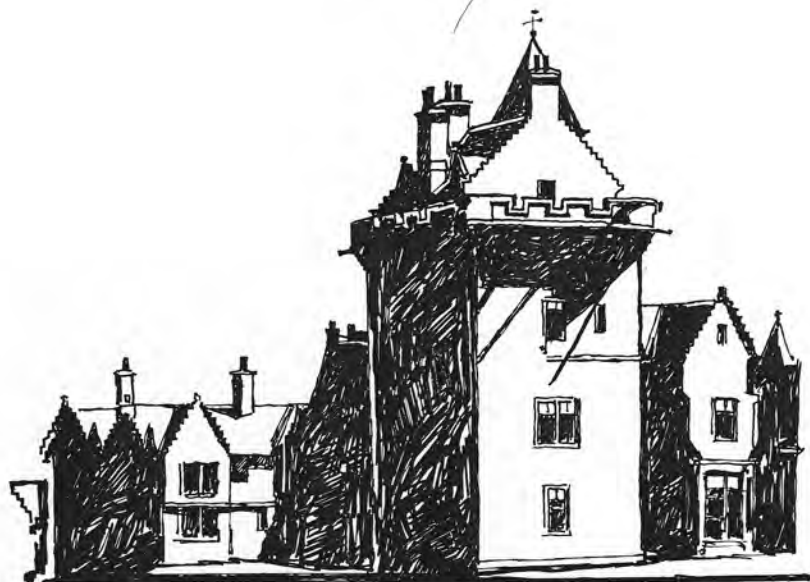
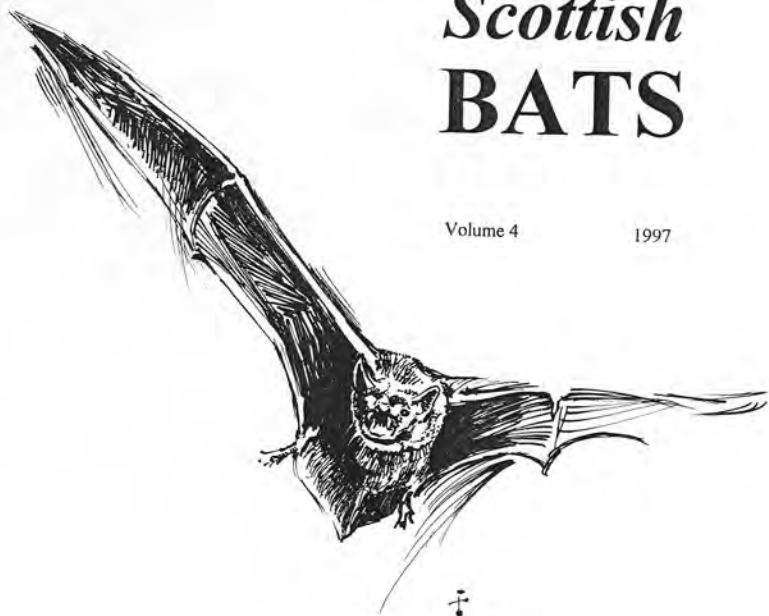


Scottish **BATS**

Volume 4

1997



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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 fourth volume of *Scottish Bats*. Papers and articles concerning bat conservation and research can be published in scientific journals, regional journals of natural history and *Bat News* (newsletter of the Bat Conservation Trust). *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.

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

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JFH/JSB

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Noctules in Ayrshire

Robert Potter

On the evening of June 6th 1997 the members of Ayrshire Bat Group, accompanied by Colin Catto of the Bat Conservation Trust, visited the Scottish Wildlife Trust reserve at Ayr Gorge Woodland.

The reason for this visit was to enable our members to gain bat detector training. We were aware that pipistrelles *Pipistrellus pipistrellus* and Daubenton's bats *Myotis daubentonii* were present in large numbers on the reserve. We were also fairly confident (within 20 metres) of the location of a Daubenton's bat roost among trees overhanging the river. One of our members had also reported picking up "noctule" noises on a previous visit.

Very soon after sunset we heard pipistrelles and almost immediately afterwards, putting Colin's excellent training to good use, we picked up noctules *Nyctalus noctula*. We then began to see them flying high and fast above the tree line.

Around 3 a.m. we again heard what we thought were noctules, however the detector was not emitting quite the right "noise". Colin finally decided that what we were hearing was probably Leisler's bat *Nyctalus leisleri*, however because of the enclosed nature of the gorge it was decided to make further investigations before declaring that this species is also present in Ayrshire.

Due to the time of the sightings of the noctules being so soon after sunset we believe that the roost is fairly close to the reserve; Ayrshire Bat Group are at present trying to find this roost.

Unfortunately we did not precisely pinpoint the Daubenton's bat roost, but have now narrowed it down to a 15m stretch of the river bank. Pipistrelles are almost certainly roosting in trees within the reserve as well.



Fig.1. Possible noctule photographed near Irvine, Ayrshire, in summer 1996

Footnote - about one year ago another of our members heard noctule "noises" from her bat detector at Eglinton Country Park in Irvine. A few weeks later a member of the public brought in photographs, which he had taken in the park at sunset, of a "large" bat flying over the tree tops (Fig.1). Perhaps noctules are much more widespread in Ayrshire than we thought. We now regularly tune the detector to much lower frequencies than we did previously.

New record of *Nathusius' pipistrelle* from Scotland

John F. Haddow and Jeremy S. Herman

On 21st November 1995 a bat was found under a fascia board on a house in Dollar, Clackmannanshire. The board was being removed for some repairs to the house and the bat was exposed as a result. The householder telephoned me as the local bat group contact. The initial advice was to put the bat somewhere similar elsewhere on the building, but because the bat appeared to have a damaged wing it was taken to a nearby "bat carer" group member. It was immediately obvious that the bat had a badly fractured left humerus and since survival would require amputation of the wing it was humanely killed by a local vet.

Although clearly a pipistrelle its fur and colouring were noticeably different from any common pipistrelle previously examined by me; the fur was very thick and long, chocolate-brown on the dorsal side and pale ventrally. Common pipistrelles have little difference in colour between front and back. Subsequently we examined the bat and agreed that its features - broad wing, dentition - fitted with descriptions of *Nathusius' pipistrelle* *Pipistrellus nathusii*. The specimen was preserved in alcohol in the National Museums of Scotland collection and at a later date we examined it together and compared it with other specimens of pipistrelles in the collection, paying particular attention to dentition and 5th digit/forearm measurement ratios.

The Dollar specimen has a 5th digit/forearm measurement ratio of 1.27 (42mm/33mm). *P. nathusii* is always given as over 1.25. The first upper premolar (P¹) is not hidden behind the canine. The second upper incisor (I²) is longer than the short tip of the first (I¹). There is a gap between the second and third lower incisors (I₂ and I₃). These are all "good" identification features for *P. nathusii*, although comparison with *P. pipistrellus* is essential for confident identification. From comparison with the other specimens we would confirm the position and size of the first upper premolar (P¹) as the best dental feature to separate *P. nathusii* from *P. pipistrellus* (Herman and Haddow 1995). Our key describes P¹ as "prominent and fully in the toothrow". By this we mean that there is a gap between the canine and P². P¹ is positioned in the gap, unlike in *P. pipistrellus* where there is no gap and the very small P¹ is behind (buccal to) the main tooth row. Examination of different specimens of *P. nathusii* shows that the actual position varies from almost in line with the neighbouring teeth to very clearly displaced inwards. The size and appearance of P¹ together with the prominence of the upper incisors would seem to be the best features for identification even in a live animal.

The ratio of the length of the fifth digit (not including the width of the wrist) to the forearm length seems to be less reliable from the specimens examined by us (Table 1). The South Ronaldsay *P. nathusii* and the older Shetland specimen both had ratios below 1.25, and a *P. pipistrellus* picked out at random had a ratio of 1.22. However as emphasised by Greenaway and Hutson (1990) the fifth digit must also be long. More than 42mm is the criterion given by them, although the Dollar specimen was exactly 42 mm.

Location	Date	5th digit/forearm (mm)	Ratio	Sex	
Dollar, Clackmannanshire	21/11/95	42/33	1.27	Male	NMSZ
S.Ronaldsay, Orkney	12/6/95	43/35	1.23	Male	NMSZ
Whalsay, Shetland	2/11/40	42/35	1.2	Female	NMSZ 1991.8
Mainland, Shetland	7/9/89	44/35	1.26	Male	NMSZ 1992.21.1
Rotterdam, Netherlands	15/1/90	47/35	1.34	Female	NMSZ 1990.102.1
Spijkenisse, Netherlands	30/4/90	43/33	1.3	Male	NMSZ 1990.102.2
Shetland	24/1/92	43.5/33.7	1.29	Male	Speakman et al
North Allwyn Field (60N2E)	13/9/92	46.6/34.9 *	1.34 *	Female	Speakman et al
Nelson Field (57N1E)	19/9/92	42.1/34.1	1.23	Female	Speakman et al
Hutton TLP Rig (61N2E)	25/9/92	46.8/34.7 *	1.35 *	Male	Speakman et al
Rob Roy Field (58N1E)	7/10/92	47.0/34.8 *	1.35 *	Female	Speakman et al

Table 1. Measurements of specimens of *P. nathusii*

(*these measurements of the 5th digit include the width of the wrist, so the ratios are consequently high)

This find of a *Nathusius' pipistrelle* in Scotland raises some questions. The most obvious is "Why was the bat at this location?" This is the first Scottish specimen that does not clearly suggest the bat had arrived as a result of vagrant behaviour; the bat was not found at a coastal, island or offshore location suggesting recent arrival from across the North Sea. Rydell and Swift (1995) recorded echolocation sounds and watched foraging behaviour of bats in Seaton Park, Aberdeen, and by the River Dee near Balmoral Castle which they attribute to this species. These observations were made in June 1993 and June 1994 so indicating summer residents. As Rydell and Swift also mention, this species normally roosts in trees, and this makes the discovery of maternity roosts difficult. Are these bats resident in the Dollar area during the summer? The Dollar bat was found in a hibernation site typical for the common pipistrelle and could well be one of a population of these bats resident in the Dollar area. Examination of the building where the bat was found in the summer of 1996 has not indicated that these bats use it as a summer roost, but this is unlikely anyway. A survey using the same sophisticated bat detection equipment as Rydell and Swift in addition to their expertise in bat sound recognition may prove that *Nathusius' pipistrelle* is a summer resident, but negative results will not necessarily prove that it is not resident!

References

- Greenaway, F and Hutson, A M** 1990. *A field guide to British bats*. London: Bruce Coleman Books.
- Herman, J S and Haddow, J F** 1995. A key to bats in Scotland. *Scottish Bats* **3**, 30-31.
- Rydell, J and Swift, S M** 1995. Observations of *Nathusius pipistrelle*, *Pipistrellus nathusii*, in Northern Scotland. *Scottish Bats* **3**, 6-7.
- Speakman, J R, Racey, P A, McLean, J and Entwistle, A C** 1993. Six new records of *Nathusius' pipistrelle* *Pipistrellus nathusii* for Scotland. *Scottish Bats* **2**, 14-16.

Footnote - Since writing this article, *Nathusius' pipistrelle* has been confirmed as a resident species in the UK following the discovery of two separate nursery roosts, one in Co. Antrim, Northern Ireland and the other in Lincolnshire, England (*Bat News* **46**, July 1997).

Daytime observation of a large bat on Deeside

W.D.G. Henrickson

Editors' note - The following description of the observation of a large bat was submitted by Watt Henrickson via Prof. Paul Racey of the University of Aberdeen. Examination of photographs taken by Mr Henrickson led Prof. Racey to conclude that the bat was either a Leisler's bat *Nyctalus leisleri* or a noctule *N. noctula*. Leisler's bat has previously been recorded on Deeside using a bat detector (Rydell, Catto and Racey 1993 *Scottish Bats* 2, 5-6). So far the noctule has been recorded only as far north as Ayrshire (Potter 1997 *Scottish Bats* 4, 5).

Forestry amenity pond in Blackhall Forest, Aberdeenshire, 29th June 1997, grid ref. NJ 651957.

Weather sunny, warm. Arrived at pond 1.00pm, departed 3.30pm. This pond has been excavated in the last 7 to 10 years, is shallow and has an area of approximately 50m by 100m, and is situated in a large clearing. There is as yet only sparse marginal growth of reeds, etc., and the water is mainly clear over a sandy bottom. There is a large boulder, about 1m in height and perhaps 2.5m in circumference, some 8m from the bank.

The bat was on top of this boulder, and we were immediately struck by its size. The body was 10cm or more in length, with a tail protuberance of perhaps 1cm. The wingspan would have been about 20cm. The body, in bright sunlight, was of a near chestnut colour, with a paler underside. The wings were much darker and of a grey/black colour.

Whilst at rest, the head moved continuously, as did the prominent ears, which were well separated and near triangular with a slightly pointed tip.

During the two hours or so that we watched, the bat made fairly regular flights, at low level over the immediate area of water. These were of short duration, and from two to six circuits, dipping to the water surface to, we assumed, capture insect prey. On one circuit it alighted on the water just short of the boulder, but to our surprise it managed to take off and regained its perch.

