Eglinton Valley
Lesser Short-Tailed Bat
Monitoring Programme 2016/2017

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Eglinton Valley Lesser Short-Tailed Bat Monitoring Programme 2016/2017

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Cover image credit (Sanjay Thakur): Short-tailed bat roost M43, Eglinton Valley 2016

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Summary

The population of South Island lesser short-tailed bats (*Mystacina tuberculata tuberculata*) in the Eglinton Valley is the only known viable population of this species on mainland South Island.

The Eglinton Valley is an ecologically important site as it is one of the only sites in the South Island with both species of bats: long-tailed bats (*Chalinolobus tuberculatus*) and lesser short-tailed bats. It is also a stronghold for populations of mohua, kaka and kakariki. Continuous stoat control and periodic rat and possum control is in place in the valley to protect these species.

The Eglinton Valley lesser short-tailed bat monitoring programme is a long-term investment with the main aim of monitoring the population survival between years and the trends over time using mark-recapture methods analysed by Program MARK to assess the effectiveness of predator control in the valley.

This year's report describes the monitoring of the lesser short-tailed bat population in January 2017.

- Automatic readers and dataloggers were set up at all known occupied roosts and 1009 PIT-tagged bats were recorded (657 females, 350 males, 2 of unknown sex)
- The highest count of bats emerging from one roost tree, via video recordings, was 1831 (n=12).
- Exceptionally bad weather throughout most of January affected monitoring, with the Eglinton River uncrossable on many days.
- A proportion of the population (155 bats) were marked with PIT-tags, bringing the total PIT-tagged to 2377. Recaptures indicate we have PIT-tagged more than 50% of the current population. The number pit-tagged this season was below the annual target (200) due mostly to the unusually high rainfall in January.
- A new App developed by the DOC electronics team was successfully rolled out this season, allowing direct downloads from dataloggers to staff smartphones.
- The annual "Bats and Banana splits" event was successful in advocating bat conservation to the local community.

1. Introduction

The South Island lesser short-tailed bat is ranked under the New Zealand Threat Classification System as nationally endangered (O'Donnell et. al., 2012). Both species of bats in New Zealand are vulnerable to introduced predators (rats, stoats, feral cats, possums) throughout the year; in summer when they congregate in large colonies, and during winter when they may remain inactive (in torpor) within roosts.

The Bat Recovery Group recognises the lesser short-tailed bat population in the Eglinton Valley as a priority for management, with the aim of maintaining long-term security of the population. The lesser short-tailed bat monitoring programme is a long-term project and compliments the suite of monitoring in the valley, resulting in a unique project with one of the longest histories and the broadest scope in the country. Informal monitoring began in 1997 when lesser short-tailed bats were discovered in the Eglinton Valley for the first time. Initially, the bats were monitored in an ad hoc fashion by conducting counts at roost sites using infra-red video-cameras and VHS SD card recorders to record bats as they exit their roost trees at night. Sampling effort has varied considerably from year to year, but a focused video-monitoring programme began in 2005. Video-monitoring of roost emergence is a useful monitoring tool; however it has limitations as it is almost certainly an under-estimate of the lesser short-tailed bat population and it varies considerably between years. Bats often emerge from several holes in a roost tree and frequently move roost sites. Roost exit counts are therefore not thought to be as sensitive at detecting changes in populations as mark-recapture analysis.

Mark-recapture analysis requires animals to be individually identified in order to calculate estimates of population size and survival. Mark-recapture analysis of banded long-tailed bats in the Eglinton Valley detected changes in populations that other monitoring methods (such as transects) failed to pick up (Pryde et al., 2005; Pryde et al., 2006). Forearm banding with uniquely numbered metal bands is the accepted technique for long-term marking of long-tailed bats. However, captive trials using a range of bands on lesser short-tailed bats indicated that bands caused swelling in forearm tissue and unacceptable damage to both forearm and wing (e.g. Lloyd, 1995; Sedgeley & Anderson, 2000). For this reason there was an urgent need to develop alternative marking techniques.

The lesser-short-tailed bat monitoring began in 2006 as collaboration between Dr Jane Sedgeley, Warren Simpson, Hannah Edmonds, Kate McInnes, DOC wildlife vet and wildlife health technician and Stu Cockburn, conservation electronics manager. The original aim of this study was to assess if passive integrated transponder tags (PIT-tags, transponders or micro-chips) are suitable for marking and monitoring population trends in lesser short-tailed bats in the Eglinton Valley. We decided to continue with the existing video-monitoring programme in order to evaluate the relative merits of each technique.

