Guidelines for surveying and monitoring long-tailed bat populations using line transects

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ABSTRACT

Standardised methods for surveying and monitoring long-tailed bat (*Chalinolobus tuberculatus*) populations are needed to enable conservation managers to identify declining populations that require management and then measure the population response to management. In the method described, long-tailed bats are counted using hand-held heterodyne bat detectors whilst walking standardised 1-km transects along roads. It is recommended that a minimum of 50 different transects be undertaken in an area that has been selected to sample a representative range of habitats and landforms. Guidelines are provided for standardising counts so that surveys between years are comparable. Recommendations for when and where to survey, how to optimise survey effort, and optimal environmental conditions for counts are provided. Results from these transects provide an index of bat activity (number of bat passes per km per survey) which can be compared from year to year and used to examine long-term trends.

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1. Introduction

1.1 WHY MONITOR LONG-TAILED BAT POPULATIONS?

The New Zealand long-tailed bat (*Chalinolobus tuberculatus*) is classified as threatened because it has declined significantly in distribution and numbers since humans arrived in New Zealand (O'Donnell 2000a). Preliminary genetic analysis suggests that North Island and South Island populations of long-tailed bats are distinct and should be treated as separate conservation units (Winnington 1999; O'Donnell 2001a). Long-tailed bats are often cited as 'common' or 'widespread', but recent work has indicated that they are rarely encountered in many areas, and their numbers may still be declining (e.g. O'Donnell 2000a, 2000b).

1.2 OBJECTIVES OF SURVEY AND MONITORING PROGRAMMES

Determining where long-tailed bat populations are located and whether the populations are increasing, decreasing, or stable is fundamental to assessing their conservation needs. Results from surveys can be used by conservation managers to make decisions about the size and conservation status of a population, and whether active management is required. Specific objectives include:

1. Identifying the geographical location of declining populations.
2. Establishing a quantitative baseline against which to measure future population changes and population trends over time.
3. Making decisions about the size and conservation status of a population.
4. Deciding which populations require active management.
5. Measuring the response of bat populations to management.

Standardised methods for monitoring long-tailed bat populations are needed to enable conservation managers to meet these objectives.

1.3 METHODS FOR SURVEYING BATS

A variety of methods are available for surveying bats, including visual or video counts at roosting sites (O'Donnell & Sedgeley 1999), stationary counts of activity using automated bat detector systems (O'Donnell & Sedgeley 1994; O'Donnell 2000c), and standardised transect counts (Helmer et al. 1987; Walsh et al. 1993; Boonman 1996; Walsh & Harris 1996). Counts at long-tailed bat roosts are potentially expensive because radio-tracking is generally required to locate roosts, but then bats change to a new roost virtually every day (O'Donnell & Sedgeley 1999). Average counts at roosts are also significantly smaller than actual population sizes (O'Donnell 2000d). Automatic detection is appealing because activity can be sampled throughout the night remotely. However, a large number of bat-detector units, costing $600–$1200 each, are needed for an effective monitoring survey, and the units only sample small areas at one time.

Transect techniques have the advantage of being very cheap to run, they can utilise enthusiastic volunteers, can sample a large area and wide variety of habitats and landforms over a few nights, and have proven to be successful in detecting population trends over time (Walsh et al. 2001).

1.4 AIMS OF THESE GUIDELINES

Current research being conducted by the Department of Conservation's Science & Research Unit aims to develop and test methods for monitoring long-tailed bat populations nationally, with particular emphasis on calibrating transect counts. Index counts are being undertaken and calibrated against a range of populations of known size and productivity. The resulting techniques will enable Department of Conservation Conservancies to institute their own monitoring programmes at key sites.

This report outlines guidelines that enable people to conduct standardised surveys for long-tailed bats. Such surveys will provide the baselines needed to measure population trends in the future.

