



Scottish
BATS

Volume 2

1993

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Editors John F Haddow and Jeremy S Herman



South-East Scotland Bat Groups

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Preface

Welcome to the second volume of *Scottish Bats*. Papers and articles concerning bat conservation and research can be published in scientific journals, regional journals of natural history, *Bat News* (newsletter of the Bat Conservation Trust) and *Batchat* (published by the former Nature Conservancy Council - the last issue was dated June 1990). *Scottish Bats* is intended to complement these publications and to collect together articles and information on bats in Scotland in a recognisable and easily available 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.

Perhaps inevitably most of the articles published here concentrate on the distribution of bats in Scotland - the type of information most easily gathered by a wide variety of observers. It is also an indication of how much there is still to discover about this element of our native fauna.

These 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 take responsibility for such essential changes as were necessary to provide consistency.

We would like to thank Dot Hartley for her help with the word-processing and the National Museums of Scotland which provided the facility for this.

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Observations of Leisler's bat *Nyctalus leisleri* in northern Scotland

Jens Rydell, Colin Catto and Paul A Racey

While listening for bats along the River Don in Seaton Park, Aberdeen on 24 June 1993 using a bat detector, a medium sized bat with rather narrow wings passed in straight flight 10-15m over the river, emitting long, powerful echolocation calls at slow and regular intervals. The bat detector model D-960: L. Pettersson Elektronik, Uppsala, Sweden was used in the heterodyne mode, and the pulses were heard as powerful smacks when the bat detector was tuned to 22-23kHz. Such sounds result from relatively long pulses of constant or nearly constant frequency (Ahlén 1981). The observation was made in favourable light conditions prevailing in clear weather at dusk 2315h, and hence permitted a good view of the bat against the sky. However, the observation was only a few seconds long, because the bat was commuting rather than feeding, and no recording of its sound could be made. On 27 June, we returned to the same place. This time three echolocation pulses of 23kHz were heard at a long distance at 2300h, but the bat was not seen.

Similar echolocation pulses were again heard the next night 29 June 1993 at 0100h, this time from a bridge over the River Dee at Peterculter about 8km west south west of Aberdeen city. The sky was dark and the bat could not be seen, but the echolocation calls could be heard very well for at least ten seconds, as the bat apparently flew over our heads commuting along the river. The pulses were heard as powerful smacks when the bat detectors were tuned to 22-23kHz. The pulse repetition rate was about 4-5 per second. Again, the bat did not return, and no recording could be made.

The fourth observation was made just outside the small village of Drumoak near the River Dee about 15km west south west of Aberdeen on 29 June at 2320h. This time we only detected a few echolocation pulses from a moving car, while driving and surveying for bats. The bat detector was tuned to 23kHz and the microphone was pointed out through the open window.

There are two European bat species which seem to fit the description above; *Vespertilio murinus* Linnaeus 1758 and *Nyctalus leisleri* Kuhl 1818. The other north European species that use echolocation pulses of similar design can be excluded: *N. noctula* Schreber 1774 is much larger and uses lower frequencies usually 18-20kHz when it commutes or when flying away from obstacles. *Eptesicus serotinus* Schreber 1774 is also larger but uses much faster pulse repetition rates, *E. nilssonii* Keyserling & Blasius 1839 and *Pipistrellus spp* are all smaller and use much higher frequencies (Ahlén 1981, 1990; Weid and Helversen 1987).

According to Zingg (1988), *N. leisleri* flying in open areas uses 5-14ms and 9ms long pulses of almost constant frequency ending at 23-25kHz. The pulses are typically repeated regularly four times per second. In the same situation, *V. murinus* uses similar pulses and similar pulse intervals, but the frequency is slightly higher 25-27kHz (Ahlen 1990). Hence, we conclude that at least the two best observations refer to *N. leisleri*.

One of us (JR) had the opportunity to observe several *N. leisleri* in urban Bristol on 6 September 1993. The bats emerged from a roost in a building and subsequently dispersed towards their feeding sites. As they dispersed, they usually flew well above the tree tops, using echolocation pulses of nearly constant frequencies of 21-22kHz and with a repetition rate of about 4Hz. These observations confirmed the conclusion reached earlier. Some individuals, however, flew lower near the trees and used higher frequencies of 26-27kHz. These latter calls were difficult to distinguish from those that *N. noctula* and *V. murinus* emit in similar situations, and may hence be less useful for species identification (see Kapteyn 1993). In contrast to *V. murinus*, which has been recorded in Britain as a vagrant only (Racey 1991a), *N. leisleri* is established there. It occurs in southern and central England and there are also two recent 1988 and 1991 records from southwestern Scotland (Arnold 1993). A record from Shetland in 1968 is assumed to be a vagrant (Corbet 1970). It is one of the commonest bats in Ireland (Racey 1991b).

Despite intensive field research on bats in the Aberdeen area over the past fifteen years, *N. leisleri* has not been encountered previously. Hence, the present observations, made near Aberdeen city, either represent a

population which previously has been overlooked or, alternatively, suggest that the species may be spreading. *N. leisleri* is regarded as a rare and vulnerable bat in Britain (Arnold 1993). However, it is known to feed over streetlamps in built up areas in England (Whiteley and Clarkson 1985) and this is also the case on the European continent (Zingg 1988). Summer colonies are found in houses (Arnold 1993). As mentioned above, a large maternity colony exists in urban Bristol and the species is also known from central London (Mickleburgh 1987). Several long range movements of *N. leisleri* have been recorded on the European continent, indicating that the species may be migratory (e.g. Krzanowski 1960; Aellen 1983-84).

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References

- Aellen, W 1983-84. Migrations de chauves-souris de Suisse. Note complémentaire. *Myotis* 21-22, 185-189.
- Ahlén, I 1981. Identification of Scandinavian bats by their sounds. *Swedish University of Agricultural Sciences, Department of Wildlife. Ecology, Report 6*.
- 1990. *Identification of bats in flight*. Stockholm: Swedish Society for Conservation of Nature and the Swedish Youth Association for Environmental Studies and Conservation.
- Arnold, H R 1993. *Atlas of mammals in Britain*. Huntingdon: Institute of Terrestrial Ecology.
- Corbet, G B 1970. Vagrant bats in Shetland and the North Sea. *Journal of Zoology, London* 161, 281-282.
- Kapteyn, K 1993. Intraspecific variation in echolocation of vespertilionid bats, and its implications for identification. In: K Kapteyn (ed), *Proceedings of the first European bat detector workshop*. Amsterdam: Netherlands bat research foundation.
- Krzanowski, A 1960. Investigations of flights of Polish bats, mainly *Myotis myotis* Borkhausen 1797. *Acta Theriologica* 4, 175-184.
- Mickleburgh, S 1987. Distribution and status of bats in the London area. *The London Naturalist* 66, 41-91.
- Racey, P A 1991a. Particoloured bat *Vespertilio murinus*. In: G B Corbet and S Harris (eds), *Handbook of British mammals. Third edition*. Oxford: Blackwell Scientific Publications.
- 1991b. Leisler's bat *Nyctalus leisleri*. In: G B Corbet and S Harris (eds), *Handbook of British mammals. Third edition*. Oxford: Blackwell Scientific Publications.
- Weid, R and Helversen, O von 1987. Ortungsrufe Europäischer Fledermäuse beim Jagdflug im Freiland. *Myotis* 25, 5-27.
- Whiteley, D and Clarkson, K 1965. Leisler's bats in the Sheffield area. *Sorby Record* 23, 12-16. Cited in: G B Corbet and S Harris (eds), 1991. *Handbook of British mammals. Third edition*. Oxford: Blackwell Scientific Publications.
- Zingg, P 1988. Search calls of echolocating *Nyctalus leisleri* and *Pipistrellus savii* Mammalia: Chiroptera recorded in Switzerland. *Zeitschrift für Säugetierkunde* 53, 281-293.

Whiskered Bats - How far north do they reach?

John F Haddow

The whiskered bat *Myotis mystacinus* and Brandt's bat *Myotis brandtii* have both been recorded in Scotland but the only confirmed record of the latter is a single specimen held in Perth Museum and collected in 1874 "four miles from Rannoch on the road to Pitlochry" (Perthshire). All other records have been *M. mystacinus*. The most recent record is of a small roost of this species in Central Region - in Blanefield, north of Glasgow - the most northerly record for this species in the UK to date. Details of this roost are given here, with an update of our knowledge of the species in Scotland, since the last published details were in 1989 and 1990.

Jenny Maskell went to a nursing home near Blanefield, Stirlingshire (OS grid ref. NS 549801) at the request of the staff who had found a bat in an attic room. The bat was a juvenile female, adult size, alive when found on 27 July 1993 but died overnight. Jenny identified it as *M. mystacinus* and took it to Richard Sutcliffe of Kelvingrove Museum, Glasgow who agreed with the identification. I later examined it and confirmed that it was *M. mystacinus* using as diagnostic characters the shape of the ear tragus and the shape and proportions of premolars two to four. The forearm length was 34mm. This is now in the Glasgow Museums collection, registration number Z 1993-40 (Figure 1). Jenny and Roger Maskell watched for emerging bats on the following evening at the nursing home and were able to count 14 thought to be whiskered bats. There were no signs of bats in any accessible roof space and they appear to roost outside the wooden sarking boards, under the ridge flashing and below slates.

An attempt to catch emerging bats on 9 August 1993 was unsuccessful. About 10 bats were seen to emerge, identifiable as *Myotis sp* using a bat detector, but the exact exit points were impossible to judge, even from on top of the large and complex roof. On 22 August 1993 a second stray bat was found hanging on a wall inside the nursing home. This was a male *M. mystacinus*, juvenile, forearm length 34.9mm. Like the first one, its fur was distinctly dark grey, much greyer than juvenile Natterer's bats *M. nattereri* or Daubenton's bats *M. daubentonii*, the latter generally a dark chocolate colour. The fur is also longer and shaggier than either of these, and also pipistrelles *Pipistrellus pipistrellus*. In comparison with a pipistrelle these bats have noticeably longer ears. This young male appeared healthy and readily flew off when released the same evening.

Finding these two juvenile bats together with the observations of bats emerging from the building indicates a small nursery roost of this species. They are in a large stone built slate roofed house close to trees and to the river Blane Water. The area is well wooded lowland farmland with small villages in the south west of Central Region. To the north and west are Loch Lomond and the River Endrick Valley. In this area there is a high density of known bat roosts, most significantly there are roosts of Natterer's bats near Strathblane, Drymen, Croftamie and Balmaha, probably a greater concentration than any other part of Central Region. It is perhaps not surprising then that if whiskered bats reach this far north they exist in such a "good" area. It seems likely that there are other colonies of the species in west Central Region still to be discovered. How far north do they reach? Within this Region the Trossachs, particularly around Loch Ard and Lake of Menteith, seem likely suitable habitat, being well wooded, lowland and relatively sheltered. Further north, parts of lowland Perthshire known to be good habitat for Natterer's bats, would seem to be a possible location.

Haddow, Herman and Hewitt (1989) summarised the state of knowledge of Scottish whiskered bats at that time. Recent live records consisted of a summer roost at Newton St Boswells, Borders; an elusive summer roost at Gorebridge, Midlothian; and a hibernating male in a mine in Ayrshire. Since that article a single hibernating bat has been seen by Jerry Herman and Stuart Smith of Lothians Bat Group two winters running in the same position in a disused stone mine north of Dumfries. A nursery roost has been found in the roof of a cottage between Lockerbie and Langholm, Dumfriesshire. Identification was made by Steve Hewitt, now of Tulliehouse Museum, Carlisle and three juvenile specimens from the roost are now in the collections of the National Museums of Scotland, register numbers 1993.168.1-3. A small group of the bats (up to 40 estimated) has been seen in the roof during July in 1992 and 1993 (M Cohen, pers. comm.). On 25 August



Fig.1. The female whiskered bat from Blane field (Glasgow Museums)

1993 a dead bat was found in the roofspace of a hotel in Kelso, Borders (OS grid ref. NT 705295) and identified as *M. mystacinus* (A Panter, pers. comm.).

Important questions which beg answers are: Why are there not more of these bats in Scotland? What limits their range? Both whiskered and Brandt's bats are found much further north in continental Europe, in Scandinavia. Are our mild winters the limiting factor, resulting in too rapid metabolism of limited stored fat? Or do our unreliable, cool summers have more influence? Is it a combination of these? It seems unlikely that there is not suitable habitat. Are these bats particularly vulnerable to disturbance? The only confirmed Brandt's bat was found in Perthshire last century. Now that whiskered bats are known to occur over the southern half of Scotland, will Brandt's bats turn up as well?

References

Haddow, J F 1992. Recorded distribution of bats in Scotland. *Scottish Bats* 1, 49-52.

Haddow, J, Herman, J and Hewitt, S 1989. *Myotis mystacinus* and *M. brandtii* in Scotland. *Batchat* 12, 1-2.

Herman, J and Smith, S 1990. Records of the whiskered bat, *Myotis mystacinus* (Kuhl), from Scotland. *Glasgow Naturalist* 21, 519-521.

Hewitt, S 1989. Brandt's bat (*Myotis brandtii*) record for Perthshire. *The Glasgow Naturalist* 21, 488.

