floors of the extensive buildings were covered in deep litter straw for the use of various animals which included horses, sheep and poultry. In the main barn, bales of straw were stacked high into the twenty-foot high roof apex. There was a plentiful supply of moths and other flying insects in this damp and dusty area. Cobwebs were in evidence throughout but especially around the rafters and ridge board of the roof.

On the 5th July I witnessed an impressive display of up to six long-eared bats foraging within the main barn. They continued the activity for over an hour whilst occasionally resting on the rafters.

During the second night the same activity occurred but only two bats were seen. At about 15 minutes after midnight one bat was seen to alight high on the rafters. Torchlight was directed away from the bat and after two or three minutes it was seen to start moving upwards towards the ridge beam. Very slowly and with spider-like care the bat started to negotiate the multi-layers of cobwebs. Destruction was minimal to the frail gossamer webs as the bat secured itself onto the ridge beam. It then carefully manoeuvred itself into the corner join of the beam rafter. There it stayed to roost, completely obscured from view behind the cobwebs.

Report on ringing of Natterer's bats in Tentsmuir Forest 1998 - 1999

Les Hatton and Keith Cohen

Introduction

A programme of bat box provision has been in place at Tentsmuir since 1985. These have proved very successful with good occupancy rates. The most important aspect of the bat box scheme has been the colonisation of two major sites (known as 'the Beeches' and 'the Icehouse') by the relatively scarce Natterer's bat *Myotis nattereri*. This species is believed to occur in internationally important numbers in Britain Stebbings 1993), and the Tentsmuir population may be significant in European terms. In 1998, permission was gained for Fife Bat Group to ring the bats at these two sites. The primary purpose for doing so was to establish if the two populations (the Beeches and the Icehouse) were entirely separate, or if there was any interchange between the two sites. In addition, the long term ringing should give us data on survival, movement and population dynamics.

Methods

The bats are handled in late May/ early June to establish the numbers of breeding animals. They are caught by hand in the boxes and sexed and checked for breeding condition (whether pregnant or not, and if they have previously bred). Any unringed bats are ringed. The rings are standard Mammal Society bat rings.

In August, the boxes are again checked to establish the proportion of juveniles present. At this time of year, juveniles are weaned and capable of flight. Ageing and sexing of the bats, and checking females for signs of having been pregnant is carried out. Any young and unringed adult bats are ringed.

Results

163 bats have been ringed to date, with 60 subsequently recaptured. This is a retrap rate of 36%. Notable results to date are as follows:

1. Two bats have been found at both sites indicating that there is some interchange of population between the Beeches and Icehouses.
2. 10 Males were found in both spring 1998 and 1999.
3. 85 adults were caught in spring 1998, but only 29 (most of which were retraps) in 1999.
4. Similar numbers of young were ringed in both years, with 22 in 1998, and 27 in 1999.

Discussion

The bat-ringing programme is in its infancy but it has already yielded some interesting results. Amongst the most important of these is that the two movements between sites do indicate that there is some interchange of population. Both bats were breeding females, both moving from the Icehouse to the Beeches, one subsequently returning to the Icehouse, the other remaining at the Beeches. Capture histories are detailed in Table 1.

Ring no.	Date	Site
T6870	01/06/98	Icehouse
T6870	12/08/98	Beeches
T6870	16/08/99	Icehouse
T6872	01/06/98	Icehouse
T6872	12/08/98	Beeches
T6872	09/05/99	Beeches

Table 6.1 Capture histories of two bats.

The capture of 10 males in both spring of both years is of interest as it hints at some stability in the gender balance. Males were caught both on their own and in boxes holding large numbers of females.

The low number of adults caught in spring 1999 was partly a result of a larger number of bats escaping capture, but also reflected a genuine absence of many females. This was thought to be due to the much cooler and wetter weather prior to checking the boxes in spring 1999, which may have slowed the movement of bats from their winter to breeding quarters. The number of adults captured in both summers, 30 in 1998 and 36 in 1999, was similar, and this may be a better indicator of the breeding population than the spring figure, which may be affected both by weather and the presence of non-breeding females.

The relative similarity in the production of juveniles is also of interest, and long term collection of such productivity data is important, as is ringing data showing the levels of subsequent recruitment into the breeding population.

Although certain boxes appeared more popular than others, the bats do appear to demonstrate some elasticity in their usage of boxes. This requires further study. The boxes at the Icehouse have recently been the targets for great spotted woodpeckers *Dendrocopos major*, and a number have been damaged. It is not clear if any bats were taken, but some boxes have had to be replaced with 'woodcrete' boxes.

Conclusion

Ringing has already developed a number of lines of enquiry concerning this important population. The possibility of examining long term trends in productivity, survival, recruitment, gender balances within the population, and movement between sites are all clearly worthy of future investigation. To date the population does not appear to be unduly disturbed by the ringing process, and the bats have been subject to bat box inspections for over a decade now with no apparent ill effects.

Acknowledgements

Fife Bat Group would particularly like to thank Forest Enterprise for their permission and interest in the project, especially for the close support provided by John Montgomery the local FE ranger. SNH both at a national and local level have provided considerable financial support, and thanks are due to John Ralston of the licensing section for his assistance in organising and managing the scientific licence. Sue Swift

provided invaluable training and advice, both in ringing and Natterer's biology. Finally, thanks are due to the many bat workers who have assisted in the project over the years, particularly June Chisholm.

Reference

Stebbings, R.E. (1993) The Greywell Tunnel. An internationally important haven for bats. English Nature: Newbury.

Nathusius' pipistrelle *Pipistrellus nathusii* recovered from Glasgow

Callum M^c^Neill Ritchie

On 21st April 2000, the Loch Lomond Bat Group (LLBG) received a call from Brigid Primrose of the Scottish Natural Heritage (SNH) Clydebank office, regarding a pipistrelle that had been received from a timber company in Glasgow. It appeared that the bat might have come all the way from Oxford on a timber lorry - as the timber was being offloaded in the yard at Glasgow, the driver spotted the bat amongst his cargo. It was passed to Brigid, who asked the bat group to assist with feeding it up for potential release.

The bat was female and was noticeably large. From initial measurements, it was just at the borderline of the maximum overall size and weight range of *Pipistrellus pipistrellus* and some other distinctive features were noted. The forearm seemed thick and long and this was reflected in its wing length and breadth. Its coat seemed shaggier in comparison to a common pipistrelle, and while the dorsal half of the coat was a typical shade of brown the ventral half was more of a distinct greyish brown, giving the bat a slight two-tone appearance.

These features suggested that the bat was not a common pipistrelle and verification of the species was sought from a surveyor from the Robert Stebbings Consultancy, who was carrying out conservation work for SNH at a bat roost at the time. He also thought that this was not a common pipistrelle but was in fact, as Brigid had suspected, a Nathusius' pipistrelle, *P. nathusii*. There were only two earlier records of Nathusius' pipistrelle in the Central Scotland area, both of them from John Haddow and, given his previous experience of this species, he was approached for confirmation of our identification.