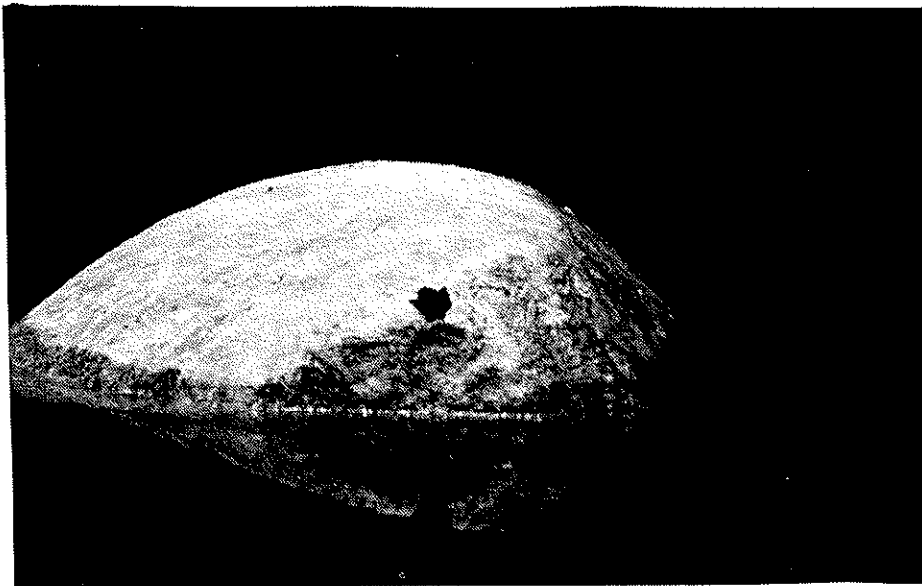


Fig. 1. The bat observed at Blackhall Forest pond on 29th June 1997.

An account of three tree roosts in Motherwell

Charlie Howe

As any batworker knows, locating tree roosts can be difficult to say the least, so to find three within about 0.5 km of each other makes them pretty special (Fig. 1).

Motherwell is well known as a centre for steel making and coal mining, but despite being heavily developed in the past it has many areas like Strathclyde Country Park linked through the Clyde and Calder Valley's estate lands of Orbiston, Dalziel, Coltness and Cambusnethan. These provided areas where wildlife could survive in an otherwise hostile landscape. The passing of the coal and steel industries has undoubtedly had a beneficial effect on all wildlife in Motherwell district.

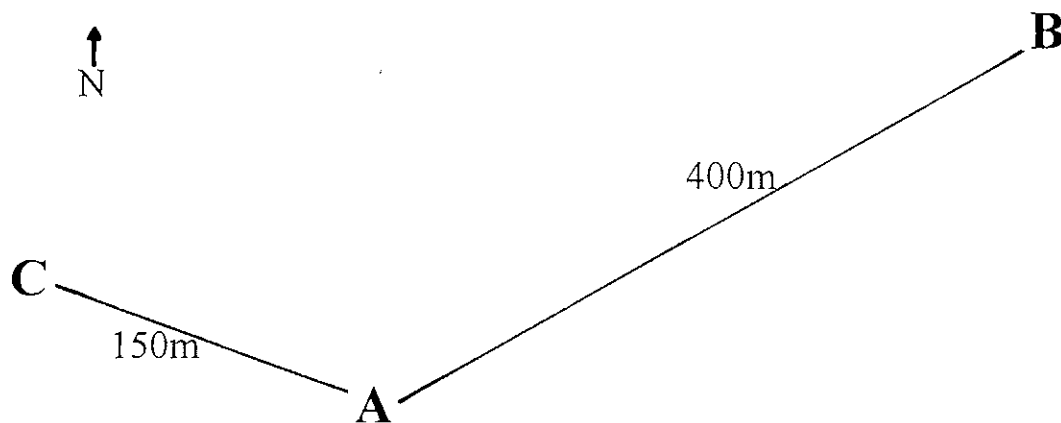


Fig.1 Relative positions of the three roosts.

Roost details

The roosts are in one of the old estates mentioned above. The estate comprises a number of habitats including parkland, semi-natural woodland, pastureland and a stream running through a wooded gorge. There is a main river course and a large area of still water between one and two kilometres away.

I have listed the roosts in order that they were found.

Roost A

The first and probably the most interesting roost is in an ancient oak *Quercus robur* standing in parkland. Dangerous limbs have been removed in the past and some of those that remain are fissured. The bats are located in an upward sloping hole 6m above the ground. The entrance measures about 30 cm by 15 cm. The upward sloping cavity extends in for about 50 cm. I discovered this roost in July 1994 whilst preparing for a "guided nocturnal walk". I pointed my bat detector at the tree, and it chirped back!

Shining a torch up into the hole, I could see a mass of furry bodies crowded together inside. I returned later that evening and watched the bats emerging. It was well after sunset, but I did not note the exact time. The bats appeared to have white underparts and were flying low beneath the trees as they dispersed. I guessed they were either Daubenton's bats *Myotis daubentonii* or Natterer's bats *M. nattereri*. Unfortunately I was unable to get anyone to come and identify them that year before they left and I myself was not licensed to catch them.

In the following year, 1995, the bats had returned to the roost around the 10th of June. I made arrangements with Ian Tanner, then of the Ayr Bat Group, to visit. Two bats were caught on the 15th of June. Both were female, and were identified as Natterer's bats from the long pointed tragus, s-shaped calcar and bristles along the tail membrane. It was a good sized nursery roost with 75 bats counted on the 13th of June. The colony dispersed around the 22nd of June.

In 1996 the anticipated return of the bats did not happen. Several visits were made to the site from May to August but no bat activity was recorded. I don't know why they did not return, however felling operations in nearby woodland during May and June may have had something to do with it.

In 1997 a training weekend had been organised by Clyde Bat Group with John Haddow providing the training. It was planned to visit these tree roosts on the afternoon of the 14th of June as part of this. No one had visited beforehand to check if any of the tree roosts were in use, so we had no idea whether we would find anything. On approaching the tree it became obvious that bats were in residence from the sounds which were coming from the hole. On the ground beneath the hole, there was a noticeable patch of droppings, more obvious than in previous years, when small piles of relatively dry droppings were noted. As the visiting dignitary, John Haddow was invited to inspect the roost. After closely inspecting inside the roost, he announced that "there are two species in there and neither is Natterer's".

The top of the cavity was occupied by Daubenton's bats and there was a smaller number of pipistrelles *Pipistrellus pipistrellus*, some of which had small young, beneath these and to the rear of the cavity. Subsequently a count of emerging bats was carried out on the 2nd of July. 36 pipistrelles emerged between 21.44 hrs and 22.12 hrs. 35 Daubenton's bats emerged between 22.36 hrs and 23.11 hrs. The count was stopped at 23.11 hrs as it became too dark and there were pipistrelles returning by then. Since a number of Daubenton's bats had still to exit, we estimated the total of that species at around 50 bats.

There was an interesting little incident as we prepared to pack up, when a tawny owl *Strix aluco* landed next to the hole, obviously looking at the bats. I wondered if it had been successful in catching any. Becoming aware of our presence it disappeared silently.

The bats dispersed on the 13th/14th July 1997.

Roost B

This roost lies approximately 400m northeast of Roost A. It is in a great spotted woodpecker *Dendrocopos major* nest hole. There is a hollow extending up from the nest cavity, which is situated 5m up in a dead oak tree. It was discovered on the 21st of June 1995 by Ian Whalley of Clyde Bat Group. He had visited the tree on a number of occasions in the weeks prior to this to watch the woodpeckers, which had raised a brood that year. He had noticed a wet stain below the hole and lots of flies around the entrance. The bats were quite audible and on the following day this was confirmed as a Daubenton's bat nursery roost with 30 adults. The colony dispersed on about the 29th of June.

In 1996 no bat activity was recorded until the 6th of August. Two bats were caught on the 10th of August, one was an adult female and the other a juvenile male. There were around 20 bats present at that time, but the roost was empty on the 14th of August.

The roost was being used on the 14th of June 1997 and although no bats were visible, they could be heard in the hollow above the nest hole. A tit *Parus sp.* had nested in the base of the hole, but the part grown youngsters were dead and covered in bat droppings. There was quite a stench coming from inside! The roost was empty on the 28th of June.

Roost C

The last of the three roosts lies 150m west of Roost A, and is again in a great spotted woodpecker hole, 10m high in an ash tree *Fraxinus excelsior*. The tree is living but the hole is in dead wood where a limb was removed. It was found by myself and Ian Tanner on the 15th of June 1995. We were checking trees with a bat detector while waiting to begin a count at Roost A, when we picked up bat social noises. We watched several bats emerge and these had the characteristics of pipistrelles, but this was never confirmed owing to the inaccessibility of the roost. No count was carried out at the time, as bats had started to emerge and we had to leave to carry out the count at Roost A. This roost was not used in 1996 or 1997, possibly because ivy had grown over the hole. Clyde Bat Group plan to rectify this in the near future.

In conclusion

This is an important site and there is much to be learned from it. Firstly the Clyde Bat Group must set up a proper monitoring scheme, recording more accurately patterns of use, then we may be able to answer these questions. Are the pipistrelles in Roost A the same bats as those which were in Roost C? Is there a connection between the bats in Roost A and those in Roost B? Why do the occupation times vary from year to year?

	1994	1995	1996	1997
ROOST A	Unidentified 50 (estimate) - 8 July 8 July - 22 July	<i>Myotis nattereri</i> 75 (count) - 13 June 10 June - 21 June	No bats recorded	<i>Myotis daubentonii</i> 50 (est/count) - 2 July <i>P. pipistrellus</i> 36 (count) - 2 July 14 June - 14 July
ROOST B		<i>M. daubentonii</i> 30 (est/count) 21 June - 29 June	<i>M. daubentonii</i> 20 (estimate) 6 August - 14 August	Unidentified 14 June - 28 June
ROOST C		<i>P. pipistrellus</i> 25 (est) - 13 June	No bats recorded	No bats recorded

Table 1. Summary of the information on the tree roosts.

Bats in Trust turrets

Gill Hinchcliffe

In July 1995, during a brief escape from my previous existence as a batworker in County Durham, I helped to run a session on bat detector surveys as part of a mammal training workshop for the National Trust for Scotland's Ranger Service. It was based at the Trust's Threave Gardens in Dumfries and Galloway. One of the highlights was convincing those involved that lying on the damp lawns gazing skyward at 4am was a worthwhile activity. Having persuaded them to do this, 45 pipistrelles *Pipistrellus pipistrellus* were watched returning to their roost in one of Threave House's conical-roofed turrets.

The start of major renovation work planned for the building was already scheduled for that autumn under the guidance of local SNH staff and the aptly named regional building surveyor for the Trust - a Mr Philip Schreiber. The work was not completed until August 1996, meaning that the bats had to find an alternative roost for that summer. During the mammal workshop a second, smaller roost of 9 or 10 pipistrelles had been located in a similar turret forming part of the garden's stable-block, used for staff accommodation. At both sites bats were roosting behind the second or third layer of "fish-scale" slates.

Just as 1996 was a year of "change of address" for the Threave House bats, so it was for myself. I moved north due to my partner taking up the ranger post at Threave Garden and Estate and, a desire of many batworkers, into a cottage with its own bat roost - directly beneath the turret of the stable block!

The slates on the main house turret had been replaced and, being hand-made, appeared irregular enough to allow bat access. However the main group of pipistrelles have not returned to them this summer (July 1997) but have instead joined their neighbours in the stable block. This has made my batwatching even more fun but causes some concern as this building is due for major work next year. Negotiations are already underway with the current building surveyor to ensure continued bat access by putting back the original slates wherever possible, investigating the use of adhesive-free roof lining felt and creating additional roosting opportunities elsewhere in the building.

I would welcome comments from anyone who has had experience of maintaining roosts in turrets and look forward to reporting back in future issues of *Scottish Bats*.



Fig. 1. The turret roost

The design and construction of bat boxes in houses

J Stewart Pritchard

When Scottish Natural Heritage (SNH) is called upon to give advice to roost owners on proposed activities that may affect bats or a bat roost, as required under the Wildlife and Countryside Act 1981 or the Conservation (Natural Habitats, etc.) Regulations 1994, the advice has generally fallen into one of two categories: either keep the bats or exclude them. Often, roost owners would like to keep their bats, or would at least be willing to tolerate their seasonal presence, but because of concerns over smell, droppings or noise they feel compelled to exclude them.

In recognition of the need to improve the range of options for this significant group of would-be bat supporters, SNH commissioned Simpson and Brown Architects, Edinburgh to work on some possible solutions. Specifically, the architects were asked to produce designs for the construction of bat boxes within the roofs of existing Scottish houses. These designs were to cater for the needs of (1) the bats, for roosting (2) the house owners, for removing concerns over the bats, periodic cleaning and maintenance and (3) the building itself, for ventilation, weatherproofing and other building control requirements. The designs were required to be supported by clear guidance for professional building tradesmen and experienced DIY.