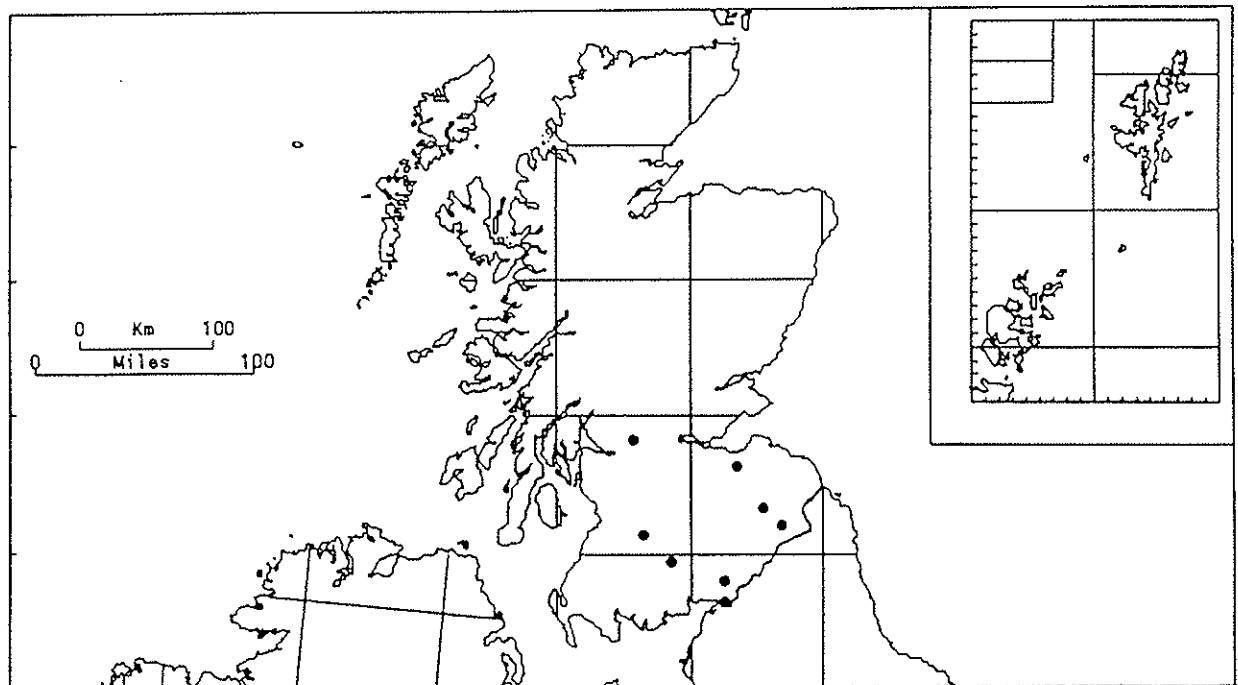


Fig.2. Records of *Myotis mystacinus* in Scotland

Bats confirmed on the Isle of Canna

Grace M Yoxon

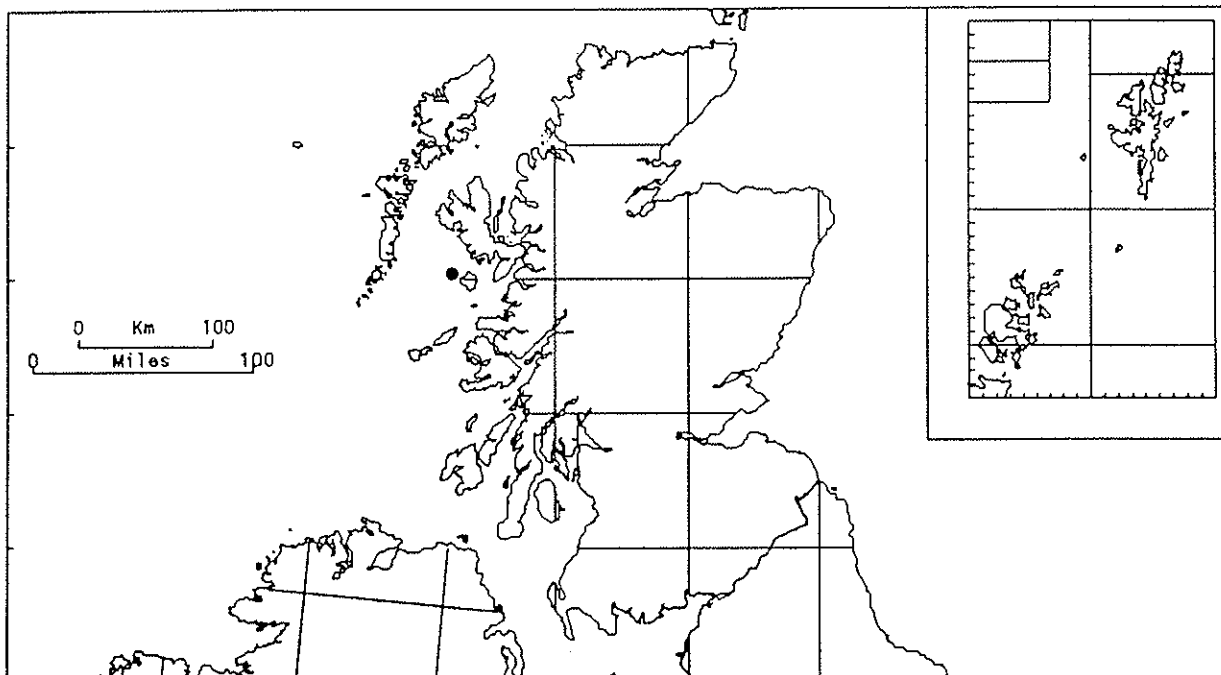
Until this summer bats had only been recorded on Canna, one of the Small Isles, on odd occasions and there was no known roost.

However I have been visiting the island every May since 1989 and have personally seen bats on each trip so felt sure that the lack of records was due to a lack of investigation rather than a real absence of bats. So before our trip I wrote to Dr Campbell of Canna House to see if he had any more definite information. To my surprise Dr Campbell denied the presence of a colony and this intrigued me even more.

The house where we stay on Canna is Tigh Ard, which belongs to the National Trust for Scotland and is a stone building with slate roof surrounded by planted woodlands - ideal for bats.

On the first night about half a dozen bats were seen emerging above a window on the east-facing side so the following night we waited patiently with a net out of the window. However it turned out that there are a number of exit points from the roof space and indeed the bats were seen to emerge from east-facing, north-facing and west-facing exits - every direction except south-facing. When we investigated the attic we saw a group of eight pipistrelles *Pipistrellus pipistrellus* tucked down beneath the tiles, thus confirming the existence of the colony.

We shall be visiting Canna again next year and will obviously check the bats, but it proves once again that the lack of records is so often more a lack of recorders. Island populations in general are always interesting as the number of species declines with distance from the mainland and so this colony on Canna, the furthest out of the Small Isles, is particularly noteworthy.



Natterers bat (*Myotis nattereri*) in North East Scotland

John R Speakman, Abigail C Entwistle and Jennifer McLean

Two years ago we published minimum estimates of the population densities of bats in a study site in North East Scotland (Speakman *et al* 1991). The study area covered 35 10km squares, although the total land area within these squares was only 3200 km², the balance being made up by a sector of the North Sea. The area comprised the lower reaches of the valleys of two rivers: the Dee and the Don. The centre of the study area was at 57° 85' North and 1° 03' East.

Between 1973 and 1989 we recorded three species of bats breeding in the study area: pipistrelles *Pipistrellus pipistrellus*, brown long-eared bats *Plecotus auritus* and Daubenton's bats *Myotis daubentonii* (Speakman *et al* 1991). Although we had also recorded a breeding colony of Natterer's bats *M. nattereri*, in 1988, approximately 15km outside the study area, the only record of Natterer's bat within the study area between 1973 and 1989 was a single male. This bat was found dead in the driveway to a known maternity roost containing all three of the other species, hut which apparently contained no Natterer's bats despite extensive searches.

Bullock *et al* (1986) reviewed the status of Natterer's bats in Scotland, and noted that the known distribution at that time was consistent with a temperature limit to the distribution, as an apparent enclave of breeding Natterer's bats was present in Morayshire, which is relatively warmer than the surrounding areas which contained no records (including the study area in NE Scotland).

In the four years since 1989 we have recorded Natterer's bats on three further occasions within the study area. These observations are as follows.

Record 1: August 1991. Single male bat. Found roosting solitarily in the apex of an attic which was known to be a long established roost of long-eared bats, in central Deeside (ACE/JRS).

Record 2: May 1992. Single male bat found at the base of a large tree near a farm on the NE coast (JRS). Not adjacent (>5kms) to any known roost. This bat was listless and incapable of flying. It appeared on capture to be very fat hut paradoxically felt very light. On closer inspection the bat had a large air sac between the dorsal surface of the body wall and the skin. This was detaching the skin from the body such that it was possible to look transversely through the bat and see daylight! The air sac was drained using a syringe and the bat fed and given antibiotics. It apparently recovered fully and was released at the capture site three days later.

Record 3: June 1993. Cluster of 25 Natterer's bats captured in a long established roost of long-eared bats in central deeside (JM/JRS). No long-eared bats were present at the time, although long-eared bats were in the roof three days previous to the capture of Natterer's (ACE) and 5 days later (JM). On neither of these occasions were Natterer's bats found in the roof. The Natterer's bats comprised 24 females which were heavily pregnant and a single non-pregnant female. The bats were captured in the early morning following a cool night of rain and all the bats were torpid when captured. This roost site has been known since the early 1970's and visited at least 30 times since then. It is an unoccupied and unheated outbuilding which comprises a single roof space. The structure of the building means it is highly unlikely that a breeding colony of Natterer's bats could have been overlooked during these previous visits.

These observations confirm Natterer's bat as a breeding species in the same area covered by the previous paper (Speakman *et al* 1991). The 10 km squares from which records have occurred cover the entire span of the study area and thus this species may be present throughout the area. The paucity of records relative to those of other species may reflect in part the lack of association of this species with human habitation. The breeding bats reported here, and the breeding roost just outside the study area, were both in unoccupied unheated outbuildings, whilst almost all the bat roosts discovered as a result of poster surveys run since 1984, in the area, have been in dwelling houses, where bats are probably more likely to be noticed. Indeed the breeding bats in record three (above) were only transiently present in the outbuilding, perhaps due to the

bad weather, and their regular roost is still unknown.

The observation that Natterer's bat breeds in NE Scotland where it was previously supposed to be absent (Bullock *et al* 1986) calls to question the suggestion that the distribution of this species in Scotland is limited by the summer temperature.

References

Bullock, D J, Haddow, J F, Neville, P A and Placido, C 1986 The distribution of Natterer's bat *Myotis nattereri* (Kuhl), in Scotland. *Glasgow Naturalist* 21, 137-141.

Speakman, J R *et al* 1991 Minimum summer populations and densities of bats in NE Scotland, near the northern borders of their distributions. *Journal of Zoology* 225, 327-345.

Stebbings, R E 1991 Natterer's bat. In: G B Corbet and S Harris (eds), *Handbook of British mammals. Third edition*. Oxford: Blackwell Scientific Publications.



Hibernating Natterer's bats from Inverness-shire

Mick Canham

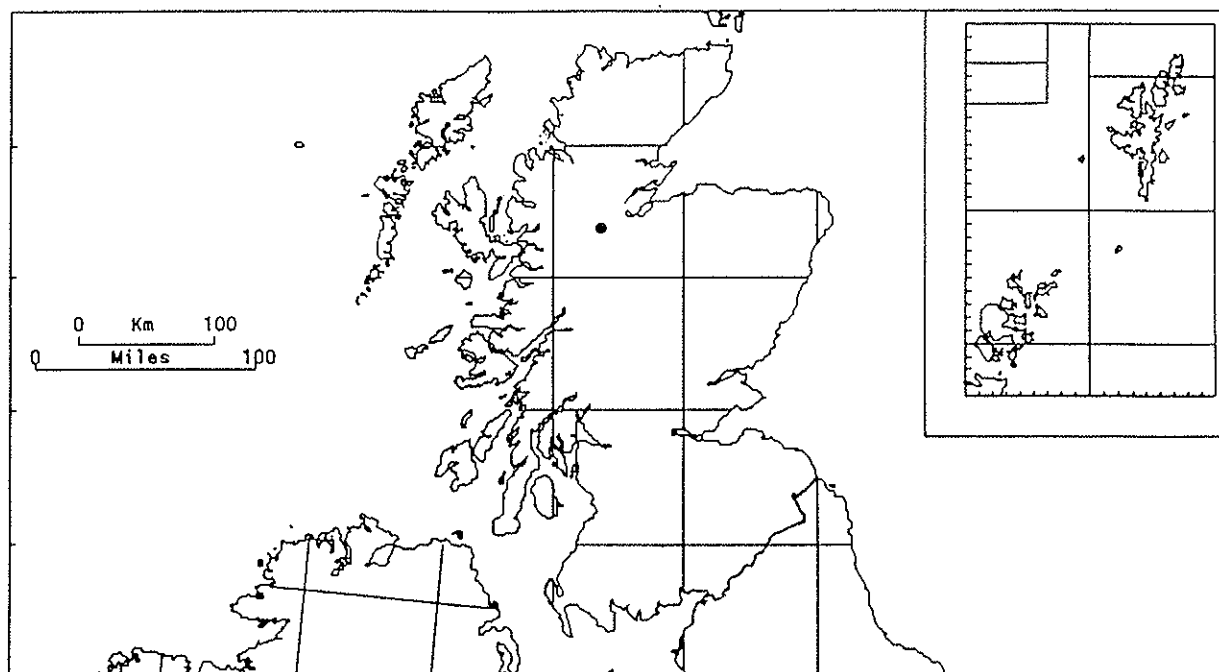
During a visit to a glen in Inverness-shire, Mike Daniels, Lorne Armstrong and Gill Hinchcliffe saw a myotis bat in the roof of a small cave.

Hugh Brown and I subsequently followed up this report with a visit to the cave on 2 December 1992. After searching the roof of the cave, which was 4m high and had many cracks and crevices, no bats were seen. On checking lower down the cave walls I found two Natterer's bats *Myotis nattereri* hibernating in a small fissure in the rock. Although the walls and parts of the roof of the cave were dripping wet the fissure was dry.

The bats were about 2m from the nearest entrance to the cave and 1.5m from the cave floor. The bats were not completely torpid and the temperature in the cave was 3°C. The cave was situated at an altitude of 150m.

Also found in the cave were one small tortoiseshell butterfly *Aglais urticae*, four herald moths *Scoliopteryx libatrix*) and numerous cave spiders *Meta menardi* and *Metellina merianage*.

This was, to our knowledge, the first verified record of hibernating bats underground in Highland Region. If anyone has any records of bats which they have seen or found in roosts during the months of November to March, please contact me.



Six new records of Nathusius' pipistrelle *Pipistrellus nathusii* for Scotland

John R Speakman, Paul A Racey, Jennifer McLean and Abigail C Entwistle

Speakman *et al* (1991) summarised 21 records of *P. nathusii* from throughout the UK recorded between 1969 and 1989. They suggested that the non-random pattern of records throughout the year was consistent with the species being a regular winter visitor to the UK from its' summer breeding grounds in eastern Europe and the Baltic States. Since that time records of *P. nathusii* have continued to accumulate, including the (re)discovery of a bat from Shetland first recorded in 1940 but wrongly identified (Herman, 1992). Herman (1992) has questioned the interpretation that bats previously reported from Shetland are winter visitors, and claimed that at least these records, and perhaps others from Northern Britain are more consistent with the bats being vagrants. Herman's view would also be more consistent with the usual designation of the bat as a vagrant (Stebbins, 1988; Greenaway and Hutson, 1990).

In this paper we detail six further records of *P. nathusii* recorded in Scotland since 1989 (Table 1). Since these records include two from Shetland and two in winter they have some bearing on the debate concerning the status of this species. The total distribution of records of *P. nathusii* throughout the UK in time (Fig. 1), which includes 15 records from Scotland and the North Sea out of a total of 27 records, is still clearly consistent with our original hypothesis that this species is a winter visitor, since there are peaks in spring and autumn when bats are presumably actively migrating out of, and into, the country respectively. There are also records for all winter months, particularly January which is not generally a time for migratory movements of other bat species or other activity. However, there are no bats reported during July when bats would be active except a single individual found long dead (Speakman *et al* 1991).

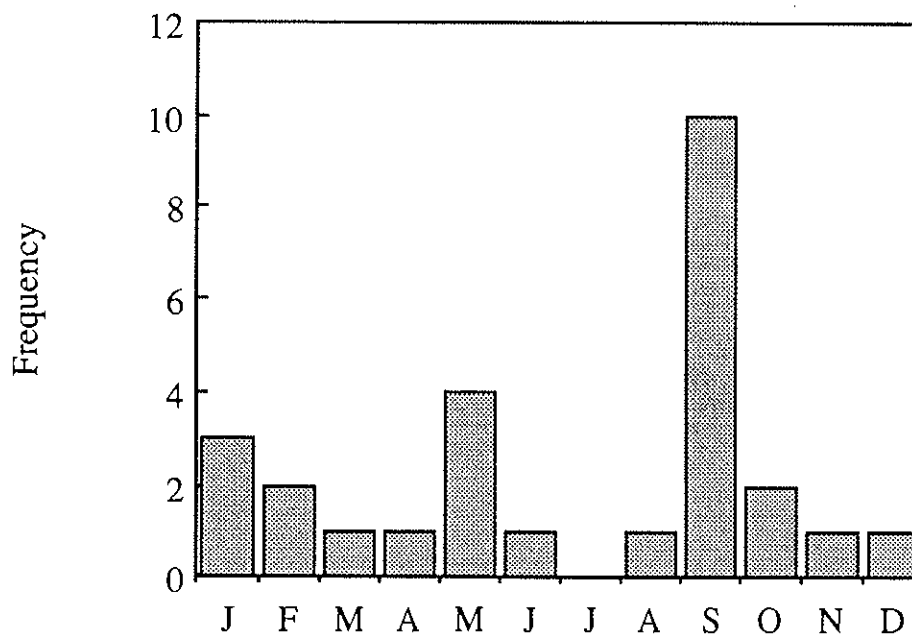


Fig.1.

