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PART 1

PART 2
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Night roosting Natterer's bats

John F Haddow

Central Scotland Bat Group is privileged to have its own bat "reserve". This is a small disused building, commonly referred to as the "Aberfoyle Bat House", which is located in Achray Forest 0.5 kilometres north of Aberfoyle village and 0.5 kilometres east of the David Marshall Lodge visitor's centre (Haddow 1988). The building, at a height of 85 metres above sea level, sits at the top of a sloping mixed oak and birch wood which fringes the mainly coniferous plantation of Achray Forest in the area to the north and west of Aberfoyle. The property has been leased from the Forestry Commission (now Forest Enterprise) since 1987. Natterer's bats *Myotis nattereri* have been known to roost in the roof of the building during late spring to summer since 1986, and probably occupied the roost for at least a decade before that. The building was made secure against disturbance to bats in 1987 and since then it has been visited occasionally throughout the year by myself and other bat workers.

Roosting and emergence behaviour

Although the Natterer's bats appeared to occupy the roost during the summer months of 1986, in subsequent years it appears that the normal pattern of occupancy by this species is for a number of females to roost from early May to early June. Visits to the building at this time of year enable counts of up to 65 bats emerging. The bats roost in a space enclosed by roof timber and wall bricks at the apex of the south facing gable end at a height of approximately four metres. They may be visible through the small entrance to that space or they may be out of sight, roosting further in either within the cavity wall or above the sarking boards and ridge beam, below the pottery ridge tiles (the roof covering is otherwise underfelt and slate).



Fig.1. The Aberfoyle "bat house" (John Haddow)

The bats emerge, usually singly, from this entrance hole into the roof space and fly along the length of the building and back repeatedly before "flipping" down to the lower level below the tie beams and partial loft

floor and exiting the building through one of two "bat windows" in the west facing wall. These windows, constructed for the bats, are two metres from the ground and 225 millimetres square. Most of the bats emerge from the southern window. Emerging bats may fly round at the lower level before flying out, but this is more common when bats are returning to the roost. The inside walls were painted with white emulsion in 1987 and the gable end walls soon became stained with spots of urine which are released as the bats fly up to the wall and turn.

When the bats emerge from the windows they drop down, often almost to ground level, within 1 metre of the exit. Flying fast and between ankle height and chest height these bats are increasingly difficult to see as darkness falls. Even with the aid of a bat detector they can be difficult to observe since two or more may emerge almost simultaneously.

Timing of emergence

In order to give an idea of the pattern of roosting and emergence in early summer, there follow some examples taken from my notes. The highest count of 65 bats was recorded on 22nd May 1988 from 2217 hours to 2300 hours BST. Sunset time (Glasgow) on that day was 2134 hours BST so first emergence was 43 minutes later. On 30th May 1992 the first Natterer's bat flew out at 2218 hours, 31 minutes after sunset (2147 hours). On that occasion 15 bats had emerged by 2235 hours and 48 by 2248 hours. The last bat, making a total of 62, flew out at 2303 hours. My notes record that it was "possibly an undercount with widges in my eyes" but at most only two or three bats would have been missed.

Times for individual bats emerging were recorded on some occasions. The table below gives a summary from one of these evenings, 20th May 1990. The first bat emerged at 2213 hours, 42 minutes after sunset (2131 hours), and the last (42nd) at 2248 hours.

<i>Time (hours BST)</i>	<i>Total bats emerged</i>
2210	0
2213	1
2220	7
2230	15
2240	32
2248	42
2250	42

Table 1. Summary of emergence times of bats on 20th May 1990

Counting Natterer's bats is not straightforward as my notes from that evening show: "2224 hrs 1 bat circled the building at least 5 times; 2227 1 bat flew *into* the building, and another two at 2231 and 2233; before 2232 the sound of several bats flying inside was heard on the detector then numbers 16 to 20 flew out one after the other; numbers 23 to 26 emerged at 2235 also in rapid succession." Adding this to the hedge-hopping (or heather-skinning?) flight pattern it is often difficult to keep track of the *net* total number of bats emerging. This is a common problem in observing any Natterer's bat roost. Of our British species probably only the horseshoe bats *Rhinolophus spp.* have emergence behaviour which is more difficult to observe, although Daubenton's bats *Myotis daubentonii* emerge later than Natterer's bats and therefore in even less light. Daubenton's bats emit stronger echolocation signals than Natterer's bats, so use of a bat detector offsets the difficulty in seeing these bats.

Use of the building as a night roost

In most years this roost is occupied by a group of Natterer's bats continuously for only about five weeks - one tenth of the year. When these bats are examined the majority are pregnant females. They use this site as an early-summer roost and find another site for the period approaching birth and during the nursery phase.

Most likely this will be in a building in Aberfoyle although possibly it is a more "natural" roost in a tree in the woodland. What was surprising was to discover that although not present in the roost in daytime, this species can be found in the "Bat House" on most nights during the summer and early autumn. Visits have not been regular enough to give accurate figures, but it is possible to see one or more Natterer's bats in the building on more than 90% of visits.

A midsummer evening in 1994 illustrates this. On 22nd June I arrived at 2238 hours (32 minutes after sunset). Bats were not visible or audible inside. At 2252 hours (46 minutes after sunset) the first Natterer's bat was observed flying *past* the building from the south (the direction of Aberfoyle) at about knee height. At 2308 hours a bat flew out of the southern window. At 2310 hours a bat flew in through the same window. At 2319 hours a single female Natterer's bat was found inside, on the roof ridge beam. I have observed this to be the normal behaviour pattern during mid to late summer. From shortly after emergence time bats will fly to, around, and in the building, sometimes landing in the roof, either in the open roof space or the enclosed "hole" at the south end. What is not known is how many individuals are involved, or for how long a bat will roost there during the night. No marking of the bats has been done, and entering the building to catch and examine the bats, or even to observe them, will clearly disturb their normal behaviour.

One might expect that the bats emerge from their day roost, forage for a period, then rest for a time in the "Bat House" before continuing their night's foraging. This cannot explain the appearance in the building of bats immediately after emergence from another roost. It can be presumed that these individuals are from the group roosting there in early summer and perhaps because the bats remember forage routes *from* the "Bat House" they return to it briefly in order to re-familiarise themselves. A human equivalent would be travelling to a particular station or car park in a city before setting out on a tour of the shops. If one is accustomed to starting from one point, then changing the starting point can be confusing.

Some discarded insect wings can be found among the droppings below the Natterer's bats' main roost at the gable end so it is likely that some bats use the roost as a night feeding roost. However most of the insect wings found on the floor are associated with brown long-eared bats *Plecotus auritus*, one or two individuals of this species occasionally being found in the building at night.

The "Aberfoyle Bat House" provides an ideal site for the study of Natterer's bats and their roosting and foraging behaviour. All that is needed is someone with time and resources to take it further!