Initial work has led us to be confident that we have successfully pioneered the PIT-tagging procedure for lesser short-tailed bats. The focus of the project is now long-term monitoring of the population trends in relation to pest management. Five or more PIT-tagging sessions are conducted at communal roost trees throughout the month of January, to reach the required target of 200+ PIT-tagged bats per annum.

Invasive animal pests such as stoats, cats, rats and possums are controlled to protect a range of threatened native species present in the valley. Monitoring of mustelid and rodent abundance and survival of several threatened species is conducted each year. Long-tailed bats in the Eglinton Valley are increasing following a number of bait station and aerial pesticide operations. However, because both species of bats only give birth to single young, once a year, recovery will be slow and difficult to detect in the short term, hence requiring a long-term commitment.

The size and scope of the rat control has varied over the year. A 100x100m bait station grid has been in place for several years and was gradually expanded and now covers 4800ha of the Eglinton Valley. In recent years pre-fed aerial 1080 operations have significantly increased the area under rat control. The first aerial 1080 operation in the Eglinton Valley was conducted in December 2014, as part of the Battle for our Birds initiative, due to rising rat numbers in the valley. The survival of short-tailed bats through the 2014 aerial 1080 operation was a key focus of the 2014/15 monitoring season, and is discussed in detail in that season's report (Edmonds & Pryde, 2015). Analysis of data from last year's monitoring programme using mark-recapture showed an increase in survival from 2014 to 2015 which indicated that the control of rats following the 2014 mast year was successful. A second pre-fed aerial 1080 operation was completed in October 2016. This year's report discusses the results of the short-tailed bat monitoring work conducted in January 2017.

2. Objectives

Aim

To estimate lesser short-tailed bat survival and population size in the Eglinton Valley from year to year, in relation to the current pest control regime.

Outcome measures

1. Record PIT-tagged bats via automatic readers and dataloggers at all roosts found.
2. Insert new Passive Integrated Transponder (PIT) tags into at least 200 bats.
3. Analyse population data using Program Mark to gain survival estimate between years.
4. Film and count bats emerging from roosts as a secondary monitoring method.

3. Methods

1. Estimate survival between years by using mark-recapture with PIT-tagged bats and automatic data loggers at roosts.
    a. Find active roosts using radio-tagged bats (tagging more if losing track of location of active communal roosts).
    b. Follow radio tagged bats to roosts, set up antennae around roost holes, set up data loggers
    c. Monitor for a minimum of three weeks throughout January
    d. Calculate survival using mark-recapture

2. Insert new Passive Integrated Transponder (PIT) tags into at least 200 unmarked bats.
    a. Catch bats at active communal roosts, and insert PIT-tags into new unmarked bats as per Best Practise Manual for Conservation Techniques for Bats (Sedgeley et. al., 2012). Record recaptured bats. Record age, sex and reproductive status of all bats.

3. Film and count bats emerging from roosts as a secondary monitoring method.
    a. Follow radio tagged bats to roosts, set up cameras and recorders to film for 2 hours during emergence (10pm to midnight).
    b. Count all recorded emergent bats from videos.
    c. Compare and graph results with logged counts from roosts.

4. Results

Two non-lactating female bats had transmitters attached to them on the first night of the 2017 monitoring season. One was tracked to a known roost tree (M43) in the Knobs Flat area. A further 7 lactating female bats had transmitters attached to them on subsequent nights and two more communal roost trees were located in the Murcott Burn area: a new roost (M39) and a previously known roost (M65). Dataloggers and cameras were set up at all three communal roost trees. Four pit-tagging sessions were held at M43 and one at M65, with a total of 155 bats pit-tagged over the five nights.

A total of 155 new bats of a range of age, sex and reproductive classes were PIT-tagged. This brings the total number of lesser short-tailed bats tagged in the Eglinton Valley to 2377.

All previously PIT- tagged bats handled were healthy and the majority of tags were in the correct position, between the shoulder blades.

Table 1. Captures of short-tailed bats in the Eglinton Valley 2006-2017

Year	total recorded	recaps	New	AF	AM	JF	JM	unknown
2017	1009	854	155	65	29	24	36	1
2016	1030	777	253	55	14	89	95	0
2015	965	734	231	42	21	80	86	2
2014	894	648	245	110	99	13	24	0
2013	756	550	206	124	31	25	26	0
2012	831	607	224	71	35	45	71	2
2011	663	436	227	93	41	48	45	0
2010	559	309	250	91	44	56	58	1
2009	375	229	146	62	54	9	13	8
2008	239	90	149	46	49	22	26	6
2007	284	6	278	133	58	48	39	5
2006	12	0	12	5	2	4	1	0
Total pit-tagged			2377					

Survival analysis to date indicates the lesser short-tailed bat population in the Eglinton Valley is stable to increasing. The low survival rate in 2008 is likely to be related to the high rat numbers experienced in 2006/07. The slightly lowered survival in 2011 may reflect the increase in rats in October 2009, which were subsequently controlled. Rat numbers increased again in winter 2011 but were subsequently controlled.