Herman (1992) has suggested that bats reported in Shetland (and perhaps also North Britain) are probably vagrants since, their occurrence often coincides with periods of stormy weather (see also record 1 in Table 1) and it is inconceivable that bats could travel to Shetland by intent. This latter point is clearly debatable since birds visit Shetland both as summer and winter visitors and presumably do so by intent. There is consequently no reason why some bats should not also go there deliberately. The major summer distribution of *P. nathusii* is in the Baltic States which are between 55° and 61°N so migrating through Scandinavia and ultimately across the North Sea to Scotland is certainly a feasible migration route. Herman's interpretation of the coincidence of records with stormy weather makes the assumption that the bats were transported to

1. 24 January 1992:

Bat found at the door of a house in Sand, west Mainland, Shetland that morning. Measured by A. Douse (SNH Shetland). Wing = 33.7mm and ratio to fifth digit = 1.37 and identified as *P. nathusii*. Weather in Shetland mild that day but previous night had some fairly severe gales from the S/SE. Bat sent to Aberdeen to confirm its identification.

Details recorded at Aberdeen (JRS) Male. Frosted fur on dorsal surface. Hair extending down onto uropatagium. Forearm length = 33.7mm. Fifth digit (inside wrist) = 43.5mm, outside wrist 47.8mm. p3 visible behind upper canine. Confirmed as *P. nathusii* on basis of wing digit ratio and dental characteristics.

2. 4 February 1992:

Bat found in Unst, Shetland. Identified by A. Douse (SNH Shetland) as *P. nathusii*. No details recorded. Bat died before it could be sent to Aberdeen. Carcass lost.

3. 13 September 1992:

Bat found on unspecified rig in North Allwyn Field North Sea off coast of Shetland (60°N 2°E). Imported to Aberdeen. Details recorded at Aberdeen (JRS). Female. Fur long and shaggy. No evidence of frosted tips. Forearm = 34.9mm. Fifth digit (outside wrist) = 46.6mm. Ratio = 1.335. p3 long and visible behind upper canine. Third digit (outside wrist) = 61.8mm. Confirmed as *P. nathusii* on basis of wing digit ratio and dental characteristics.

4. 19 September 1992:

Bat found on Sante Fe 135 rig Nelson Field North Sea (57°N 1°E). Imported at Aberdeen. Details recorded at Aberdeen (JRS). Female. Fur long but no evidence of frosted tips. Forearm = 34.1mm. Fifth digit (inside wrist) = 42.1mm. Ratio = 1.235. p3 visible behind upper canine. Length of third digit (outside wrist) = 59.2mm. Confirmed as *P. nathusii* on basis of wing digit ratio and dental characteristics.

5. 25 September 1992:

Bat found on Hutton TLP Rig operated by Conoco, North Sea. This field is mid way between the Shetland islands and the west coast of Norway (61°N 2°E). First arrived at rig on 25 September 1992 and caught but escaped. Recaptured on 1 October and imported to Aberdeen. Details recorded at Aberdeen (JRS). Male. Fur brown no frosted tips. Forearm = 34.7mm. Fifth digit (outside wrist) = 46.8mm. Ratio = 1.348. p3 very long and clear. Third digit (outside wrist) = 63.4mm. Confirmed as *P. nathusii* on basis of wing digit ratio and dental characteristics.

6. 7 October 1992:

Bat found on Amada Hess 001 rig on Rob Roy field (North Sea) (58°N, 1°E). Imported at Aberdeen. Details recorded at Aberdeen (JRS). Female. Fur long and shaggy. Brown with no frosted tips. Forearm = 34.8mm. Fifth digit (outside wrist) = 47.0mm. Ratio = 1.352. p3 very distinct. Third digit (outside wrist) = 60.4mm. Confirmed as *P. nathusii* on basis of wing digit ratio and dental characteristics.

Table 1. New records of *Nathusius' pipistrelle* in Scotland

the islands by high winds. However, this latter interpretation neglects other possible linkages between stormy weather and bat activity. An equally plausible hypothesis is that bats are more likely to be disturbed from hibernation sites during storms. This latter possibility may be particularly relevant for *P. nathusii* which appears to hibernate in exposed locations (Racey, 1991).

Given the difficulty of separating *P. nathusii* from *P. pipistrellus* and the fact that very few bats of any type are captured and examined during winter in Scotland (Pritchard 1992), it is certainly conceivable that a substantial population of *P. nathusii* migrates annually into Scotland and the UK as a whole. The records presented previously (Speakman *et al* 1991), strongly support this notion. We therefore advise close examination and identification of any bat of the genus *Pipistrellus* found in Scotland during winter¹. Detail of how to separate *P. nathusii* from *P. pipistrellus* can be found in Speakman *et al* (1991), Haussler and Braun (1989), Banks *et al* (1983) and Toshi and Lanza (1959).

References

- Banks, C, Clark, M and Newton, R 1983 A second Nathusius's pipistrelle (*Pipistrellus nathusii*) in Britain, caught in flight. *Trans. Herts. Nat. Hist. Field Club* **29**, 15-18.
- Greenaway, F and Hutson, A M 1990 *A field guide to British bats*. London: Bruce Coleman.
- Haussler, M and Braun, M 1989 Sammlung einheimischer Fledermause (Mammalia: Chiroptera) der Landessammlungen für Naturkunde Karlsruhe. *Acta Biol. Carol.* **47**, 117-132.
- Herman, J S 1992 The earliest record of Nathusius' pipistrelle from the British Isles. *Scottish Bats* **1**, 48.
- Pritchard, J S 1992 Winter behaviour of bats in Scotland. *Scottish Bats* **1**, 38-45.
- Racey, P A 1991 *Pipistrellus nathusii*. In: G B Corbet and S Harris (eds), *Handbook of British mammals. Third edition*. Oxford: Blackwell Scientific Publications.
- Speakman, J R, Racey, P A, Hutson, A M, Webb, P I, and Burnett, A M 1991 Status of Nathusius' pipistrelle (*Pipistrellus nathusii*) in Britain. *J. Zool. Lond.* **225**, 685-690.
- Stebbing, R E 1988 *Conservation of European bats*. London: Christopher Helm.
- Toshi, A and Lanza, B 1959 *Fauna d'Italia IV Mammalia Generalitita - Insectivora - Chiroptera*. Bologna: Edizioni Calderini.

¹ Many records of *P. nathusii* come from oil installations in the North Sea (see Speakman *et al* 1991). It should be noted that it is illegal to import any mammal (including bats) from an oil installation into the UK without permission from the Department of Agriculture and Fisheries (Scotland). Any bat brought illegally from an oil rig into Scotland is likely to be destroyed (as happened to a *P. nathusii* brought in in 1985) and the person authorising its import liable to prosecution under the prevention of rabies legislation. This is unnecessary since at Aberdeen there is a registered quarantine facility in the Department of Zoology at the University of Aberdeen, to which bats can be legally imported from oil installations. If you hear of a bat on an offshore installation then please contact us and we will arrange its legal and safe import.

Pipistrelle parasites - Is this a record?

Richard Sutcliffe

On 10 October 1992 there was a telephone call from a householder in Westerton, Bearsden, north of Glasgow, regarding an injured bat. The property was visited that evening, where a baby female pipistrelle *Pipistrellus pipistrellus*, had been found clinging to the grate of a downstairs fireplace. The householder believed that the bat had probably been brought into the house by her cat.

The bat was slightly dehydrated, but after it had taken some water it became more active. It did not appear to be badly injured, although some of the fur was missing from its ventral surface. It was immediately obvious that the bat had ectoparasites present. At least two fleas were seen moving through the hair on the bat's back when it was being examined. Closer examination revealed that it was very badly infested with tick larvae mainly on its back and ventral surfaces, but with occasional ones attached to the wing membranes. A few ticks had fed sufficiently on the bat's blood to drop off naturally. All those collected were fully fed larvae. Following advice from Bob Stebbings, the rest were removed using fine forceps. It was only when they were being removed that the true number became apparent. The following parasites were removed from the bat:

Tick <i>Argas vespertilionis</i> (Latreille)	171
Flea <i>Ischnopsyllus octactenus</i> (Kolenati)	2
Mite unidentified	2

As a few small ticks were certainly missed, there were probably in excess of 180 ticks present! According to Avery (1991), the maximum count from a sample of 300 pipistrelles was 57.

Patches of the bat's hair appeared to be missing as a direct result of the bat having been scratching in an attempt to get rid of its parasitic burden.

The bat was kept in captivity for several days and fed on cat food and mealworms in order to regain some of its strength before being released outside the house where it had been found. Unfortunately it was later found dead at the release site.

The bat and parasites have been deposited in Glasgow Museum's collection.

References

Avery, M I 1991 *Pipistrelle*. In: G B Corbet and S Harris (eds), *Handbook of British mammals. Third edition*. Oxford: Blackwell Scientific Publications.

Acknowledgements

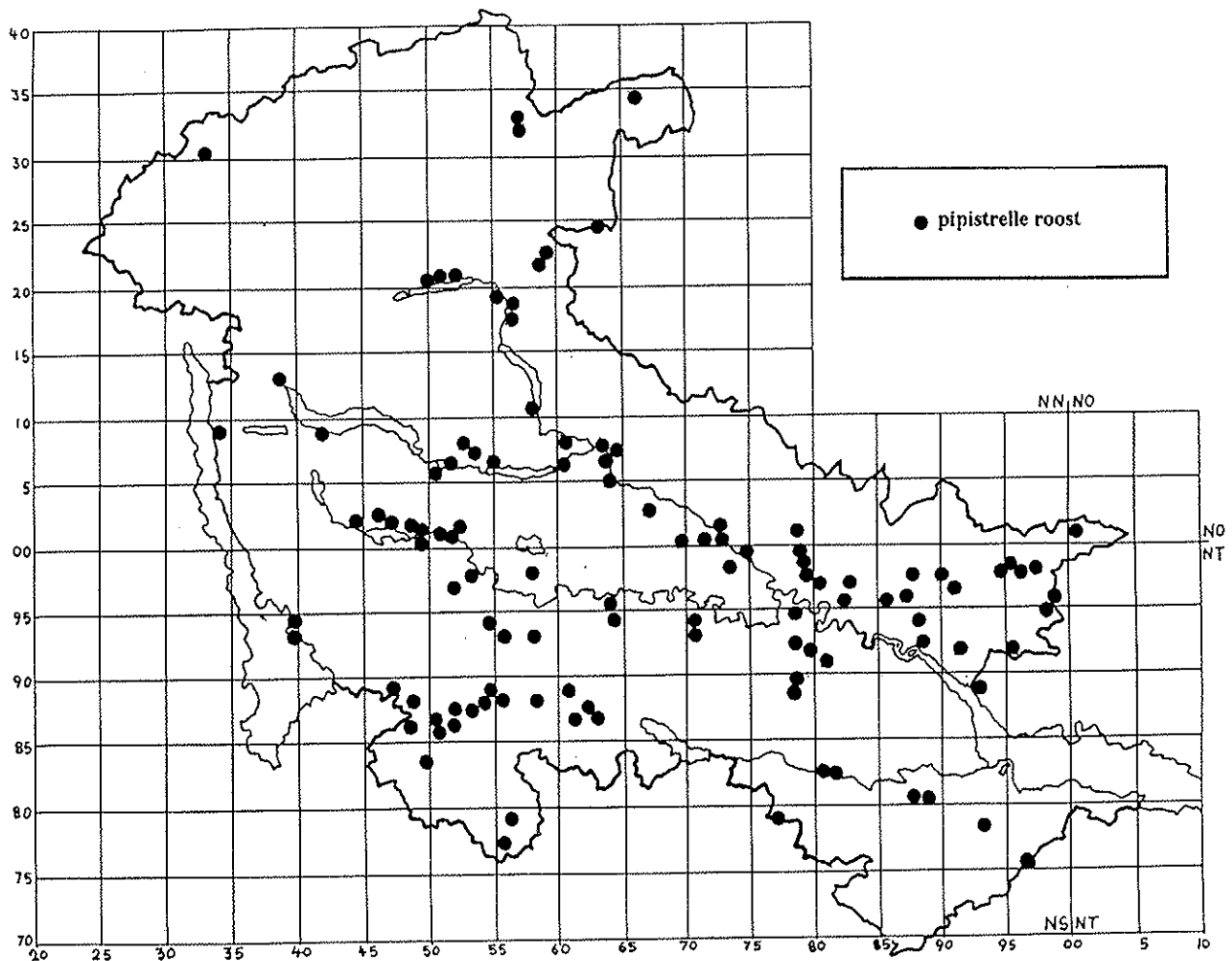
Thanks to Geoff Hancock for identifying the fleas and ticks and to Joanne Small for alerting me to the presence of the bat.

Pipistrelle roosts in Central Region

John F Haddow

Central Scotland Bat Group (CSBG) was formed in 1984, and since 1985 has kept records of bats counted on emergence from roosts during the month of June. Most of these are roosts of the pipistrelle *Pipistrellus pipistrellus* (Map) but some roosts of the brown long-eared bat *Plecotus auritus* and Natterer's bat *Myotis nattereri* are also counted. The reasons for counting these bat roosts include assessing the status of bats within Central Region, contributing to the National Bat Colony Survey and stimulating membership of the bat group. There is also a conservation role, since householders can be encouraged to count their roost and increase their sense of "ownership" and therefore care of the bats. It may also provide an opportunity to discuss any possible problems associated with the roost and solve them before they become critical. The National Bat Colony Survey was originally run from The Institute of Terrestrial Ecology's Monks Wood Experimental Station by Dr R E Stebbings and H R Arnold (ie Bob and Henry) but latterly from the Robert Stebbings Consultancy.

The method for counting is simple: bats are watched from the start of their emergence period (about 30 minutes after sunset) and counted until 10 minutes after the last has emerged. This is done on one to three good evenings in June (originally the dates were 10 June to 10 July but the period was brought forward to avoid counting juveniles in the later part, particularly in southern Britain). About half the membership of CSBG have taken part in counts, plus several householders and many others.



Map of Central region showing all records of pipistrelle roosts 1981-1993

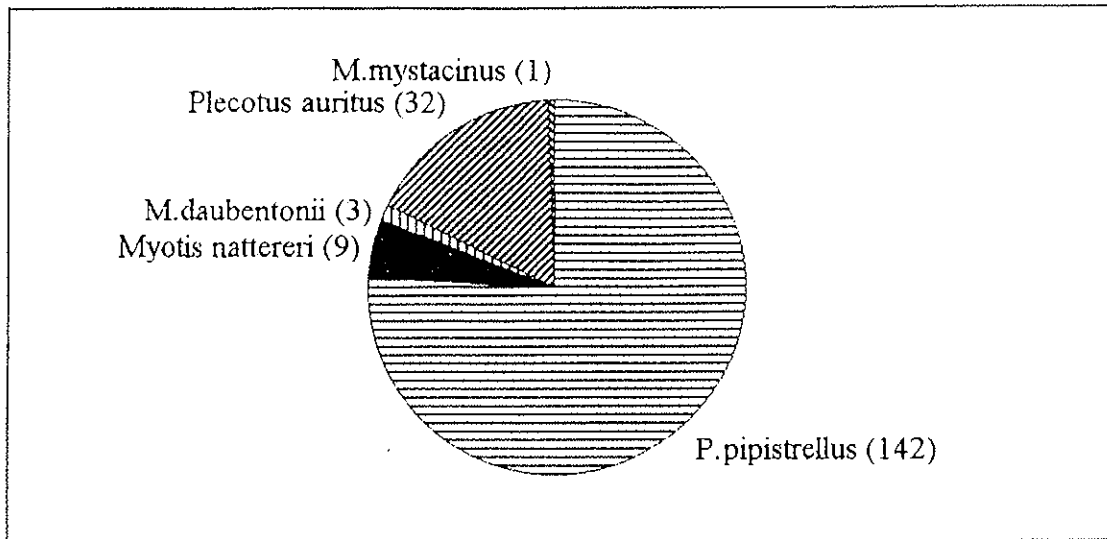


Fig.1. Bat roosts in Central region (all species)

Records of roosts in Central Region have built up steadily from 1984, new roosts being discovered annually. A large proportion are found through the roost owner seeking advice, either from the bat group or from Scottish Natural Heritage (formerly the Nature Conservancy Council, then NCC for Scotland). Many other roosts are either unknown to the householders or known about but just accepted. The bat group may be informed about the latter type when it becomes known that there is an organisation interested. To date there are 142 pipistrelle roosts on our records. The proportion compared to the other known species is illustrated in Fig.1.