Three criteria were used to determine that the bat was a Nathusius' pipistrelle rather than one of the two "common" pipistrelle species *P. pipistrellus* and *P. pygmaeus*. The two morphological criteria are outlined in Herman and Haddow (1995):

- The length of the fifth digit (including the wrist) was more than 42 mm and its length (excluding the wrist) was more than 1.25 times the length of the forearm.
- The first pre-molar tooth appeared to be prominent and in line (as opposed to being displaced inwards) in the tooth row, however this character was difficult to see due to its size.
- A recording was made from a time expansion bat detector, as the bat flew around a room, and after analysis the results were summarised by John Haddow as follows – "My recordings taken from the bat flying round Calum's living room are spot on! In a cluttered environment the pipistrelle call loses its CF (constant frequency) section and there is basically a FM (frequency modulated) call. John Russ states in his book *The Bats of Britain and Ireland* '…in cluttered environments, the bat may drop the CF pulse and produce a simple FM sweep. On analysis the sweep usually terminates slightly above 39 kHz, at about 43 kHz, and the maximum frequency may be as high as 95 kHz'. Analysis of the recording showed exactly this, the sweep terminated at 43-44 kHz."

We had also observed subtle behavioural differences displayed by this bat, compared to other pipistrelles that we had cared for. This bat tended to flutter then glide, allowing us to observe the breadth of the wings, in contrast to the almost continuous

fluttering of the common pipistrelles. Also, whereas the common pipistrelles would usually make a gradual bid to hide themselves after alighting, this bat would make immediately for cover.

Confirmation of the bat as Nathusius' pipistrelle presented us with a problem. Although the carer's wife was not upset about the "cluttered" environment comment, the carer himself was very nervous that such an important bat might not survive if kept too long! Although the species may be resident in Scotland, it has been shown to be a long distance migrant elsewhere. An urgent decision had to be made whether to:

- release it locally?,
- take it to Oxford and release it?
- keep it captive, given our lack of knowledge of any local Nathusius' pipistrelle sites?

After much discussion, it was decided to release the bat locally, given that the species is migratory and at least a regular vagrant here.

On 28th April, the bat was released into a bat box at a site in the Loch Lomond area that was thought to provide suitable habitat of deciduous woodland with nearby water. The following night, there was no sign of it.

References

Herman, J.S. and Haddow, J.F. (1995) A key to bats in Scotland, *Scottish Bats* 3, 30-31.

Russ, J. (1999) *The Bats of Britain and Ireland.* Alana Books.

Figure 9.1 the Nathusius' pipistrelle before release

Figure 9.2 the Nathusius' pipistrelle before release

Recorded distribution of bats in Scotland

John F Haddow and Jeremy S Herman

These distribution maps show the presence of species regarded as resident in Scotland, in the period from 1980 to the present. They have been prepared by updating the maps previously published in *Scottish Bats* volumes 1 to 4 with new records, which have been provided by Scottish bat groups and other expert recorders, together with a handful of published records. Generally records had to be from bats identified visually in roosts or from live or dead specimens "in the hand". Additional records of some species have been accepted in certain circumstances which are explained below.

Daubenton's bat *Myotis daubentonii* records were accepted from confidently identified feeding bats, since their feeding behaviour over water is distinctive and the use of an ultrasonic bat detector allows the experienced observer to make a reliable identification.

Some Natterer's bat *Myotis nattereri* records were accepted when these were identified in flight by certain experts, using ultrasonic detectors.

There is a single record of either whiskered bat *Myotis mystacinus* or the very similar Brandt's bat *Myotis brandtii* from the Borders (S. Smith *pers. comm*.). A map has not been included for this species pair, nor for Brandt's bat itself, which may be present in Scotland but has not been recorded here since the nineteenth century.

In view of the scarcity of observers in Scotland with sufficient experience to distinguish a noctule *Nyctalus noctula* from a Leisler's bat *Nyctalus leisleri* by such means, bat detector/in flight records of bats of the genus *Nyctalus* have generally been classified as noctule/Leisler's bat, for which category a separate map has been included. However some records of *N.noctula* have been reliably recorded using "time expansion" bat detectors which allow recording and computer analysis of the calls.

The common pipistrelle *Pipistrellus pipistrellus* has, since 1999, been formally separated into two species. In flight these may often be reliably separated on the basis of their echolocation calls into the 45kHz *Pipistrellus pipistrellus* and the 55kHz *Pipistrellus pygmaeus.* The Bat Conservation Trust recommends use of the vernacular names common pipistrelle and soprano pipistrelle respectively for these newly recognised forms. The continued use of the term "common" is misleading, however, as in many parts of Scotland *Pipistrellus pygmaeus* (55kHz) seems to be more common, although this impression may in part be due to the large and noticeable nursery colonies formed by the species. For these maps we are using the names "Bandit" and "Brown" after the facial appearance which can, with some reliability, be used to separate the two, for the 45kHz and 55kHz species respectively.

Active searching for Nathusius' pipistrelle in Northern Ireland has increased the knowledge of this species in that part of the UK. It is not unreasonable to assume that the species will be found increasingly in Scotland, with the increase of skilled observers, but as yet no nursery colony has been found here.

Systematic recording of the three pipistrelle species has not been widespread until the last two years (1999 and 2000). The recorded distribution of each is consequently very patchy, and the separate maps reflect this. A composite map for all pipistrelle species has therefore been included, showing records of each pipistrelle species together with the many records that could belong to any of these.

While the maps contain information on bat distribution, inevitably they also reflect the distribution of observers. In particular, many gaps remain in our knowledge of bat distribution in western Scotland, but gaps are also apparent in the well-recorded areas. The question still remains to be answered. Are these indicative of discontinuities in distribution or are they a consequence of limited observation?

The full list of vagrant species recorded in Scotland is as follows. Note that noctule, Leisler's bat and Nathusius' pipistrelle are included in view of the likely origin of some of the records of these species. However in the case of Nathusius' pipistrelle there remains a reasonable case to interpret some or all of the records of these supposedly vagrant bats as migrants. Vagrant individuals of all of the species listed below are likely to have a European origin except for the Hoary bat *Lasiurus borealis* which is a North American species.