The project resulted in the publication by SNH, in 1996, of *The design and construction of Bat Boxes in Houses. A guide to the installation of roost boxes for bats in existing Scottish houses*. This 32 page, A4 book provides details of designs for use along the ridges and eaves of roofs with variations for traditional and modern constructions and for use in coom spaces. There is a section on forming weather tight access holes through a ridge or, should it be necessary, through a gable wall. Importantly, the reader's attention is drawn to situations where a bat box is not recommended. With the great breadth of local building styles, not every situation is addressed. The book should however provide a good briefing for the professional tradesman or experienced DIY to tackle other situations.

It is recognised in the book that the designs are the result of limited trials and the gathering of often anecdotal information and should be considered as largely experimental. Given these caveats, interest has been considerable and over 400 copies have been distributed, some to exotic addresses in South America and Australia.

The number of boxes known to have been installed as a result of the publication is low. A prototype box was built into SNH's building at Battleby and others are known to have been installed in houses in Perthshire, Ayrshire and Renfrewshire.

If you know of any bat boxes installed in buildings, or of other designs, I would be very pleased to receive details of these from you. Single copies of *Bat Boxes in Houses* are available free of charge from Scottish Natural Heritage, Publications Section, Battleby, Redgorton, Perth PH1 3EW.

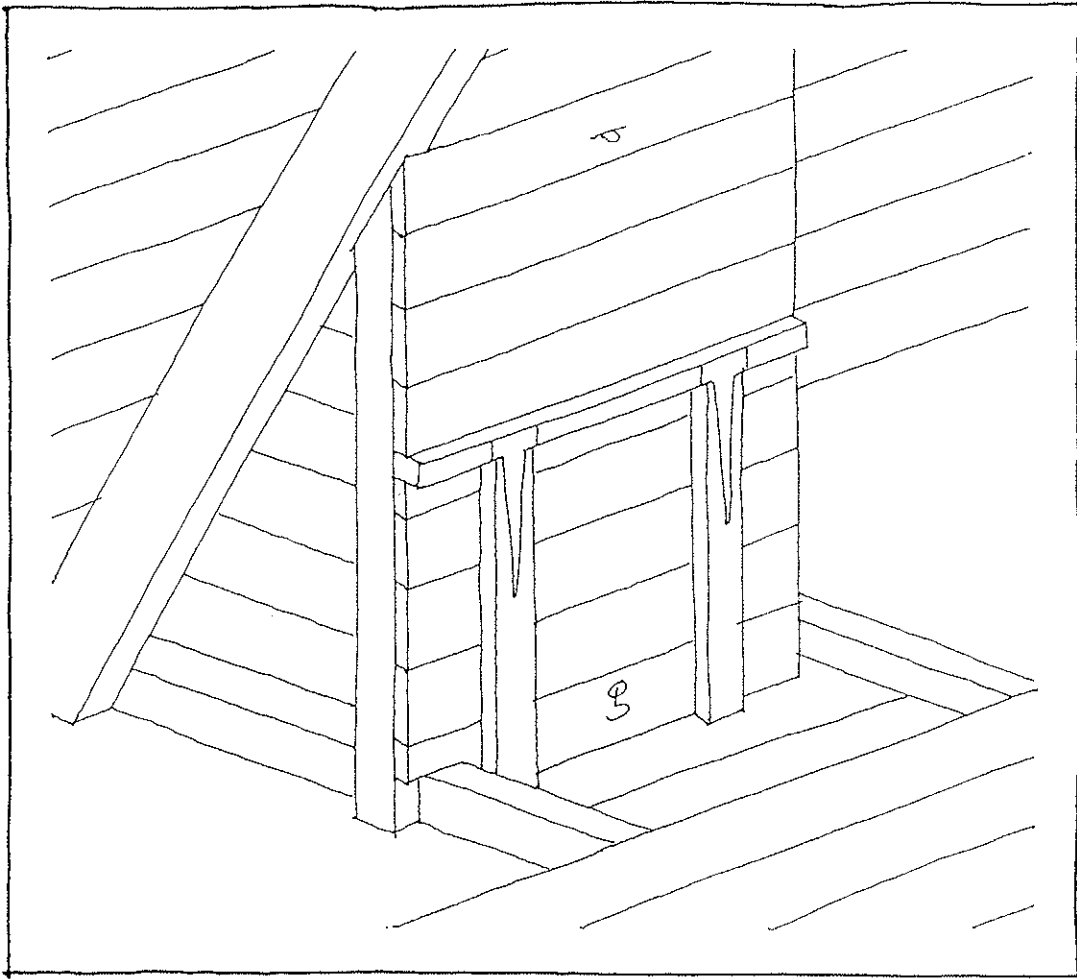


Fig. 1. Completed eaves bat box

An unusual bat enquiry

Anne Youngman

On 22nd October 1996 I received a telephone call from Anne Mackay, a home help in a local village. She had visited an old lady, Mrs Duff, earlier that morning. When she arrived she found Mrs Duff very upset and sure that she had been attacked by a bat during the night. To my shame my first question was "Could Mrs Duff have dreamt it?" Mrs Duff had bite marks on her face and was sure the creature had been a bat because it was flying. After biting her it flew onto the curtains, ran up them and disappeared.

Mrs Mackay (the home help) had searched the bedroom thoroughly but couldn't find anything. Poor Mrs Duff was still too terrified to go back into her bedroom. I arranged to call at the house at 2.00pm that afternoon.

I then promptly rang BCT for advice! The advice was that if a bat has bitten someone and punctured the skin then a rabies injection was recommended. I really did not fancy giving Mrs Duff that piece of news! However BCT suggested it was possible that Mrs Duff might have been bitten by a flying beetle. Bat bites show up as two "pin-prick" marks about 2mm apart. Some large beetles have a similar bite mark.

At 2.00pm I arrived at Mrs Duff's house, armed with a box of chocolates, bunch of flowers and a dead bat. The idea of taking the bat along was that if I thought I could show it to Mrs Duff without the risk of a fatal heart attack she might be able to say if it resembled her attacker. Mrs Duff's doctor had already called and given her some penicillin.

I was quite taken aback when I saw Mrs Duff. She had a grazed patch about 1cm in diameter on her scalp. The skin was bruised and had small specks of dried blood on it. There were no clear sets of teeth marks at this point but rather lots of little marks all over. Above her right eyebrow there were two sets of puncture marks and above her left eyebrow a single pair of punctures. The puncture marks looked like dashes (- -) rather than pin pricks (. .). I did not measure the marks with a ruler, as I did not want to alarm Mrs Duff, but I estimated that they were about 5mm apart.

We looked at the jaw of the dead bat and agreed that it looked too narrow for the marks on Mrs Duff's face. (Incidentally she did not have heart failure at the sight of the bat.) She did think that the size of the bat looked about right for the size of the "thing" that ran up the curtains.

Anne Mackay and I thoroughly checked every nook, cranny, drawer, curtain and bedsheet in the bedroom. There were no open windows, no cracks between walls and the ceiling, no gaps around pipes, no gaps anywhere that a bat might have squeezed through. We found no bats, no beetles and no bat droppings. We did find five or six small mouse droppings on the window sill.

What caused the "bites" on Mrs Duff's face and scalp remains a mystery. Mouse droppings were found, but it seems unlikely that a mouse would repeatedly bite someone.

I rang the next day to find out how Mrs Duff was. She had not slept well, but apart from her feelings of anxiety she did not seem to be suffering any further ill-effects.

Has anyone else encountered a similar incident?

Recorded distribution of bats in Scotland

Jeremy S Herman and John F Haddow

These distribution maps show the presence of eight resident species 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 3 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 identified roosts or from live or dead specimens "in the hand". Additional records have been accepted in the following circumstances:

- a. 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.
- b. Natterer's bat *Myotis nattereri* records were accepted when these were identified in flight by certain experts using more sophisticated ultrasonic detectors.

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/visual records of bats of the genus *Nyctalus* have generally been classified as noctule/Leisler's bat, for which category a map has been included.

No attempt has been made to distinguish between records of the two species which have until recently been considered as the common pipistrelle *Pipistrellus pipistrellus* (see *Bat News* 46, July 1997). It should also be borne in mind that some records of this species may even have been based on examples of Nathusius' pipistrelle *P. nathusii*. From our own experience pipistrelles found in Scotland, certainly the central belt, are predominantly the brown faced type, phenotype 55 kHz.

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

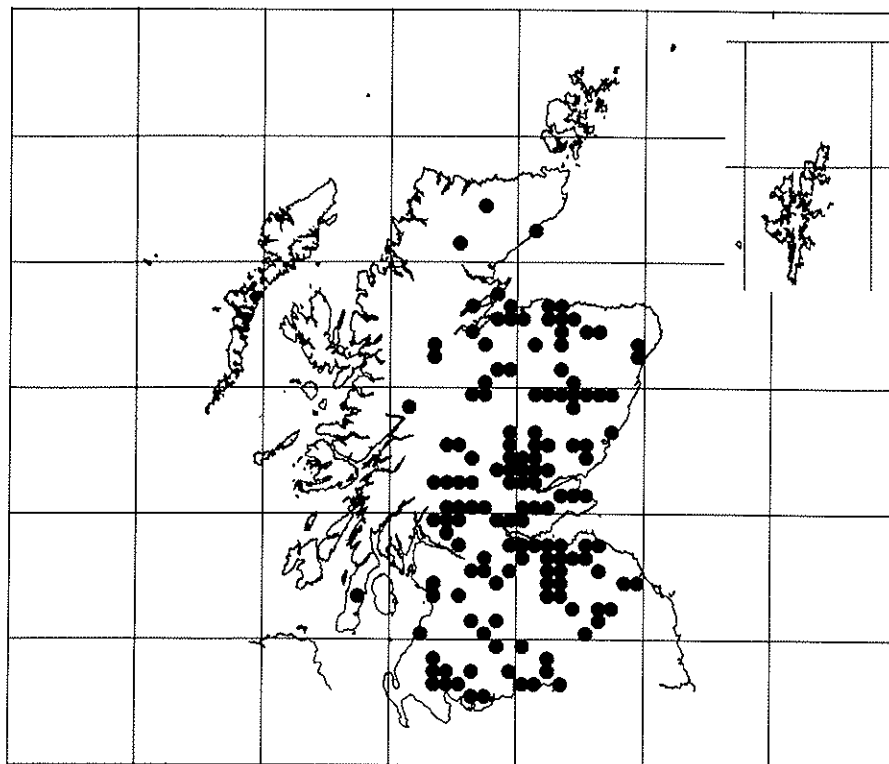
The full list of vagrant species recorded in Scotland is as follows. Note that noctule, Leisler's bat and Nathusius' pipistrelle are included in view of the likely origin of some of the records of these species. However in the case of Nathusius' pipistrelle there remains a reasonable case to interpret 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.

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*

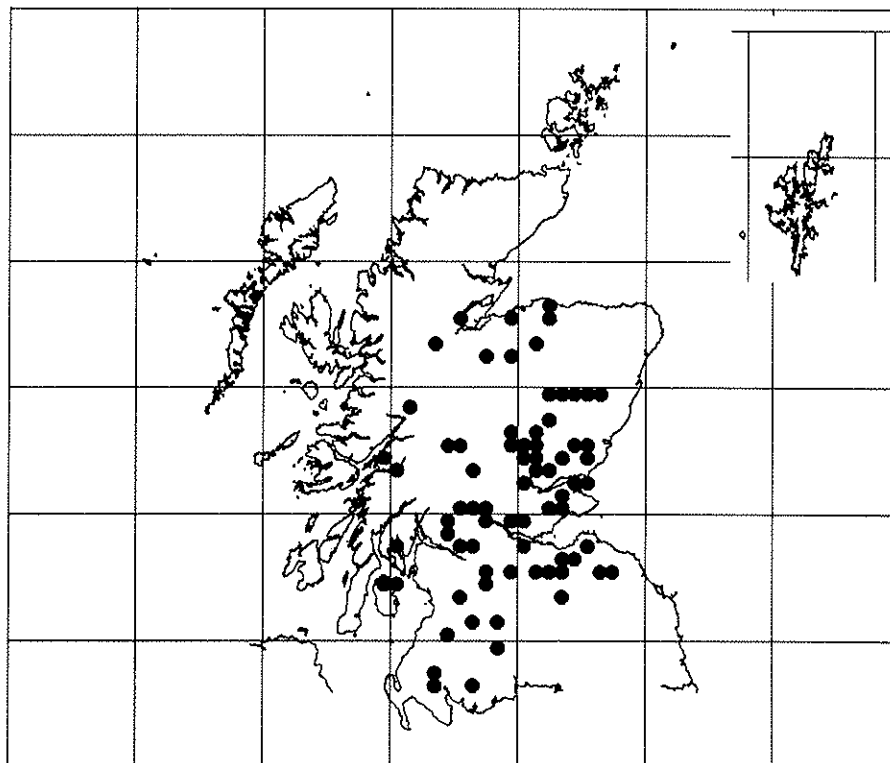
In addition the following bats have been recorded on offshore oil or gas installations.