Reference

Haddow, J 1988. Central Scotland's big bat box. *Bat News* 13, 2-3.

Additional note

Since writing this I have been informed of night roosting Natterer's bats found by Susan Swift in three sites during a search for *Myotis* bat roosts in the summer of 1994. Susan found a total of 13 roosts of this species in Perthshire and Aberdeenshire - 3 night roosts, 7 nursery roosts and 3 all-male roosts (comprising between 12 and 25 males in each - the nursery roosts contained between 20 and 79 adult females).

Bat ectoparasites: an introduction

Neil D Redgate

The Bat Habitat

When studying and observing mammals and birds, how many naturalists pause to think that their object of study is a habitat itself? The animal's body plays host to a wide range of internal and external parasites whose lifestyles are so intimately woven with that of the host's. In general, every aspect of the host's body is a potential niche for one form of parasite. A better knowledge of the parasites' distribution and host specificity may help us to understand more fully the cause and transmission of diseases, delineate the taxonomic relationships of species and families, understand certain aspects of zoogeography, and increase understanding of the host's biology. In a recent study on the swallow, it has been shown that a heavy infestation of mites in the bird's nest greatly reduced its breeding performance.

The major groups of ectoparasitic arthropods are mites, ticks, bugs, lice, louse- and bat-flies and fleas. All these animals can occur on the host's body; an examination of the host's nest will reveal individuals of all these groups, with the exception of lice which live exclusively upon the host's body. Different species and individuals may be infested to varying degrees: parasites may overrun one individual's body, while another individual may be free of them.

Mites and Ticks

These animals are closely related to spiders and thus the adults and nymphs have eight legs; however, the larvae have only six.

Adult ticks are quite large and either orbicular or oval in shape, and are frequently found attached to the skin while they are taking a blood feed from a sleeping or resting host. The larvae spend more time on the host than the adult as they require frequent meals of blood for their normal development. When not feeding, the ticks will spend their time away from the bat, in crevices of the roost.

Mites are much smaller, rarely exceeding 2 mm and are usually white to pale-coloured. Due to their size they can be found in or on skin, inside the mouth and other orifices; as a result their diet is varied, including blood, hair, dead skin and living tissue. Frequently, handlers will see tiny white specks running over the wing membrane - these "pieces of dandruff" are the most conspicuous mites that are found on a bat. The majority of other mites that are found on bats, many of which are the same size or even smaller, are unseen moving about within the fur.

Bat-bugs

These animals are dorso-ventrally flattened and sandy-brown in colour. They are rarely encountered on the host as they are not well adapted for travel with their host - they are normally found in groups gathered in crevices at the roost site. They will feed from the host only when the bats are at the roost. Bugs and their cast exoskeleton can be found scattered around the roost site or in the guano.

Lice

No lice have been recorded from bats.

Bat-flies

Bat-flies or Nycteribiids are so highly modified that they look superficially like a small, pale-coloured, six-legged spider. The flies have no wings and the thorax is considerably reduced and distorted that the head and legs arise from its dorsal side. The female produces fully developed larvae which are deposited singly near to a roost site: each larva is pale-coloured and is glued to the substrate where it immediately develops

in to a dark-coloured puparium. A well used roost will be encrusted with old pupal cases.

Fleas

Fleas are small leggy wingless insects which appear to move on their narrow edge. Unlike the other ectoparasites, the flea is laterally compressed which enables it to move through the fur very easily. It is the adult which feeds on the host's blood, the larvae feed on detritus and guano in the roost. Some species of flea are quite specific to a host but others are specific to a particular roost type which offers the most favourable breeding conditions.

Bats and their parasites

The parasites of the fifteen British bats are little-known. A small number of species of mites (20), ticks (2), bat-bugs (2), bat-flies (3) and fleas (8) have been recorded from British bats. The continental populations of the same species that are found in Britain have a greater number of ectoparasites. This may be due to lack of a serious investigation into this ecological group in Britain or it may well reflect a genuine difference in British populations. Given the possibility of migration between the host populations of Britain and Europe, it is feasible that "continental" ectoparasites have yet to be discovered on our British bats.

Two species of British tick are found associated with our bats - *Ixodes vespertilionis* C. L. Koch and *Argas vespertilionis* (Latrielle) have been recorded from long-eared bat (presumably brown *Plecotus auritus*), pipistrelle *Pipistrellus pipistrellus* and serotine bats *Eptesicus serotinus*. *I. vespertilionis*, whose preferred hosts are members of the Rhinolophidae, has not been recorded from Scotland, whereas *A. vespertilionis*, whose primary host appears to be the pipistrelle bat, is widespread throughout the British Isles. Only one other tick has been found on a bat - *Ixodes arboricola* Schulze & Schlotke on a noctule *Nyctalus noctula* and must be regarded as a stray as it is normally found on birds whose nests are found in tree cavities.

At present a total of 20-25 species of mites have been recorded from a small number of bat species. These mites belong mainly to the families of Spinturnicidae (usually found on the wing membrane) and Macronyssidae (found in the fur): members of both families are very specialised bat parasites. The largest number of mite species recorded from British bats have been from the pipistrelle (9) and the noctule (8). However, seven species of bat have not been recorded as playing host to mites as well as many other ectoparasites in the British Isles - viz whiskered *Myotis mystacinus*, Brandt's *Myotis brandtii*, Bechstein's *Myotis bechsteinii*, mouse-eared *Myotis myotis*, Leisler's *Nyctalus leisleri*, Nathusius' pipistrelle *Pipistrellus nathusii* and grey long-eared *Plecotus austriacus* - in contrast to their counterparts in Europe.

Of the two bat-bugs that have been recorded from British bat populations, one - *Cimex pipistrelli* Jenyns - is believed to be quite common and widely distributed but rarely encountered. It has been found frequently in the roosts of Pipistrelle and Noctule bats. The other bat-bug - *C. dissimilis* Horváth - is very closely related and further specimens are required to confirm its presence. [*Cimex pipistrelli* has been found associated with both pipistrelles and Daubenton's bats in Scotland - eds.]

Bat-flies are poorly represented in Britain. Only three species have been recorded from British hosts - *Nycteribia kolenatii* Theodor & Moscona, *Phthiridium biarticulatum* Hermann, and *Basilina nana* Theodor & Moscona. *N. kolenatii* is the most widely distributed of the three species and is primarily associated with the Daubenton's bat, although it has been recorded from other *Myotis* species; *P. biarticulatum* occurs mainly on the horseshoe bats; and *B. nana* has only been recorded from Bechstein's bat. However, on the continent, these three species of bat-flies are found on a wider range of hosts.

In the British Isles, all fleas that are parasitic on bats belong to one family (Ischnopsyllidae) and are included in two genera - *Nycteridopsylla* Oudemans (2 species) and *Ischnopsyllus* Westwood (6). The former has not yet been recorded from Scotland, though their hosts - non cave-roosting hosts (pipistrelle, brown long-eared and noctule bats) - are present. Fleas of the latter genus are more widespread and occur on a wider range of hosts, both cave-roosting and non cave-roosting species.

