BA Protocol

BATS

***Version 1.1* (updated Dec 2001)**

Aim

To assess bat activity and usage of habitat types, and to monitor changes in bat numbers at ECN sites

Rationale

There are 15 species of bat, the only flying mammal, which are considered native to Britain where they are ubiquitous predators of insects. Bats are known to be sensitive to changes in the environment, their numbers having declined significantly during the present century through a combination of loss of habitats, roost sites and food supply, and by increased frequency of disturbance. Bats are therefore believed to be useful indicators of environmental change. Considerable national and international interest in and concern for the future of bat populations has led to a number of survey and monitoring schemes, including a recent survey in Britain (Walsh, Harris & Hutson 1995). Current methodology is somewhat limited in the amount of information which it can provide on the precise relationships between population levels and environmental change; nevertheless, by linking ECN results to those from more widespread monitoring programmes these limitations can be minimised.

Method

The method is based on that used in a Bats and Habitats Survey organised by Prof S Harris and colleagues at the University of Bristol for the Joint Nature Conservation Committee. It uses a tunable bat detector to record bats in 1 km squares, noting the positions along a pre-determined transect of all bats seen or heard. Habitat features along the transect, and changes in those features, are also recorded using a standard list.

Location

One or more kilometre squares are selected at the site. The selection need not be at random, and a square which is reasonably typical of the ECN site should be used. Selection should be based on the practicality of safely walking along a transect which crosses the square in darkness.

Using a map at 1:25 000 or 1:10 000, the square is divided into two halves with either a north/south or an east/west line, depending on which direction is easier to walk. For each half of the square, the transect should go from the middle of one edge to the middle of the opposite edge by a reasonably direct but practical route. Where linear features such as field boundaries, hedges, streams or fences can be used these should be followed, but where these do not exist a straight line transect should be used. The chosen route should be marked on the map, the starting and ending positions of the two halves (A-B and C-D) being labelled, and the observer should become familiar with the route during daylight as it will not be as obvious in darkness. In areas where hazards such as ditches, cattle, etc, may pose a problem in the dark, it may be desirable for the observer to have a companion. In any case suitable safety precautions should be taken. In planning the transect, the time taken will need to be checked, bearing in mind that both halves of the transect must be walked on the same night, and that the whole transect should be completed within 45-90 minutes. It should also be remembered that the walk will take longer in darkness and that extra time will be needed when stopping to record any bats seen or heard.

Sampling

Habitat recording

The transect is likely to follow linear features and boundaries between habitat types. Although the observer will not walk through the middle of crops, it will be possible to walk straight across a pasture, rough grazing, moorland, etc, and in

such circumstances there is no need to follow any linear features. Having selected the transect, any linear habitat features from the list provided (see page 183) are marked on the map, as are other habitats occurring within about 20 m on either side of the transect/linear feature being followed. If walking through a uniform habitat, simply record the same habitat feature on both sides of the transect. The habitat features are recorded on a separate 1:10 000 map using coloured crayons, and identified with the habitat code numbers given on page 183. They should be updated annually.

Frequency and timing

The transect should be walked four times in each year, once in each of the following three-week periods:

15 June - 6 July
7 July - 27 July
28 July - 17 August
18 August - 7 September

Starting 30-45 minutes after sunset, the transect should be walked steadily at the observer's chosen pace and extra time should not be spent in areas which might be thought especially good for bats. The starting point of the walk should be rotated, if this is practicable, so that it is different on successive occasions. The observer should aim to complete the whole of the transect in 45-90 minutes, including the time taken to get from one half of the transect to the other, during which bats are not recorded.

Surveys should not be carried out when rain is heavier than a light drizzle or when there are strong winds, because bats may not be flying in these conditions.

Bat recording

The Batbox III tunable bat detector is recommended for use during the survey; it is capable of recording significantly higher activity than other available models. If the observer is inexperienced, the output from the detector should be connected to a tape recorder so that identification can be improved and confirmed by comparison with a tape of bat calls which is available commercially. The detector should be tuned to 45 kHz and left on this frequency, as this will pick up the largest range of bats. The frequency should not be changed during the walk.

