# Bats: counting away from roosts—visual counts

## Version 1.0

This specification was prepared by Jane Sedgeley in 2012.

## Contents






**Inventory and monitoring toolbox: bats**

**DOCDM-590754**

Department of Conservation
*Te Papa Atawhai*

# Synopsis

Long-tailed bats begin flying while it is still light enough for them to be seen and counted. Observers stand at vantage points on roads, tracks, or forest-edges and clearings that have large open horizons and clear skies so that any bats that appear will be silhouetted against a backlit sky. This method cannot be used to count lesser short-tailed bats because they do not emerge from their roosts until after dark and forage mainly inside forest.

Long-tailed bats frequently forage in open habitats such the edges of forests and vegetated margins (e.g. along shelter belts and rivers) and can be observed for about 45 minutes around dusk. If bats are seen and counted, the observer can confirm long-tailed bats are present in an area and perhaps form an impression of their numbers (e.g. Gaisler 1979). However, if bats are not seen, then the observer cannot assume that bats are absent because a large number of factors influence their detectability. Bat detectors can be useful aids in visual surveys (alerting observers to the presence of bats and confirming identification), but the range of the detectors is limited compared with the eye. Binoculars can also be used to confirm identification.

A variation of this method is to search for long-tailed bats flying around outside their roost sites at dawn or dusk (Stebbings et al. 2005). These types of counts are primarily useful for locating new roosts or determining whether known roosts are occupied (Walsh & Catto 2004). Large numbers of long-tailed bats swarming around roost sites prior to entering at dawn can be highly visible and certainly very audible on the bat detector. The field technique for visual counts is very simple: The surveyor walks with a bat detector through potentially suitable habitat (or an area pin-pointed from previous reports) 1 hour before dawn; they look and listen for bat activity. Alternatively, observers can go out at dusk and look for emerging bats. However, emerging bats are more likely to fly off directly rather than circle around the roost. Again, these methods are unsuitable for lesser short-tailed bats because these bats leave and return to their roosts when it is too dark to see them.

Because bats are patchily distributed and can be exceptionally cryptic, the chance of encountering them casually using this method (and its variations) is remote. The method can be useful for inventory of long-tailed bats, particularly if there are no bat detectors available for surveying, but it will be more effective if used to check sites where there are previous reports or unconfirmed sightings. Systematic collation of sightings can form part of the first phase of regional and national inventories.

Sampling using this method is limited, especially because the sampling period is restricted to approximately 45 minutes around sunset per night (or approximately 60 minutes at dawn if looking for roosts).

This method is not recommended for monitoring.

# Assumptions

- Bats will be seen if present.

- All identifications of bats are reliable. Sometimes birds such as swallows are misidentified as bats.

## Advantages

- This method has the advantage of being very cheap to apply. Relatively little equipment is needed and surveys can be conducted using volunteers or DOC staff working on other projects in the area.
- Sightings yield information about presence or continuing presence of bats and, potentially, location of roosting areas.

## Disadvantages

This technique is not applicable to lesser short-tailed bats because they do not emerge until after dark and mainly forage inside forests.

- Bats are exceptionally cryptic, so the chance of encountering them casually is remote.
- Sampling using this method is limited to approximately 45 minutes around sunset per night (or approximately 60 minutes at dawn if looking for roosts).
- Absence of sightings (or very low frequency of reporting) is not evidence of absence or rarity:
    - Behaviour of bats is influenced by a wide range of environmental factors which means they do not always emerge from roosts.
    - Visibility in different habitat types can vary, and bats may leave the forest using different routes or at different times from night to night.
- Bats can be misidentified, particularly if identification aids such as bat detectors or binoculars are not used. For example, swallows and fantails flying at dusk have been mistaken for bats.

## Suitability for inventory

Because bats are patchily distributed and cryptic, the chance of encountering them casually using this method is remote. Sampling using this method is limited especially because sampling is restricted to short periods at dawn or dusk.

However, this method can be useful when establishing an inventory of long-tailed bats, particularly if there are no bat detectors available for surveying. It will be more effective if used to check sites where there are previous reports or unconfirmed sightings. Systematic collations of sightings can form part of the first phase for large scale inventories.

## Suitability for monitoring

This method is not recommended for monitoring.

## Skills

No special skills are required, just good observation skills and the ability to identify long-tailed bats on the wing.