Request for material

I am interested in receiving any ectoparasitic material from any bat throughout the British Isles. The purpose of my research is to provide a current list for the host-parasite associations, with up to date nomenclature, cross-referenced to known sources (museum specimens, literature, etc.) and, where possible, annotated to provide an indication of host specificity. Another aspect of the research is to investigate the possibility of characteristic ectoparasitic faunal communities upon a specific host.

I would be very grateful to anyone who handles live/dead bats or examines roosts if they could forward any parasites that they collect. A sample of guano can be collected throughout the year and placed in a well-ventilated container, e.g. a cloth bag. I don't expect a detailed examination of the bat's body, but should any parasite be conspicuous could I ask that it be collected. Alternatively, I would be grateful to receive any dead animal so that I may examine the body thoroughly - I have removed many mites and ticks from dehydrated hosts found in roosts.

The most likely places to see parasites will be on the wing membrane, feet, back and head - seen by gently blowing the fur (or actively running over the hand of the handler!). The animals can be collected by using fine tweezers dipped in strong alcohol (ethyl, methyl, methylated, or [dare I say it] whisky, gin?!). Care should be taken when removing any specimen that is attached to the skin - very gently pull at the place of attachment after adding a few drops of alcohol onto the parasite. Those specimens, that have been collected from one individual, can be placed into a tube of alcohol and later transferred to tissue paper, moistened with strong alcohol, which is folded over them. Then the tissue envelope is sandwiched in aluminium foil, the edges folded over 2 or 3 times and pressed firmly down. This makes a reasonably liquid proof seal and the package can be posted without excessive cost.

Each bat, tube, or tissue layer should be clearly labelled with the host's name, age and sex (when possible), whether the host was alive or dead and from which part of the body, locality, county, grid reference, date and collector's name and address. The label should be written in pencil and placed in the appropriate receptacle.

I apologise for the strict instructions but they are essential if the specimens and data are to be of value. It is very easy to lose labels or for specimens to be accidentally transferred to another tube: this will result in erroneous host/parasite records to say the least.

Specimens should be sent to me at the address on page 4. If anyone would like further details, particularly about forwarding dead specimens through the post, I can be contacted at that address or by telephone (01847 82495).

BatData in South East Scotland

J Stewart Pritchard and Anne Kiggins

Did you ever wonder what happened to all those copies of roost visit report forms which you sent to Tony Mitchell-Jones at the Nature Conservancy Council (NCC) in Peterborough?

If you have read Tony's publication on "The distribution of bats in Britain 1982-1987 as revealed by enquiries" (Mitchell-Jones 1990) then you will know part of the answer. The real value of these forms however is not in the production of distribution maps.

Information on the number of bat enquiries, types of roosts, problems and solutions is essential to gauge the effectiveness of the Wildlife and Countryside Act in protecting bats. For example, analysis of the forms may reveal regional differences in roosting behaviour of a species, possibly as a result of local architectural style, which in turn give rise to a large number of enquiries. Clearly, to handle the volume of reports, a computerised database was necessary. "BatData" was therefore developed.

Up to 1992, when the NCC was split into the three Country Agencies, updating and maintenance of BatData was carried out at NCC's Great Britain headquarters in Peterborough.

In 1993, Scottish Natural Heritage (South East Region) acquired a copy of the software and about 400 roost records dated up to 1991. Over the winter of 1993/94 and with the help of the South-east Scotland Bat Groups, the database was brought up to date by the addition of about a further 700 records, bringing the total number of entered roosts to 1,060 (for the period 1980 to 1994).

The data can be analysed in a number of ways including to show the numbers of roosts reported of each species or combination of species, by year of initial visit, by type (e.g. house, church, fortification, etc), by class of visitor (e.g. bat group or SNH) and by location (e.g. Local Authority area, 10 kilometre grid square or by village or town).

Bat Group Area	No of Roost Sites	No of Roost Sites as % of Total
Perth	402	38
Central	200	19
Fife	127	12
Borders	139	13
Lothian	115	11
Angus	77	7

Table 1. Analysis of the distribution of roosts by bat group area.

There are however several shortcomings of the software which limit its usefulness. The information in those sections of the form describing each roost in terms of age, construction, roof type, position of access and roost site cannot currently be entered and it is not therefore possible to analyse these aspects of a species' roost preferences. Similarly, the fate of roosts following the initial visit or details of subsequent visits can only currently be entered as a "note" and cannot be analysed by the programme. Remedy of this latter point poses problems for the actual computer software but would greatly simplify an assessment of the effect of advice and persuasion from the statutory bodies and bat group members.

Where next?

On completion of the first update, copies of the relevant parts of the database were distributed to the bat groups and SNH area offices for information and comment and it is envisaged that corrections and a second update will be made later in 1995.

Following the second update it will then be possible to integrate the South East Region data with that held by other SNH Regions and by English Nature and the Countryside Council for Wales, to improve the national perspective. It is also envisaged that access to relevant parts of the database will be made more widely available, subject to certain controls for confidentiality and consistency, through SNH area offices in South East Region and possibly also to bat groups.

It must be stressed that the value of any database is dependent upon the quality, in terms of accuracy and completeness, of the data entered and the extent to which it can be used successfully to answer appropriate requests. If BatData is to be developed and used as a tool for bat conservation then it will require the cooperation of all those visiting and reporting roosts as well as those who collate and disseminate the data. A simple first step is to ensure that report forms are fully completed for all roosts and that they do reach the bat group coordinator and local SNH contact.

Finally, if you have a query that you think BatData might help with please contact Stewart Pritchard at the address on page 4.

Reference

Mitchell-Jones, A J 1990. The distribution of bats in Britain 1982-1987 as revealed by enquiries. *Mammal Review* 20.

Fife bat roost owner questionnaire

J Stewart Pritchard

In 1993, a questionnaire was sent out to all known owners of pipistrelle *Pipistrellus pipistrellus* and brown long-eared bat *Plecotus auritus* roosts in Fife in a joint initiative by Scottish Natural Heritage and Fife Bat Group.

As a result, it was hoped

- (1) to update our roost records and establish contact with any new roost owners,
- (2) to inform roost owners of the new contacts for Fife Bat Group and Scottish Natural Heritage, following the merger of the Nature Conservancy Council for Scotland and the Countryside Commission for Scotland,
- (3) to ensure that roost owners were still aware of the requirement to seek advice from SNH prior to carrying out operations that might harm their bats or damage, disturb or obstruct their roosts, and
- (4) to gauge how roost owners perceived the service provided by the Bat Group and by (the then) Nature Conservancy Council.

A simple questionnaire was prepared and sent, with a covering letter and a postage paid return envelope, to approximately 80 addresses in January 1993.