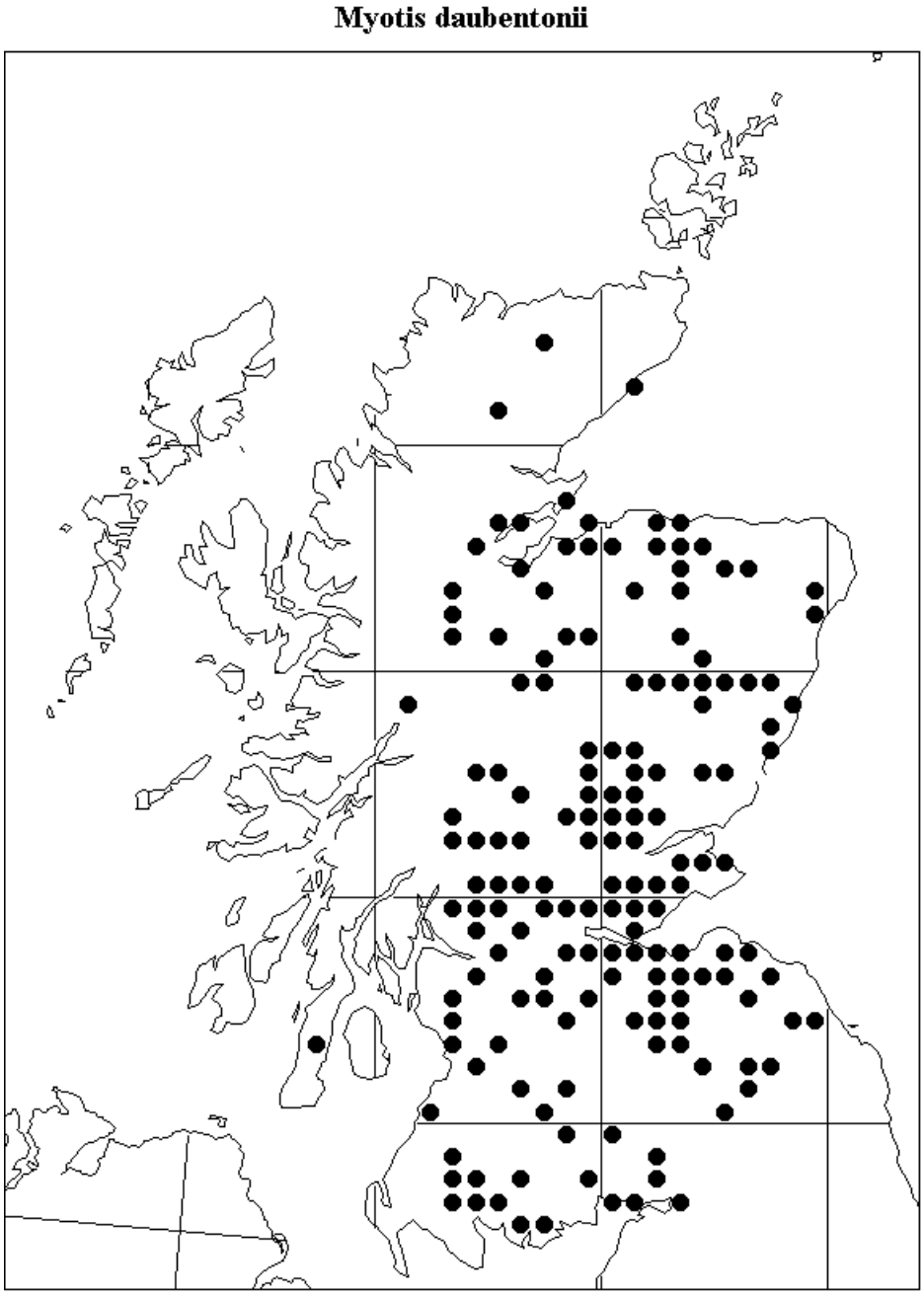
Vagrant species:
Noctule *Nyctalus noctula* (Orkney, Shetland)
Leisler's bat *Nyctalus leisleri* (Shetland)
Nathusius' pipistrelle *Pipistrellus nathusii* (Shetland, Peterhead)
Savi's pipistrelle *Pipistrellus savii*
Parti-coloured bat *Vespertilio murinus*
Hoary bat *Lasiurus borealis*

In addition the following bats have been recorded on offshore oil or gas installations.

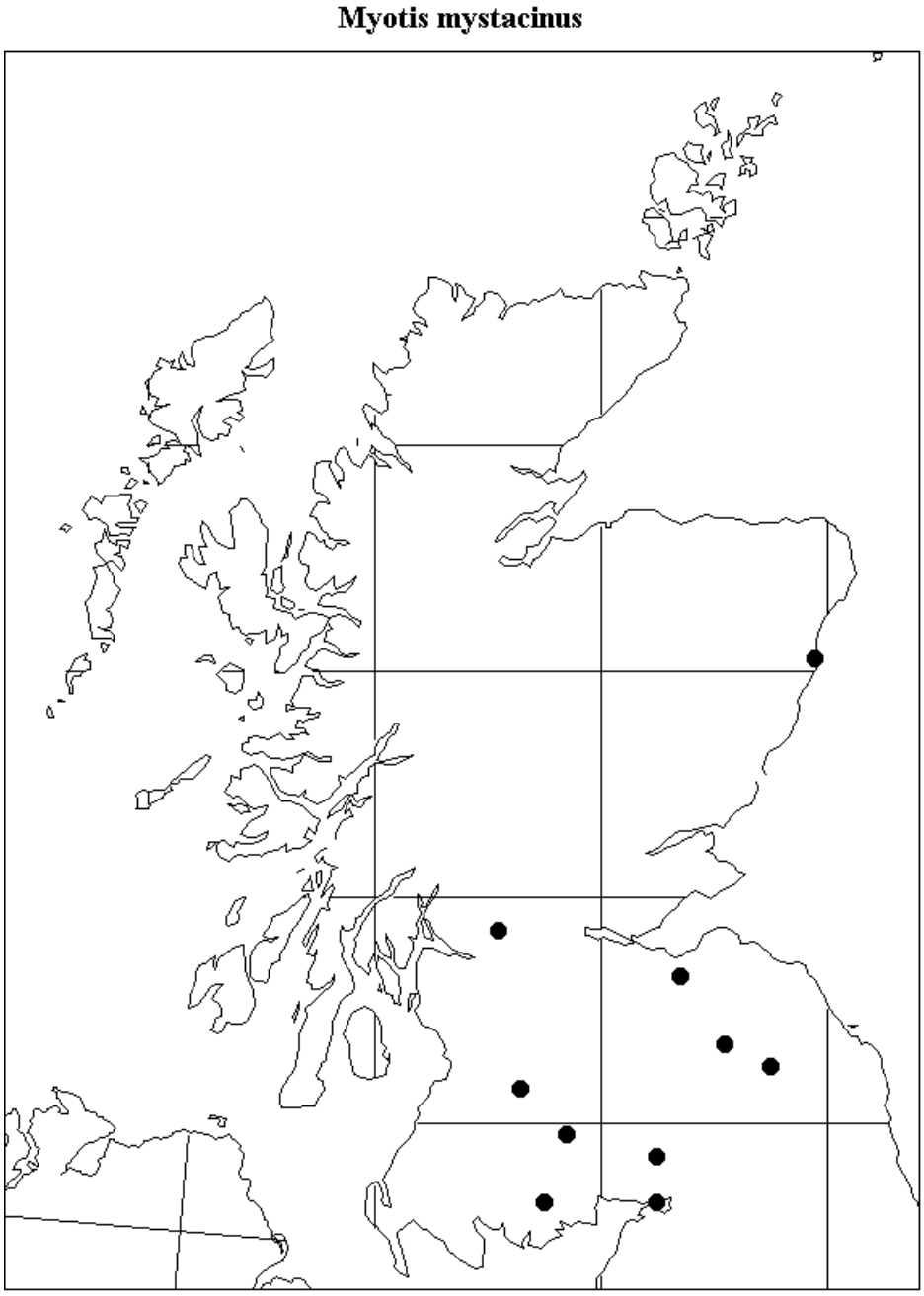
Noctule *Nyctalus noctula*
Northern bat *Eptesicus nilssonii*
Nathusius' pipistrelle *Pipistrellus nathusii*
Parti-coloured bat *Vespertilio murinus*

The maps (Apologies to the Shetland Isles, since the base map of Scotland has been cropped for convenience. No bats are known to be resident on the Shetlands. The only bats recorded there have been migrants or vagrants)