2. Standardising bat counts

2.1 WHY USE STANDARDISED TECHNIQUES?

Transect counts are useful for (1) one-off surveys of an area to determine presence or absence of long-tailed bats, and (2) long-term monitoring of populations. For monitoring programmes clearly defined, standardised, and hence repeatable techniques are needed to enable meaningful comparisons of populations to be made between years, experimental areas, habitat types, or geographic areas. Trends derived from data collected by proven standardised techniques can be interpreted with greater accuracy. For example, if bat counts are seen to decline from one year to the next, we need to be confident when interpreting the results that this decline reflects a real change in bat numbers rather than simply changes in the way the survey was conducted, or changes in environmental conditions or bat behaviour.

2.2 WHAT NEEDS TO BE STANDARDISED?

All facets of surveys (transect technique, equipment, the time of year, survey effort—i.e. duration and length of each transect, and environmental conditions) should be standardised to ensure comparable counts between years.

Bat activity can be highly variable and is influenced by numerous environmental factors including time of night and weather conditions (wind, rainfall, humidity, moonlight, reviewed in Erkert 1982, Hayes 1997, Vaughan et al. 1997). Ambient temperature and insect availability have been found consistently to have a profound effect on bat activity (e.g. Avery 1985, Barclay 1991, Rydell 1993), including that of long-tailed bats (O'Donnell 2000c). Planning surveys to be undertaken under standardised conditions can reduce much of this variability.

Sensitivity to bat calls varies among bat detector brands and recording situation (Waters & Walsh 1994, Parsons 1996) and depending on how fresh the detector's batteries are (O'Donnell & Sedgeley 1994), so the use of standardised equipment will reduce this variability. Additionally, clear notation on survey data forms of factors which are likely to influence levels of bat activity (such as time survey began and finished, temperature and weather conditions throughout) will greatly aid in analysis and interpretation of results.

3. The line transect method

3.1 PRÉCIS OF THE SURVEY METHOD

Bats are counted by observers using hand-held bat detectors whilst walking standardised 1-km transects along roads in a particular study area. Each transect takes c. 20 minutes to walk. A minimum of 50 different transects should be undertaken in an area that has been selected to sample a representative range of habitats and landforms present. A specific survey should last no longer than 2 weeks to avoid changes in the conspicuousness of bats. Results from these transects provide an index of bat activity (number of bat passes per km per survey) which can be compared from year to year and used to examine long-term trends or changes in long-tailed bat numbers. To standardise between surveys, transects must be walked along the same route as previous surveys. Surveys should be undertaken at the same time of year for each site, preferably in summer (October–February), when long-tailed bats are most conspicuous. Winter surveys should be avoided.

3.2 BAT DETECTOR AND FREQUENCY

The Department of Conservation uses heterodyne Batbox III bat detectors (Stag Electronics, Sussex, UK) as its standard for surveying long-tailed bats. The Batbox III detector was used because it appeared to be twice as sensitive as many other tuneable narrow-band bat detectors, especially around 40 kHz (Walsh et al. 1993; Waters & Walsh 1994).

Detectors are set on 40 kHz for long-tailed bat surveys, which represents the peak loudness of their calls (Parsons et al. 1997). Bats navigate in the dark using sonar (usually known as echolocation). The frequency of their echolocation calls is much higher than humans can hear. The bat detector's sensitive microphones can pick up these calls and convert them to a sound we can hear through the detector speaker. These calls are heard on the detector as series of clicks as a bat flies into range. A series of clicks is defined as a 'bat pass' (Furlonger et al. 1987). Passes are defined as a sequence of two or more echolocation clicks, and a period of silence separates one bat pass from the next bat pass. A Batbox III on full volume can detect long-tailed bats on average (± *SD*) 43.5 ± 9.8 m away when recorded along forest edges (C. O'Donnell unpubl. data).