The response was reasonable with some 40 usable questionnaires being returned. A copy of the questionnaire and full account of the results is available on request.

Drawing conclusions from such a brief series of questions and a small number of returns is not easy and should be viewed with caution. However, certain responses were encouraging.

The responses gave us useful information on the activity of 38 roosts (or 47% of those to whom letters were sent) over the previous two seasons, the implementation of advice (especially to exclude) given at 27 roosts (34%) and the nature of current problems or concerns at another 13 roosts (16%).

Twenty-seven (67%) owners who responded had received advice from the Bat Group or SNH and in 21 cases (52%) the advice had been to "do nothing and leave bats alone". In only three cases was advice for total or partial exclusion reported and in one case this advice had not been implemented. Of 13 owners who reported that they had not received advice, none were unduly concerned about their bats.

As a measure of "after care" roost owners were asked if they had been in contact with, or had been contacted by, the Fife Bat Group, NCC, NCCS or Scottish Natural Heritage since the date of their first enquiry. Twenty-seven (67%) owners reported that they had.

To gain a measure of owners enthusiasm for and interest in their bats they were asked if they had ever counted their bats and if so when and how many bats were counted. Fifteen (45%) had made counts and 19 (48%) indicated willingness to count their bats in the forthcoming summer.

Roost owners were also asked if they would be interested in becoming more involved in the activities of the Bat Group. Encouragingly, eight (25%) said that they would.

Whilst the sample size was small and precluded detailed analysis, the four objectives were achieved to a greater or lesser extent. The details of half of the roosts to which letters were sent were updated. All roost owners were advised of the new contact points and reminded of the need to seek advice. Some feedback on the service provided by the Bat Group and SNH was obtained along with an indication of roost owners'

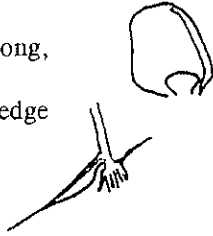
interest in their bats.

It is recommended that a similar approach, with or without a questionnaire, may be useful in other areas where contacts with roost owners are infrequent. Organisation, which could be done during the quieter winter months, is relatively simple and the only costs incurred are for postage, envelopes and photocopying (currently approximately 50p per roost address).

A key to bats in Scotland

Jeremy S Herman and John F Haddow

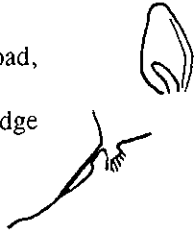
Ear short.
 Tragus broader than long, mushroom-shaped.
 Postcalcarial lobe on edge of tail membrane



Forearm
 47-58mm

Forearm
 39-47mm

Ear short.
 Tragus longer than broad, tip bluntly rounded.
 Postcalcarial lobe on edge of tail membrane



Length of fifth digit (excluding wrist)
 less than 1.25 times length of forearm.
 Fifth digit (including wrist) < 42mm

Forearm
 28-35mm

Length of fifth digit (excluding wrist)
 more than 1.25 times length of forearm.
 Fifth digit (including wrist) > 42mm

Forearm
 32-40mm



Ear medium, pale and pinkish,
 slightly recurved at tip.
 Tragus more than half length of ear,
 straight sided

Forearm
 36-43mm



Ear short - medium.
 Tragus longer than broad, tapered.
 No postcalcarial lobe on edge of tail membrane

Ear short, dark.
 Tragus less than half length of ear,
 bluntly pointed with convex outer edge

Forearm
 34-40mm



Ear medium, very dark.
 Tragus about half length of ear,
 outer edge straight or slightly concave

Forearm
 30-37mm



Ear medium, dark.
 Tragus about half length of ear,
 outer edge slightly convex

Forearm
 31-39mm

Ear very long,
 almost as long as forearm.
 No postcalcarial lobe on edge of tail membrane



Forearm
 34-42mm

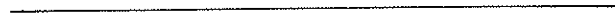
This key will enable field identification of well-grown bats of all those species which are recognised to be resident in Scotland. Allocate the bat to a category at each stage, working from left to right - the bat must fit every feature on its species' line.

Coat short and sleek,
fur golden brown,
hairs all one colour



Noctule
Nyctalus noctula

Coat shaggier,
dark brown,
hairs with dark bases



Leisler's bat
Nyctalus leisleri

Coat quite sleek,
fur on underside similar
colour to fur on back



P¹ very small and displaced inward

Common pipistrelle
Pipistrellus pipistrellus

Coat shaggier,
fur on underside paler
than fur on back



P¹ prominent and fully in tooth row

Nathusius' pipistrelle
Pipistrellus nathusii

Fur sandy brown,
very pale on underside



Fringe of stiff bristles on edge of tail membrane, calcar S-shaped, wing membrane joined to side of foot

Natterer's bat
Myotis nattereri

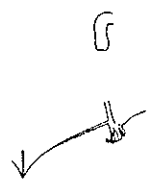
Fur brown above,
buffy grey on underside



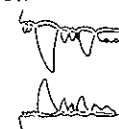
Fringe of fine hairs on edge of tail membrane, calcar simply curved, side of foot free of wing membrane

Daubenton's bat
Myotis daubentonii

Fur dark grey brown
above, greyish white
on underside

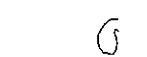


Calcar simply curved, wing membrane joined to side of foot.
Penis of male straight.
Cusp of P³ < P², P₂ < P₁



Whiskered bat
Myotis mystacinus

Fur brown above,
buff on underside



Calcar simply curved, wing membrane joined to side of foot.
Penis of male bulbous.
Cusp of P³ ≥ P², P₂ = P₁



Brandt's bat
Myotis brandtii

Brown long-eared bat
Plecotus auritus

Recorded distribution of bats in Scotland

John F Haddow and Jeremy S Herman

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 and 2 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.

In light of the recent evidence for summer residence of Nathusius' pipistrelle *Pipistrellus nathusii* in Scotland (see the article by Rydell and Swift in this volume), a map showing bat detector/flight records of this species has been included. No attempt has been made to distinguish between records of the two recently described "phonotypes" of the common pipistrelle *Pipistrellus pipistrellus* here and it should also be borne in mind that some records of this species may even have been based on examples of Nathusius' pipistrelle. From our own experience pipistrelles found in Scotland, certainly the central belt, are predominantly the brown faced type, phonotype 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 and the western isles, 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?