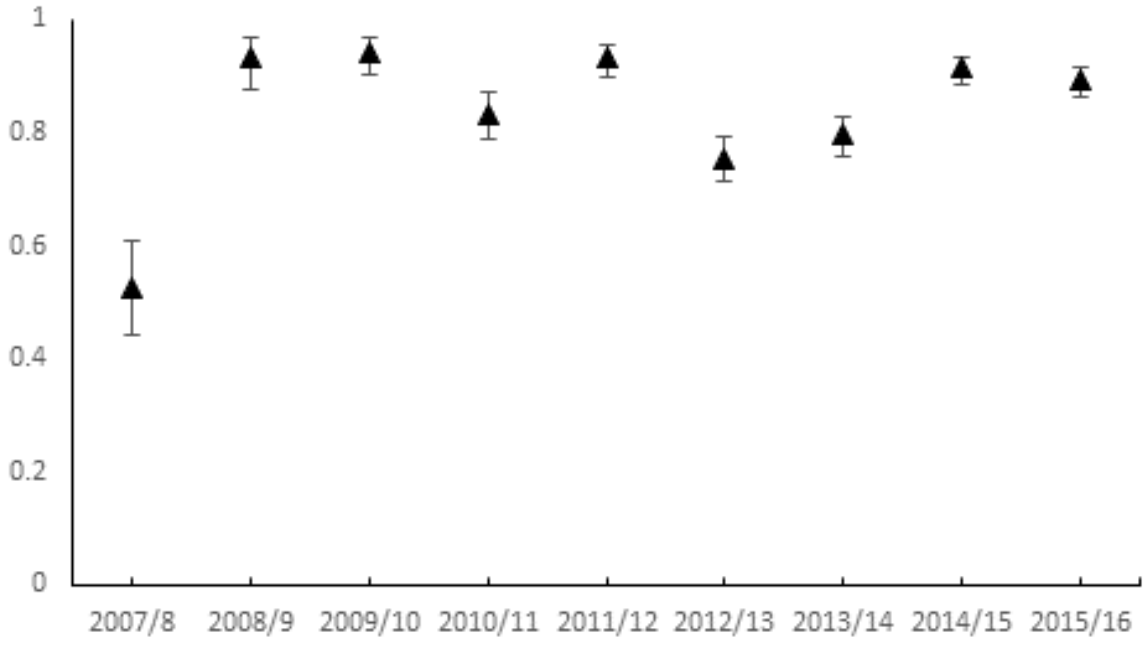

Figure 1. Annual survival of adult females with 95% confidence intervals from 2008-2016.

Emergence was recorded from three roost trees over 11 nights in January (two roosts were occupied simultaneously over one night). The largest count was 1831 individual bats from one roost tree. This is the highest number of bats counted on a single night since video monitoring began in 1997. The video counts over the years can be seen in Figure 2.