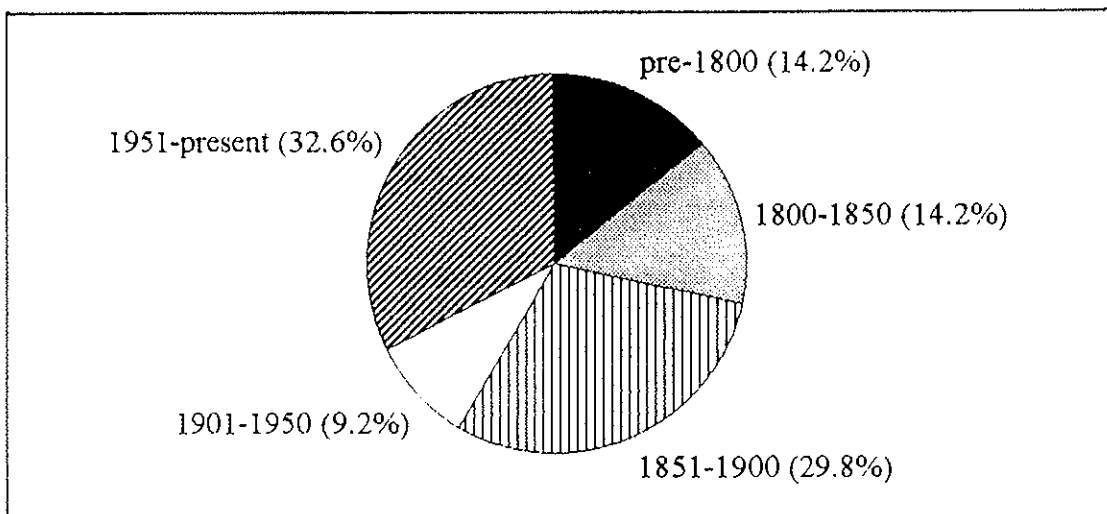


Fig.2. Pipistrelle roosts by building age (142 roosts in Central Region)

Pipistrelle roosts are evenly divided between 19th century (44%) and 20th century (42%) buildings (Fig.2), but when total numbers are considered, exactly 50% of the pipistrelles are roosting in 19th century buildings, compared with 29% in 20th century and 21% in pre-1800 buildings (Fig.3a and 3b).

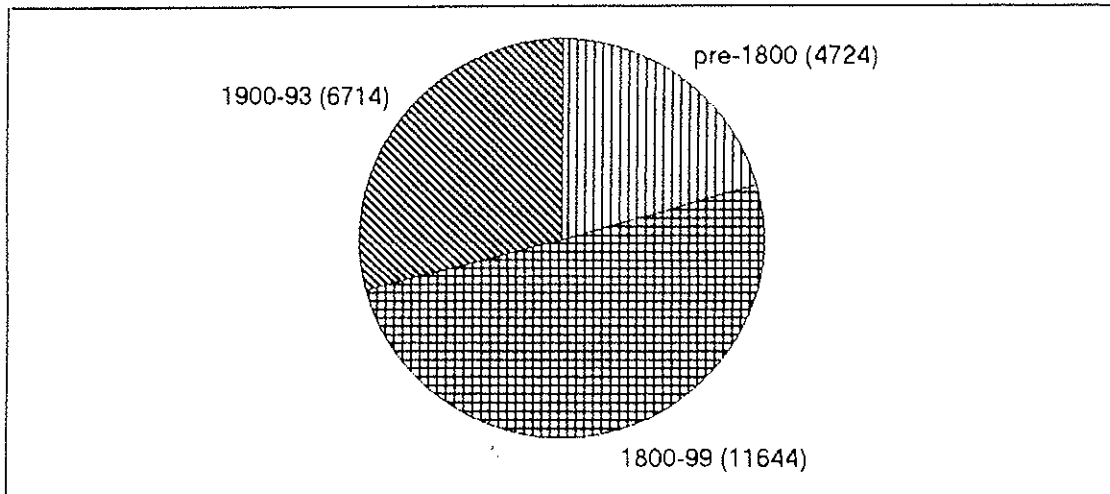


Fig.3a. Central Region pipistrelles, total numbers by age of building.

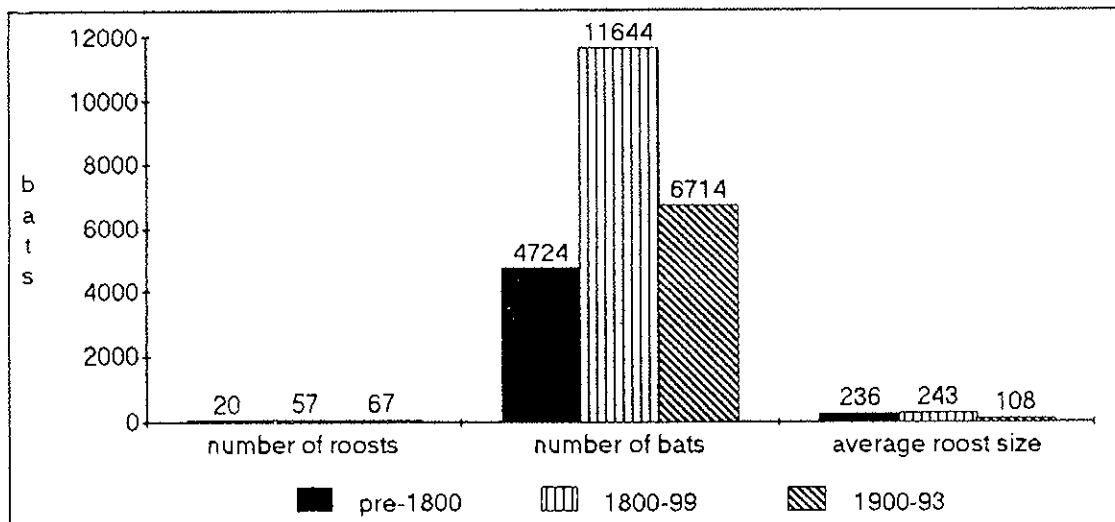


Fig.3b. Pipistrelle roosts in Central Region, by age of building.

The choice of roosts to count was unselective in some senses, for example in the beginning there were few known roosts to choose from, and newly found roosts would be counted to establish the size of that roost. This still continues, and every year new roosts are counted. Some of these will be counted the following year, and become added to the list of roosts within the survey. The inclusion of a roost will also depend on human factors: how many group members/ householders are willing to take part; time that individuals can spend; unforeseen circumstances. Since it is important to compare roosts from one year to the next, priority is always given to those roosts counted in the previous year, so established roosts tend to be included over several years. Roosts become established in the survey if for example a householder is willing to continue the survey from year to year, or a group member finds the roost convenient to count regularly. It can be seen therefore that the selection of roosts counted cannot be regarded as a scientific sample. The advantage of the approach, however, is that continuity can be maintained over a long period, involving a variety of "surveyors".

ROOST	Maximum June count							
	1985	1986	1987	1988	1989	1990	1991	1992
002 Buchlyvie	123	81						
005 Dunblane	596	694	730	656	672	607	732	753
012 Fintry	1112	1166	852	645	666	630	608	20
013 Strathyre	128	118	128	121	84	121	78	0
017 Balfon	113	222	191	305	305	247	286	196
021 Callander		84	71	97	0	10	27	484
022 Killin		234	250	524	344	243	590	546
024 Dollar		239	483	375	365	471	590	366
027 Devonside		232	272	353	374	419	531	0
037 Callander				151		58		
040 Croftamie			247	7	2	345	475	375
050 Doune			492	420	590	520	475	544
062 Killearn				191	200	581	614	661
076 Drymen				327	182	280	102	181
081 Doune							633	1010
083 Brig o' Turk						237	188	249
total	2072	3070	3716	4172	3784	4769	5929	5385
average	414.4	341.1	371.6	320.9	315.3	340.6	423.5	384.6

Fig.4. Maximum June counts 1985-1992

There is probably a bias in our survey towards the larger roosts. The principal reason for this is not as some would suggest the element of competition, going for the biggest numbers, but rather that larger roosts are more stable and make the continuity easier to maintain. It is difficult to maintain counts from year to year at a roost where the bats are not present. With limited human resources as explained, "empty" roosts are neglected in favour of occupied roosts. The table of roost counts (Fig.4) shows that there are some reliable, stable colonies (005, 017, 022) but that even within those, numbers can fluctuate substantially from year to year. No roosts of under 100 can come into the "reliable" category. The smallest roost consistently recorded is 013 Strathyre, generally around 120 pipistrelles, but the numbers there dipped in 1989 and 1991, and the roost was absent during June 1992. The Callander roost 021 indicates a mobile colony, varying between 0 and 484, the reason for this roost being counted consistently being that the building also houses a colony of around 50 brown long-eared bats, one of about five roosts of that species counted from year to year.

The roost with the largest recorded numbers, 012 Fintry, has shown great variation. However, even when the maximum count was 1166, the number dropped to 800 by the end of June. This is the normal pattern, indicating that the nursery colony is around 800 for the post-partition period (not including the juveniles). There is a strong indication that a roost size of between 500 and 800 is an optimum for this region, and given little disturbance a colony will tend to this optimum (Fig.5). What determines this number? Type of building is important, since only in larger stone built houses will large numbers of bats exist without the possibility of being a nuisance to the householder in some way. Given the type of building, the environmental temperatures associated with large numbers of bats must be advantageous to survival in the colder Scottish summer. Such large roosts become scarcer as one travels south in the UK, and in addition roosts tend to stay for less time in one building. The distance which individuals travel to forage will also be a limiting factor. Clearly individuals from large colonies will have to travel further on average. Perhaps the size difference compared with further south is determined more by the quality of the foraging territory?

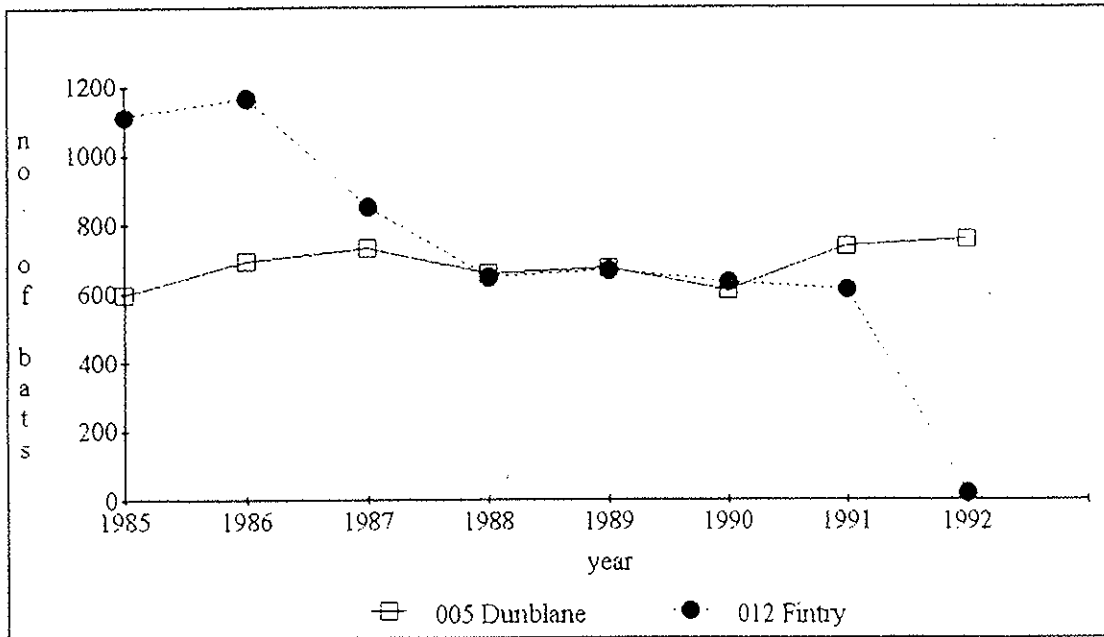


Fig.5. Counts from two roosts.

There are clearly limitations to the information provided by this long term survey. The majority of roosts show large changes in numbers particularly during the May - June period. A colony may be present during May, building up in numbers, then disappear from a roost in early June perhaps to return in late June. It is obvious that most if not all colonies have more than one roost location, but generally only one site is counted. Using the largest number at any one time in June will hopefully record when a large proportion of the colony is present at one site. Circumstances could also result in the colony being "missed" entirely, and this does happen.

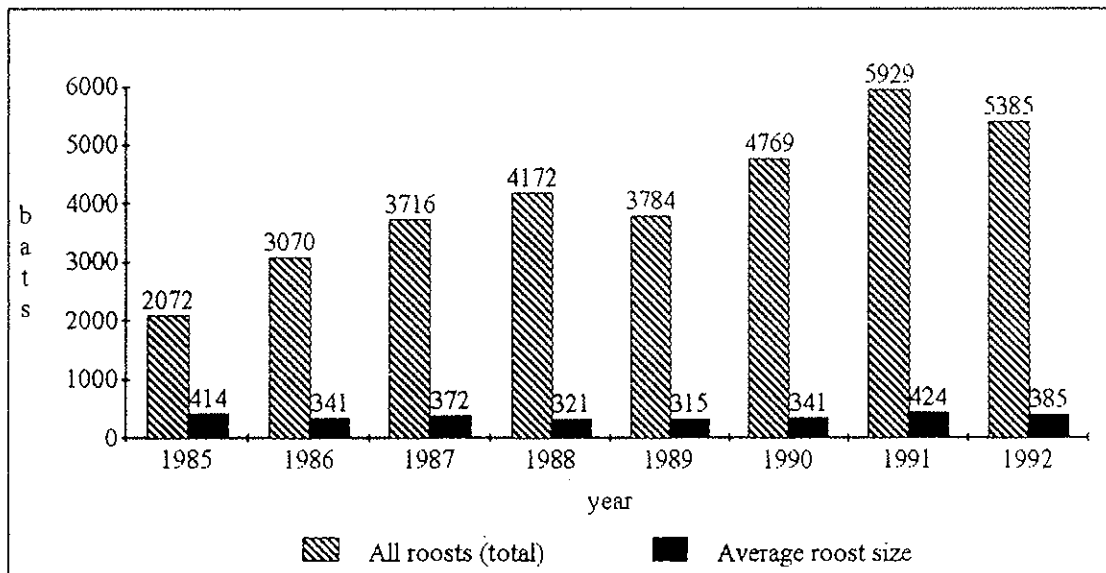


Fig.6. Summary of pipistrelle counts.

The advantage of such a survey is to use simple methods with volunteers requiring little skill to obtain a measure from year to year of pipistrelle numbers in the Region. What is apparent from the numbers (Fig.6) is that there has been remarkably little change in overall numbers from year to year. In other words the pipistrelle bats are maintaining their numbers. This is perhaps not surprising in this Region where there is a mixture of rural, urban and industrial areas. Changes in farming practice mean that while good feeding habitat continues to be lost, other areas are improving (for example with the effects of broadleaved woodland grants and set-aside land). The economic recession, together with the decline of mining and heavy industry, mean that parts of the Region are less polluted than in the recent past. A more detailed breakdown of roosts by area would probably show variation within Central Region. The most industrial part, also the most heavily populated, is Falkirk District, and there are very few pipistrelle roosts recorded here compared to the rest of the Region.