There is little chance of encountering short-tailed bats (*Mystacina tuberculata*) or misidentifying bat species while walking transects along roads, because short-tailed bats rarely forage in the open and along forest edges where long-tailed bats are most common, and because the two species have different call characteristics (O'Donnell 2000c; O'Donnell et al. 1999; Parsons 2001). Peak amplitude of *M. tuberculata* calls is ca. 27–28 kHz (Parsons 1997). Although there is overlap between the fundamentals and harmonics of the calls of *M. tuberculata* and *C. tuberculatus* (Parsons 1997), only 3.9% of *M. tuberculata* calls were detected at 40 kHz using Batbox III detectors, both in the Eglinton Valley (C. O'Donnell, unpublished data) and on Codfish Island (O'Donnell & Sedgeley 1994). Overlapping calls were distinguishable because the call rate of *M. tuberculata* was twice as fast as *C. tuberculatus* (Parsons 1997; O'Donnell et al. 1999).

3.3 RECORDING BAT ACTIVITY

To use a bat detector, simply turn on the switch and check the frequency dial is set to 40 kHz to detect long-tailed bats. The on/off switch and volume are combined on the same knob. The detector should be held with the microphone pointing forwards, and upwards at a slight angle, and can be moved from side-to-side as the observer walks. The observer records the number of bat passes heard while walking each transect. Number of bat passes provides an index of activity (e.g. passes per km per survey) rather than an actual measure of the number of bats in a population. Thus detectors can be used for either determining presence or absence of bats in an area and for comparing bat activity levels from year to year.

3.4 PLANNING A STANDARDISED SURVEY

Time of year: Long-tailed bats are much more active in spring and summer months (October–February) than they are in the winter (O'Donnell 2000c). A specific survey should take place at the same time each year and last no longer than 2 weeks to avoid seasonal changes in the conspicuousness of bats. October–December surveys sample populations before young of the year begin flying. January–February surveys sample populations once young have begun flying.

Time of night: Emergence of bats from roosts varies geographically, averaging 30 minutes after sunset in South Canterbury (Griffiths 1996), 17 minutes after sunset in Hawkes Bay (Gillingham 1996), 14 minutes after sunset in the King Country and 2 minutes after sunset in Fiordland (O'Donnell 2001a). Although long-tailed bats can be recorded at any time of the night, transects should be walked over 2–3 hours commencing 30 minutes after official sunset time when peak long-tailed bat activity occurs (maximising the chance of recording the bats) and because activity decreases significantly after this time (O'Donnell 2000c). Official sunset times are listed in the New Zealand Nautical Almanac. The times listed are NZ Standard Time. One hour needs to be added to these times during daylight saving.

Temperature and weather conditions: Bat activity varies significantly with temperature and weather conditions (O'Donnell 2000c). Surveys should take place on fine warm nights, ideally above 10ºC and definitely not when dusk temperature is less than 7ºC because both bat activity and insect activity (food availability) decline considerably below these temperatures (O'Donnell 2000c). Surveys on nights with heavy rain and strong winds should be avoided. If weather deteriorates once an evening's sampling has commenced, the survey should be abandoned for that night.

Habitat type: Most records of long-tailed bats are associated with a variety of indigenous forest types including pohutukawa, kauri, beech and podocarp hardwood forest. They also forage over regenerating kanuka- or manuka-dominated indigenous shrublands and some pine forests (O'Donnell 2001a). However, most foraging occurs along forest-grassland edges and roads through forest with little foraging within the forest interior (O'Donnell 2000c). Therefore transects should focus on forest edge habitats to maximise the chance of encountering long-tailed bats.

In long-term monitoring programmes that do not involve surveying transects at random, it is important to walk transects along the same routes.

3.5 SURVEY AREA AND NUMBER OF TRANSECTS

The location of 1-km transects should be planned carefully. Ideally, the location of transects in an area should be random to aid statistical analysis. In most situations this will not be possible because of health and safety considerations or the impracticalities of surveying rugged terrain. Therefore, systematic surveys are best, where transects cover the whole of a study area (e.g. the whole of a valley) or sample all representative habitat types proportionately. In these situations the start points of each survey should be randomised.