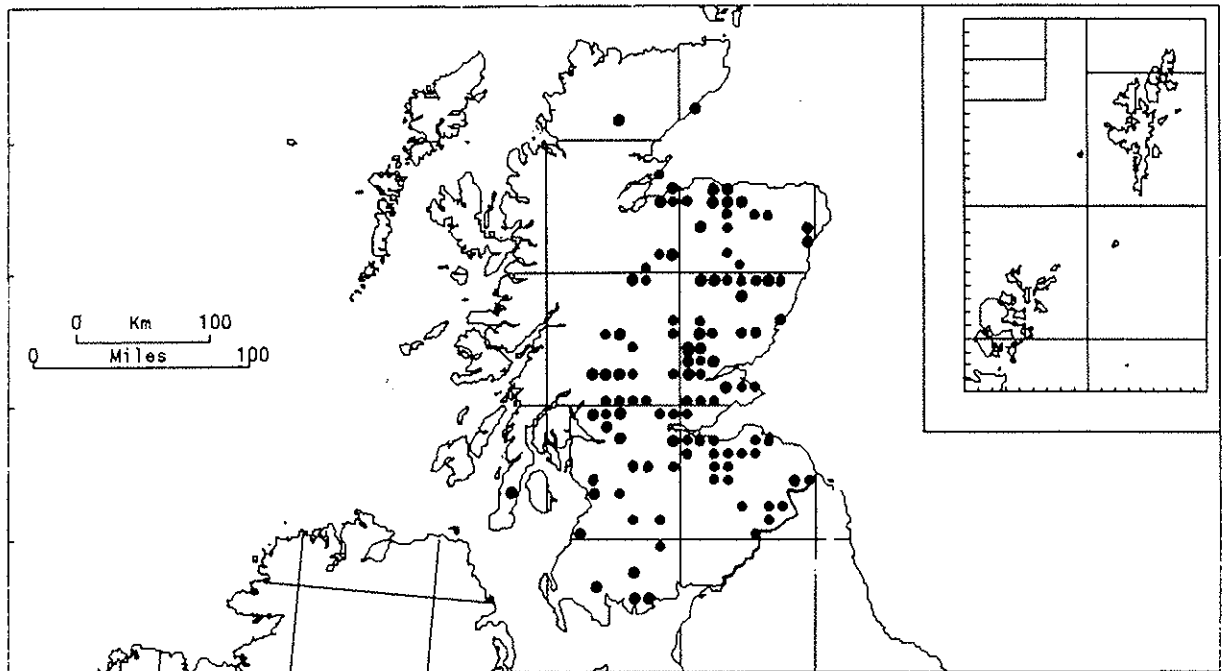
The full list of vagrant species recorded in Scotland is as follows. Note that noctule, Leisler's bat and Nathusius' pipistrelle are included in view of the likely origin of some of the records of these species. However in the case of Nathusius' pipistrelle there remains a reasonable case to interpret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

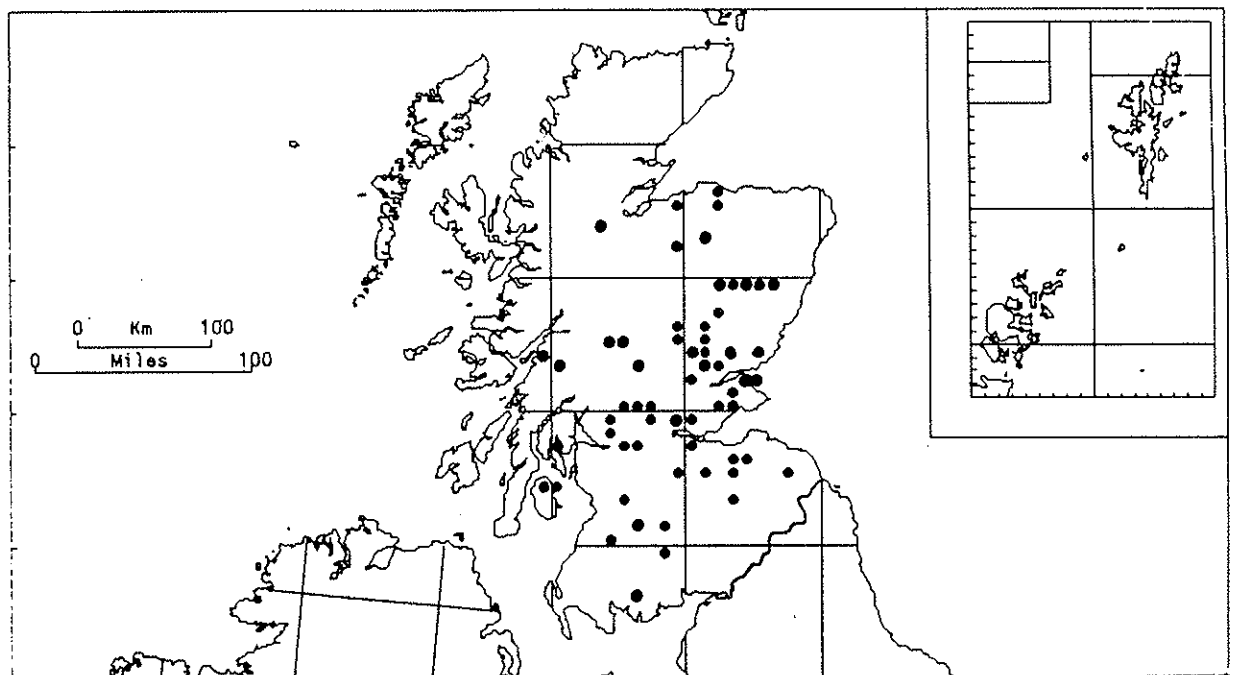
In addition the following bats have been recorded on offshore oil or gas installations.