An apparently rosy picture for our widespread and adaptable bat species should not obscure the uncertainties for our other, more vulnerable bats. The bat count survey has given us little reliable data for these. Other, more organised and scientific methods will be necessary to provide good indicators of those species' status. If those populations are declining steps should be taken to provide evidence, and strategies developed to conserve them.



Counting pipistrelles in the Lothians

Stephen Carter

Introduction

The Lothians Bat Group, since it was established in February 1986, has recorded emergence counts at pipistrelle *Pipistrellus pipistrellus* roosts throughout its region. The number of counts undertaken has steadily increased from 11 in 1987 up to 70 in 1992. This reflects both an increase in the number of roosts being counted and the number of counts per roost. Effort was initially focused on June counting for the National Roost Survey and this is beginning to provide information about population trends. In the past three years a few roosts have been counted throughout the summer so patterns of roost occupation can now be studied. Attention is also spreading away from nursery roosts to sites occupied in spring and autumn and to the use of multiple roosts by a single colony of bats.

The purpose of this paper is to present some of the data recorded so far and indicate the types of information that they provide.

The roosts

Lothians Bat Group has recorded emergence counts at over twenty pipistrelle roosts but only nine of them are referred to in this paper. Their approximate locations are shown on the map (Fig.1) and brief descriptions follow.

1. *Linlithgow*

A nursery roost in the roof space of a private house. First counted in 1991.

2. *Glendevon*

A nursery roost in the roof of a private house. First counted in 1989.

3. *Ford*

A nursery roost in the roofspace of a private house. First counted in 1987.

4. *Garvald*

Four roosts in the village; three (a, b and c) are in adjacent buildings and appear to be used by bats of the same colony.

a. A nursery roost in the roof space of a private house. First counted in 1987.

b. A nursery roost in the roof space of a private house. First counted in 1988.

c. A spring and autumn roost in the wallhead of a church. First counted in 1992.

d. A presumed nursery roost (never entered) in a private house. First counted in 1992.

5. *North Berwick*

A nursery roost in the roofspace of a private house. First counted in 1987; bats were excluded from this roost in 1993.

6. *Whittinghame*

A nursery roost in the roof space of a converted coachhouse, now a private house. First counted in 1987.

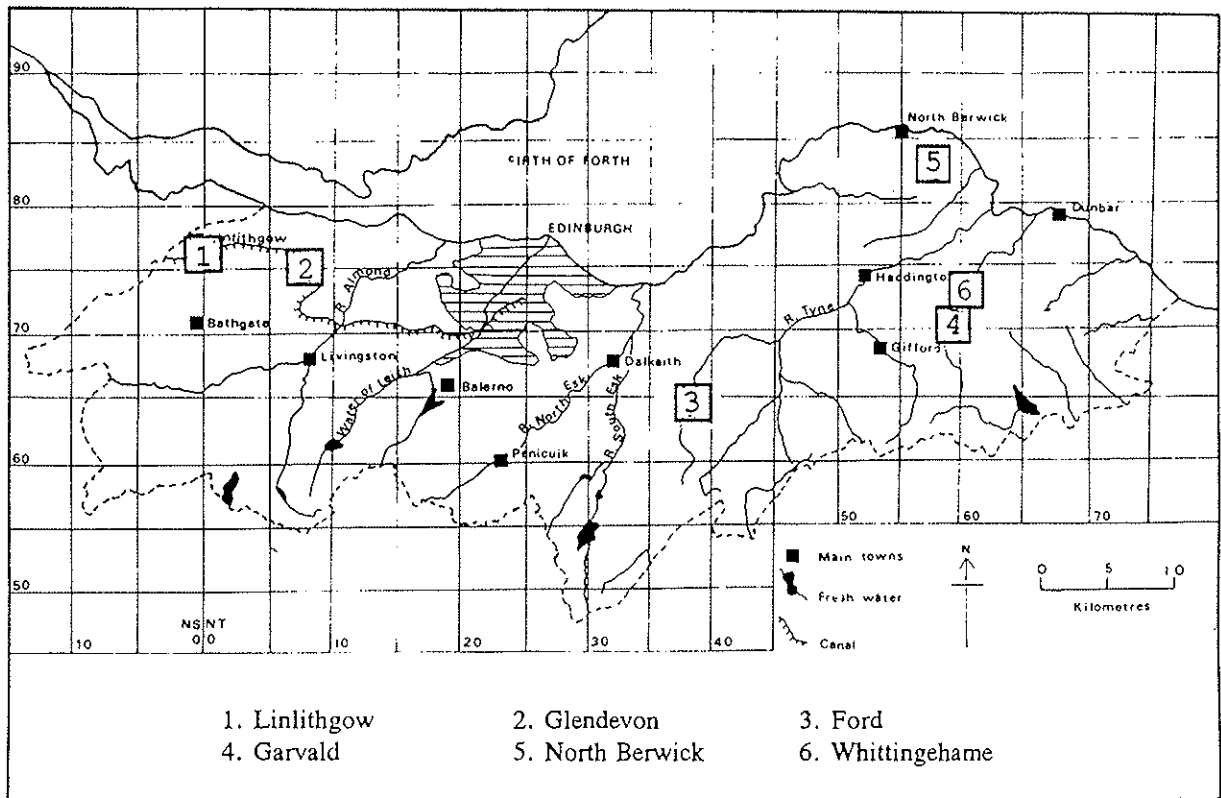


Fig.1. Pipistrelle roosts described above.

June counts from nursery roosts

June emergence counts have been collected by the group as part of the National Roost Survey since 1987. Runs of at least four years are available for six roosts, all containing pregnant female bats. Maximum June counts, based on at least two separate counts in the month, are presented in Table 1.

Roost	1987	1988	1989	1990	1991	1992	1993
Ford	459	580	132	619	633	483	747
North Berwick	-	211	255	223	212	286	-
Whittingehame	549	777	924	1115	1008	1183	1402
Glendevon	-	-	56	151	202	198	-
Garvald <i>a</i>	170	70	-	65	159	9	9
Garvald <i>b</i>	-	92	-	4	70	174	143

Table 1. Maximum June emergence counts for selected pipistrelle roosts

Glendevon, Ford, North Berwick and Whittingehame show more or less consistent trends with numbers of bats either increasing or at least being maintained over the period of study. These results mirror the wider Scottish picture, recorded by the National Survey, of maintenance or increase of pipistrelle numbers in surveyed roosts.

The two Garvald roosts do not produce consistent results but show wide fluctuations in numbers. *Garvald b* was first located as the result of a search for bats that had vacated *Garvald a* and it is clear that both roosts are used by the same colony. More recent work has revealed a more complex picture in Garvald and this is

discussed further below.

The Lothians are blessed with many large, reliable pipistrelle nursery roosts that are ideal for June counts but, so far, only a few have continuous runs of data. The available data appear to indicate a population that is at least stable but it is not known how representative these large nursery roosts are of the pipistrelle population as a whole. There are two sources of uncertainty: the proportion of the female population using the large roosts is unknown and the performance of smaller roosts in recent years has not been recorded.

Frequent counting at large nursery roosts

Introduction

The consistent results obtained from June emergence counts at the large roosts give the impression that they are used as the sole nursery roost by a particular colony of female bats. Frequent counting throughout the summer at a few roosts has revealed details that indicate a more complex picture of occupation and possible interaction with other roosts. Two roosts may be used to illustrate the type of data coming from frequent counts: Ford and Linlithgow.

Ford

The Ford roost was counted mostly in June from 1987 to 1990 and then over a longer period of the summer from 1991 to 1993. Emergence counts are presented in Table 2.

	1987	1988	1989	1990	1991	1992	1993
May	25th: 450				11th: 414	18th: 673	20th: 577
						31st: 533	
June	18th: 459	10th: 578	17th: 132	5th: 615	16th: 633	24th: 483	5th: 717
	25th: 148	17th: 580	26th: 1	13th: 619	24th: 632		21st: 747
		28th: 517	27th: 1	19th: 423			
				26th: 573			
July			10th: 550		1st: 617	22nd: 874	1st: 528
			20th: 812				23rd: 910
August					13th: 318	23rd: 130	
September					2nd: 55		

Table 2. Ford pipistrelle roost emergence counts. All records.

The numbers of counts in any one year is not large but there are sufficient data to make some general observations. High counts are recorded in late May and early June but for a period in the second half of June and early July, counts are lower in all years except 1991. Maximum numbers for the year are then obtained in late July for those years with counts at this time.

These results appear to indicate that numbers of bats build up during the late spring but at some point in mid-June a proportion of them choose to move roost. The percentage that leave is variable: only 30% left in 1990 but almost 100% in 1989. In most years it is not clear whether these bats return to give birth although in 1989 this must have happened. Only one bat was recorded on 26 and 27 June but by 10 July 550 were present and this increased to 812 by 20 July (numbers presumably augmented by flying juveniles).

It is concluded that the bats in the Ford roost regularly make use of at least one other roost close to the end of their pregnancies. The requirement to move appears to vary between years and could therefore reflect

weather and food availability. The data collected so far are only just sufficient to indicate that more than one roost is involved. Immediate objectives for future work are the identification of the other roost or roosts, and more frequent counting in June and July to determine if all of the bats return to the known roost.

Linlithgow

The Linlithgow roost has been counted at roughly weekly intervals over the summer for three years. Emergence counts for 1991, 1992 and 1993 are presented in Fig. 2.

1991 results show a continuous rise from 19 May to a maximum of 610 on 11 July and then a steady fall to the final count on 3 September. In 1992 there was a rapid rise from 5 May to a peak of 465 on 19 May. This was followed by two low counts until 9 June when numbers rose again to counts in excess of 400. Four very high counts were recorded through July before numbers fell through to the end of September. The two exceptional low counts on 4 August and 1 September are the result of poor weather and therefore only limited emergence. Very low temperatures resulted in no bats emerging on 14 May 1993; otherwise, the 1993 results show rising numbers from April to a count of 718 on 5 June. After a single lower count, numbers are steady until July when four high counts were recorded. These are followed by a rapid decline to 9 August (the latest result available).

In contrast to the Ford results, the use of the Linlithgow roost appears to be relatively simple. In 1992 and 1993, counts stabilise in June, allowing precise estimates of adult female numbers (c.430 in 1992 and c.730 in 1993). Again in 1992 and 1993, there is a clear peak of numbers in July as juveniles begin to fly. The maximum count is 99% higher in 1992 and 62% higher in 1993 than the estimated number of adult females, indicating minimum survival rates for juvenile bats. It may be suggested from these figures that the substantial increase in numbers of adult females (300) in 1993 reflects a high production from the roost in 1992.

The low counts recorded on 26 May and 2 June 1992 do not correlate with poor weather conditions and therefore appear to reflect a temporary movement to another roost. This is the only clear evidence of an alternative roost so far from Linlithgow.

The results for 1991 may or may not conform to the interpretation established for the 1992 and 1993 results. The absence of counts for much of June 1991 means that there is no good estimate of adult female numbers, unlike 1992 and 1993. Then, in July there is no well defined peak in the counts as juveniles begin to fly. If the 1992/93 interpretation is applied, 1991 looks like a year with poor breeding success with 555 females producing a minimum of only 55 offspring. Two other possibilities may be raised: firstly that the timing of the counts missed the brief peak of adults and juveniles in July and therefore breeding success is greatly underestimated. Secondly, that a proportion of the adults left the roost soon after giving birth.

It is concluded that the Linlithgow roost is close to the model for a large pipistrelle nursery colony, using one roost throughout the summer. It is therefore particularly suitable for accurate counting of the population of adults.

Multiple roost colonies

Pipistrelle colonies that make use of more than one roost during the summer are hard to keep track of and count. Therefore, although examples of such colonies have been identified in the Lothians, they have by and large not been studied. A group of roosts have been studied in the village of Garvald since 1987 and more frequent counting from 1991 is beginning to reveal a pattern of roost occupation.

Up until 1992, only two roosts were known (*Garvald a* and *b*). These had both been used as nursery roosts (both roosts have been entered in the summer and seen to contain a cluster of adults and juveniles) but not apparently at the same time. The total emergence count from the two roosts was not consistent in June (see Table 1) so it was concluded that at least a third roost was being used at this time of year. In 1992 two additional roosts were located in the village and in 1993 a co-ordinated series of emergence counts was made for all four roosts. The results of these counts are presented in Fig. 3.

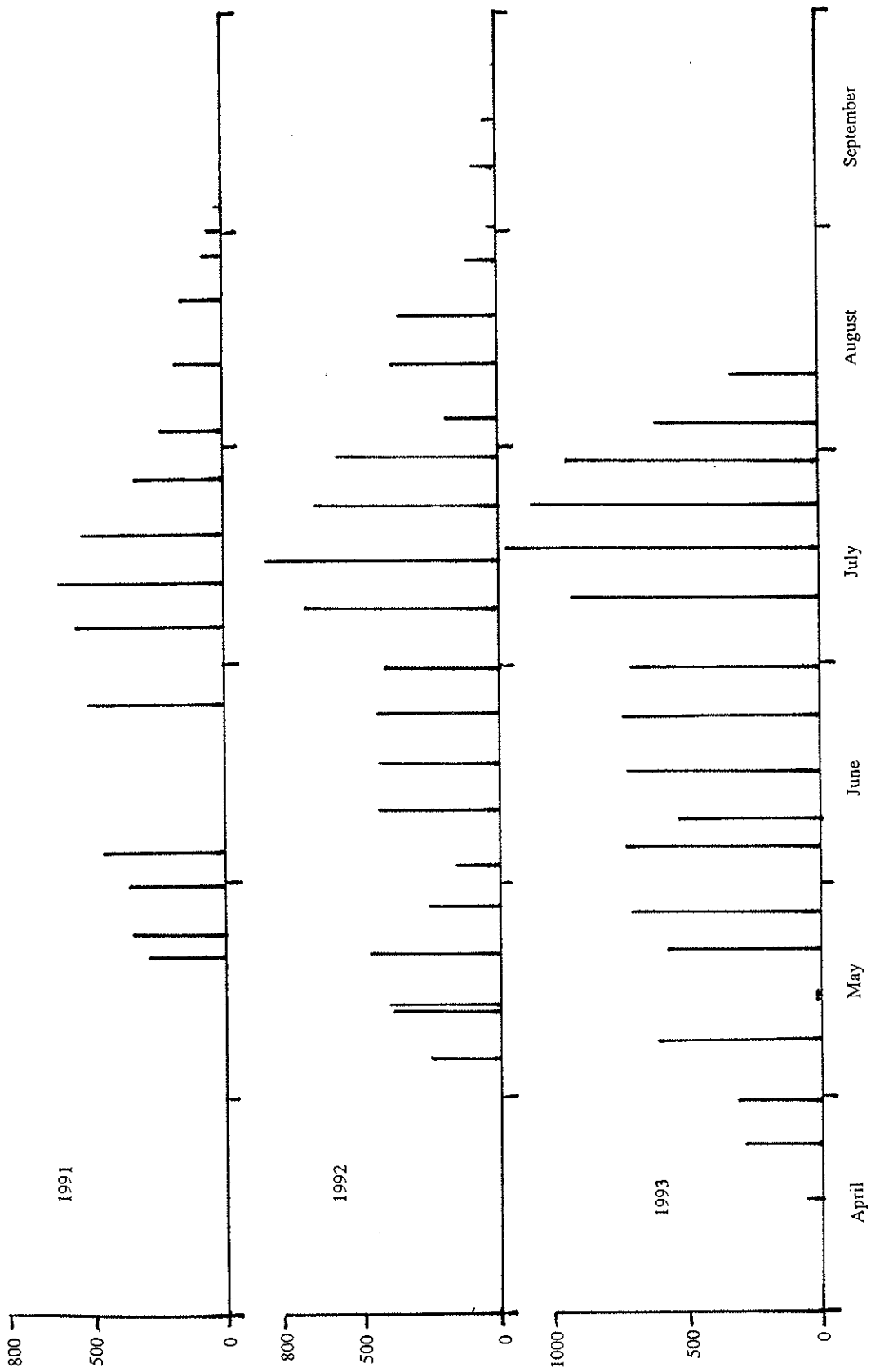


Fig.2. Linlithgow pipistrelle roost emergence counts. All records.