A separate copy of the map should be used for each evening walk, even if no bats have been recorded on previous occasions. At the start and end of the survey, air temperature should be measured, together with cloud cover on an eighths scale (clear sky= 0/8, total cloud cover=8/8). The time at which the walk is started and ended, and the start and end position of each transect are recorded. When a bat is seen or heard, the appropriate symbol (see Chapter 3, page 182) is recorded on the map and the walk continues immediately, with no pause to listen for bats. A circle is drawn on the map where each bat is detected. If the species can be identified with certainty to one of the groups listed, the appropriate letter code is added to the left. If a feeding buzz is heard, add a letter 'f' on the right of the circle, and if it is heard echo-locating but a feeding buzz was not recorded, add a letter 'h'; there may be instances in which both suffixes are attached. Bats which are seen, but not heard on the bat detector, should be recorded with a circle and a letter 's' to the right.

These categories are not mutually exclusive and more than one may be recorded, eg:

Of	bat of unknown species - feeding buzz heard
Pos	long-eared bat seen, not heard
Oh	bat of unknown species heard echo-locating
NnOsh	noctule seen and heard echo-locating

Each bat pass consists of an unbroken stream of ultrasonic calls, or for as long as a bat is continuously in sight. When the symbol is marked on the map, the observer should be sure that it is clear in exactly which habitat the bat was recorded. If there is a possibility of confusion, a note should be added at the side of the map for clarification. If any bat roosts are known or suspected in the area, these should be recorded on the map.

Authors

A.L. Walsh, S. Harris and A.H. Hutson

Reference

Walsh, A.L., Harris, S. & Hutson A.H. 1995. Abundance and habitat selection of foraging vespertilionid bats in Britain: a landscape-scale approach. In: Ecology, evolution and behaviour of bats. *Symposia of the Zoological Society of London*, **67**, 325-344.

BA Protocol

Appendix I. Equipment required

Equipment

Batbox III tunable bat detector

Supplier

Stag Electronics (manufacturers)
15 Sir George's Place
Steyning
West Sussex
BN44 3LS
UK
Tel: +44 1903 816298
Fax: +44 7000 228269
WWW: www.batbox.com

Specification of results and recording conventions

The measurement variables listed below are those required for each BA sampling location at an ECN Site. Sites submitting data to the ECNCCU should refer to the accompanying Data Transfer documentation for the specification of ECN dataset formats, available on the restricted access Site Managers' extranet. Contact ecnccu@ceh.ac.uk if you need access to this documentation.

The first 4 key parameters uniquely identify a sample or recording occasion in space and time, and must be included within all datasets:

• Site Identification Code (e.g. T05)	Unique code for each ECN Site
• Core Measurement Code (e.g. PC)	Unique code for each ECN 'core measurement'
• Location Code (e.g. 01)	Each ECN Site allocates its own code to replicate sampling locations for each core measurement (e.g. for different surface water collection points)
• Sampling Date (/time)	Date on which sample was collected or data recorded. This will include a time element where sampling is more frequent than daily

ECNCCU 2001

Core measurement: vertebrates – bats (BA Protocol)

Bats are recorded along a pre-defined transect four times per year, and species and behaviour codes are marked on to maps. Habitat maps are also prepared each year.

Variable	Units	Precision of recording
Map-based recording		
Site Identification Code		
Core Measurement Code		
Location Code		
Year of recording		
Habitat	habitat codes[1]	
Visit code	numeric code (1-4)	
Start and end positions of each half of transect	character code (A-D)	
Species	character code[2]	
Behaviour	character code[3]	
Form-based recording for each half of the transect		
Site Identification Code		
Core Measurement Code		
Location Code		
Recording (Sampling) date		
Start time	BST 24-h clock	1 min
Finish time	BST 24-h clock	1 min
Start position	character code (A-D)	
Start temperature	°C	
Finish temperature	°C	
Cloud cover at start	eighths scale	
Cloud cover at finish	eighths scale	

Recording forms
A recording form is available from the CCU.

Notes
1. Habitat codes (p183).