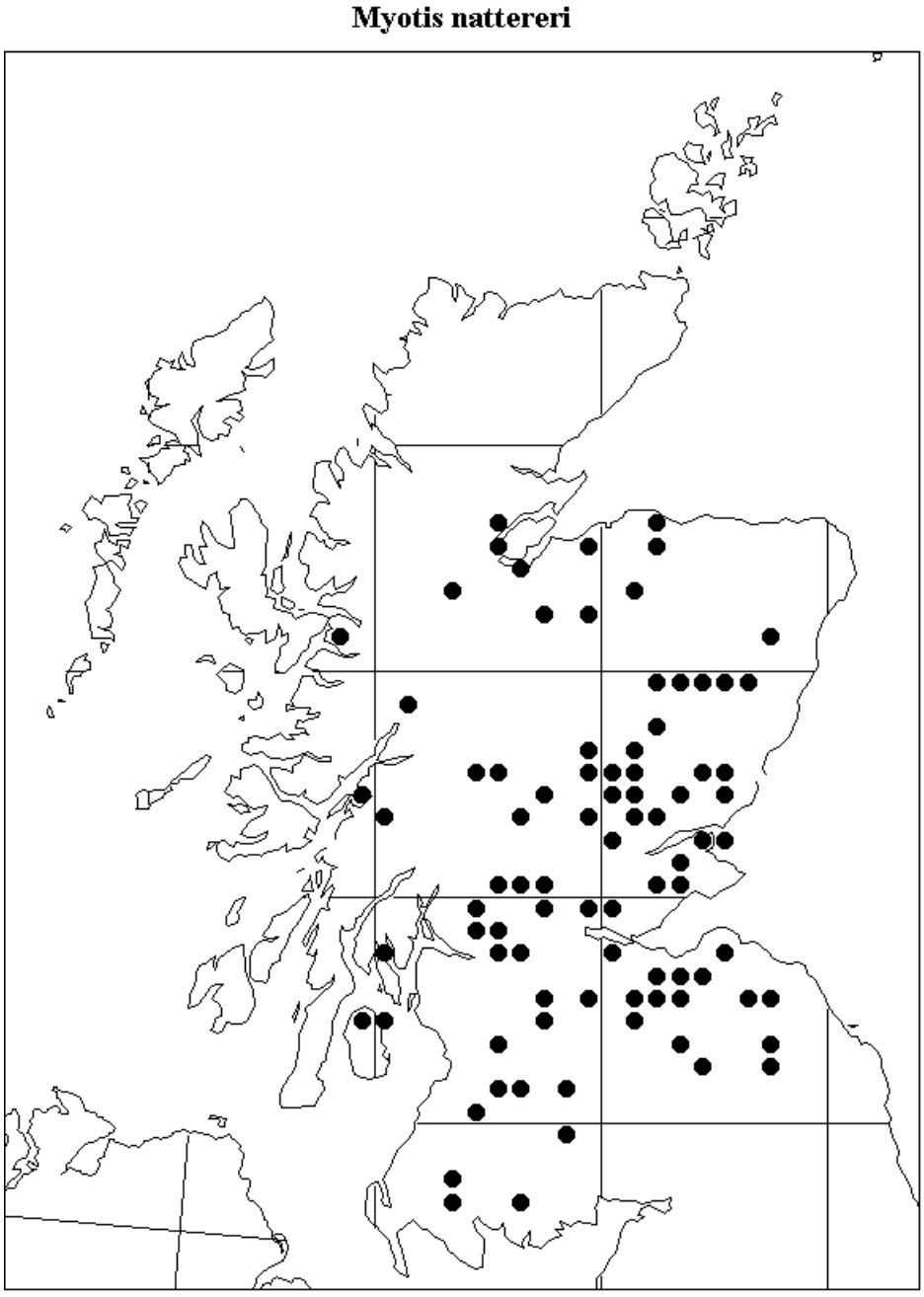
Map 1 Daubenton's bat *Myotis daubentonii*
Map 2 Whiskered bat *Myotis mystacinus*
Map 3 Natterer's bat *Myotis nattereri*
Map 4 Leisler's bat *Nyctalus leisleri*
Map 5 Noctule *Nyctalus noctula*
Map 6 Noctule/Leisler's bat *Nyctalus spp.*
Map 7 Nathusius' pipistrelle *Pipistrellus nathusii*
Map 8 Bandit pipistrelle *Pipistrellus pipistrellus*
Map 9 Brown pipistrelle *Pipistrellus pygmaeus*
Map 10 Pipistrelles (composite map of the three species) *Pipistrellus spp.*
Map 11 Brown long-eared bat *Plecotus auritus*



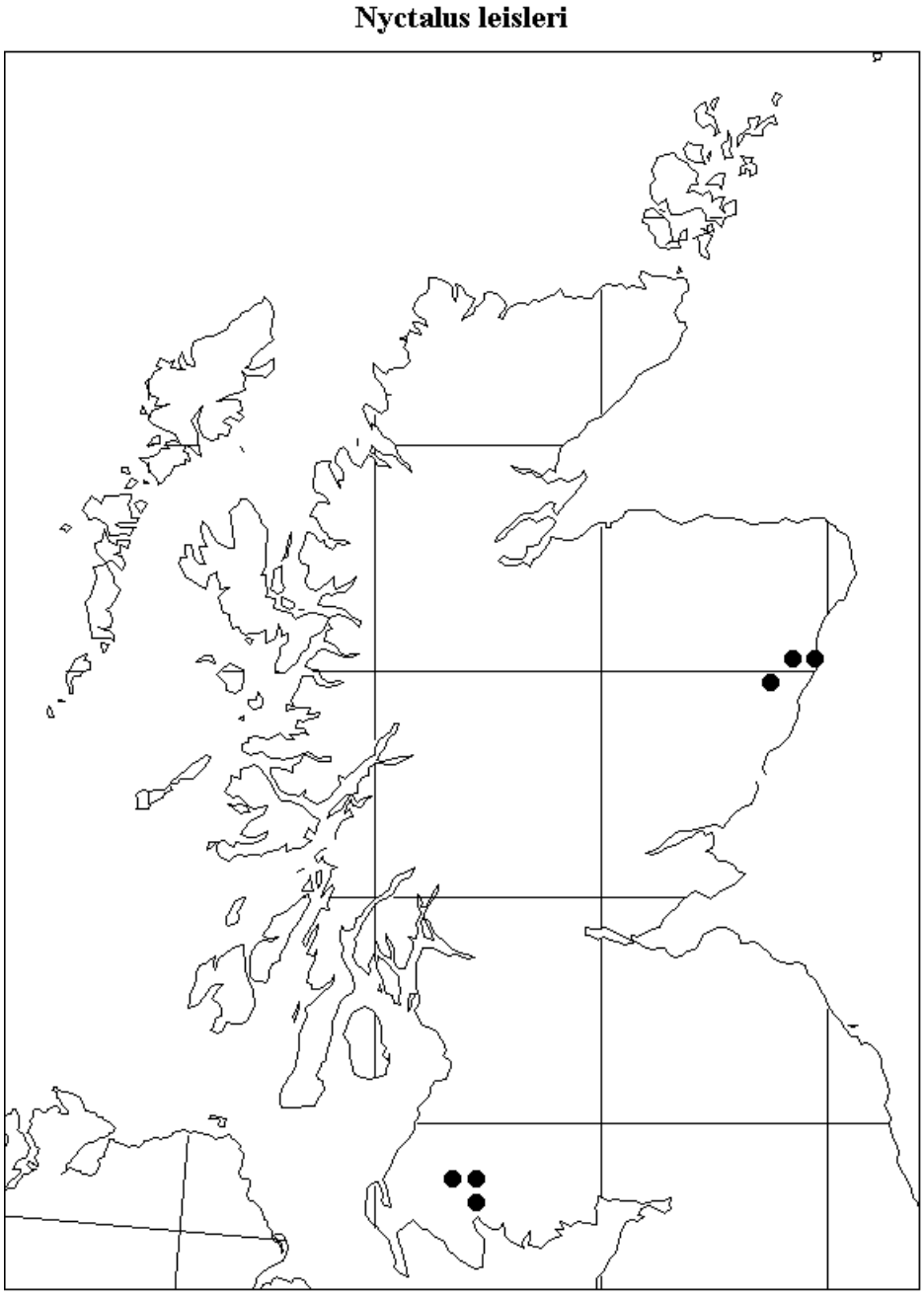
Map 1 Daubenton's bat *Myotis daubentonii*