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

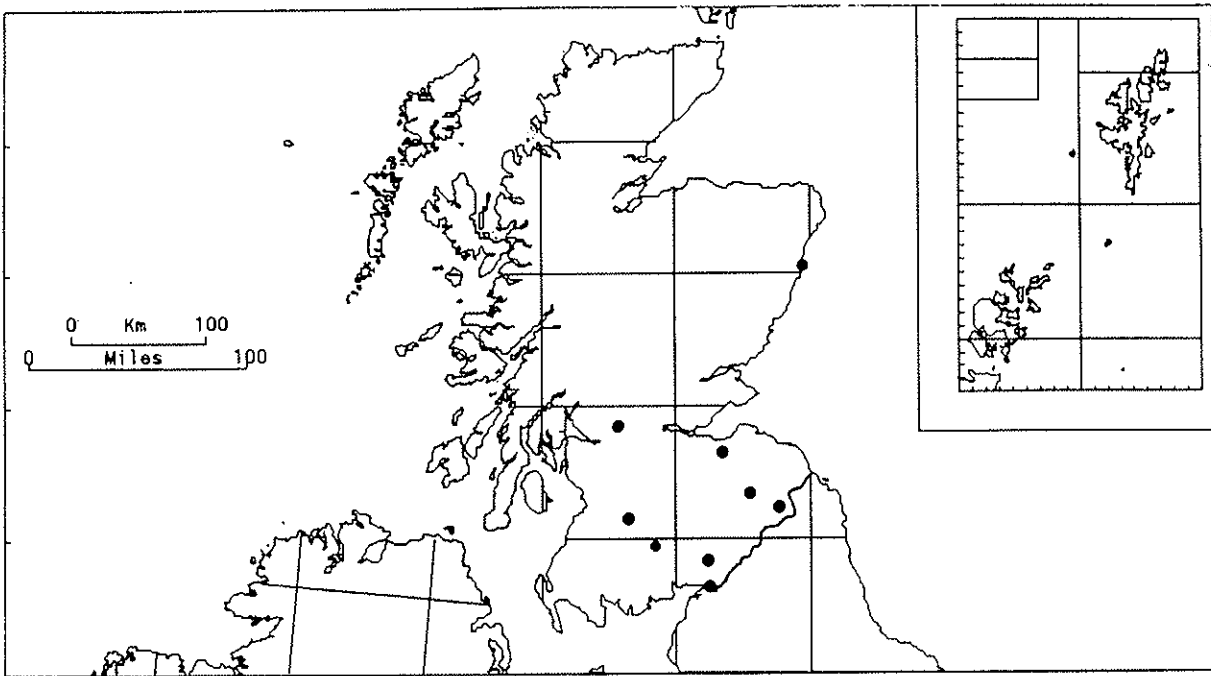
Daubenton's bat
Myotis daubentonii



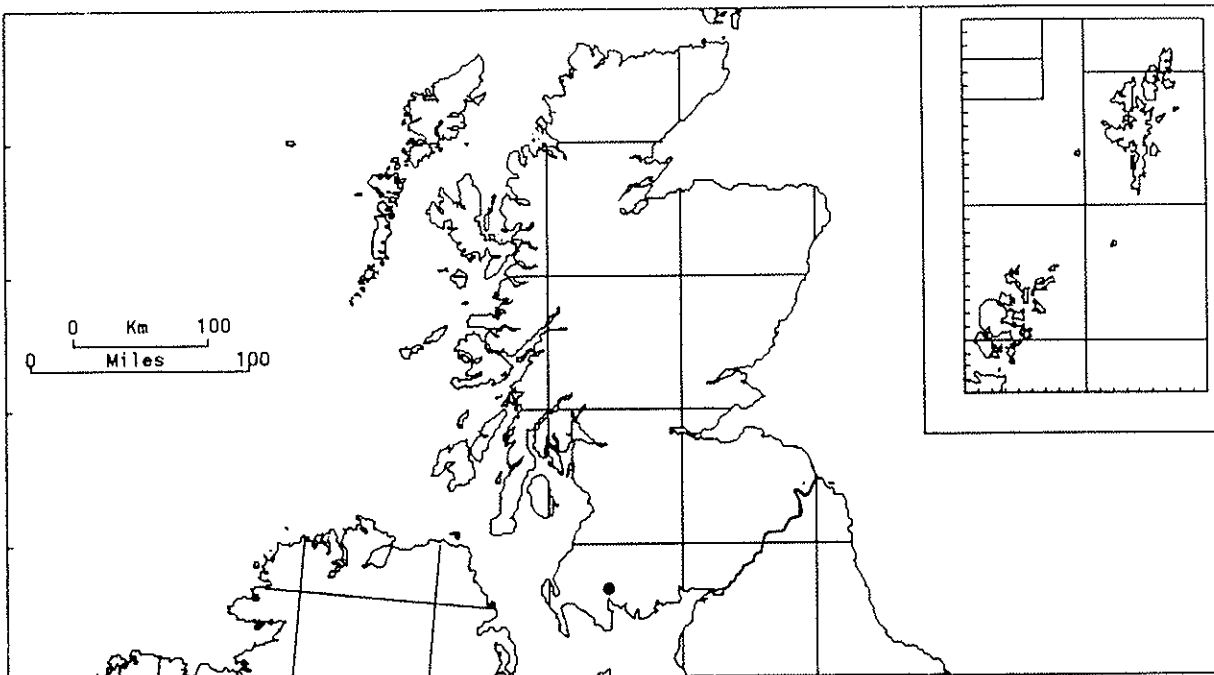
Natterer's bat
Myotis nattereri



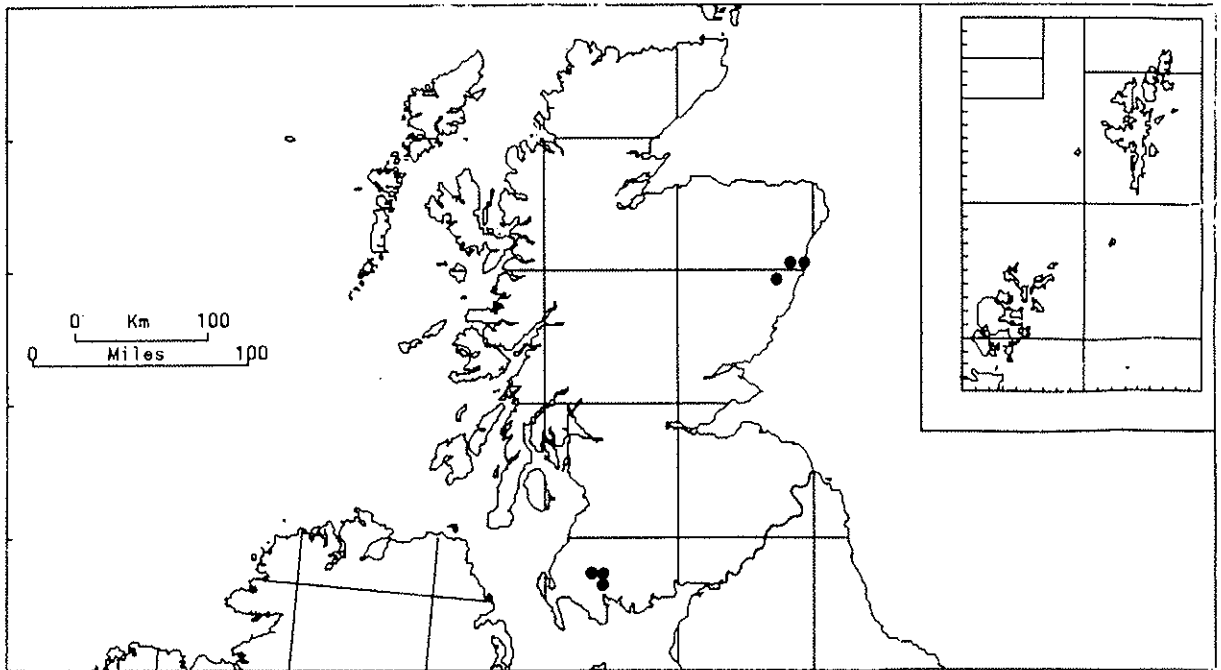
Whiskered bat
Myotis mystacinus



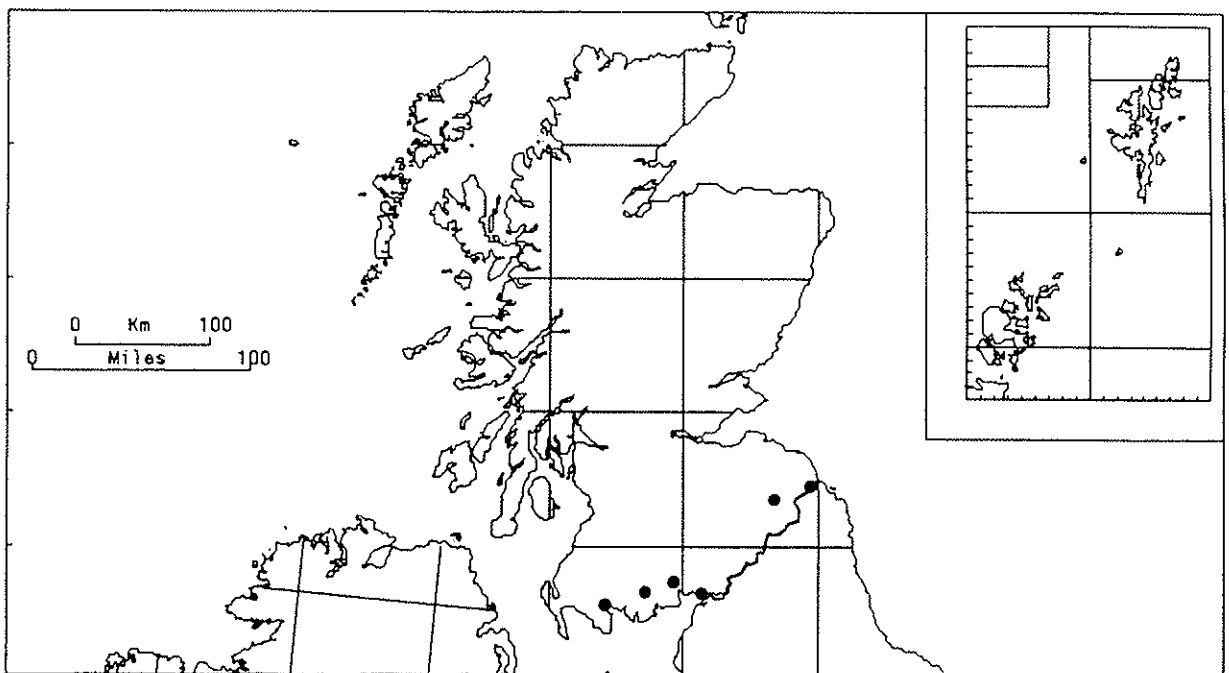
Noctule
Nyctalus noctula



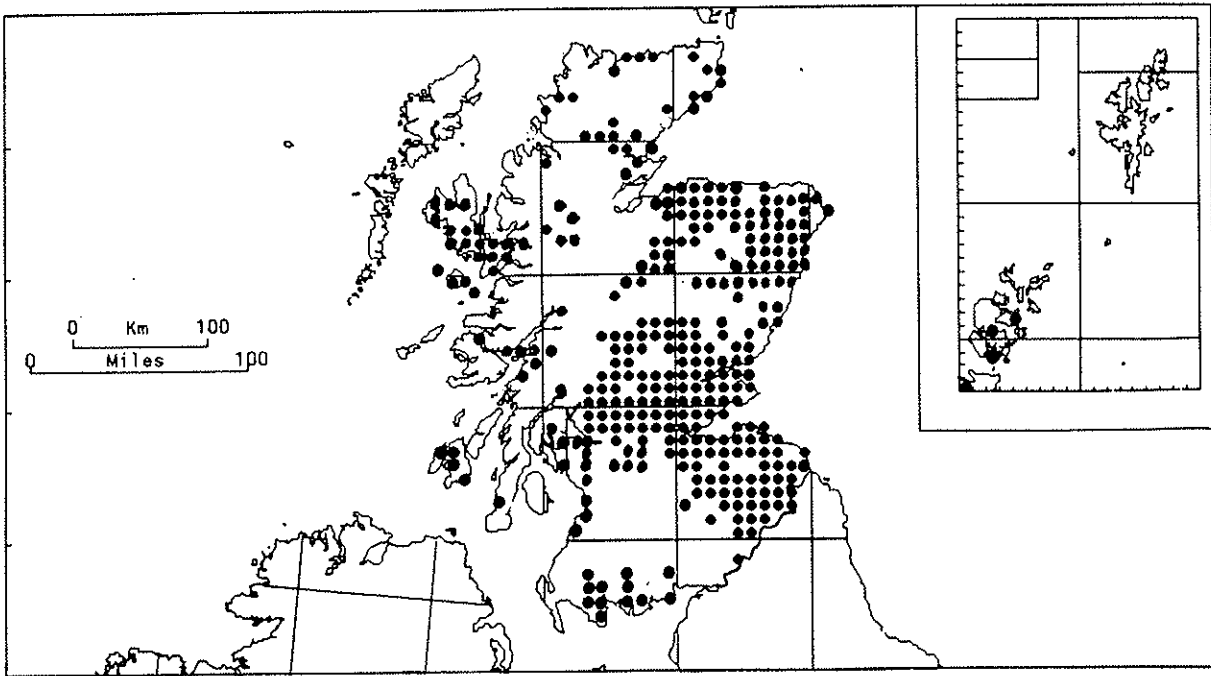
Leisler's bat
Nyctalus leisleri



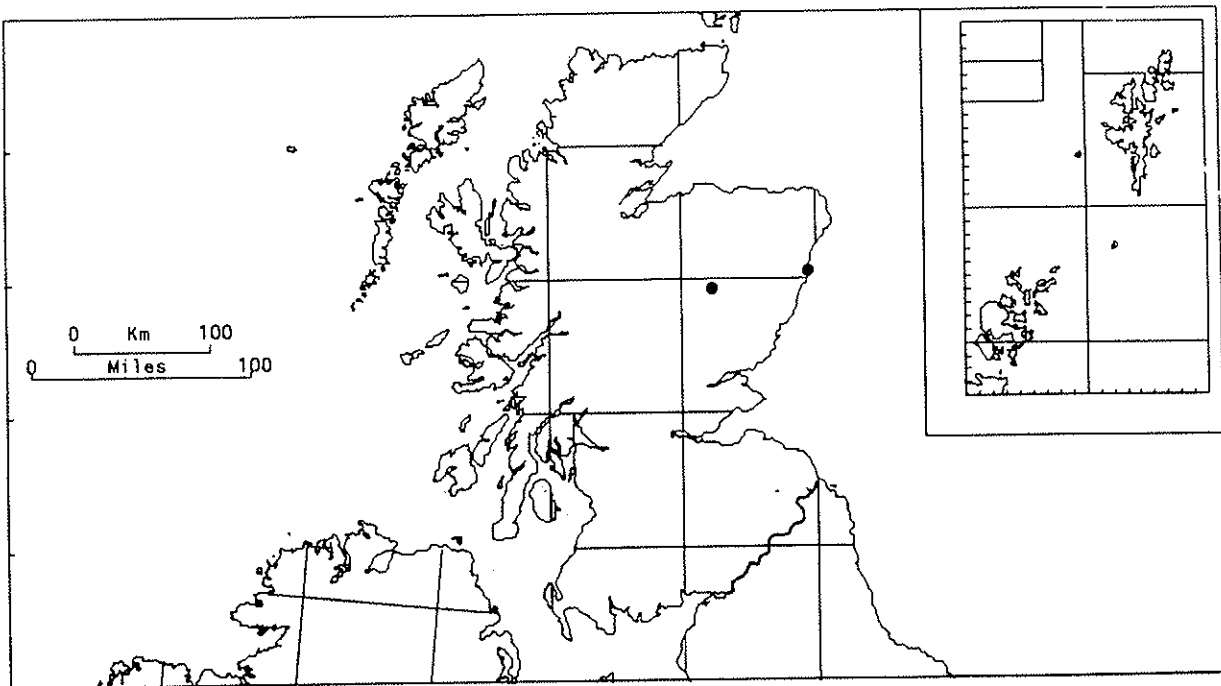
Noctule/Leisler's bat



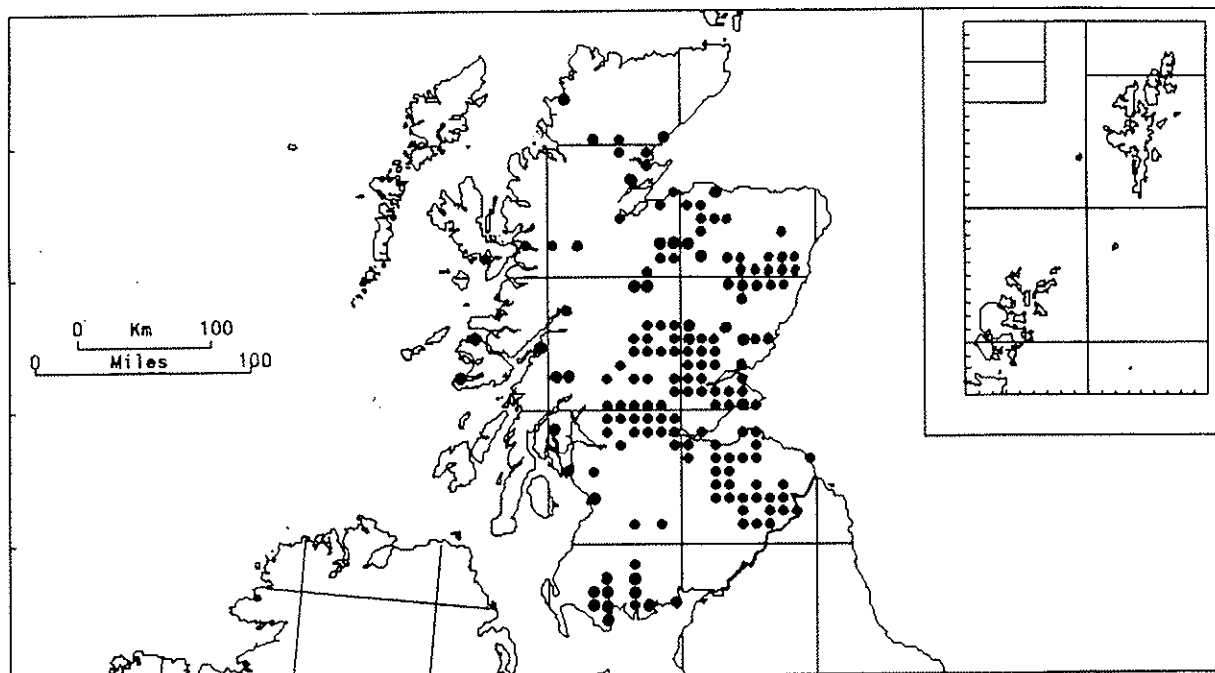
Common pipistrelle
Pipistrellus pipistrellus



Nathusius' pipistrelle
Pipistrellus nathusii



Brown long-eared bat
Plecotus auritus



Scottish bat group addresses (arranged 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. 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

Sutherland and Caithness

Scottish Natural Heritage Old Bank Street, Golspie, Sutherland KW10 6TG. Tel. 01408 633602