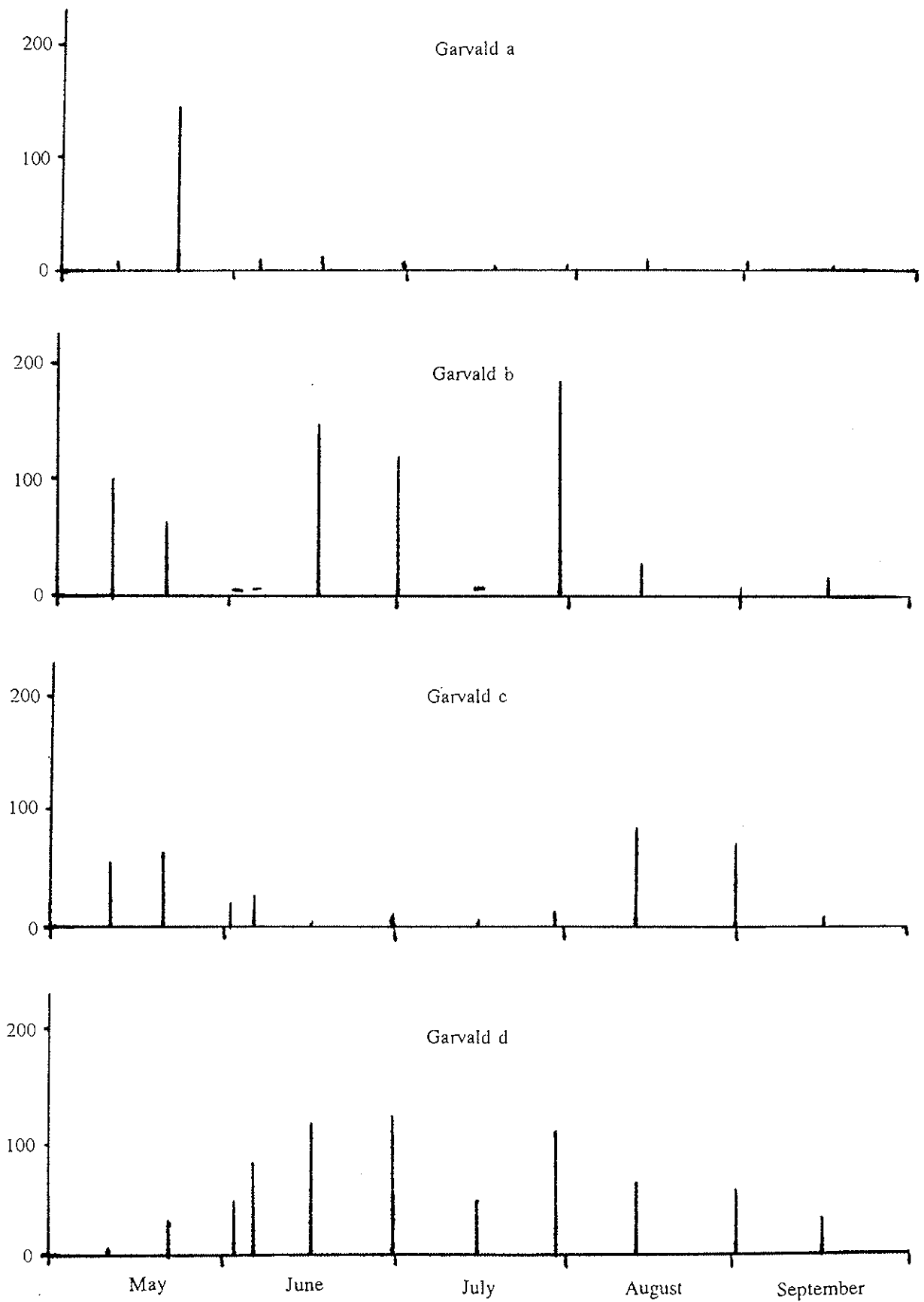


Fig.3. Garvald a-d pipistrelle roost emergence counts, 1993.

A limited amount of netting was carried out at *Garvald b*: on 16 June pregnant females were present and on 30 June lactating females were caught. On 28 July adult males and females were caught. Juveniles were first observed flying on 28 July, but none was seen to leave a monitored roost. This information provides a rough timetable against which to examine the emergence counts.

Results from *Garvald a* show that apart from a brief period in May, this roost was not used by the nursery colony in 1993. All counts later in the year refer to less than 10 individual bats that emerged singly from separate points on the house roof. *Garvald c* also displays a clear pattern of use, early and late in the summer. A cluster of c.150 bats appear to have used *Garvald b* during their pregnancy and given birth there. Their absence in early June coincides with a prolonged period of cold, wet weather which is known to have seriously affected the breeding success of insectivorous birds in the region. The nursery cluster was absent from *Garvald b* on 14 July and when bats were again resident on 28 July, they comprised 187 adult males and females. It appears that the females moved from *Garvald b* with flightless young in early July to an unidentified roost and then returned without them in late July. Interpretation of *Garvald d* is hampered by the fact that it has never been entered by the Bat Group and netting is not possible. Counts appear to show numbers of adult females rising to a total of 125 by late June but then, as was recorded in *Garvald b*, numbers fall and there is no peak count of adults and juveniles. The sex and age of bats resident from late July onwards in *Garvald d* is not known.

So far only one year's records have been collected for the four roosts and it is clear that additional roosts remain to be located. There are apparently two nursery clusters (in *Garvald b* and *d* in 1993) which may or may not be related. The moving of flightless young is an interesting finding and the limited number of counts from previous years suggest that it also happened in 1988 and 1992.

Conclusions

All of the roosts discussed in this paper would have benefited from many more emergence counts over longer periods of time. The weekly counts at Linlithgow (carried out by a resident counter) indicate what can be achieved by group members. Mobilising counters will remain a problem and the time commitment for co-ordinated frequent counts on multiple roosts is large. It is therefore important that effort is carefully targeted.

June counting for the National Roost Survey should remain a priority as any gaps in runs of data greatly reduce the value of counts for this study of population trends. After seven years of emergence counting the Lothian roosts are just beginning to provide useful information about the behaviour of pipistrelle colonies here.

Acknowledgements

I would like to thank all those who have taken part in these counts and especially the roost counters Nuala Lonie, Peter Rigby, Duncan McDougall, Vin Odey, Joyce Stephens and Stuart Smith.



Batting in Edinburgh (1971-74)

Tom P McOwat

In the summers prior to the autumn of 1974 when I left Edinburgh, I attempted to catch bats in a number of locations in the town. At that time I was relatively new to bats and had little experience of their habits. Householders were not very receptive to enquiries about roosting bats and it was difficult to find or identify likely roosts. Additionally very few people I met in the town had ever encountered bats within Edinburgh. I therefore tried to contribute to the bat records by pursuing bats where they fed or as they travelled between roosts and feeding areas. This was not a systematic survey.

Equipment

I used a 30 inch diameter net mounted on the end of an eight foot pole. The net was made from a piece of mist netting and was about three feet deep. Various types of netting were tried including some fine terylene gardening net. It was harder than the soft mist net fibres and was quickly rejected. The mist netting had the disadvantage of snagging on almost anything and removing bats could be a lengthy operation. This hand net was a bit cumbersome but could be used to catch flying bats. The technique is no longer approved of as injuries can be inflicted on bats. Only one bat was slightly injured in the years of using this equipment. Mist nets were not readily available at this time and were never tried.

Spotlights were not available to me and would probably not have been used anyway. Weak torchlight proved adequate but still drew unwelcome attention to the activity most of which took place in public parks.

Timing

Bats were caught in spring and late summer. June and July were avoided as it was assumed that some nursing females might be carrying young and therefore have been vulnerable to separation if caught. Work usually started as soon as the first bats appeared and frequently continued until after midnight.

Method

The net was used to capture bats by sweeping it in a following motion and sometimes arising from an ambush at right angles. Initially attempts were made to capture bats head on but this approach proved more difficult to control and the sudden evasive action of the bat could have one spinning round and stumbling in the dark, on occasions painfully. The direct approach was abandoned in part because of difficulty and risk of harming bats by direct contact with the fast moving wire rim.

The net also proved difficult to use in some locations. Bats close to vegetation were impossible to catch as the net was liable to snag on the herbage. It took some time before any expertise was acquired and only a small number of bats were ever caught.

Netting Sites

Attempts to catch bats were made at various places around the city but it soon became obvious that some places were unsuitable. Success depended on a good area of sky to back light the bats. It was also more rewarding to work where there were concentrations of bats.

Craiglockhart Pond

This small pond was rectangular in shape with woodland or marsh scrub on three sides. The fourth was walled and backed by gardens and a road. There was a footpath on one side of the pond along the bottom of the heavily wooded hill. You could not walk round it. Bats often concentrated over the water below the wall and particularly under a street lamp. These bats were inaccessible.

Bats were seen regularly feeding over the pond and marshy area on its north east end. Overhanging trees and vigorous scrub limited the areas where hand netting was possible. A number of pipistrelles *Pipistrellus pipistrellus* were caught here over the period. Most were taken when flying between the pond and the reeds. On some nights bats like Daubenton's bats *Myotis daubentonii* were seen over the pond but they were more active over the areas of open water which were less accessible or too close to the water to catch.

Attempts to locate roosts were unsuccessful. The woodland was checked for suitable holes but no signs of bats were found in any of the cavities identified. It was obvious that bats were approaching the pond in the shelter of the wall and overhanging vegetation on the southern edge of the George Watson College recreation ground. Individual bats were seen to come from the direction of the pavilion in the above grounds on two occasions. Other bats came down the woodland edge of Craiglockhart Hill, apparently from Craig House (The Thomas Clouston Clinic). This is a large building and I was not able to find the right person to approach for permission to examine it.

The nearby Union Canal was looked at on two occasions (near the bridge by Craiglockhart) but as few bats were seen the site was subsequently ignored.

Lochend Loch

This small loch in a park could be walked round, which allowed bats to be pursued over most of their active flight range. The eastern side was flanked by trees behind which was a steep scrubby cliff-like slope.

No Daubenton's-like bats were noted here but bats seemed very numerous. Most flew near and over the loch but some flew in the corridor between the trees and the steep bank. Some of the bats also flew out low over the grassy park land. This made catching relatively easy as the net could be laid on the ground and raised to intercept passing bats. Bats were also caught near the trees and water. All bats caught were pipistrelles. Bats were often seen flying close to the vegetation on the steep slope, especially in good light. They also seemed to be "different" but they evaded capture either because they were too fast, too nimble or not sufficiently clear of the shrubbery to work the net properly.

No roosts were located here nor were any serious attempts made to locate them. However the first bats often seemed to appear from the south east.

Inverleith Pond

This small pond had many of the qualities of the Lochend pond. It was situated in a park with regularly mown grass. I can recall no shrubs or trees by it. It was also shallower which made attempts to catch bats over the water easier.

Like the other sites the only bats caught were pipistrelles. Again bats flew over the water and low over the grassland.

Water of Leith, from near Powderhall Stadium to Stockbridge.

The river bank is well vegetated along this section and varies from bramble scrub to heavily shaded tree sections. The river is not deep for most of this part and walking up the middle of the course was relatively easy.

No bats were caught on this section of river but it had considerable bat activity at times. Some of this might just have been bats using the river as a fly-way or as a feeding area. The section from Cannonmills to about 100 metres beyond the bend by Inverleith park could be particularly good. The river was checked on several occasions despite the difficulties in finding suitable "catching windows" where a good view of bats against the sky could be had. At all locations bats which looked different were pursued in the hope that they were species other than pipistrelle. On all previous occasions the bats when caught had been the same species. Here many bats seemed different. The lighting of the location will have influenced quite a number of these sightings but a slightly larger pale bat which flew apparently on a beat at shoulder height was particularly

frustrating and always eluded capture, in part because of the height at which they flew but also because they were often close to the bank scrub. Nowadays I would have called these Natterer's bats *Myotis nattereri*.

Summary

The pipistrelle bat was found by three ponds in public areas in Edinburgh. No other species were identified although flight characteristics suggest that others were sometimes present. This was not an exhaustive search of Edinburgh's small ponds and lochs, most others were not looked at. Nor are they the only places where bats were encountered in the city. All bats caught were identified and had their forearms and fifth digits measured. Fusion of the epiphyses were also checked for as an indication of age. Bats were released after examination. Only some bats were recorded with Arnold at Monkswood.

Acknowledgements

I should like to thank C Placido who introduced and advised me on the catching technique and for his encouragement. R E Stebbings also provided much support in some very useful correspondence.



Bat boxing in Fife II or Bat boxes in Tentsmuir - the continuing story

Nigel Mortimer

Tentsmuir is to be found in the very north east corner of Fife and is probably best known for its huge plantations of Scots Pine managed by the Forestry Commission. It is an area of some 35km² of stabilised marine derived sand, accreted over the last 10,000 years. The area was used as a grouse moor in the last century but with improved drainage was used for agriculture. As anyone who has been there will tell you, the water table is still very close to the surface and Tentsmuir is reputed to have been the last place to harbour malaria in the UK. The area boasts two National Nature Reserves (NNR), one Local Nature Reserve (LNR) and three Sites of Special Scientific Interest (SSSI).

With the high water table there is plenty of standing water, giving west coast like conditions for a very large biomass of bat grub - blood seeking insects! However, in 1985, with so few roosting sites in the conifer plantations and very few suitable buildings the bat population was considered low and David Bullock and others erected 90 standard design bat boxes. The initial success of these bat boxes is well documented (Bullock and Altringham 1988) and Tentsmuir is considered by many to have been one of the most successful bat boxes schemes.

Of the 90 standard boxes, 80 (89%) have at some time been used by pipistrelles *Pipistrellus pipistrellus*, Natterer's bats *Myotis nattereri* or brown long-eared bats *Plecotus auritus*. The presence of droppings was taken to indicate use of the boxes by bats, but the species was only recorded where the bats themselves were found.

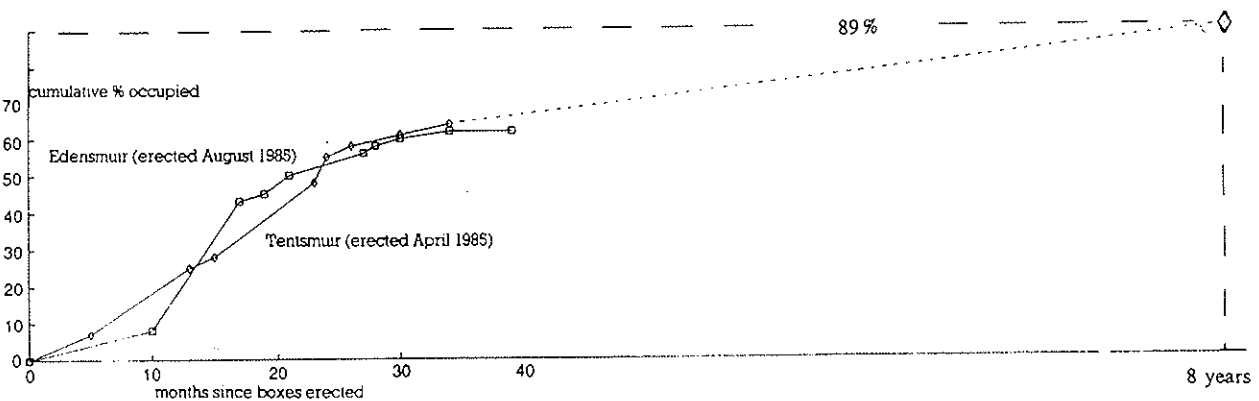


Fig. 1. The cumulative percentage of boxes occupied by bats since erection in two coniferous plantations in Fife. (90 boxes per site; five clusters of six trees, three boxes per tree.)