A minimum of 50 transects per study area is recommended because sample sizes below this reduce the power of the survey to detect population changes over time (Walsh et al. 2001; C. O'Donnell unpubl. data). If surveys are being carried out more than once in order to monitor population change, then the programme should ideally run for at least 8 years. Shorter programmes may lack the power to detect significant population changes, although they can still provide valuable data on bat presence/absence or distribution.

Before commencing the counts, a base map of the survey area should be set up. Each transect intended for survey should be allocated a unique number and marked clearly on the base map. It is most practical, and safest, to run transects along roads or tracks in a study area. The survey organiser should assess how many people are available and work out how to subdivide the survey into manageable sections. If the survey is a repeat from previous years then transects must follow the same routes unless the organisers are using a completely randomised design.

3.6 TRANSECT SPEED

Each transect takes c. 20 minutes to walk (walking speed = c. 3 km/hr). Long-tailed bats usually concentrate their foraging in small areas of habitat, the locations of which are unknown at the beginning of a survey (O'Donnell 2000d). Therefore, time spent on a transect represents a compromise between spending as long as possible in an area to maximise the chance of detecting bats at a site, and the need to sample as many sites as possible in a geographic area to identify patchily distributed bats.

3.7 PERSONNEL FOR A SURVEY

The best way to undertake a survey is by encouraging large groups to participate over one or two nights. Ten people, each with a detector and using 5 vehicles could survey 50 km of transects in one 2–3 hour evening. In the past, Forest & Bird Society members, Conservation Corps, student groups, and members of local communities have assisted with Science & Research Unit bat surveys, and enjoyed the experience. Personnel need to familiarise themselves with how a bat will sound on the detector and how to count 'bat passes' by listening to tape recordings or to bats in the field before the survey commences. (Tape recordings are available from Colin O'Donnell, Department of Conservation, Private Bag, Christchurch).

3.8 LOGISTICS FOR SURVEYING A SERIES OF TRANSECTS

A team of two people with one vehicle can undertake a section of around 10 transects (5 transects each) per night. It is worth driving the stretch of road to be surveyed before it gets dark to check road conditions, locate parking spots, and categorise habitat types. The survey is best carried out using a 'leap-frogging' technique. The driver drops observer one at the beginning of the first transect in the section. The starting point is drawn on the base map. Observer one begins walking the first transect. The driver zeroes the odometer and drives 1 km along the road to the start of the second transect (also the end of the first transect). The driver parks the vehicle, gets out and begins the second transect (becoming observer two). Meanwhile, observer one completes the first transect and reaches the parked vehicle. Observer one then drives 1 km along the road, usually passing observer two. The driver can call out the odometer reading as a check for the person still walking. After 1 km, observer one parks the vehicle and begins transect three, and so on. The two observers continue leap-frogging each other using the vehicle until the required number of transects have been completed.

3.9 CHECK EQUIPMENT BEFORE STARTING

It is advisable to run through the field checklist (Appendix 2) before commencing a survey. Surveyors should check that all bat detectors have new batteries and the frequency and on/off knobs function correctly. The organiser should make sure there are enough survey forms or notebooks (forms are preferable) for all teams, pencils (and spares), functioning torches, spare 9-V batteries, thermometers, watches, and fluorescent safety-vests.

Bat detector frequencies can change over time. Therefore recalibrate the frequency dials on each detector at the beginning of each field season using a 40 kHz ultrasonic signal generator.

3.10 AT THE BEGINNING OF THE TRANSECT

Fill in one survey form per transect (Appendix 1). Record the correct transect number on the form (check on survey map). Fill in all spaces on the form. Familiarise yourself with how to interpret and record variables such as weather conditions and number of insects before beginning walking.

Record observer name, the date and the transect number (one transect per form). Record weather and wind conditions by circling one of the choices given on the form. Record the time the transect started.

Record temperature using a thermometer. Let the temperature on the thermometer settle down for a few minutes before recording. Avoid touching the mercury bulb. Digital thermometers are easier to read! Attach the thermometer to the outside of the vehicle so that both observers can use it.