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

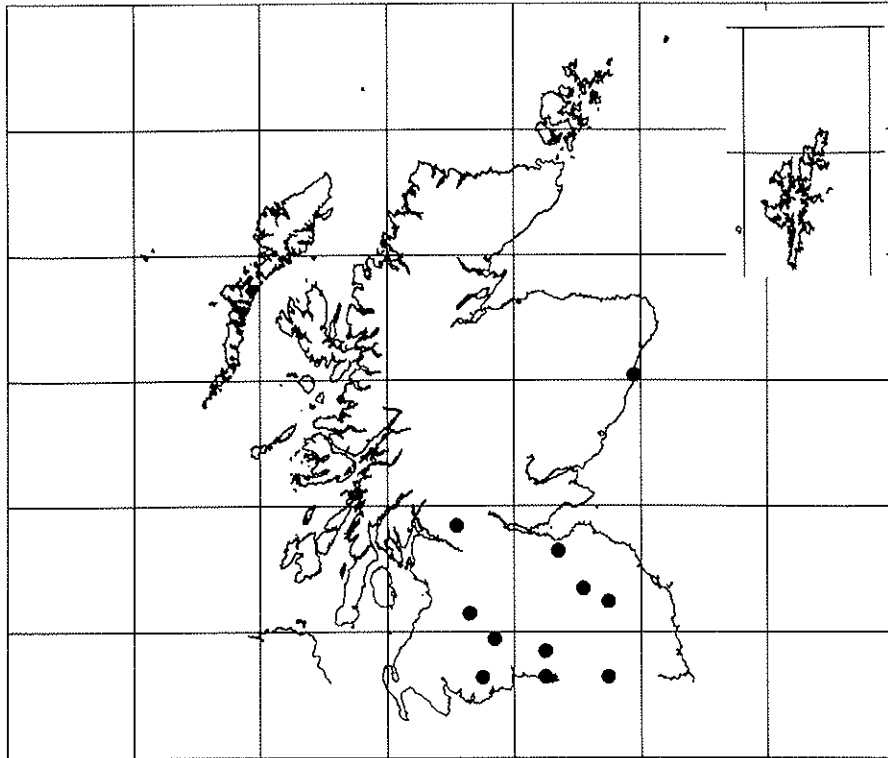
Daubenton's bat
Myotis daubentonii



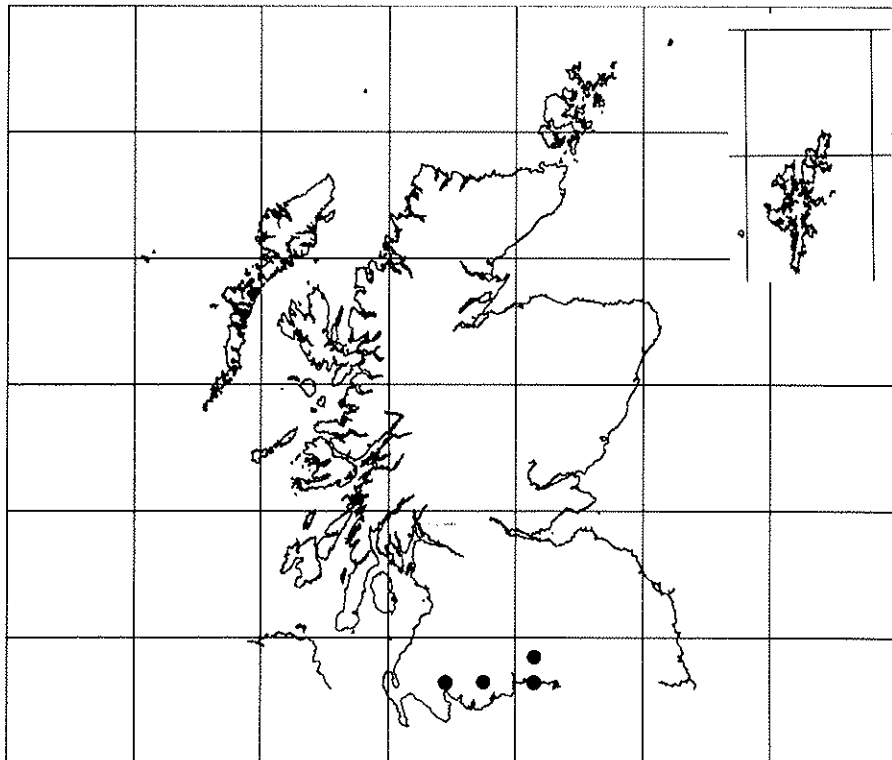
Natterer's bat
Myotis nattereri



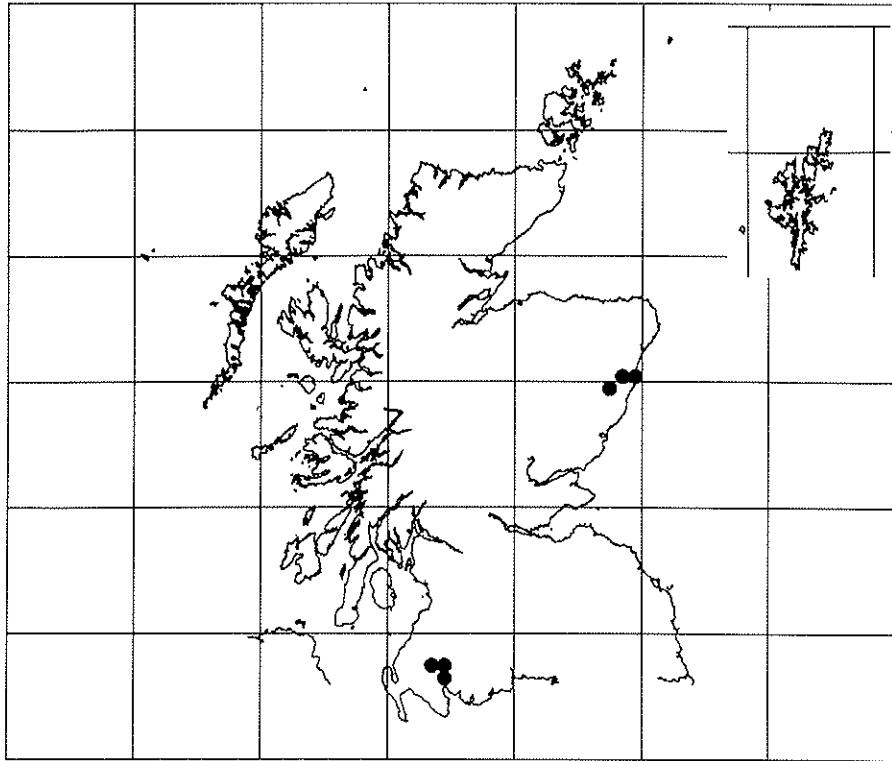
Whiskered bat
Myotis mystacinus



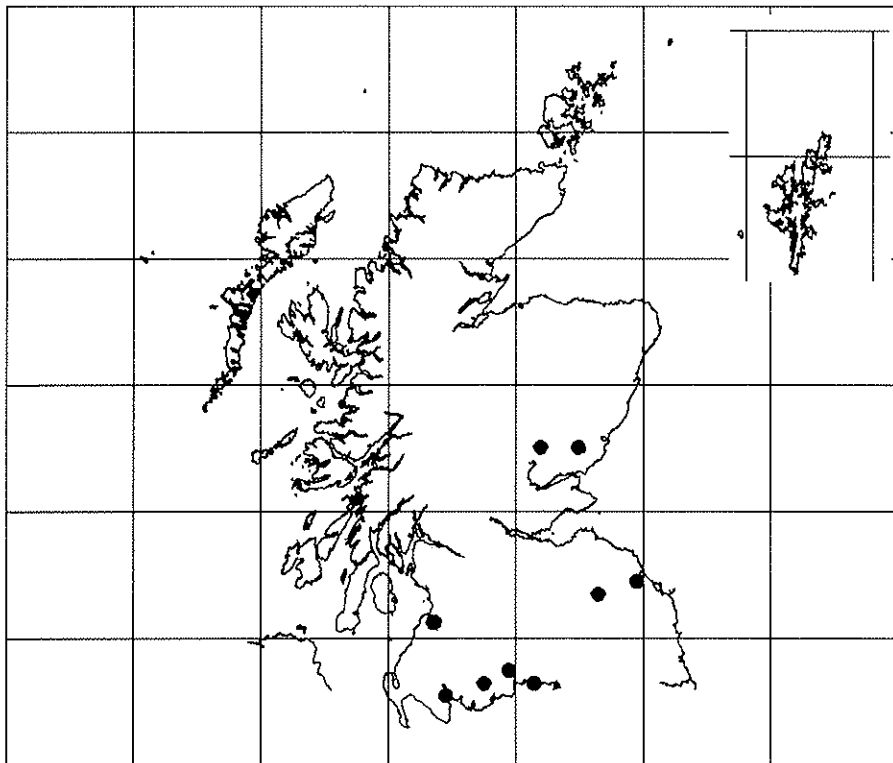
Noctule
Nyctalus noctula



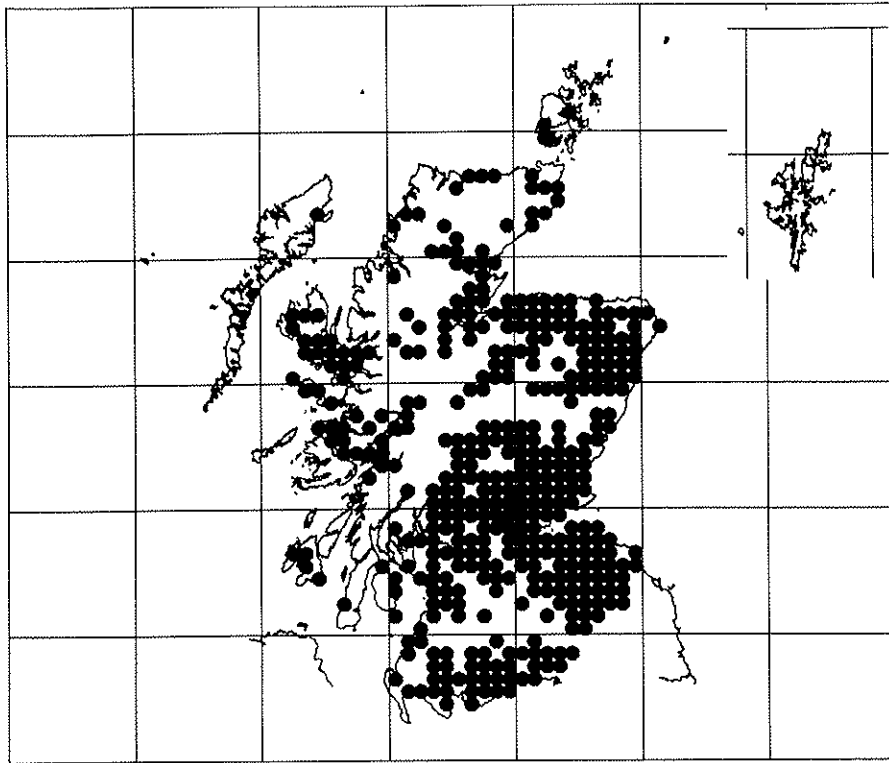
Leisler's bat
Nyctalus leisleri



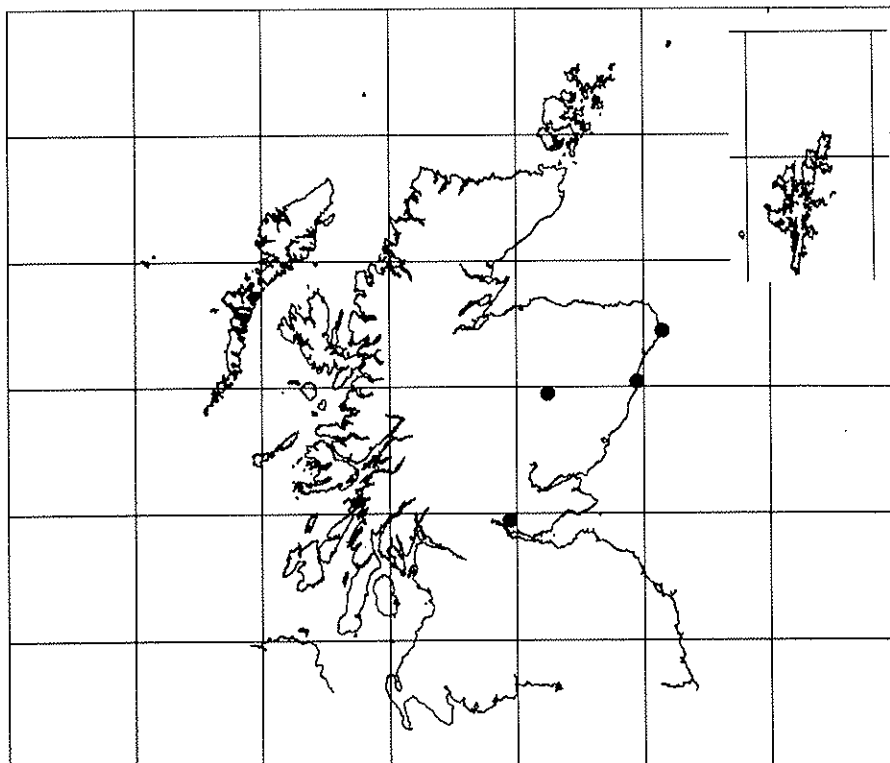
Noctule/Leisler's bat



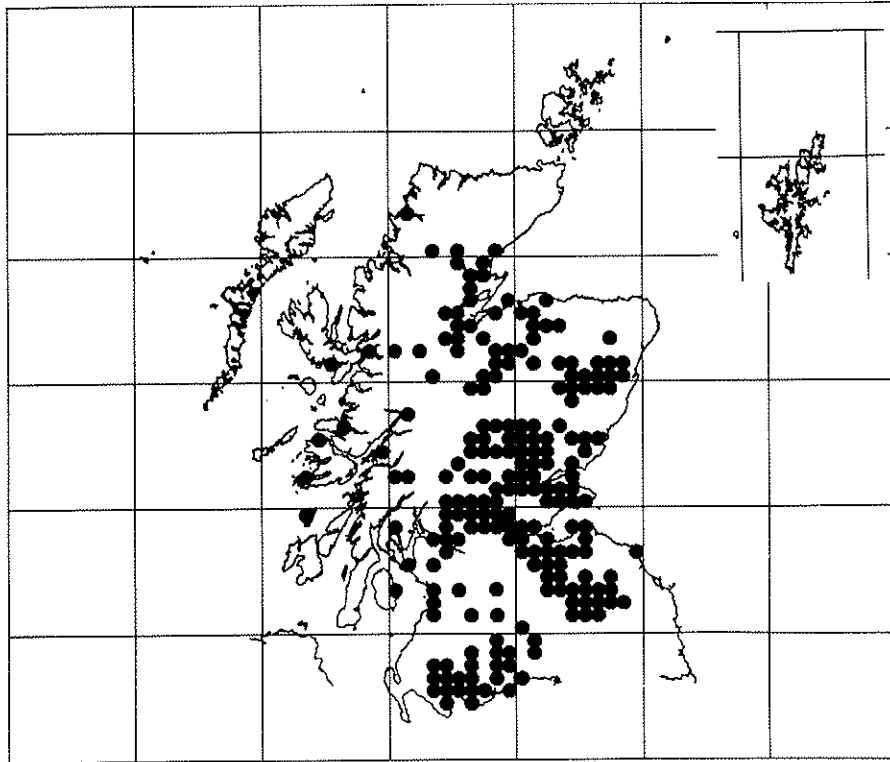
Common pipistrelle
Pipistrellus pipistrellus



Nathusius' pipistrelle
Pipistrellus nathusii



Brown long-eared bat
Plecotus auritus



Scottish bat group addresses (arranged geographically from north to south)

Orkney	Chris Booth Ronas, 34 High Street, Kirkwall, Orkney. Tel. 01856 872883
Sutherland and Caithness	Scottish Natural Heritage Old Bank Street, Golspie, Sutherland KW10 6TG. Tel. 01408 633602
Inverness	Ann Youngman Scottish Natural Heritage, Foddarty Way, Dingwall Business Park, Dingwall, Ross-shire IV15 9AF. Tel. 01349 65333, or (h) Ardival, Raddery, Fortrose, Ross-shire IV10 8SN. Tel. 01381 621233
Skye	Grace Yoxon Skye Environmental Centre, Broadford, Isle of Skye IV49 9AQ. Tel. 01471 822487
Moray	Denice & David Law 27 Drumbeg Crescent, Llanbryde, Elgin, Morayshire IV30 3JS. Tel. 01343 842007
Aberdeen	Isobel Davidson Department of Zoology, University of Aberdeen, Tillydrone Avenue, Aberdeen AB9 2TN. Tel. 01224 272858
Strathspey	Malcolm Currie Scottish Natural Heritage, Achantoul, Aviemore, Inverness-shire PH22 1QD. Tel. 01479 810477
Angus	Richard Brinklow Dundee Museum, Barrack Street, Dundee DD1 1PG. Tel. 01382 23141
Perth	Mark Simmons Museum & Art Gallery, George Street, Perth PH1 5LB. Tel. 01738 32488
Central Scotland	John Haddow 27 Balmoral Court, Dunblane FK15 9HQ. Tel. 01786 823390
Fife	Fife Council Ranger Service Craigtoun Country Park, St Andrews, Fife KY16 8NX. Tel. 01334 472151
Clyde	Charlie Howe 36 Kenmar Road, Hamilton ML3 0JJ. Tel. 01698 458086
Lothians	Dr Stuart Smith 125 Howdenhall Drive, Edinburgh EH16 6UX. Tel. 0131 467 1138
Borders	Andrew Panter Scottish Natural Heritage, Anderson's Chambers, Market Street, Galashiels, Selkirkshire TD1 3AF. Tel. 01896 756652
Ayrshire	Robert Potter Scottish Wildlife Trust, 2 Callander Road, Heathfield, Ayrshire KA8 9AF. Tel. 01292 610529
Dumfries	Stuart Spray c/o Wildfowl and Wetlands Trust, Eastpark Farm, Caerlaverock, Dumfries DG1 4RS. Tel. 01387 770200
Galloway	Dr Peter Hopkins Barbuchany, Newton Stewart, Wigtownshire DG8 6QE. Tel. 01671 403870

Bats in Scottish Castles

John F. Haddow

Background

The **Bats in Scottish Castles** project developed from discussions which took place at the quarterly meetings of representatives from the bat groups in the "South East Scotland Region" - Angus, Borders, Central Scotland, Fife, Lothians, Perth. The aim was to find a project which would serve a number of purposes: it had to be of value to bat conservation; it should provide bat groups with easily accessible and interesting activities - for novice and experienced members alike; it should appeal to the public, so gaining publicity for bat conservation. It was decided that a survey of bats in castles in Scotland would meet these criteria.

The high profile "national" project south of the border at the time was the "Bats in Churches Project". It was recognised that there was very little use of churches by bats in Scotland, so extending the surveys of churches northwards would not be valuable. However, Scotland is famous for its castles, many with long exciting histories and in dramatic scenic settings. Castles are used as roosts by bats, both in winter and in the warmer months, but our knowledge of their use has been very patchy. Some castles have been well studied and documented, but there were many which had not been surveyed for bats.

There are obvious conservation problems regarding castles. Firstly there are possible conflicts between conservation of the buildings and conservation of bats roosting in them. Bats do not make nests, they use buildings as roosts without altering the structure in any way. Their requirements vary with the species of bat (there are at least seven kinds in Scotland), with their status (e.g. nursing mothers, males, juveniles) and with the season. In general, however they require a means of access - an entrance hole, which can be tiny - and somewhere safe to roost. These may be present in the building as part of the normal construction, or may be the result of age or weathering - gaps in wood as a result of warping, spaces where old mortar has fallen out. All buildings require maintenance, in the course of which roost entrances or spaces may be blocked. There may be a perceived incompatibility between the upkeep or renovation of a building and allowances for roosting bats. This is true for any building, but when the building is an ancient and historic structure, priorities have to be considered carefully, and in a different way from a more ordinary house.

Organisation

Once the idea for the project was agreed, these general aims were put forward:

The Bats in Scottish Castles project aimed to:

1. gather useful information on the use of castles as bat roosts
2. gain publicity for bats and bat conservation
3. help provide conservation advice for castle owners and managers
4. give volunteer bat workers a valuable project to work on
5. stimulate other bat group activities based on the project publicity

What follows is a description of the methods involved in setting up and carrying out the survey, and an analysis of the results of the survey, with some indication of how bat conservation can be further advanced. A fuller report on the survey is produced and distributed separately.

The project was to be organised by representatives of the South East Scotland bat groups, with myself as the coordinator. While run entirely from Scotland, it was given the backing of the Bat Conservation Trust. It is worth giving an explanation here about the relationship between voluntary batworkers and the BCT. The formal UK organisation devoted solely to bat conservation is the Bat Conservation Trust. It is a charitable trust with a current membership of over 3,000. There are around 80 separate bat groups in the UK, and 18 in Scotland. Bat groups are the local organisations for voluntary bat conservation, and are independent, though obviously linked with the BCT. Many