The main question to be asked is why has the Tentsmuir project been so successful? The quick answer is that we don't really know - maybe variety of habitats within Tentsmuir. The boxes themselves show a very wide variety of height above the ground, between 1.5m and 4m, and facing direction, the team putting them up could not have had a compass!

Bullock and Altringham (1988) answered some of the questions, but it is felt that there are many more variables that need to be measured and correlated to answer the question of why some boxes are more popular than others. Such measurements are distance to the sea, water pools, clearing, relative wind exposure, sun exposure, amount of adjacent forestry operations disturbance.

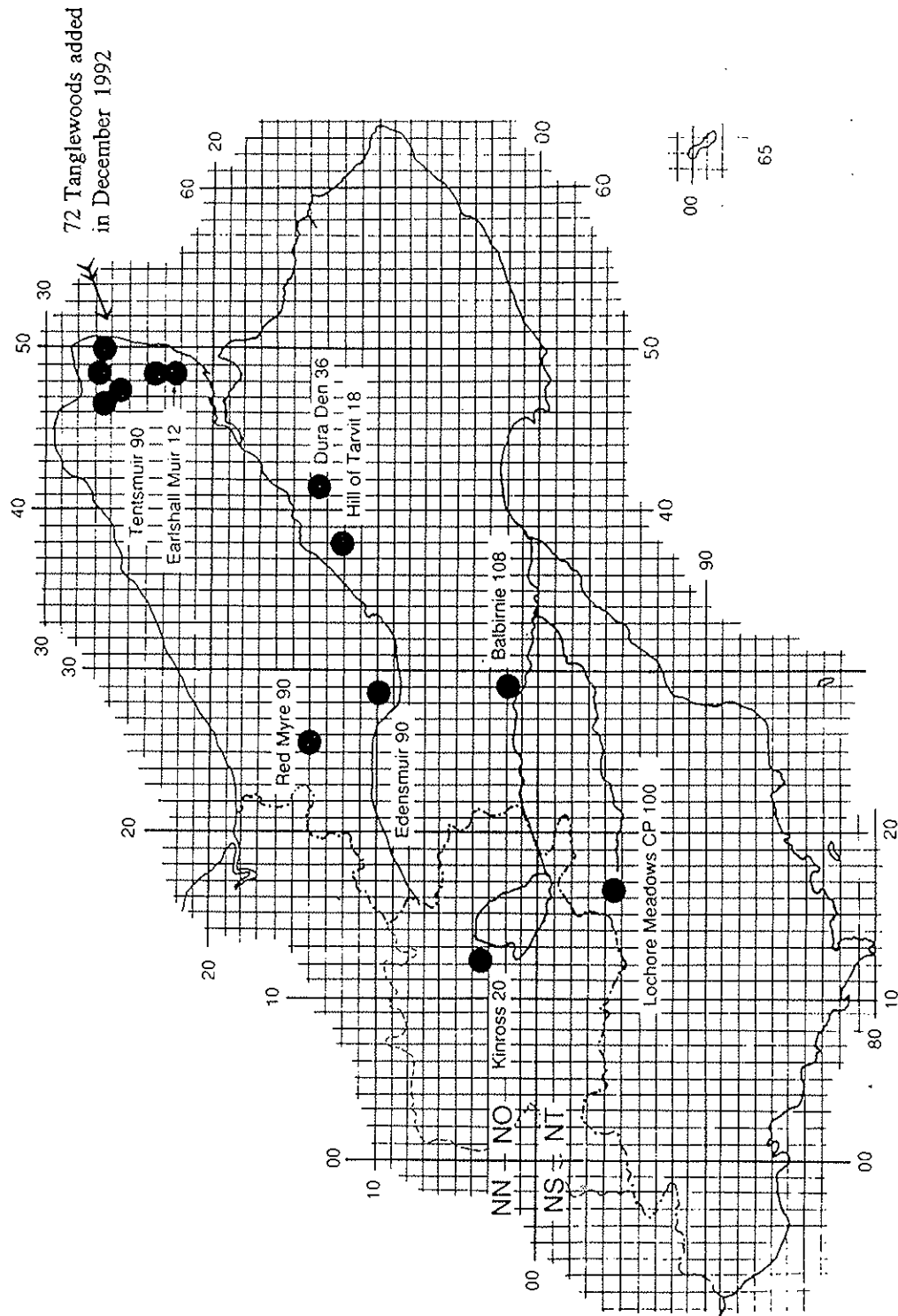


Fig.2. The size and location of bat box schemes in Fife. Edensmuir, Red Myre and Tentsmuir are coniferous plantations, all other sites are deciduous/mixed woodland/parkland.



Fig. 3. Fife's only known tree roost was blown down during the severe storms of this past winter. However the group managed to cut out the section of the tree with the roost and remount this latest design of bat box on an adjacent tree.

Fife bat group have been recording bat activity at Tentsmuir for 8 years now and the records are clearly laid out awaiting computerisation! Any student wishing to take on a very worthwhile research project out there?

Some things have been quite obvious to those carrying out the recording, such as the brown long-eared bats not returning to their boxes in a line of beech trees, after the adjacent forestry block was felled. Instead these boxes are now very popular with breeding Natterer's bats.

In December 1992, 72 tanglewood wedge boxes (Hines, 1985) were erected around Tentsmuir. It will be interesting over the next few years to see how these compare with the existing boxes. All of the boxes were inspected this July and 7 (10%) of the tanglewoods have already been used by bats, including two single male Pipistrelles which were actually found in residence.

This number of boxes occupied after 7 months falls very neatly on the curve (Fig.1) for the previous boxes! However, one point on the curve does not exactly prove anything yet.

References

Bullock, D and Altringham, J 1988. Bat Boxing in Fife. *Batchat* 11, 4-7.

Hines, J 1985. The "Tanglewood Wedge" bat box. *Batchat* 1(6), 5-6.

Acknowledgements

The boxes were made and erected with the help and/or financial or timber assistance of Fife Bat Group, Scottish Natural Heritage, North East Fife Ranger Service, Forest Enterprise and R M Law Sawmills.



1992 summary of Forest Enterprise (North Scotland) bat boxes

Mick Canham

Checks of bat boxes in Forest Enterprise (North Scotland) Region were continued during 1992, with the addition of two new groups of boxes at Kildermorie and Achnashellach (Table 1).

Numbers in the brown long-eared bat *Plecotus auritus* maternity roost at Caplich in the Dornoch Forest District are increasing. This is still the only known maternity roost in a bat box in the Highlands. The only Natterer's bat *Myotis nattereri* to have been found in Forest Enterprise bat boxes turned up in its usual box in Teindland, Moray Forest District.

However, the highlight of the year must be the three male Daubenton's bats *Myotis daubentonii* recorded in the Loch Morlich boxes, Inverness Forest District. This is the first example of Daubenton's bats in bat boxes in Scotland!

New groups of boxes are planned in the south-west of the region in Lorn, Loch Awe and Kintyre Forest Districts. Work is underway on a hibernaculum in Lossie Forest, Moray Forest District, and this should be completed for this winter.

Category	Bat box groups	
	Number	%
Total	24	100
Evidence of use by bats	17	70
Bats present when checked	14	57
<i>Plecotus auritus</i> present	3	13
Evidence of use by <i>P. auritus</i>	5	22
<i>Pipistrellus pipistrellus</i> present	10	43
Evidence of use by <i>P. pipistrellus</i>	16	65
<i>Myotis nattereri</i> present	1	4
<i>Myotis daubentonii</i> present	1	4
Used by birds for roosting	16	65
Used by birds for nesting	5	22

Table 1. Summary of results of 1992 bat box checks

Note. A bat box group is a site with a number of individual boxes (three to one tree), varying from 18-90.

Keeping the Bats in Battleby

J Stewart Pritchard

When, after the merger of the Countryside Commission for Scotland (CCS) and the Nature Conservancy Council for Scotland (NCCS) in 1992, the newly formed Scottish Natural Heritage (SNH) occupied Battleby House (Fig.1.) the staff inherited not only a fine work place in the form of a 19th Century mansion set in 36ha of designed landscape but a sizeable pipistrelle *Pipistrellus pipistrellus* colony as well!

Background

History does not record when the bats first occupied the building but the Nature Conservancy Council were asked for advice concerning bats flying inside the building in 1983. At that time the colony was dispersed around the old building. Mike Taylor of the Perth Bat Group recalls how in 1987, they didn't have enough members to cover all the exit points for an emergence count. With the offices unoccupied during the evenings and the dispersed nature of the colony the bats attracted little attention. It is not certain whether or not bats used the newer Battleby Centre before 1991, but in that year an apparently new roost in the roof above the foyer significantly raised the profile of bats at Battleby.

The new site is typical of pipistrelle maternity roosts and is located along the wall-head on the south side of the building. Occupancy appears to be seasonal with bats arriving in April/May and staying until late autumn. An emergence count in 1992 recorded 280 bats emerging from this roost.

If the bats confined themselves to the wall-head then I am sure that few people would ever notice them. The colony however has access through gaps between the ceiling and the rough stone walls into the large foyer areas. On warm days during summer, the bats remain active for much of the day, crawl upwards through the ceiling and frequently emerge and fly circuits around the inside of the building. At night many more enter the building and fly through the deserted corridors. That they also take insects (feeding buzzes heard using a bat detector) whilst flying inside is not always sufficient to convert visiting delegates (who lunch and dine in this same area) into bat enthusiasts.

The way forward

Establishing the position

The roost in the reception area was obvious but how many other parts of the building were used by bats? A survey of the many lofts was carried out in August and bat droppings were found in a further seven locations - five were of pipistrelle and two of (probable) brown long-eared bats *Plecotus auritus*. The latter species had not previously been suspected of occupying the building as the pitch of the roof was low and greatly reduced the loft space volume.

Identification of the "problems"

The future of the bats was of interest to the various Branches within Battleby - for different reasons. Representatives from the Branches and the Perth Bat Group were invited to attend a meeting to discuss the situation and agree a course of action.

The "problems" caused by the bats' presence were considered first and fell into five categories:

- The bat roost in the reception area is in close proximity to a catering area and the foyer itself is used frequently as a dining area. Whilst SNH has emphasised that the bats do not present any known health hazard to humans, contamination of food by bat droppings and urine was considered unacceptable.
- Bats regularly entered the building and flew around the foyer and reception offices. The staff most affected were not unduly concerned and had become quite accustomed to them. Indeed the receptionist

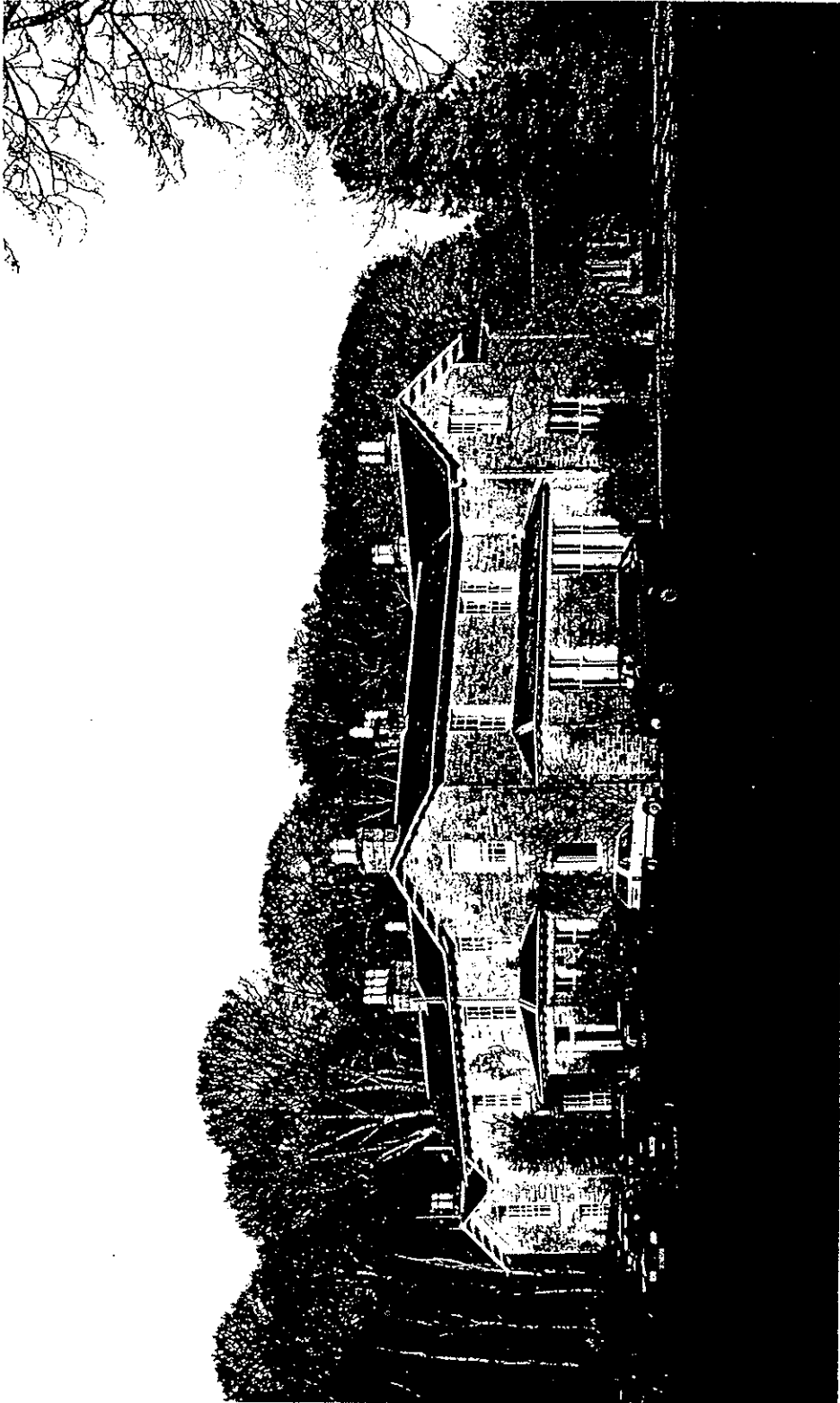


Fig.1. Battleby House (Lorne Gill, Scottish Natural Heritage)

had developed an automatic "ducking" manoeuvre without interruption of her typing as the bats passed by.

- Droppings and urine from the roost fouled the large picture windows and collected on the carpet and tables in the foyer. With bats flying inside the building further droppings could be found almost anywhere in the connecting rooms (including the kitchens). The staff upon whom the additional cleaning requirements fell were quite tolerant of the bats but would rather not have the extra work.
- Not surprisingly, there was a noticeable odour arising from the roost. More surprisingly not everybody noticed it!
- It had been expected that there would be a level of intolerance and fear amongst staff but this was not found.

"Problems" for the bats were then considered.

- Battleby House is in need of extensive maintenance work, which will involve the stripping of the roof, replacement of timbers, repointing of the stonework and remedial timber treatment and which is to commence in this financial year.
- Bats which enter the interior of the building are often unable to escape. Frequently, especially during July and August, small numbers of dead bats are found around the foyer in the mornings.

Opportunities presented by the presence of the bats were also identified.

- There is an obvious opportunity to promote bat conservation by the provision of interpretative material focused on the Battleby roost.
- Battleby is well located for the provision of batworker and SNH staff training.

The outcome and future course of action

There was unanimous agreement that all reasonable steps would be taken to ensure, insofar as possible, that the bats would return and continue their use of the building in future years.