## Resources

This method is simple. It requires minimal equipment such as a notebook or field survey form, pen/pencil, watch, thermometer and a torch if you plan to be out after dark. Useful additional items include a bat detector, GPS unit, binoculars, warm clothing, a light-reflective vest and a first-aid kit.

## Minimum attributes

Consistent measurement and recording of these attributes is critical for the implementation of the method. Other attributes may be optional depending on your objective. For more information refer to 'Full details of technique and best practice'.

DOC staff must complete a 'Standard inventory and monitoring project plan' (docdm-146272).

- Location name and GPS coordinates
- Date
- Weather conditions
- Start time and start temperature
- Finish time and temperature
- The time each bat was seen
- The direction each bat appeared from and the direction to which each departed
- Dominant vegetation and habitat types where bats were seen
- Total number of bats seen
- Whether a bat detector was used

Additional attributes to record if roost sites are found:

- GPS coordinates of the roost
- Basic roost description (tree species, cave name/type, building, etc.)
- Description of bat exit/entry point

Minimum attributes can be recorded on a standardised field sheet (Fig. 1; see 'Form for recording observations of flying long-tailed bats at dusk'—docdm-167000).

**DIRECT OBSERVATIONS OF FLYING LONG-TAILED BATS**

**Observer's name and contact details:**

**Date:** **Location:**

**GPS eastings:** **GPS northings:**

**Temp. beginning:** **Temp. end:** **Cloud cover** (0 = clear, 8 = overcast):

**Weather** (circle): Fine Showers Drizzle

**Wind** (circle): Calm Light Moderate Mod-Strong Strong

**Habitat type*:**

**BAT OBSERVATIONS** **Bat detector used** (circle): YES NO

**Time start:** **Time finish:** **Total time:** **Total bats seen:**

**Times bats seen** (record time for every bat):

**Directions from where first seen:**

**Directions in which flew off:**

**Notes:**

* e.g. native forest, exotic forest, shelter belt, river margins

Figure 1. A standard recording sheet for collecting data in the field.

# Data storage

Forward copies of completed survey sheets to the survey administrator, or enter data into an appropriate spreadsheet as soon as possible. Collate, consolidate and store survey information securely, also as soon as possible, and preferably immediately on return from the field. The key steps here are data entry, storage and maintenance for later analysis, followed by copying and data backup for security.

Summarise the results in a spreadsheet or equivalent. Arrange data as ‘column variables’, i.e. arrange data from each field on the data sheet (date, time, location, plot designation, number seen, identity, etc.) in columns, with each row representing the occasion on which a given survey plot was sampled.

If data storage is designed well at the outset, it will make the job of analysis and interpretation much easier. Before storing data, check for missing information and errors, and ensure metadata are recorded.

Storage tools can be either manual or electronic systems (or both, preferably). They will usually be summary sheets, other physical filing systems, or electronic spreadsheets and databases. Use appropriate file formats such as .xls, .txt, .dbf or specific analysis software formats. Copy and/or backup all data, whether electronic, data sheets, metadata or site access descriptions, preferably offline if the primary storage location is part of a networked system. Store the copy at a separate location for security purposes.

All bat sightings should be recorded in the DOC bat database. Each DOC conservancy should have a separate Excel spreadsheet for this purpose. Access rights are held by the conservancy bat contact (see 'Bat Recovery Group contacts'—docdm-132033). If a conservancy has not set up its own spreadsheet, one can be created using the 'National bat database template' (docdm-213136). See the 'Canterbury Conservancy bat database' (docdm-213179) for an example of a spreadsheet containing data. Many of the data entry fields will not be relevant, but there are fields for location, GPS coordinates and for comments that could be used to describe survey results (Fig. 2)