bat groups are affiliated members of the BCT. Bat groups also have close links to the statutory countryside organisations - in Scotland it is Scottish Natural Heritage. Individual batworkers may act as advisers or consultants to SNH, but this is normally in a voluntary capacity. Bat groups in the UK also organise themselves into committees for liaison with each other and with the BCT, hence the South East Scotland Bat Groups committee. Unlike individual groups, however, this committee has no formal constitution.

With this background, it was proposed to offer the project to all the Scottish bat groups, a mixed assemblage with between 5 and 50 members each. In order to assist the surveyors, as well as funding the paperwork involved in the project, a grant was obtained from the Scottish Office Environment Department through its Environmental Grants Scheme. This grant was for 50% of the estimated costs of publicity leaflets/posters, recording forms, envelopes, stationery, postage, data collection (travel) and printing a report at the end.

For the project to work successfully it depended on the efforts of as many of the Scottish bat groups as possible. It was thought that a realistic aim was for every group to survey 10 castles within their area, and with 18 group areas this gave a total of 180 roosts. This then was the target number of castles - approximately 10% of the total number in Scotland. All the Scottish groups were invited to take part in the survey and the project was launched at a seminar for bat groups in May 1995.



Fig. 1. Falkland Palace, Fife (Keith Cohen)

The survey procedure

Bat groups were asked to follow these stages in their survey

1. Find 10 suitable castles
2. Contact the local SNH office and explain what will be done locally
3. Identify the owners/managers/custodians of these castles
4. Make contact with the correct person for each castle
5. Send a list of castles with basic details to the project coordinator
6. Publicise the project locally
7. Carry out summer surveys
8. Provide a report of the findings to the castle contact

9. Send the summer reports to project coordinator
10. Arrange and carry out winter surveys
11. Provide reports for castle contacts + SNH and collated reports to the coordinator

This was the guide given to bat groups:

Stage 1 Find 10 suitable castles

What is a castle? The dictionary defines it as a "fortified building". For this survey find buildings that are obviously castles, not large mansion houses. To provide a range of roost sites the castle should be substantially intact. Ruins will have more limited roost sites - they are likely to have crevices occupied by bats at some time, but surveying these is likely to be time consuming, largely fruitless, and dangerous. So castles with roofs should be the first choice, and the more decayed structures only considered if there is time and expertise available. A list of some castles has been provided from national databases, but use maps, SNH office files, local knowledge and initiative to select your sample.

Stage 2 Contact the local SNH office and explain what will be done locally

We must of course remember the Wildlife and Countryside Act while organising the survey, so it is important to have good contacts with local SNH officers to ensure that they know the survey is being done within the law. It will be important to make best use of members licensed to disturb bats under the Act. Provided there is at least one person with a licence a small group can legally do the survey - the licence holder will have the responsibility. It will be important to stress that any advice which may affect bats must be given by SNH, so work in the normal way for any roost visit - provide SNH with a copy of the report and suggest any recommendations to be given.

Stage 3 Identify the owners/managers/custodians of these castles

Who to contact? It is clearly important that you contact the best person. If the castle is privately owned, it is the owner or estate manager. If the castle is in the hands of Historic Scotland, first contact the custodian and find out who is the area manager. The director, Properties in Care section of HS has been approached about the survey, and is reasonably happy to have their castles included but they have a recent consultancy report on management of wildlife in all their properties, so to a certain extent it is felt this is duplication. Emphasise that the survey is a comprehensive national one and it is important that all types of castles be included, and any data already gathered will be valuable in this survey.

Castles in the hands of the National Trust for Scotland should be treated in the same way - contact the custodians as well as area factors and remember that they may already have had surveys done. Bear in mind that people are often reluctant to make extra work for themselves so emphasise the benefits of the survey and emphasise that minimal disturbance will be involved.

Stage 4 Make contact with the correct person for each castle

Initial contact with the owner/ custodian/ area manager should be in writing, but you will probably also want to speak to them in person or by phone. Include a leaflet, and emphasise that the survey will be done by trained persons and will be as non-intrusive as possible - i.e. butter them up! You will probably encounter the range of responses from welcoming to uninterested to suspicious. Don't be put off! Assure them that you will provide a written report (a copy of the survey form), though it is also important to speak to them if possible. Copies of the overall report will be available at the end of the project on request and if anyone requests a copy, make a note of that on the report form.

Stage 5 Send list of castles with basic details to the project coordinator

Once the group has selected its castles and obtained contact details, complete the *bat group castle list* form and send to the project coordinator. If the list is modified during the survey, that is not a problem. A list of the intended sample is what is needed initially. Once the local publicity starts it will be important for the coordinator to know which castles are to be included in the survey.