The agreed course of action included the following main points:

- A letter confirming that the agreed course of action met with the approval of SNH was sought and obtained from the local Area Officer.
- A detailed note of the legal protection afforded bats and their roosts, SNH's wishes to retain the bat roosts, practical advice on the choice of timber preservatives and timing etc was prepared and will accompany all invitations to tender for the building works.
- The contractor's workers are to be briefed on the situation and on what to do in the event of finding bats or signs of bats, before commencing. When uncovering known roosting areas, the opportunity to inspect them will be made available.
- Crevices and gaps identified as being used by bats will be maintained and, where appropriate, new accesses to the loft space will be incorporated.
- The reception area roost will be confined to the wall-head and lower ceiling area by the construction, around the roost, of a large box structure. For aesthetic reasons this box, which will incorporate a variety of internal partitions to provide additional roosting crevices, will extend the full length of the foyer. Could this be the largest bat box ever?
- Ideas for interpretation of the roost and the bats (including the potential for viewing the bats by closed

circuit television), are being considered and, if the bats find their "improved" roost acceptable, will be developed in 1994/95.

Summary

Scottish Natural Heritage is taking a number of positive steps to maximise the chance of bats returning to and continuing their use of Battleby House.

Work on the building is due to commence in November 1993 and will take several months. However, we will not know whether, or not, we have been successful in enticing the bats back until later in the year.

If the bats do return, it is proposed to use them as the focus of an interpretative display for visitors to Battleby.



Recent news of distribution of bats in Scotland

Jeremy S Herman and John F Haddow

Scottish bat groups were asked to submit species records from 1980 to August 1992 and distribution maps showing the presence of seven bat species, by 10km OS grid square, were published in *Scottish Bats* volume 1. Records had to be from identified roosts or from live or dead specimens "in the hand".

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.

We also accepted records of noctules *Nyctalus noctula* identified in flight visually and with the aid of a bat detector. However, while this is possible, there are few people in Scotland with sufficient experience to distinguish a noctule from a Leisler's bat *N. leisleri* (see elsewhere in this volume, in the article by Jens Rydell *et al*). Consequently any bat detector/visual records of "noctules" will now be regarded by us as noctule/Leisler's bat unless there is strong supporting evidence of the identification to species.

For example, Vincent Fleming of Scottish Natural Heritage sent this note of bats in south west Scotland.

"Noctule: 9th June 1987, ICI Explosives Factory, Powfoot, Dumfriesshire. NY165658. At dusk I noticed several large bats, giving the impression of almost starling size, flying in high, fast and direct flight over a large *Typha*-filled pool. Their flight was interrupted by glides and steep twisting dives; I did not have a bat detector with me but the calls were audible to the unaided ear. I had no doubt that these were noctules but despite several nocturnal visits to this site, before and since, I have not seen noctules (or bats similar to the description above) on other occasions. The site is potentially a rich feeding area with unimproved grassland, with frequent maybugs, and wetland."

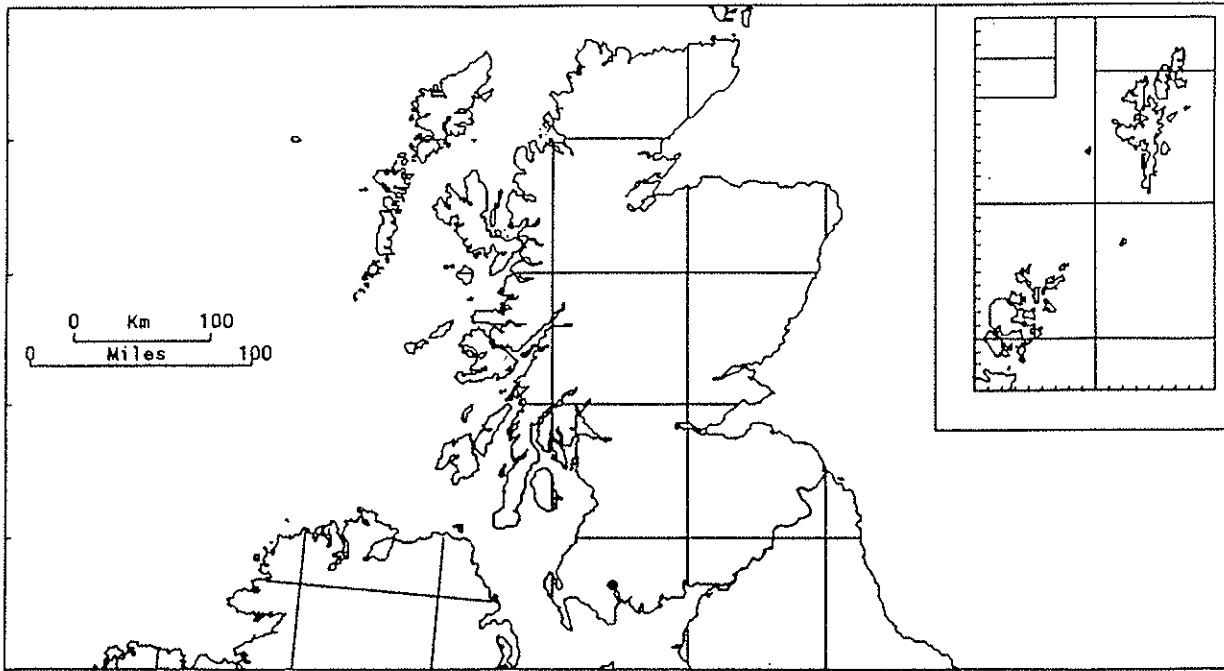
The only recent records of Leisler's bats in the hand have been from Dumfries and Galloway. Geoff Shaw of Forest Enterprise found a male in a bat box in Caldons Wood, Glentrool (NX 407787) on the 18 September 1992 and during August/September 1993 three individuals were found in bat boxes in Wood of Cree (NX37) by Paul Collin, the RSPB warden. One male was found on its own and later a male and a female were found together in another box, some distance away. Both Caldons Wood and Wood of Cree are oak woods.

Revised maps showing our current knowledge of the noctule and Leisler's bat are shown below. A revised map for the whiskered bat *M. mystacinus* appears on page 9.

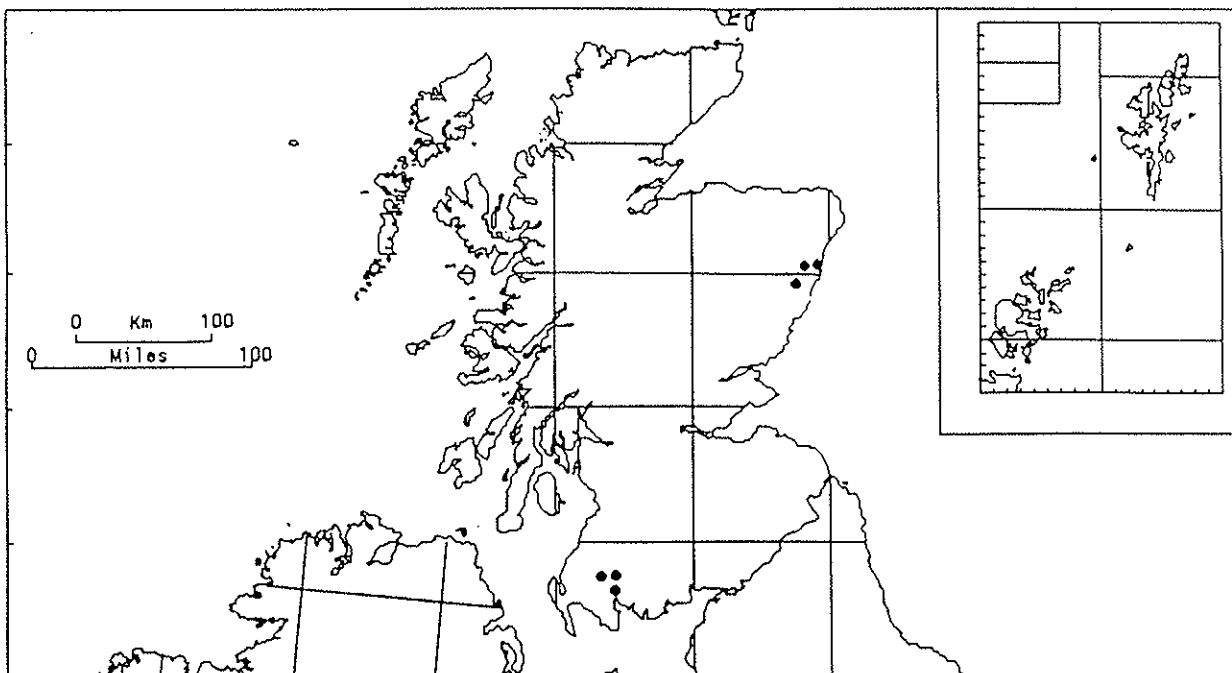
We intend to bring all of the distribution maps up to date for the 1994 issue of *Scottish Bats*, so we are appealing to all bat groups in Scotland to send any additional records of all species. If individuals have records, and there is no bat group for the area, then please send the information direct to us (if you want to know more about the area coverage of groups, write to us anyway). The deadline for submission will be 31 July 1994, but it will make compilation of the data more manageable if the bulk are submitted by 31 May.

Particular gaps remain in our knowledge of bat distribution in much of western Scotland and many of the islands are underrecorded, but gaps are also apparent in the well recorded areas. Are these real gaps or are they due to lack of observer effort?

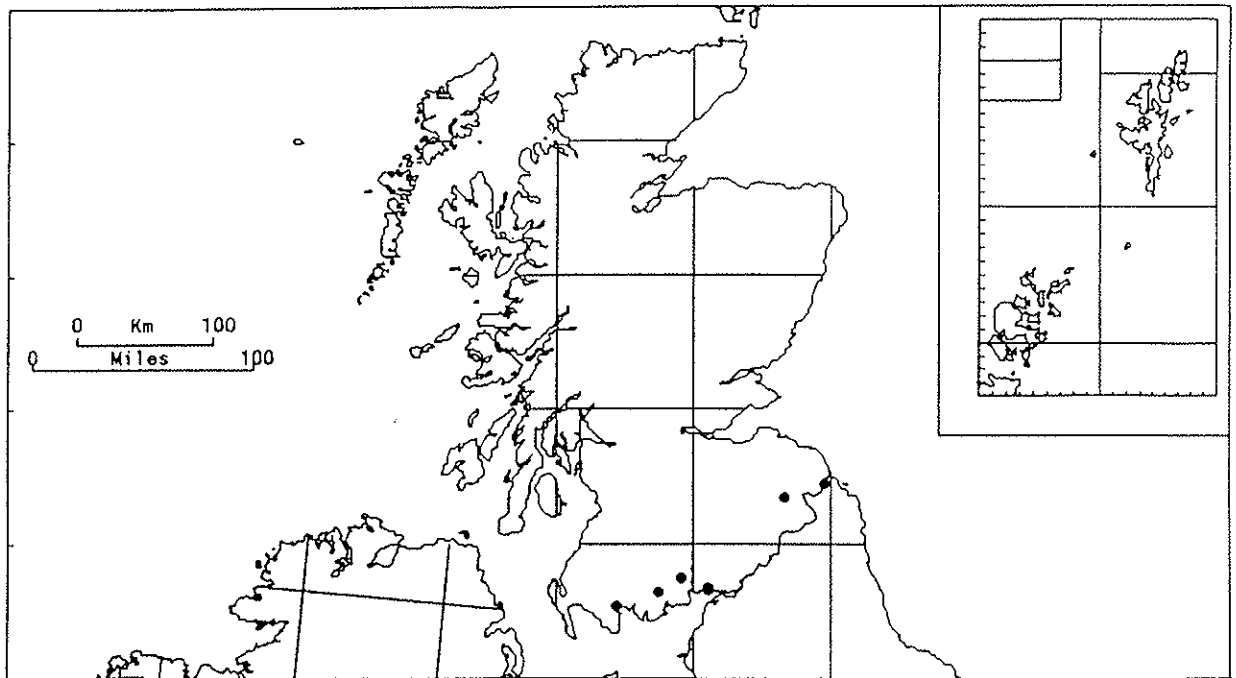
Noctule
Nyctalus noctula



Leisler's bat
Nyctalus leisleri



Noctule/Leisler's bat



Distribution maps were not prepared for species unless they are known to be resident in Scotland. However records of bats regarded as vagrants continue to be reported and these are welcome as they will allow a list of vagrant species to be included in future volumes. On North Ronaldsay, Orkney, for example, a noctule was identified at the Bird Observatory in September 1992 (Orkney Field Club Report for 1992).

To our knowledge, the full list of vagrant species recorded in Scotland is as follows.

- Noctule *Nyctalus noctula* (Orkney, Shetland)
- Leisler's bat *N. leisleri* (Shetland)
- Parti-coloured Bat *Vespertilio murinus* (Shetland)
- Nathusius' pipistrelle *Pipistrellus nathusii* (but see Speakman *et al* elsewhere in this volume)
- Savi's pipistrelle *P. savii*
- Hoary bat *Lasiurus borealis* (Orkney)

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

- Noctule *N. noctula*
- Northern bat *Eptesicus nilssonii*
- Nathusius' pipistrelle *P. nathusii*
- Parti-coloured bat *V. murinus*

Scottish bat group addresses (arranged according to Scottish Natural Heritage/bat group regions)

North West Scotland

Inverness

Ann Youngman Scottish Natural Heritage, Foddarty Way, Dingwall Business Park, Dingwall, Ross-shire IV15 9AF. Tel. 0349 65333, or (h) Ardival, Raddery, Fortrose, Ross-shire IV10 8SN. Tel. 0381 621233

Skye

Grace Yoxon Skye Environmental Centre, Broadford, Isle of Skye IV49 9AQ. Tel. 0471 822487

Sutherland and Caithness

Scottish Natural Heritage Old Bank Street, Golspie, Sutherland KW10 6TG. Tel. 0408 633602

North East Scotland

Aberdeen

Prof. Paul Racey and Abigail Entwistle Department of Zoology, University of Aberdeen, Tillydrone Avenue, Aberdeen AB9 2TN. Tel. 0224 272858 (PR), 0224 272879 (AE)

Moray

Denice & David Law 27 Drumbeg Crescent, Llanbryde, Elgin, Morayshire IV30 3JS. Tel. 0343 842007

Orkney

Andrew Dorin Scottish Natural Heritage, 54/56 Junction Road, Kirkwall, Orkney KW15 1AW. Tel. 0856 875302

Strathspey

Malcolm Currie Scottish Natural Heritage, Achantoul, Aviemore, Inverness-shire PH22 1QD. Tel. 0479 810477

South West Scotland

Ayrshire

Ian Tanner Ayr Wildlife Survey, Unit 8/4, Cambuslea Industrial Estate, Cambuslea Road, Newton upon Ayr, Ayrshire KA8 9HT. Tel. 0292 610529

Clyde

Bill Webster The Visitor's Centre, Calderglen Country Park, Strathaven Road, East Kilbride G75 0QZ. Tel. 03552 36644

Dumfries

Stuart Spray c/o Wildfowl and Wetlands Trust, Eastpark Farm, Caerlaverock, Dumfries DE1 4RS. Tel. 0387 77200

Galloway

Dr Peter Hopkins Barbuchany, Newton Stewart, Wigtonshire DG8 6QE. Tel. 0671 3870

Lorn

Patrick Cashman Scottish Natural Heritage, Glensalloch Road, Barcaldine, Argyll PA37 1SF. Tel. 063172 363

South East Scotland

Angus

Richard Brinklow Dundee Museum, Barrack Street, Dundee DD1 1PG. Tel. 0382 23141

Borders

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Central Scotland

John Haddow 27 Balmoral Court, Dunblane, Perthshire FK15 9HQ. Tel. 0786 823390

Fife

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Lothians

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Perth

Michael Taylor Perth Museum & Art Gallery, George Street, Perth PH1 5LB. Tel. 0738 32488