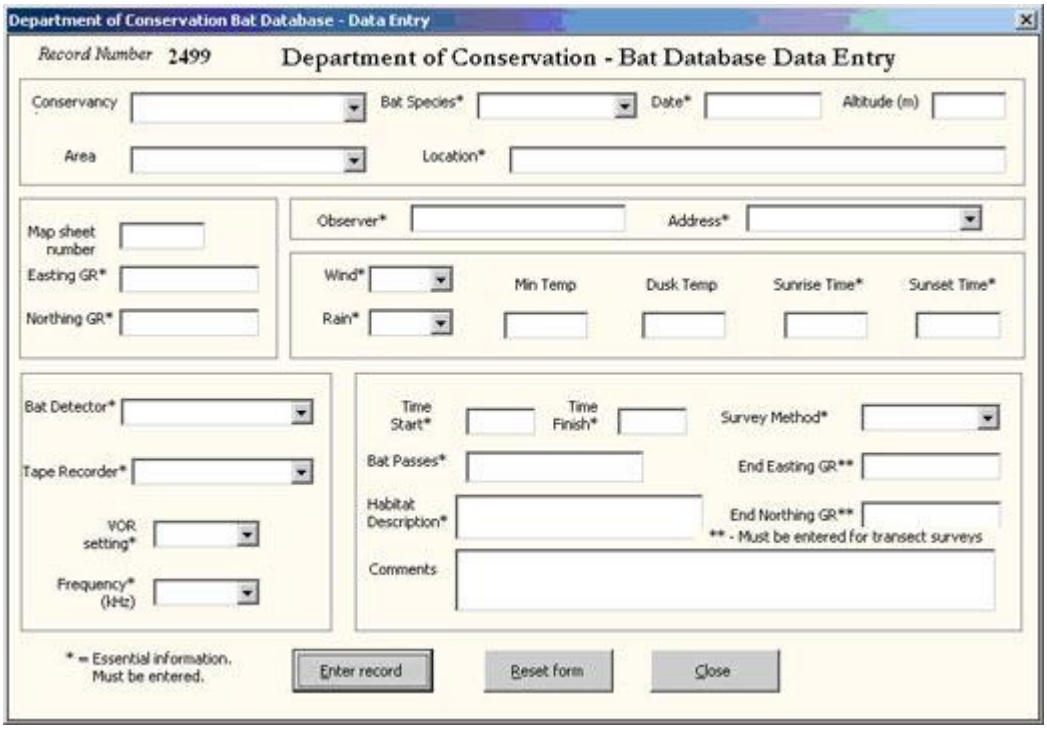


Figure 2. Data entry page from the DOC bat database.

## Analysis, interpretation and reporting

Seek statistical advice from a biometrician or suitably experienced person prior to undertaking any analysis.

This method measures:

- Presence of long-tailed bats
- Number of bats seen from a sampling point

- A variation of this method can be used to help locate roost sites

Interpretation of direct observation data is limited and it is unlikely that an observer would rely solely on this method to undertake an inventory in an area. Identification of long-tailed bats in an area confirms presence but not absence. Reports of many bats in an area in a short time may imply something about population size, but reporting few bats does not imply that the population is small, because reporting rates are influenced by so many factors. If many bats are seen emerging from a particular patch of forest right on sunset, their presence might indicate that a roost site is nearby.

Simple statistics and maps (such as those outlined below) can be reported for a study area (in combination with the results of other methods):

- Maps of presence of long-tailed bats, and potentially, maps of points where observations were made in favourable conditions but no bats were reported.
- Total number of long-tailed bats reported over discrete time frames and in distinct geographic areas.
- Simple statements like ‘long-tailed bats are present in the study area’; ‘long-tailed bats are present in this district’; ‘long-tailed bats are present in the area targeted for management’; ‘numerous long-tailed bat reports have been received for the management area’, etc.

# Case study A

**Case study A: the first semi-systematic survey of long-tailed bats in the Eglinton Valley, Fiordland**

## Synopsis

DOC workers noticed long-tailed bats feeding at dusk near Knobs Flat in the Eglinton Valley.

## Objectives

Knowing that long-tailed bats are classified as a threatened species, the researchers wished to determine how widespread and common they were in this valley.

## Sampling design and methods

There was no formal sampling design. Observers systematically surveyed different points throughout the Eglinton Valley at dusk, simply watching for bats and recording their numbers and locations. Effort was largely opportunistic because there were no resources available for a formal survey. Observers simply took advantage of already being in the valley for other work. This meant that survey effort was somewhat ad hoc. If people had some spare time in the evening, they would go to a new spot in the valley and see if they could see any bats emerging from the forest at dusk.

## Results

Long-tailed bats were sighted at dusk in 25 locations along the length of the Eglinton Valley (c. 40 km) between November and February in 1990–91. A total of 132 bats were sighted, with a maximum of 12 bats emerging from the forest at one location. Fifty-two percent of observations were of bats feeding just above the forest canopy. Ten percent were 10–30 m above the canopy and 15% were higher again, 30–120 m above the canopy.