Switch on the bat detector. The on/off knob is also a volume control, so turn fully clockwise to achieve maximum volume. Check that the frequency dial is set on 40 kHz. Bat calls through the detector sound like a series of repeated rhythmic clicks. The 'Batbox III' bat detector can pick up long-tailed bat calls over 50 m away. The calls will naturally change in volume as the bat flies closer or farther away.

Turn off any torches. It is better if the majority of the transect is walked in darkness to minimise the chance of attracting or scaring away bats with the torch light and to retain the observers' night vision. Putting a red filter over the torch may be of value.

Hold the detector at waist height (or wherever is comfortable). It is not necessary to hold it forward with arms out-stretched. Point the detector with the foam-covered microphones at the front and the surface with the speaker, and control knobs on top. Don't point the detector down at the ground (it gets very noisy picking up footsteps and the ground isn't the best place to locate long-tailed bats!). Angle the front of the detector slightly upwards (it doesn't need to be pointing vertically to the sky).

Walk the transect slowly, at about 3 km/h so that it takes about 20 minutes to complete one transect. Walk steadily and try not to stand in one place for too long. This is crucial to provide repeatable surveys. If surveyors carry out transects which take different lengths of time then the chance of encountering bats becomes more variable. The first transect walked is likely to be too fast (or too slow in some walkers). Try and adjust for this on subsequent transects.

3.11 WHAT TO RECORD

Tally the total number of bat passes heard, total number of bats seen, and record the time each pass was heard. Long-tailed bats are usually only seen close to dusk, while there is still some light. The part of the form that asks you to record 'the maximum number of bats at one time' applies only to the maximum number of bats seen flying around at one time. If for example, two bats were seen, but never together, then the maximum is one.

Record the habitat type in the area that each bat pass was heard. The detectors are directional, so the calls will sound louder when the bat is close and the detector is pointing directly at the bat. Habitat categories can be fairly simple, e.g. paddock, wetland/marsh, native bush (forest type if known), river, trees along road.

Record the number of insects encountered on each transect by circling one of the choices given on the form. An easy way to do this is to turn on the torch on a couple of occasions for a few seconds while walking and see how many insects there are flying around. Then categorise them as common, occasional or rare. Confirm assessments by observing the activity of insects illuminated in the vehicle headlights when driving between transects.

3.12 FINISHING THE TRANSECT

At the end of the transect record the time it was finished and the temperature. Count up and record the total number of bat passes heard, the total number of bats seen, the maximum number of bats seen at one time and how long it took to walk the transect.

Don't forget to record zeros on the form. The fact that no bats were recorded on a transect is an important result.

If there is doubt about anything observed, or how to record it, write some explanatory notes on the form. Write a detailed description if necessary. It's always better to have too much information than too little.

3.13 HEARING OTHER THINGS

The bat detector will pick up any high-frequency sound that is close to 40 kHz, not just bats. Insects can be very noisy on warm summer nights (e.g. cicadas, crickets). Observers should listen for a pattern in the sound to try and distinguish between bat calls and other sounds. Bat calls are usually very repetitive and rhythmic, and the calls will come and go as the bat flies towards and away from the observer. Insect calls are more likely to be stationary and have a different sounding rhythm. Electric fences make a very repetitive clicking noise, but the sound will be stationary, close to the ground and the time between clicks will be much slower than in bat calls. If a 9-V battery is getting low it can create a feedback in the detector's speaker.

3.14 ANALYSIS OF RESULTS

Results are best summarised in a spreadsheet (e.g. Excel; Appendix 3). Columns in the spreadsheet should include all data recorded on the field sheet because the influence of factors such as transect length, observer, temperature etc. need to be accounted for in any analysis.