Stage 6 Publicise the project locally

Send copies of the *Bats in Scottish Castles* leaflet to your local wildlife/countryside contacts. Contact local newspapers (a copy of BCT press release guidelines plus a copy of a national news release is supplied - it can be adapted). Put up the poster in suitable places (some of the leaflets have been supplied unfolded for that purpose). Provide copies of the leaflet. Organise bat/castle events. Bat walks in castle grounds; castles and bats art competitions, poem competitions; find the spookiest castle? Remember that you must put your *local* contact address/number on all the leaflets you distribute. Send copies of press cuttings to the project coordinator.

Stage 7 Carry out summer surveys

Arrange to do a daytime survey of the building during the summer months. Based on the results of that exercise, follow up with a dusk watch/ bat count. Record the information by completing the summer survey form as fully as possible. If the "castle" comprises more than one building use a separate form for each building (you may decide to concentrate on the main castle building and not survey the rest - if so, make this clear). If the initial survey is done in the early evening the dusk emergence watch can be done later in the same visit, but this will depend on access to the interior being possible outside normal working hours. Particularly in the case of HS and NTS properties this may not be possible.

Obtain a plan of the castle to attach to the survey form. Castles open to the public normally have a guide book, usually including a plan. This will save time and energy in drawing your own plans! Who does the survey? Clearly to get the most out of it, the surveyors should have experience of surveying buildings for bats. This means the survey "team" should include a licensed bat worker if possible. If bats are to be disturbed for the purpose of identification this will be a requirement. Otherwise much of the survey can be carried out by unlicensed (preferably experienced) bat workers.

Stage 8 Provide a report of the findings to the castle contact

Provide the owner/ manager with a copy of the survey form. If the survey (including conversation with the owner/manager) reveals problems or plans to alter the building or "disturb" the bats in the terms of the Wildlife and Countryside Act, immediately provide your local SNH office with a copy of the report form, together with any recommendations. Otherwise send copies of the summer reports to SNH once they are all completed. As with any survey of this type it is important to ensure that any advice in connection with disturbance to bats be given by the statutory body (SNH), and it is made clear to the owner/ manager that the surveyors cannot give direct advice under the W&C Act.

Stage 9 Send the summer reports to project coordinator

Send all summer survey report forms to the project coordinator. All report forms will be valuable, even where the survey is incomplete. Include the forms detailing travel and other costs. Reimbursement will depend on the money available.

Stage 10 Arrange and carry out winter surveys

During the period December to February arrange for a follow-up winter survey of likely hibernation sites within the castles, and complete the winter survey forms. Again provide the owners/managers and SNH with copies.

Stage 11 Provide reports for castle contacts and SNH and send collated reports to the coordinator

Again provide the owners/managers and SNH with copies. Send the set of completed forms to the project coordinator.

The Survey Information

A standard set of information was sought for the castles surveyed, and forms were provided to enable this. The categories of information were as follows.

A. RECORDER INFORMATION: bat group name, name of recorder, address of recorder, phone number, date(s) of visit(s)

B. CASTLE INFORMATION: 1. Location (name of castle, address, grid reference). 2. Contacts (name, address, phone number of contact for castle - owner/manager/etc). 3. Building details (age, wall construction material, roofing materials (or if roof absent), recent treatment against "pests" - timber treatment, stone treated with algicide/fungicide, underground or basement features, present status of castle (private accommodation/ open to public/institution)

C. CASTLE SURROUNDINGS

Was the castle located in countryside (fewer than 50 houses within 1km), small village (pop. less than 1,000), village/country town (pop. 1,000 or over, less than 5,000), town or city? Was the castle situated in an estate? Was there freshwater habitat within 1km of castle?

D. EVIDENCE OF BATS: Type of evidence and species present in the castle (species name, identification method - droppings, moth wings, dead bat, live bat, bat detector - plus an indication of how confident the identifier was.

E. LOCATION OF EVIDENCE: 1. Roosting: a brief description of the roosting evidence (type of roost, position(s) of roosting bats) and positions of evidence, to be marked on a plan of the castle. 2. Access: If bat access points were known, a brief description, including height above ground. 3. Plan: A simple plan of the castle layout indicating evidence of bats. Also to be shown was the direction and distance of any freshwater features within 1km, plus sketches of roost and access positions where appropriate.

For the winter surveys, in addition to these standard details, a more detailed description of roost sites was sought, plus some indication of temperatures close to roost sites.

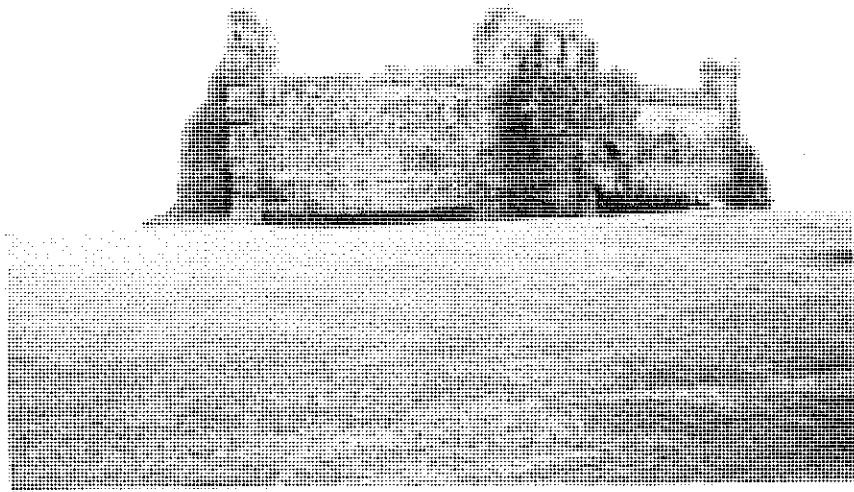


Fig.2. Tantallon Castle, East Lothian (Stuart Smith)

Castles survey results

At the start of the survey period a total of 97 castles were selected by bat groups within their areas. In actuality, a number of these were not surveyed, for a variety of practical reasons. Survey reports were submitted for 74 castles for the summer period, and of these, only 27 were surveyed again in the winter (36% of those surveyed). The summer surveys identified whether there were likely to be suitable hibernation sites for bats within the castle structure, hence only a proportion of the total were revisited in winter.

The survey results are summarised below.

1. The full list of castles for the survey

castle	bat group	surveyed
Aberdour Castle, Aberdour NT193854	Fife	no
Airlie Castle, Kirriemuir NO293523	Angus	yes
Airth Castle Hotel, Airth NS899869	Central Scotland	yes
Airthrey Castle, Bridge of Allan NS812967	Central Scotland	no
Alloa Tower, Alloa NS886925	Central Scotland	yes
Ardblair Castle, Blairgowrie NO164445	Perth	no
Ashintully Castle, Kirkmichael NO101613	Perth	yes
Balgonie Castle, Markinch NO313007	Fife	yes
Bishop's Palace, Kirkwall HY460110	Orkney	yes
Blackhouse Tower, Yarrow NT281273	Borders	yes
Blackness Castle, Bo'ness NT057803	Lothians	yes
Blair Castle, Blair Atholl NN865663	Perth	yes
Borthwick Castle, N. Middleton NT369597	Lothians	yes
Braemar Castle, Braemar NO156924	Aberdeen	yes
Broughty Castle, Dundee NO465304	Angus	no
Buckholm Tower, Galashiels NT482379	Borders	yes
Caerlaverock Castle, Dumfries NY025656	Dumfries	yes
Cardoness Castle, Gatehouse of Fleet NX590552	Dumfries	yes
Carsluith Castle, Wigtonshire NX494541	Dumfries	yes
Castle Campbell, Dollar NS961993	Central Scotland	yes
Castle Leod, Strathpeffer NH486593	Inverness	yes
Clackmannan Tower NS906919	Central Scotland	no
Comlongon Castle, Dumfries NY079689	Dumfries	yes
Craigend Castle, Mugdock NS550772	Central Scotland	no
Craighall Castle, Blairgowrie NO175480	Perth	no
Craigmillar Castle, Edinburgh NT287709	Lothians	yes
Crichton Castle, Crichton NT380612	Lothians	yes
Culcreuch Castle, Fintry NS621877	Central Scotland	yes
Culzean Castle, Maybole NS233103	Ayrshire	no
Dean Castle, Country Park NS435297	Ayrshire	yes
Delgaty Castle, Turriff NJ754506	Aberdeen	yes
Dirleton Castle, Dirleton NT515839	Lothians	yes
Doune Castle, Doune NN728011	Central Scotland	yes
Drumlanrig Castle, Thornhill NX852993	Dumfries	yes
Dryhope Tower, Yarrow NT268247	Borders	yes
Dundarg Castle, Rosehearty NJ894649	Aberdeen	yes
Dundonald Castle, Ayrshire NS362355	Ayrshire	yes
Earl's Palace, Birsay, Orkney HY250280	Orkney	yes
Earl's Palace, Kirkwall HY460110	Orkney	yes
Earlshall Castle, Leuchars NO465211	Fife	yes
Edzell, Brechin NO585693	Angus	no
Eglinton Castle, Irvine NS323423	Ayrshire	yes
Elcho Castle, Perth NO165211	Perth	no
Elibank Castle, Borders NT395362	Borders	yes
Fairnilee Tower, Yair NT457331	Borders	no
Falkland Palace, Falkland NO254075	Fife	yes
Finlarig Castle, Killin NN575338	Central Scotland	yes
Fordell Castle, Fife NT147854	Fife	yes
Fulton Tower, Jedburgh NT605158	Borders	yes
Gardyne Castle, Guthrie, Forfar NO574493	Angus	yes

(full list of castles, continued)

castle	bat group	surveyed
Gight Castle, Aberdeenshire NJ393827	Aberdeen	yes
Greenan Castle, Ayrshire NS312202	Ayrshire	yes
Guthrie Castle, Guthrie, Forfar NO564515	Angus	yes
Hailes Castle, East Linton NT574758	Lothians	yes
Hoddum Castle NY156730	Dumfries	yes
Hume Castle NT704413	Borders	no
Huntingtower, Perth NO083252	Perth	no
Huntly Castle, Huntly NJ532408	Aberdeen	yes
Kelburn Castle, Largs NS192648	Ayrshire	no
Kellie Castle, Elie NO520052	Fife	yes
Keltie Castle, Dunning NO007133	Perth	yes
Kilbryde Castle, Dunblane NN756037	Central Scotland	yes
Kildrummy Castle, Strathdon NJ164455	Aberdeen	yes
Kirkhope Tower, Ettrick Bridge NT379250	Borders	yes
Linlithgow Palace NT596850	Lothians	yes
Loch Leven Castle, Kinross NO138017	Perth	yes
Lochmaben Castle, Dumfries NY088811	Dumfries	yes
Lochwood Castle, Annandale NY084967	Dumfries	yes
MacLellan's Castle, Kirkcudbright NX677508	Dumfries	yes
Menstrie Castle, Menstrie NS848966	Central Scotland	no
Morton Castle, Carronbridge NX891992	Dumfries	yes
Mugdock Castle, Mugdock NS550772	Central Scotland	no
Newark Castle, Selkirk NT418296	Borders	yes
Newark Castle, Elie NO518012	Fife	yes
Oakwood Tower, Ettrick NT419259	Borders	yes
Pitligo Castle, Rosehearty NJ938669	Aberdeen	yes
Pitullie Castle, Fraserburgh NJ945670	Aberdeen	yes
Ravenscraig Castle, Fife NT291925	Fife	no
Roslin Castle, Roslin NT275628	Lothians	yes
Rossie Priory, Inchtute NO285308	Perth	yes
Sauchie Tower, Fishcross NS895955	Central Scotland	yes
Scone Palace, Scone NO113266	Perth	no
Scotstarvit Tower NO370113	Fife	no
Slains Castle, Cruden Bay NK102364	Aberdeen	yes
Smailholm Tower NT637346	Borders	no
St. Andrews Castle NO513169	Fife	no
Stirling Castle NS792941	Central Scotland	yes
Tantallon Castle, N. Berwick NT596850	Lothians	yes
Taymouth Castle, Kenmore NN785466	Perth	no
Terpersie Castle, Alford NJ546203	Aberdeen	yes
Threave Castle, Castle Douglas NX739623	Dumfries	yes
Tolquhoun Castle, Udny NJ870280	Aberdeen	yes
Torwoodlee Tower, Galashiels NT466377	Borders	yes
Towie Barclay Castle, Auchterless NJ745439	Aberdeen	yes
Whitefield Castle, Kirkmichael NO089617	Perth	yes
Yester Castle, Gifford NT556667	Lothians	yes