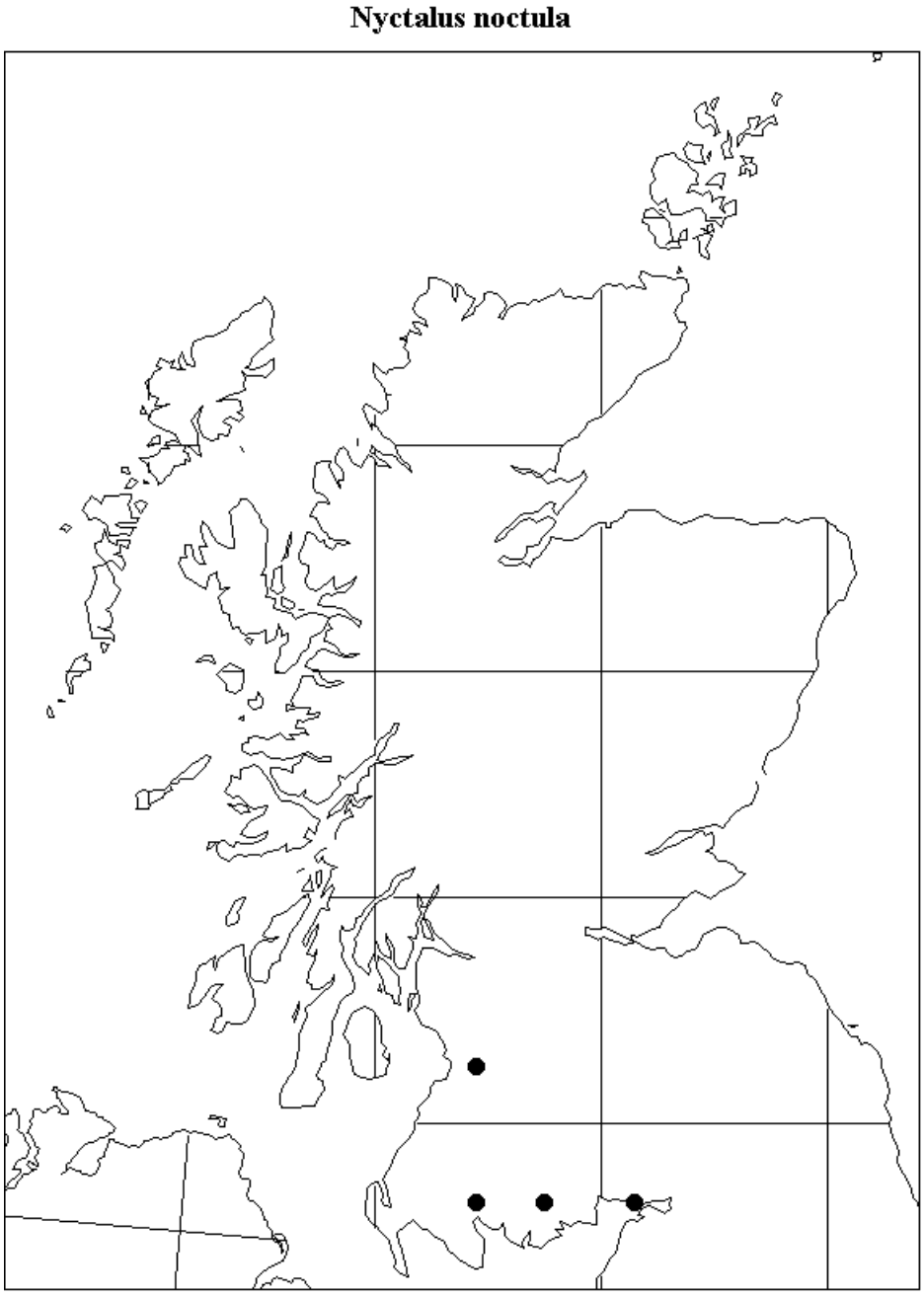
Map 2 Whiskered bat *Myotis mystacinus*



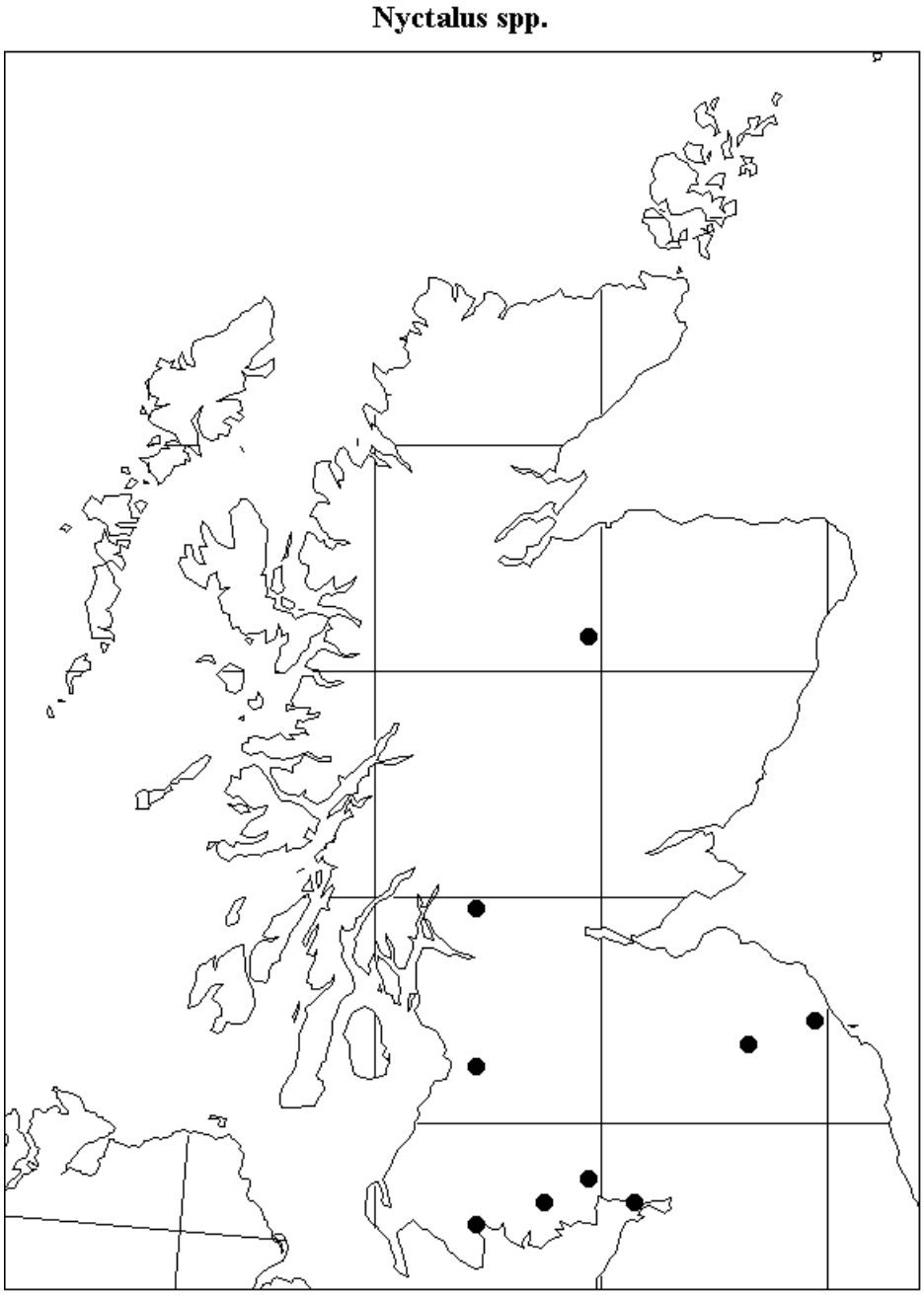