Results can be presented in a number of ways. Distribution maps of presence/absence can be drawn (O'Donnell 2000a) or the frequency of occurrence of bats on each survey or average number of bat passes/survey graphed (e.g. Fig. 1). Simple statistics for comparison can be calculated, such as the percentage of transects bats were encountered on or mean number heard/km/h. In most circumstances statistical comparisons should only be made between standardised surveys at the **same** site. Comparison between different sites may be misleading because surveys could have been undertaken in different conditions. Equally important is that the distribution of bat foraging habitats may differ between sites, resulting in animals being distributed differently in the landscape. For example, in the Eglinton Valley, where food availability is limited, a population of > 350 bats ranges over > 110 km^2 (O'Donnell 2001b). In contrast, a smaller population of c. 150 bats near Geraldine is concentrated in a much smaller area (< 30 km^2) (Griffiths 1996; O'Donnell 2000b). Thus higher activity levels have been recorded at Geraldine because the bat population is concentrated in a much smaller area, but the population is significantly smaller.

Detailed statistical analysis of population trends requires specialist skills and conservation managers should seek advice on the best ways to analyse counts. Data distributions for long-tailed bat counts generally show strongly skewed distributions because of a high number of zero counts. For this reason, transformations sometimes used for analysing counts of bats (e.g. Walsh & Harris 1996; Vaughan et al. 1997) are not possible. Because it is not possible to standardise all aspects of surveys between years, statistical modelling procedures are used that distinguish between variation in counts resulting from variability in environmental or sampling conditions and the actual variation in activity levels of bats between years. We have used analysis of deviance (Baker & Nelder 1978; O'Donnell 2000c) to determine which of the significant factors best explain variation in levels of bat activity over time.