North East Scotland

Aberdeen

Prof. Paul Racey and Abigail Entwistle Department of Zoology, University of Aberdeen, Tillydrone Avenue, Aberdeen AB9 2TN. Tel. 01224 272858 (PR), 01224 272879 (AE)

Moray

Denice & David Law 27 Drumbeg Crescent, Llanbryde, Elgin, Morayshire IV30 3JS. Tel. 01343 842007

Orkney

Andrew Dorin Scottish Natural Heritage, 54/56 Junction Road, Kirkwall, Orkney KW15 1AW. Tel. 01856 875302

Strathspey

Malcolm Currie Scottish Natural Heritage, Achantoul, Aviemore, Inverness-shire PH22 1QD. Tel. 01479 810477

South West Scotland

Ayrshire

Robert Potter Scottish Wildlife Trust, 2 Callander Road, Heathfield, Ayrshire KA8 9AF. Tel. 01292 610529

Clyde

Bill Webster The Visitor's Centre, Calderglen Country Park, Strathaven Road, East Kilbride G75 0QZ. Tel. 013552 36644

Dumfries

Stuart Spray c/o Wildfowl and Wetlands Trust, Eastpark Farm, Caerlaverock, Dumfries DG1 4RS. Tel. 01387 77200

Galloway

Dr Peter Hopkins Barbuchany, Newton Stewart, Wigtownshire DG8 6QE. Tel. 01671 3870

North Argyll (Lorn)

Patrick Cashman Scottish Natural Heritage, Glensalloch Road, Barcaldine, Argyll PA37 1SF. Tel. 0163172 363

South East Scotland

Angus

Richard Brinklow Dundee Museum, Barrack Street, Dundee DD1 1PG. Tel. 01382 23141

Borders

Andrew Panter Scottish Natural Heritage, Anderson's Chambers, Market Street, Galashiels, Selkirkshire TD1 3AF. Tel. 01896 56652

Central Scotland

John Haddow 27 Balmoral Court, Dunblane, Perthshire FK15 9HQ. Tel. 01786 823390

Fife

Nigel Mortimer NEFDC Countryside Ranger Service, Craigtoun Country Park, St Andrews, Fife KY16 8NX. Tel. 01334 472151 (w) 01333 50434 (h)

Lothians

Adrian Jordan, 7a St Bernards Crescent, Edinburgh EH4 1NR. Tel. 0131 332 2397

Perth

Michael Taylor Perth Museum & Art Gallery, George Street, Perth PH1 5LB. Tel. 01738 32488