2. Details of results from the castles surveyed

castle	bat group	evidence of bats:		species found*
		summer	winter	
Airlie Castle	Angus	yes		Nln**, Pa, Pp
Airth Castle Hotel	Central Scotland	no		
Alloa Tower	Central Scotland	no	yes	?Pp
Ashintully Castle	Perth	yes		Pa, Pp
Balgonie Castle	Fife	yes	no	Pp
Bishop's Palace, Kirkwall	Orkney	no		
Blackhouse Tower	Borders	no		
Blackness Castle	Lothians	no	no	
Blair Castle	Perth	yes		Pa, Pp
Borthwick Castle	Lothians	yes		Pp
Braemar Castle	Aberdeen	yes		?Pa
Buckholm Tower	Borders	no	no	
Caerlaverock Castle	Dumfries	yes		Md, Pa, Pp
Cardoness Castle	Dumfries	yes		Pa
Carsluith Castle	Dumfries	no		
Castle Campbell	Central Scotland	yes		Pa, Pp
Castle Leod	Inverness	yes	no	Pa, Pp
Comlongon Castle	Dumfries	no		
Craigmillar Castle	Lothians	yes		Pa, Pp
Crichton Castle	Lothians	yes	yes	Mn (summer), Pa, Pp (winter)
Culcreuch Castle	Central Scotland	yes		Pa, Pp
Dean Castle	Ayrshire	no	no	
Delgaty Castle	Aberdeen	no	no	
Dirleton Castle	Lothians	yes	no	?Pa, ?Pp
Doune Castle	Central Scotland	yes	yes	Md, Pa, Pp (Pp winter)
Drumlanrig Castle	Dumfries	no		
Dryhope Tower	Borders	no	no	
Dundarg Castle	Aberdeen	no		
Dundonald Castle	Ayrshire	no		
Earl's Palace, Birsay	Orkney	no		
Earl's Palace, Kirkwall	Orkney	no		
Earlshall Castle	Fife	yes		Pp
Eglinton Castle	Ayrshire	no		
Elibank Castle	Borders	yes	no	Md
Falkland Palace	Fife	no	no	
Finlarig Castle	Central Scotland	yes	yes	Md (summer)
Fordell Castle	Fife	yes		Pa
Fulton Tower	Borders	no		
Gardyne Castle	Angus	yes		Mn
Gight Castle	Aberdeen	yes		?Pa
Greenan Castle	Ayrshire	no	no	
Guthrie Castle	Angus	yes		Mn, Md**, Nln**, Pa, Pp,
Hailes Castle	Lothians	yes	yes	Md, Mn (winter), Pp (winter)
Hoddom Castle	Dumfries	no		
Huntly Castle	Aberdeen	yes	no	Md
Kellie Castle	Fife	yes		Pa
Keltie Castle	Perth	yes		Pp
Kilbryde Castle	Central Scotland	no		
Kildrummy Castle	Aberdeen	no	no	
Kirkhope Tower	Borders	no		
Linlithgow Palace	Lothians	yes	yes	Md, Pa (winter), Pp (winter)
Loch Leven Castle	Perth	yes		Md

(details of castles surveyed, continued)

castle	bat group	evidence of bats:		species found*
		summer	winter	
Lochmaben Castle	Dumfries	no		
Lochwood Castle	Dumfries	no	yes	Md
MacLellan's Castle	Dumfries	no		
Morton Castle	Dumfries	yes		Md
Newark Castle, Selkirk	Borders	yes		?Pa
Newark Castle, Fife	Fife	no	yes	Pp
Oakwood Tower	Borders	yes		?Pp
Pitsligo Castle	Aberdeen	no		
Pitullie Castle	Aberdeen	no		
Roslin Castle	Lothians	yes	yes	Md (winter), ?Pa (summer), Pp (winter)
Rossie Priory	Perth	yes		Mn
Sauchie Tower	Central Scotland	no	yes	?Pp
Slains Castle	Aberdeen	no		
Stirling Castle	Central Scotland	yes		Pp
Tantallon Castle	Lothians	yes	yes	Pp
Terpersie Castle	Aberdeen	no		
Threave Castle	Dumfries	yes		unknown - droppings only
Tolquhoun Castle	Aberdeen	no		
Torwoodlee Tower	Borders	no		
Towie Barclay Castle	Aberdeen	no		
Whitefield Castle	Perth	no		
Yester Castle	Lothians	yes	yes	Md, Pa

*Key to species abbreviations:

Md = Daubenton's bat *Myotis daubentonii*Mn = Natterer's bat *M. nattereri*Nln = Leisler's/ Noctule bat *Nyctalus leisleri*/ *N. noctula*Pa = brown long-eared bat *Plecotus auritus*Pp = common pipistrelle *Pipistrellus pipistrellus*

Note: where presence of bats is recorded for both summer and winter surveys, the species indicated were recorded for both unless indicated - i.e. "(summer)" = summer only

**bats positively identified with bat detector in grounds near castle, but not found roosting in the building

What do the results tell us?

1. Types of castle, types of roost

Of the 74 castles surveyed, 42 showed presence of bats in the combined summer and winter surveys, i.e. 57% of the castles were used by bats for roosting at some time during the year. Most of this use is in the summer period, of the castles surveyed in winter only 12 showed presence of bats - 44% of those surveyed in winter, or 16% of the total sample. The figures are most likely to be an underestimate, since presence of bats is often difficult to establish from only one or two visits, unless there is a substantial roost in one place. The most difficult time to establish presence is during winter, firstly because the bats roost individually or in small groups and are hidden in crevices, and may only give themselves away by their droppings - which may be washed away by rain or blown away by wind in more exposed places. Secondly bats are quite mobile in winter, and may use a roost for a limited period during winter. This does not make the roost of little importance, since bats require a range of temperature regimes and a variety of sites from which to choose a preferred temperature and humidity. Bats do not alter their environment by making a nest, so they are dependant on their external environment - they may move from one cellar to another, or to different positions within a cellar, or just change position within stone crevices - I find that in milder weather

bats are generally near the surface of crevices but when the temperature drops to near freezing they squeeze into the deepest recesses.

Of the 32 castles where no bat evidence was found, 21 (65%) were classed as ruins, compared with only 18 ruins (43%) out of the 42 which *were* bat roosts. This is not surprising, since bats use a variety of types of roost through the year, and an "intact" castle is likely to provide a better variety of roost types. Some of the castles which are substantially intact have ruined parts which extends their range of roost sites further. The "ruin" category means that the roof is all or substantially missing, but many of these castles have intact and fairly weather-proof cellars or in some cases upper floors. Such ruined castles are more likely to form hibernation roosts for bats, the roost type most difficult to establish, and the type that was under-surveyed.

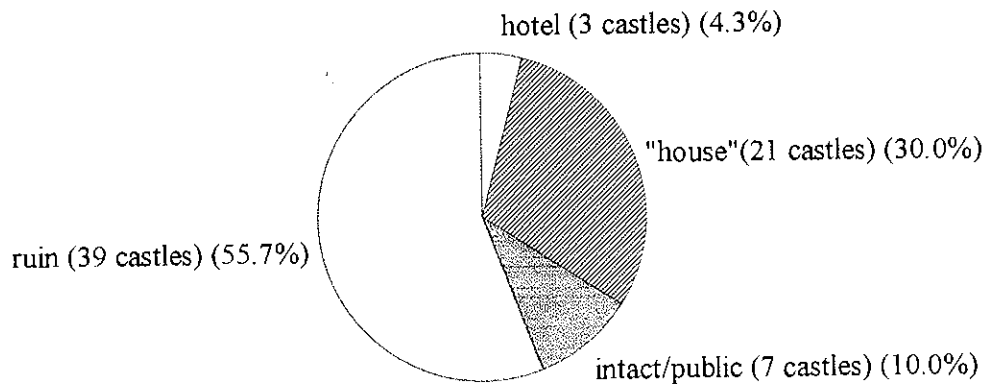


Fig.3. Types of castle surveyed

Figure 3 shows the four broad categories of castles within the survey. The "house" category means that there is a totally or substantially intact building used as a home, though some of these will be open to the public at times. At least 3 within this group have substantial ruins attached to the "house" portion. The "hotel" group is clearly similar, being well maintained country houses, essentially. The "intact/public" category includes buildings open to the public, for example Blackness Castle which is in the care of Historic Scotland and Stirling Castle, the responsibility of the National Trust for Scotland. The "ruins" all lack a roof, but vary greatly in their condition. However one of the guidelines for selecting the castles was to favour the more complete buildings so most of these ruins are substantial structures.

2. The bats found in the survey:

Four species were found roosting in the castles surveyed: the pipistrelle *Pipistrellus pipistrellus*, Daubenton's bat *Myotis daubentonii*, Natterer's bat *M. nattereri* and the brown long-eared bat *Plecotus auritus*. In addition a significant fifth species was observed feeding in the grounds of two castles in Angus. These were large bats of the noctule type. Although distinct from other species in their echolocation calls, it is very difficult to distinguish between the two species found in Britain by means of a bat detector alone. Therefore these observations were recorded as Leisler's bat/noctule *Nyctalus leisleri/N. noctula*. These bats roost in tree holes over much of their range, although Leisler's bats commonly roost in houses in Northern Ireland. It is therefore the estate grounds or country around the castle which is important for these bats. Not surprisingly 32 of the castles surveyed (43%) are within estate grounds, and the remainder almost all in countryside or in villages. The only "city" castle surveyed was Craigmillar, in Edinburgh, and it is on the edge of the green belt. The importance of castles as roost sites is clearly linked to their closeness to good bat feeding habitat - open parkland and woodland with freshwater, typical of castle surroundings, will provide a rich

source of insects for all the kind of bats encountered. Mature trees, in addition, will provide tree holes for these species - further extending the range of roost categories provided by the buildings.

Figure 1 shows the relative proportions of records of bat roosts in south-east Scotland. The source of these numbers was the database in Scottish Natural Heritage's offices at Battleby near Perth. The total number of records on the database was 1,100, including over 200 "unidentified" bat roosts, most of which are likely to be pipistrelles. These records include buildings of all types, including castles.

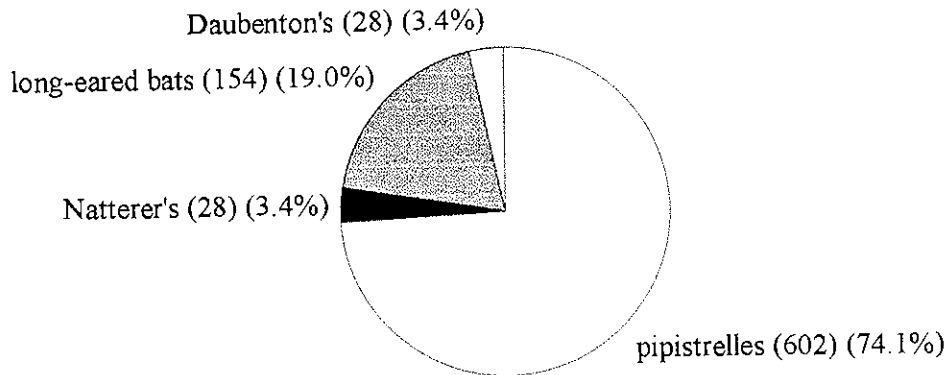


Fig.4. Records of bat roosts in south-east Scotland

If the proportions of the different species in a normal sample of roosts are compared with those from the survey results (Fig. 5) there are clearly proportionally more castles occupied by long-eared bats and Daubenton's bats. Note that the pie charts show the relative proportions, since more than one species was found in several castles. The numbers therefore add up to more than 42, the number of castles where bats were found.

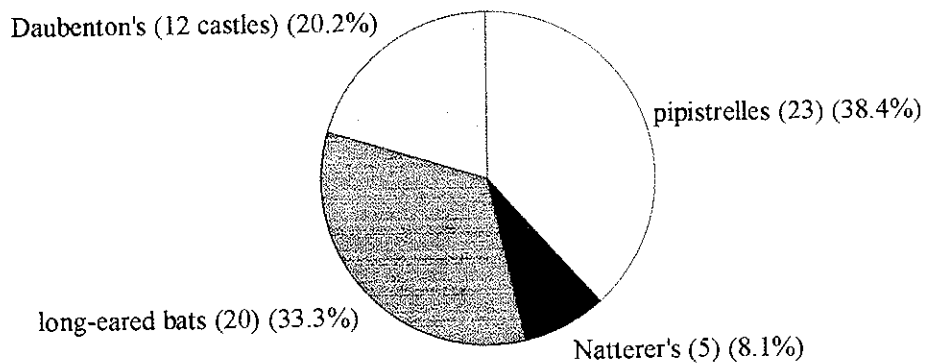


Fig.5. The proportions of bat species found in the survey

The higher proportion of long-eared bat roosts among castles can be explained by: (a) their preference for large roof spaces for summer roosts; (b) habit of using open building structures for feeding perches and leaving evidence of feeding, typically moth wings; (c) strong preference for roosts close to woodland feeding habitat. Daubenton's bats generally roost close to water, where they feed on insects which they catch close to the surface of lochs and rivers. Since most castles are built close to water or have aquatic habitat within their grounds it is no surprise that Daubenton's bats show a preference for these buildings. Both species of bat are widespread in Scotland wherever there is suitable habitat, but both have particular roosting requirements which change through the annual cycle and are vulnerable through direct disturbance and damage to their habitats of woodland and freshwater edges.