Map 3 Natterer's bat *Myotis nattereri*



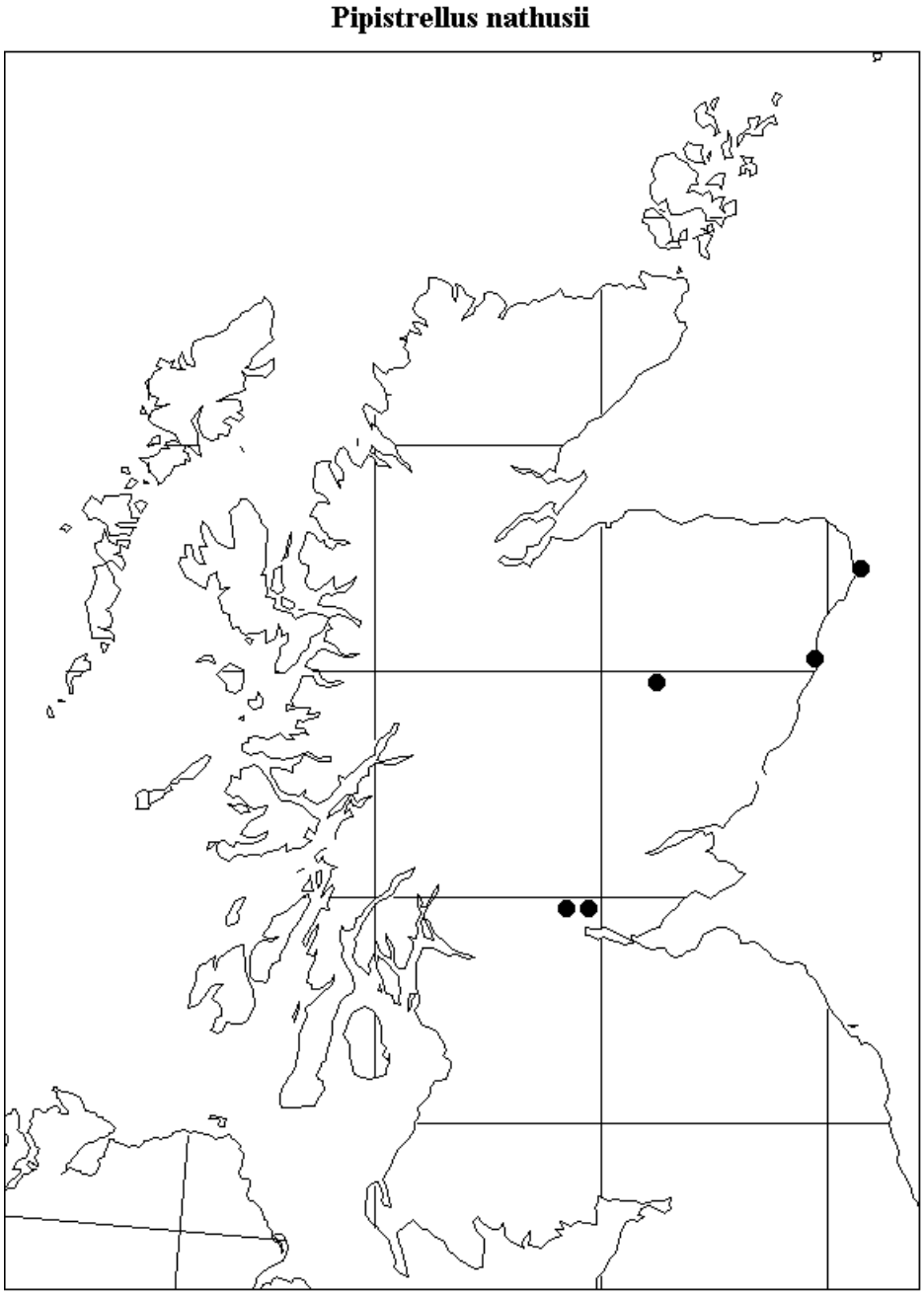
Map 4 Leisler's bat *Nyctalus leisleri*



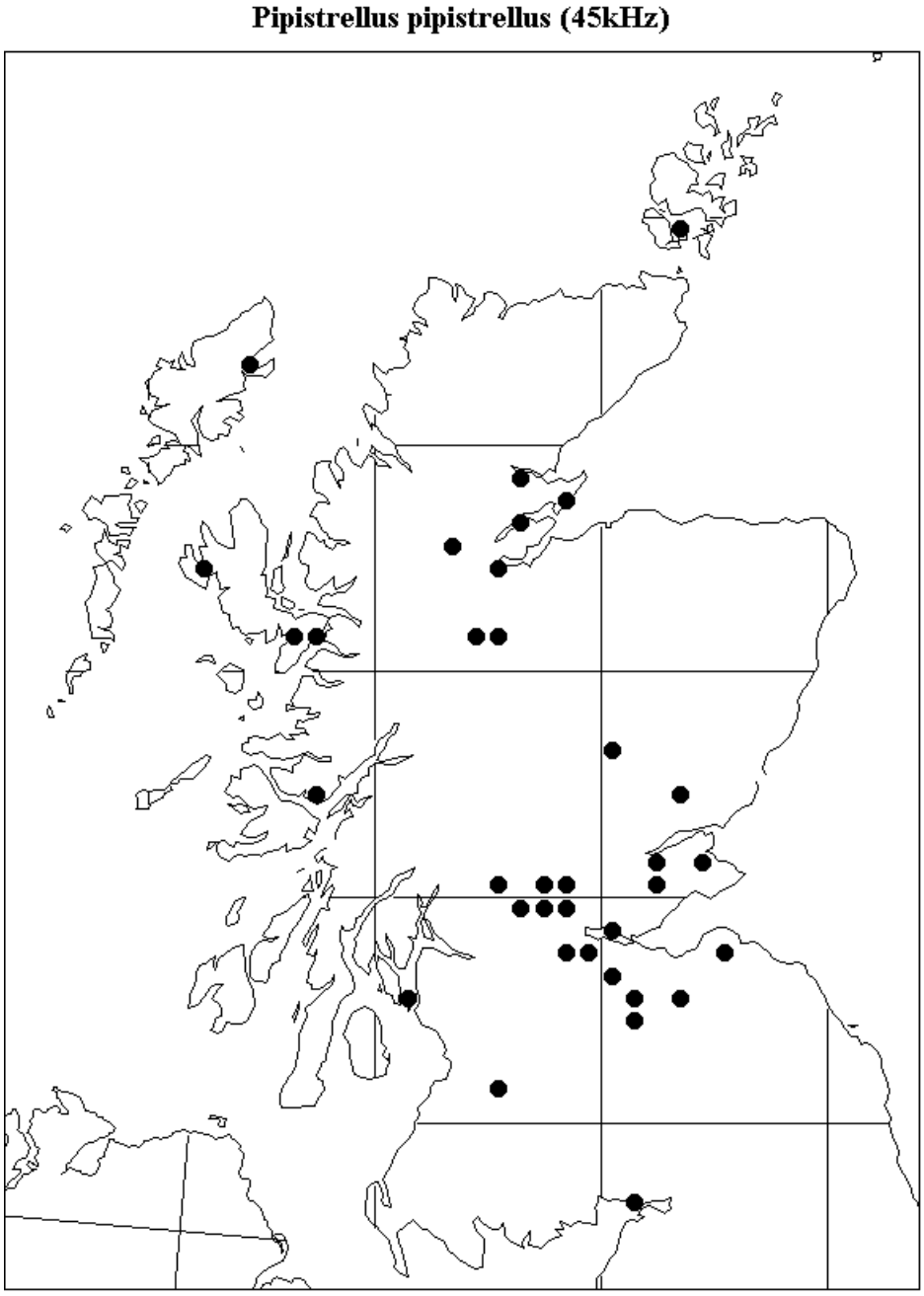