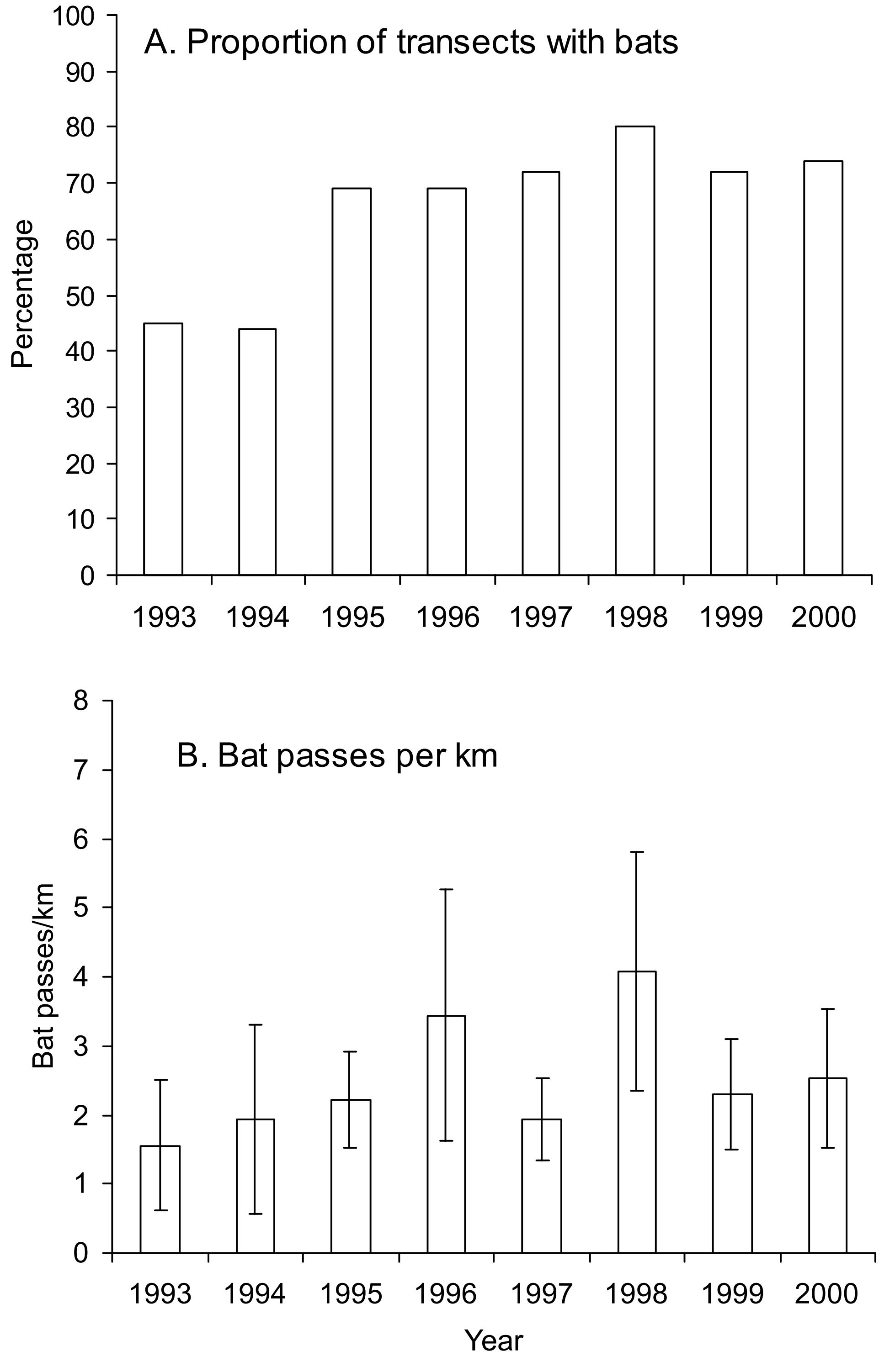

Figure 1. (A) Proportion of transects that long-tailed bats were recorded on each year on standard surveys in the Eglinton Valley, January 1993–2000 (n = 50 counts/year) and (B) Average number of bat passes/km/survey during the same period. Although some counts appear to vary from year to year, Analysis of Deviance Models indicate that differences are due to variations in weather and temperature. Once these differences are taken into account, there is no significant difference in counts from year to year. This was confirmed by actual counts at roosts and recaptures of banded bats, which also did not vary significantly among years (C. O'Donnell & G. Elliott unpubl. data). Error bars are 95% Confidence Intervals in Fig. 1B.

3.15 FURTHER INFORMATION

Contact Colin O'Donnell, Science & Research Unit, Department of Conservation, Private Bag, Christchurch. Phone: 03 3799 758.
Email: codonnell@doc.govt.nz).

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APPENDIX 1
STANDARD SURVEY FORM

Long-tailed bat transect counts

(1 km transects, ca. 20 minutes/transect)

Location:				Transect No.	
Observer:				Date	
Temperature beginning =			Temperature end =		
Cloud Cover	0=clear, 8=overcast				
Weather (circle)	Fine	Showers	Drizzle	Rain	
Wind (circle)	Calm	Light	Moderate	Mod–strong	Strong
Insects (circle)	Unknown	None	Rare	Occasional	Common
BAT COUNTS					
Time start:		Time end:		Total minutes:	
Number of bat passes heard		Number of bats seen		Maximum number of individuals at one time	
TIMES BATS HEARD & HABITAT:					

APPENDIX 2
FIELD CHECKLIST

What you need

Batbox III detector, survey forms or notebook (forms are preferable), pencil and spare pencil, torch, safety-vest, thermometer, spare 9 V battery and a watch.

Checklist

1. Record your name, transect number, start time and start temperature on the form.
2. Turn the detector on/off knob around fully to reach maximum volume. Check the frequency knob is set to 40 kHz.
3. Hold the detector so it is angled slightly upwards and not pointing towards the ground.
4. Keep your torch turned off as much as possible or use a red filter.
5. Walk slowly, but steadily. Try to avoid standing in one place for too long. Each transect should take approximately 20 minutes to walk.
6. Record weather conditions and insect abundance by circling one of the choices given on the form.
7. Record the time each bat pass is heard and the habitat type where it was heard.
8. Record the finish time and temperature.
9. Tally up the total number of bat passes and the time it took to walk the transect.

Try and fill every gap on the form. If you are unsure about what you observed, or how to record things on the form, write some explanatory notes. Too much information is better than too little.