Summary of survey results

- (a) A sample of 74 Scottish castles were surveyed, and evidence of roosting bats found in 57% of them.
- (b) 27 of the 74 castles were surveyed for presence of bats in winter, and 16% of the sample total (74) were found to have hibernating bats.
- (c) More substantial, intact castles are more likely to be used by roosting bats.
- (d) Ruined castles are less likely to have bats present in them, but since winter use was under-recorded, and these are more likely to provide hibernation roosts, further surveys should be done before this can be confirmed or refuted.
- (e) Compared with a general sample of bat roost sites, significantly more castles are used as roosts by brown long-eared bats and Daubenton's bats.

Conservation implications

As explained at the beginning of this report, there is likely to be an element of conflict between the need to maintain an ancient castle structure and the roosting requirements of our vulnerable and legally protected bat species. The figure of 57% for castles used by bats at some time during the year is likely to be a lowest estimate. Castle managers and owners should be aware that there is a strong likelihood of their buildings being used by bats. One of the aims of this project involved bringing the "surveyors", the local bat group members, together with those responsible for castles, and since every castle is different one of the best sources of conservation advice will be the local batworkers, in addition to local staff of Scottish Natural Heritage. The difficulties of determining presence of bats in castles in winter should be clear, and also the likelihood of bats being found within walls when renovation work is done. As an illustration, Alloa Tower in my own area was surveyed in the winter and initially no bats were found, but when workmen engaged in restoration work removed an ancient wooden door lintel a number of bats were discovered, probably pipistrelles from the description (they had gone when I arrived).

It is important to recognise the value of castles as roosts for our less common, more vulnerable species of bats, though castles and large houses are also important for large roosts of pipistrelles which are less likely to be noticeable to people occupying a castle than in an average house.

The importance of feeding habitat for bats around castles was not closely examined in the survey. Management of the castle surroundings for wildlife will have important implications for bats roosting in the buildings. A healthy insect population is important, but it may be necessary to consider how changing the vegetation, trees and hedges in particular, will influence the routes taken by bats to and from feeding areas.

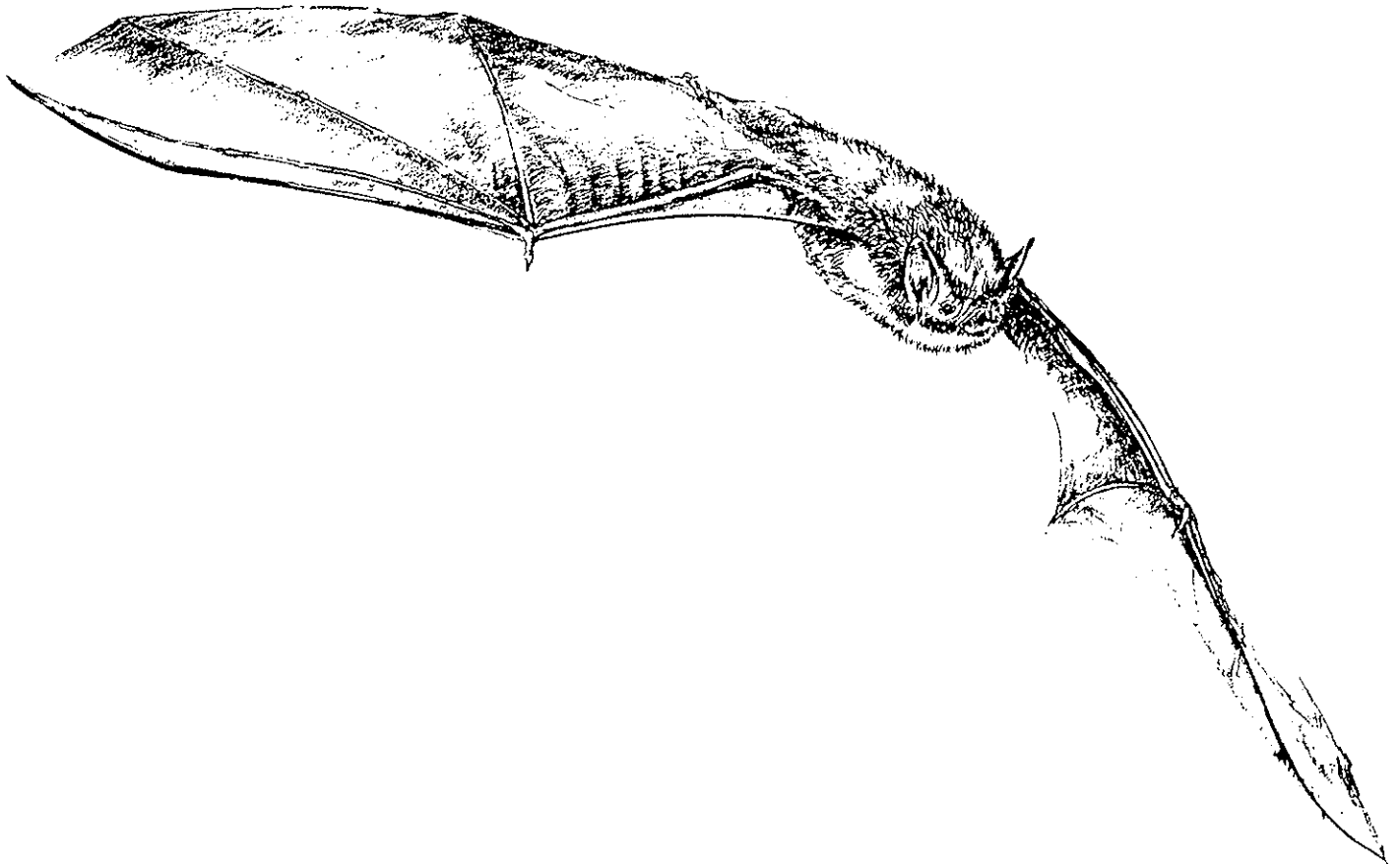
Acknowledgements

The Bats in Scottish Castles project depended in the first place on the work and enthusiasm of all those batworkers involved. Secondly it depended on the cooperation and assistance of the owners, managers and custodians of the castles, who are to be thanked. The National Trust for Scotland and the government agency Historic Scotland, who care for so many of our historic castles, should be thanked for their changing attitudes towards wildlife conservation. Both have commissioned surveys of wildlife on and in their properties in recent years, with a view to better management. Very importantly, thanks should be given to the Scottish Office Environment Department for its generous

grant which made the project possible, through its Environmental Grants Scheme. Lastly the support of the Bat Conservation Trust staff and Scottish Natural Heritage staff throughout the country was much appreciated.

Reference

Coventry, M 1995. *The Castles of Scotland*. Edinburgh: Goblinshead



The use of flyways by bats in Scotland

Susan M. Swift

Flyways, or commuting routes, are landscape elements used by bats as corridors along which to fly between roosts and feeding sites and from one feeding site to another during a night's foraging. They are usually linear and include hedges and treelines, overgrown banks and railway lines, clearings through forests and burns with vegetation along their banks. Their importance to bats was described by Limpens and Kapteyn (1991), and field observations have recently shown that they are consistently used by several Scottish species.

Which species use flyways?

In general, small, slow-flying bat species which normally forage in cluttered environments avoid flying in open habitats and make use of flyways for commuting. Among Scottish species, noctules *Nyctalus noctula* and Leisler's bats *N. leisleri*, which fly fast and high, have not been reported to use them and they are not essential to pipistrelles *Pipistrellus pipistrellus* or Nathusius' pipistrelles *P. nathusii*, both of which forage in open situations. There is, however, some evidence that pipistrelles emerge earlier from roosts where flyways can be used and that they may use them for commuting in light situations such as early evenings or just after dawn in midsummer. On the other hand, flyways are invariably used by brown long-eared bats *Plecotus auritus* and by *Myotis* species. Both Daubenton's bats *M. daubentonii* and Natterer's bats *M. nattereri* have been found to commute along corridors in Scotland, and it seems probable that the whiskered bats *M. mystacinus* and *M. brandtii*, which have broadly similar foraging habits, also use them. Elsewhere in Europe, *M. brandtii* has been found to avoid flying in open habitats and to be prevented from reaching foraging sites by lack of vegetation corridors (Ekman and de Jong, 1996).

P. auritus consistently use landscape features along which to commute (Entwistle et al. 1996). These authors report that individual radio-tracked long-eared bats in north-east Scotland used between one and nine feeding sites each night and that the number of movements among sites ranged from one to sixteen. The bats commuted along flyways during all of these movements, even though this involved their covering significantly longer distances than they would have done had they travelled by the most direct route. Howard (1995), in England, similarly reported that a colony of brown long-eared bats always travelled 300m from their roost to a foraging site by following a hedge round a field. Had they flown directly across the field, the commuting distance would have been about 200m.

Both Natterer's and Daubenton's bats use flyways to gain access from roosts to foraging areas (Swift 1997; Limpens and Kapteyn 1991). Most Daubenton's bat roosts are situated close (within 20m) to lochs or rivers, but some are in barns, houses or bridges further away. In these cases, the roost is always connected to foraging areas by continuous woodland or by a flyway, frequently one along a burn with trees and undergrowth on its banks. In a survey of the rivers Tummel, Tay and Dee, I found that Daubenton's bats never crossed open spaces except over water; even a strip of bare shingle 30m wide was enough to prevent them gaining access to the river from nearby woodland. Similarly, *M. nattereri* always flew along corridors. At one roost in Perthshire, they had to cross a garden before reaching their flyway. A flight of 15m over a lawn was involved, and at this roost emergence took place noticeably later than at other roosts in the same area.

Why are flyways used?

There are three possible reasons why bats use flyways:

1. they may provide insects and thus enable bats to feed while commuting and so to balance energy budgets, particularly at times when energy demand is high and available foraging time is short.
2. they may provide protection from detection by predators.
3. they may be used as navigational aids by bats with short-range echolocation calls.

Of the three, protection from predation seems the most likely reason. Although there are no specialist bat predators in Scotland, Speakman (1991) estimated that predation by birds accounts for about 11% of bat mortality in Britain, and that is a significant pressure affecting bat behaviour. Flyways make

vulnerable, slow-flying species less visible to predators and so enable them to leave roosts earlier in the evening and still reduce the risk of being caught. Although it is possible that bats, such as *P. auritus*, with very low-intensity orientation calls may use flyways as navigational aids, as suggested by Howard (1995), species such as *M. daubentonii* produce much louder calls but still use flyways continually. It seems much less likely that these bats would get lost without landscape elements to guide them. However, the two explanations are not mutually exclusive, and it is quite possible that flyways serve both the above purposes. Although long-eared bats have been recorded feeding while commuting (Barataud 1990), the relatively fast, direct flight of bats along flyways suggests that this is not their main function. My own bat detector surveys concerning *Myotis* species showed that *M. nattereri* occasionally fed along flyways, but that *M. daubentonii* rarely did, suggesting that, at least in Daubenton's bats, feeding is not an important reason for their use.

Implications for conservation

Habitat destruction is, arguably, the most serious current threat to bat survival, particularly for species which forage predominantly in woodland. Felling of large areas of deciduous forest makes isolated areas of forest unavailable to some bats. If joining corridors of trees are left, or even planted, between areas of woodland, this will open them up as foraging areas for both long-eared and Natterer's bats. A patch of woodland is only of benefit to these species if they can reach it!

In agricultural areas, farmers should be encouraged to leave strips of trees and undergrowth along the banks of burns and large ditches, especially when these run through open fields, since they often provide Daubenton's bats with their only access to rivers - many potential roost sites cannot be used because of inaccessibility. For the same reason, hedges and treelines between fields should be preserved whenever possible. Small-scale conservation projects to plant and maintain vegetation corridors make a positive contribution to bat conservation, particularly that of some of our less common species.

References

- Barataud, M** 1990. Elements sur le comportement alimentaire des Oreillards brun et gris, *Plecotus auritus* (Linnaeus, 1758) et *Plecotus austriacus* (Fischer, 1829). *Le Rhinolophe* 7, 3-10
- Ekman, M and de Jong, J** 1996. Local patterns of distribution and resource utilization of four bat species (*Myotis brandti*, *Eptesicus nilssonii*, *Plecotus auritus* and *Pipistrellus pipistrellus*) in patchy and continuous environments. *Journal of Zoology, London*. **238**, 571-580
- Entwistle, A C, Racey, P A and Speakman, J R** 1996. Habitat exploitation by a gleaning bat, *Plecotus auritus*. *Philosophical Transactions of the Royal Society of London B* **351**, 921-931
- Howard, R W** 1995. *Auritus. A natural history of the brown long-eared bat*. William Sessions, York
- Limpens, H J G A and Kapteyn, K** 1991. Bats, their behaviour and linear landscape elements. *Myotis* **29**, 39-48
- Speakman, J R** 1991. The impact of predation by birds on bat populations in the British Isles. *Mammal Review* **21**(3), 123-142
- Swift, S M** 1997. Roosting and foraging behaviour of Natterer's bats (*Myotis nattereri*) close to the northern border of their distribution. *Journal of Zoology, London* **242** 375-384