## Limitations and points to consider

Although the amount of information that could be gleaned from these ad hoc sightings was severely limited, this low-cost survey:

- Confirmed that long-tailed bats were relatively common and widespread in the Eglinton Valley
- Indicated that long-tailed bats were likely to be roosting within old-age red beech forest on terraces along the valley floor
- Gave an indication that the valley would be a suitable site for management and research on this threatened species, based on the frequency of sightings

# Full details of technique and best practice

When beginning a series of visual counts of long-tailed bats, the first requirement is to identify areas of likely bat habitat such as unlogged forest, native forest remnants or sites close to locations of previous sightings (including historic records). Secondly, it is important to find good vantage points such as forest edges, roads, tracks and clearings which will allow bats to be seen against a backlit sky. If surveys are to be conducted in a very specific area, it is preferable to use many observers, to cover as much sky as possible at the chosen site. Inference about presence of bats will be improved by having many sampling points (and observers) spread over a more extensive area. Observations can begin up to 1 hour before local sunset time (as listed in the current New Zealand Nautical Almanac), and should continue until it is too dark to see.

Bat detectors can be useful aids in visual surveys, by alerting observers to the presence of bats and confirming identification, but the range of the detectors is limited compared with the eye. Binoculars can also be used to look closely at the bats to confirm identification once bats or bat-like shapes have been sighted. Binoculars usually have a narrow field of view compared with the naked eye, so unless there are numerous observers it is better not to use binoculars for initial scanning of the sky. This type of survey should not be undertaken during winter or in cold weather because long-tailed bats are less likely to emerge from roosts and forage at dusk.

A variation of this method is to search for bats flying around outside their roost sites at dawn or dusk (Stebbings et al. 2005). These types of counts are primarily useful for locating new roosts or determining whether known roosts are occupied. Many species will often swarm together, sometimes in large

numbers, around entrances to roosts at dawn during summer months and at night during the autumn and winter. Long-tailed bats have been observed swarming around roost trees at dawn in the Eglinton Valley and inside Grand Canyon Cave, Piopio, near Te Kūiti, at night. Lesser short-tailed bats usually return to their roost before it is light. High levels of activity have been recorded throughout the night at lesser short-tailed bat roost on Codfish Island during winter. Again, activity only occurs while it is dark, but it may be possible to pick up signs of activity on the bat detector or audible squeaking.

Swarming of long-tailed bats begins an hour before sunrise during summer months and can occur (or continue) well after it is light. Large numbers of bats can be very visible and certainly very audible on the bat detector. The field method is very simple; the surveyor walks with a bat detector through potentially suitable habitat (or an area pinpointed from previous reports) 1 hour before dawn and looks and listens for activity. The bats may fly around for some time before they fly into the roost entrance. Alternatively, observers can go out at dusk and search for long-tailed bats as they fly out of their roosts. However, emerging bats are more likely to fly off directly than circle around the roost.

This method is unlikely to be suitable for locating bat roosts in trees in areas that are not known to contain bats. It would literally be like searching for a needle in a haystack.

### Best practice for inventory of long-tailed bats

- Surveys must only be undertaken of fine, relatively warm conditions, with temperatures ≥ 7°C.
- Searches should commence 60 minutes before sunset and continue until it is too dark to see (or from when it is barely light and continue for 60 minutes).
- Winter surveys should be avoided.

## References and further reading

Gaisler, J. 1979: Results of bat census in a town (Mammalia: Chiroptera). *Vestnik Ceskoslovenske Spolecnosti Zoologicke 43*: 7–21.

Stebbings, R.; Mansfield, H.; Fasham, M. 2005: Bats. Pp. 433–449 in Hill, D.; Fasham, M.; Tucker, G.; Shewry, M.; Shaw, P. (Eds): Handbook of biodiversity methods: survey, evaluation and monitoring. Cambridge University Press, Cambridge.

Walsh, A.; Catto, C. 2004: Survey and monitoring. Pp. 29–39 in Mitchell-Jones, A.J.; McLeish, A.P. (Eds): Bat workers' manual. Joint Nature Conservation Committee, Peterborough.

# Appendix A

The following Department of Conservation documents are referred to in this method:

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| docdm-132033 | Bat Recovery Group contacts |
| docdm-213179 | Canterbury Conservancy bat database |
| docdm-167000 | Form for recording observations of flying long-tailed bats at dusk |
| docdm-213136 | National bat database template |
| docdm-146272 | Standard inventory and monitoring project plan |