APPENDIX 3. EXAMPLE OF EXCEL SPREADSHEET OF BAT COUNTS FROM GERALDINE, SOUTH CANTERBURY (WEATHER, WIND AND INSECT VARIABLES ARE CODED 1-5 DEPENDING ON THEIR POSITION ON THE FIELD SHEET).

FIELD SHEET NUMBER	SURVEY NUMBER	DATE	TRANSECT NUMBER	START TEMP.	END TEMP.	WEATHER	CLOUD	WIND	INSECTS	START TIME	END TIME	TOTAL TIME	BATS SEEN	BAT PASSES	MAX. BATS
18	1	13/01/99	35	15	15.3	1	4	1	5	22:20	22:40	00:20	1	1	1
18	1	13/01/99	36	15.3	15.6	1	8	1	5	22:40	23:00	00:20	0	0	0
19	1	13/01/99	37	15.4	15.6	1	8	1	5	22:47	23:04	00:17	0	0	0
19	1	13/01/99	38	15.6	15.4	1	8	1	5	23:04	23:24	00:20	0	0	0
20	1	13/01/99	39	16.1	15.7	1	8	1	5	23:25	23:44	00:19	0	0	0
20	1	13/01/99	40	15.7	15.4	1	8	1	5	23:27	23:48	00:21	0	0	0
21	1	15/01/99	41	12.6	12.6	1	8	1	5	22:05	22:25	00:20	0	0	0
21	1	15/01/99	42	12.6	12.7	1	8	1	5	22:10	22:30	00:20	0	1	1
22	1	15/01/99	43	12.7	12.7	1	8	1	5	22:30	22:50	00:20	0	1	1
22	1	15/01/99	44	12.5	12.7	1	8	1	5	22:30	22:54	00:24	1	13	1
23	1	15/01/99	45	12.7	12.8	1	8	1	5	22:53	23:13	00:20	0	12	1
23	1	15/01/99	46	12.6	12.8	1	8	1	5	23:05	23:24	00:19	0	2	1
24	1	15/01/99	47	12.7	12.5	1	8	1	5	23:17	23:38	00:21	0	0	0
24	1	15/01/99	48	12.6	13.2	1	8	1	5	23:28	23:46	00:18	0	0	0
25	1	15/01/99	49	12.5	12.8	1	8	1	5	23:41	24:02	00:21	0	0	0
25	1	15/01/99	50	13	12.9	1	8	1	5	23:48	24:06	00:18	0	1	1
26	1	14/01/99	51	13	14.7	1	8	1	5	22:17	22:35	00:18	0	0	0
26	1	14/01/99	52	13.4	13	1	8	2	5	22:22	22:48	00:26	0	0	0
27	1	14/01/99	53	13.1	13	1	8	1	5	22:42	23:00	00:18	0	0	0
27	1	14/01/99	54	13	12.3	1	8	1	5	22:53	23:15	00:22	0	0	0
28	1	14/01/99	55	12.9	12.8	1	8	1	5	23:03	23:25	00:22	0	0	0
28	1	14/01/99	56	12.7	12.4	1	8	1	5	23:18	23:37	00:19	0	0	0
29	1	14/01/99	57	13.5	12.3	1	8	1	5	23:28	23:50	00:22	0	0	0
29	1	14/01/99	58	12.8	13.6	1	8	1	5	23:41	24:00	00:19	0	0	0
30	1	14/01/99	59	13.8	12.1	1	8	1	5	23:57	24:17	00:20	0	2	1
30	1	14/01/99	60	12.7	13.4	1	8	1	5	00:04	00:23	00:19	0	0	0
31	1	16/01/99	61	14.9	14.7	1	2	1	3	22:48	23:08	00:20	0	1	1
31	1	16/01/99	62	15.6	15.2	1	0	1	5	22:50	23:11	00:21	0	3	1
32	1	16/01/99	63	14.9	14.7	1	1	1	5	23:12	23:29	00:17	0	0	0
32	1	16/01/99	64	14.7	15	1	1	1	5	23:15	23:35	00:20	0	0	0