Map 5 Noctule *Nyctalus noctula*



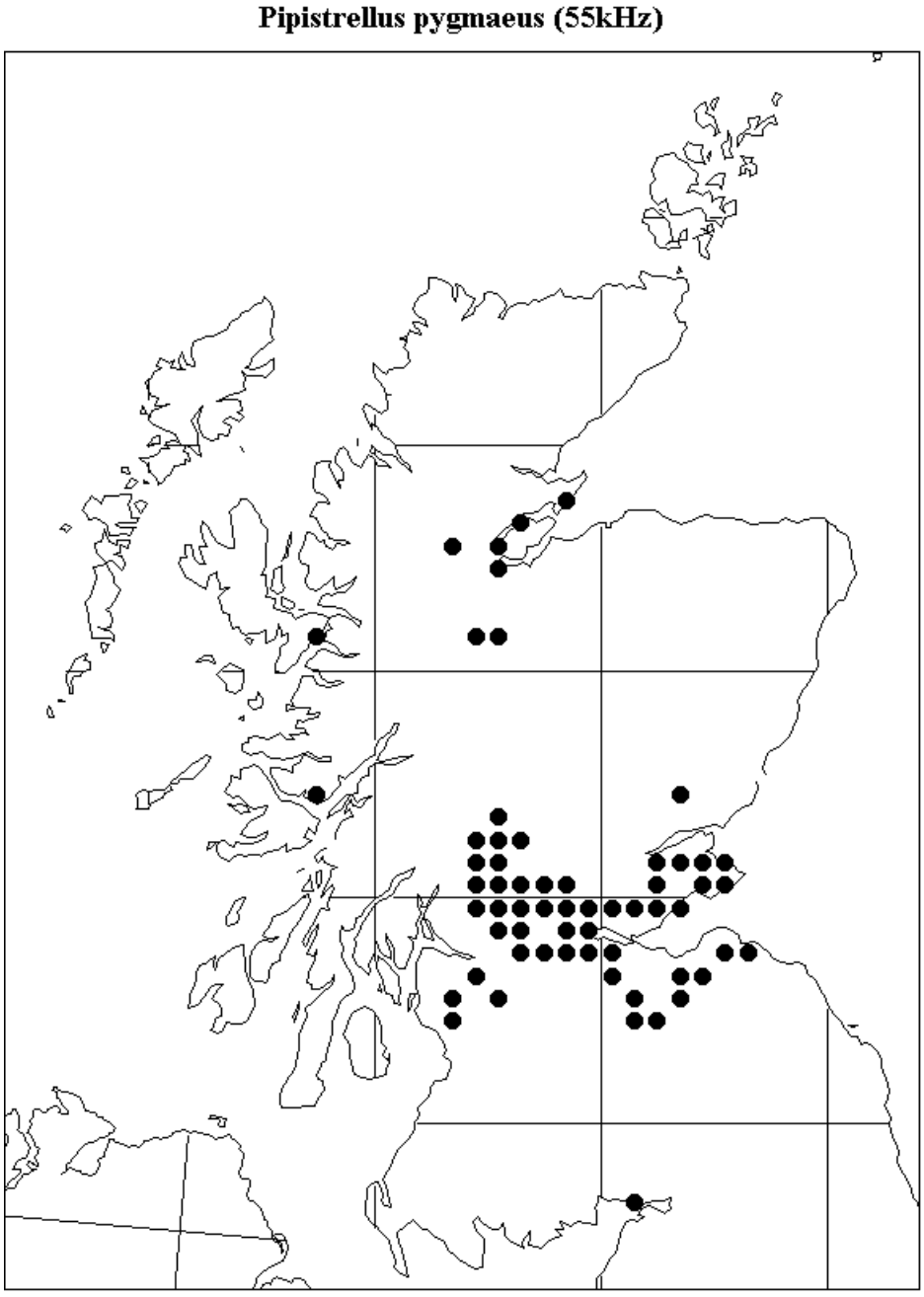
Map 6 Noctule/Leisler's bat *Nyctalus spp.*