2. To record the presence of a bat, mark O on the map. If the species is identified, add one of the following species codes to the left of the O:

Noctule	Nn
Serotine	Es
Myotid species	M
Daubenton's	Md
Natterer's	Mn
Pipistrelle	Pp
Long-eared species	P

3. Behaviour codes should be added to the right of the O on the map, and are as follows:

Bat seen but not heard	s
Bat heard echo-locating	h
Feeding buzz heard	f

Note 1 Habitat codes for bat monitoring

A. Linear features

1. **Hedgerows**: <4 m high and <5 m wide. All hedgerows are classed as continuous if the gaps are <5 m wide. Mark all larger gaps with a cross-line through the hedgerow and classify each gap as 5-10 m, 11-15 m, 16-20 m, 21-25 m, 26-30 m, 31-35 m, >35 m
2. **Treelines**: a line of single trees (minimum of 3) >4 m high and <2 crown widths apart; continuous and close-knit canopies
3. **Treelines**: as in 2. but discontinuous and spread out
4. **Stone walls**
5. **Footpaths**: small paths, usually only wide enough for one or two people
6. **Tracks/bridleways**: more substantial than above, with an earth or hardcore base but not tarmac
7. **Roads**: tarmac or similar base
8. **Ditches**: usually small, perhaps temporary, watercourses; see 9-12 below
9. **Streams**: flowing water, with no evidence of canalisation, and usually perennial flowing water. Ditches are more likely to dry up and the water flow is more likely to be interrupted
10. **Fast-flowing, rough rivers**
11. **Slow-flowing, smooth rivers**
12. **Canals**: man-made channels

Please note that it is possible to find one or more linear features in association, eg a footpath beside a stone wall, or a tree line in a hedgerow. In such circumstances, both features should be marked on the map.

B. Other habitat features

13. **Semi-natural broadleaved woodland**: predominantly of broadleaved trees >5 m high with a semi-natural appearance
14. **Broadleaved plantations (including orchards)**: tree species not native to the site, even-aged and >5 m
15. **Semi-natural coniferous woodland**: predominantly coniferous trees of any height with semi-natural appearance (confined to Scots pine, juniper and yew)
16. **Coniferous plantations**: predominantly coniferous trees which have been planted and are >5 m
17. **Semi-natural mixed woodland**: at least 25% broadleaved or 25% coniferous trees, of natural appearance with trees >5 m
18. **Mixed plantation**: at least 25% broadleaved or 25% coniferous trees, planted and >5 m
19. **Young plantation**: trees <5 m high, either broadleaved or coniferous, which have been planted
20. **Recently felled woodland**: areas for which there is evidence that woodland has been felled within the past year
21. **Parkland**: areas where tree cover is <30%, the majority of the trees are 30-70 m apart and a minimum of ten trees
22. **Tall scrub**: 3-5 m high
23. **Low scrub**: <3 m high including bracken
24. **Beach**: includes sand dunes, sand/mudflats, shingle or boulder beaches

25. **Lowland heaths**: lowland areas with >25% dwarf shrubs
26. **Heather moorland**: as above but for upland sites
27. **Bog**: areas of peat with vegetation dominated by heather and/or cottongrass
28. **Wet ground**: areas of wet ground found in association with other habitats, eg wet areas in a grass field or flushes in upland areas
29. **Ponds**: up to 0.5 ha
30. **Lakes**: more than 0.5 h
31. **Standing man-made water**: artificially created reservoirs and impoundments, including mill ponds
33. **Upland unimproved grassland**: will include some areas used for rough grazing and poor-quality grassland such as purple moor-grass, unimproved by fertilizers, herbicides or drainage
34. **Lowland unimproved grassland**: may be regularly grazed or mown, but may be totally neglected. Unimproved by fertilizers herbicides or drainage. Includes herb-rich grasslands on limestone, chalk, cliff-tops, etc
35. **Semi-improved grassland**: slightly modified by fertilizer or herbicide application, or by heavy grazing pressure and/or drainage
36. **Improved grassland**: grassland which has had regular treatments of fertilizer and/or herbicide but not including leys (see 40)
37. **Arable**: all classes of arable land, including grassland leys and horticulture. A grassland ley is defined as short-term grassland, and will usually have been re-seeded less than five years previously. It is characterised by evidence of ploughing, bare soil between grass plants, a scarcity of broadleaved plants, and is usually dominated by a single grass species, often rye-grass. There are usually less than 5-10 species per square metre. Category 36 consists of longer-term grassland with a higher density of grass and broadleaved species, usually in enclosed land
38. **Amenity grassland**: includes well-maintained non-agricultural grass
39. **Rock surfaces**
40. **Quarries and open-cast mines**: any excavation (gravel or chalk pits, etc)
41. **Bare soil on unvegetated ground** not falling into 39 or 40.
42. **Built land**: any urban areas including gardens and transport corridors
43. **Others**: please specify