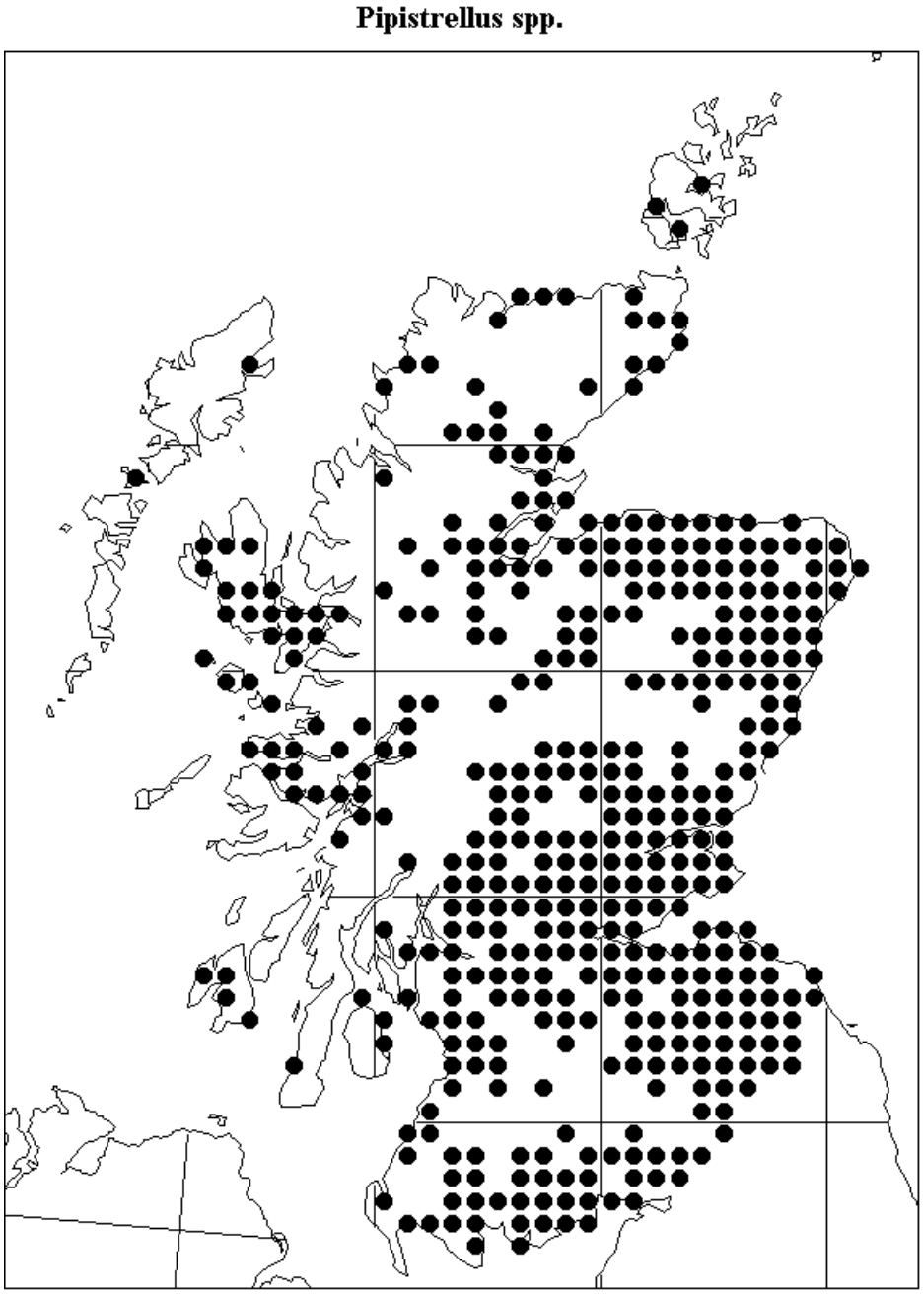
Map 7 Nathusius' pipistrelle *Pipistrellus nathusii*



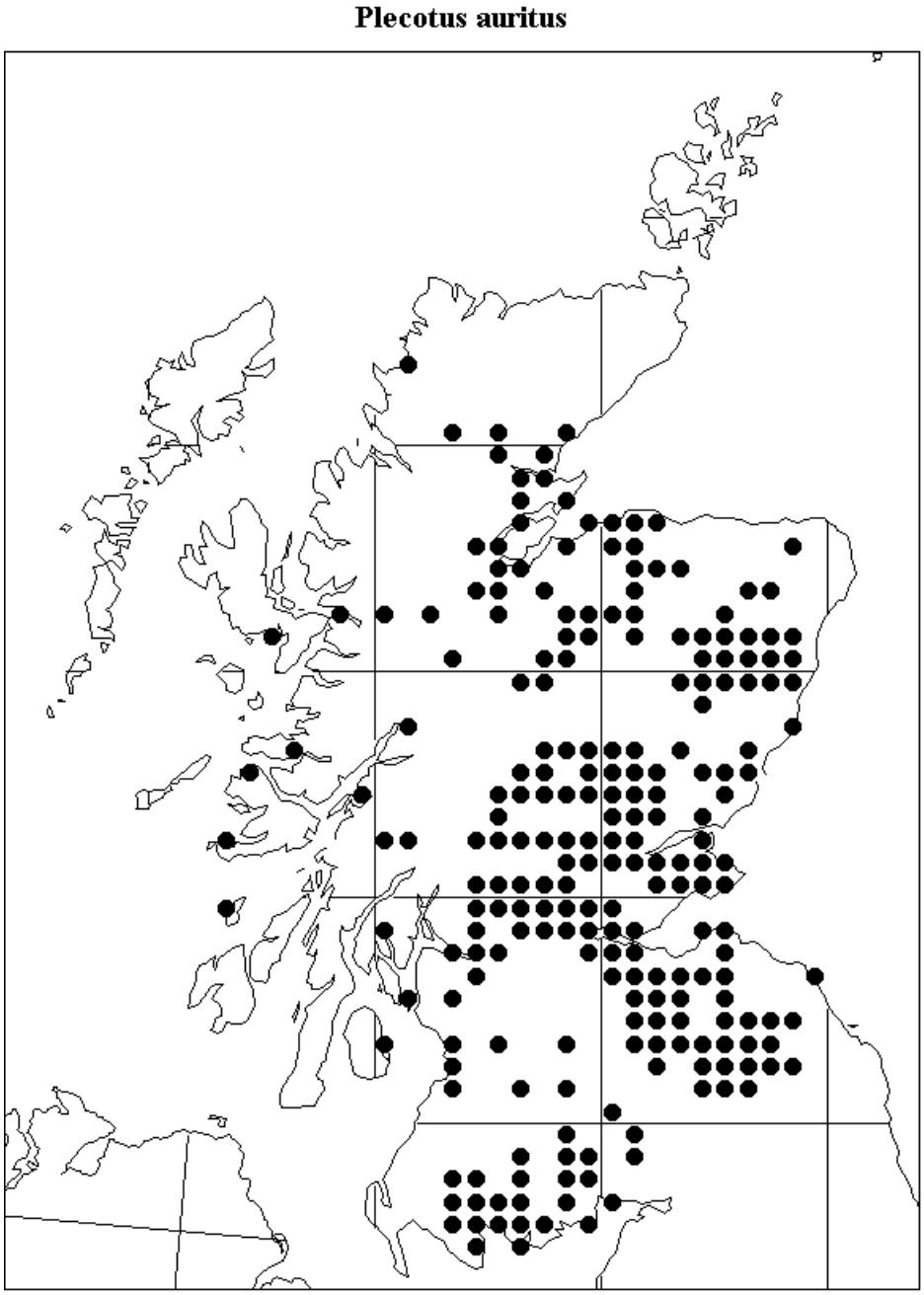
Map 8 Bandit pipistrelle *Pipistrellus pipistrellus*



Map 9 Brown pipistrelle *Pipistrellus pygmaeus*



Map 10 Pipistrelles (composite map of the three species) *Pipistrellus spp.*



Map 11 Brown long-eared bat *Plecotus auritus*

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The first four volumes of *Scottish Bats* were published from 1992 to 1997. A limited number of copies of back issues are available at a cost of £4 per copy including postage, or £6 outside the UK. Articles listed below can be copied on request, at a cost of £2 for a maximum of 10 pages (2 to 3 average length articles), or £3 outside the UK. Cheques should be made payable to *Scottish Bats*.

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