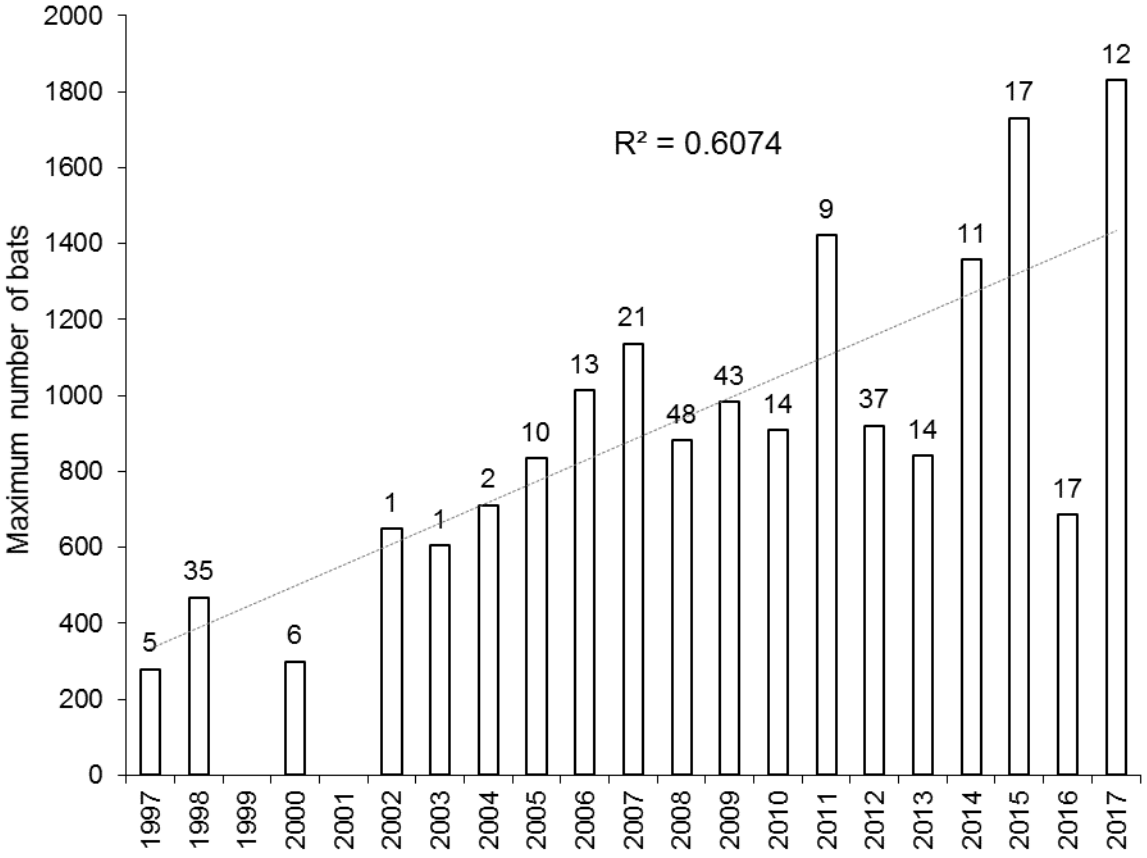

Figure 2. Graph showing maximum number of bats exiting roosts per year. Maximum number is the highest count recorded that year at either a single roost tree or the sum of roosts occupied simultaneously. The figure above each bar is the number of video counts. Note this method is an index only, it is not a true representation of the population.

5. Discussion

The weather throughout January 2017 made for the wettest and coldest bat monitoring season in memory. On many days the Eglinton River was too high to cross, and all of the bat roosts found this season were on the other (true right) side of the river, which led to some frustrating waits for the rain to stop and the river to drop. Despite these challenges we do have some good results to report.

A total of 155 bats were transpondered:

29 adult males
65 adult females (51 lactating)
36 juvenile males
24 juvenile females

A total of 1009 short-tailed bats were logged: 657 females, 350 males and 2 of unknown sex.

New technology

This year we started using a bluetooth App available from the Google play store and developed by the DOC electronics team. This means the monitoring team can now download the data from the loggers directly to our phones. After a few hiccups in the process it is now working well and provides a more efficient process that can handle more data and run for a longer time.

The bat monitoring team has also been piloting a new camera system and in 2016 Warren Simpson travelled to Whirinaki to train bat monitoring staff there in its use. Recent improvements in battery life and size allow videos to run for longer without requiring staff to carry excessively heavy packloads.

Survival of adult females

This year's monitoring indicates that survival of adult females continues to be high (as usual the 2016/2017 results will not be available until next year). Good survival of adult females is critical for population growth and the fact that survival has remained high from 2008 suggests that our management is working well. There is no evidence that 1080 has a negative effect on short tailed bats at the population level (Edmonds, Pryde, O'Donnell 2017) and all the evidence so far shows a positive effect of 1080 control on short-tailed bats.

Each season we aim to video multiple roosts on the same night so we can give an estimation of the total number of short-tailed bats in the valley that will include both tagged and untagged bats. This season we had videos set up and recording successfully on three roosts (M43, M39 and M65) but there was only one night when bats were present in multiple observed roosts (M39 and M65 on January 23rd). The highest total for the season ended up coming on the following night from a single tree (M65) when 1831 bats were observed emerging. This is the highest number of bats observed on video on a single night since video monitoring began in 1997. However, as noted in last season's report following a low maximum count (687), video counts are essentially an index of the population size but are subject to huge variability related to season and behaviour. Indices are not good at measuring inter-annual variation due to the high variability, so the fact that this year's highest count was much greater than last year's should not be interpreted as representing a dramatic increase in the population over the 12 month period. Analysis of bat transects showed that studies need to run for at least 10 years to pick up trends (O'Donnell and Langton 2003). It is positive that overall the video counts are showing an upward trend (see Figure 2) which supports the survival analysis.

6. Recommendations

We recommend the Eglinton lesser short-tailed bat project continues in its current form as a long-term project for the following reasons:

- The lesser short-tailed bat population in the Eglinton Valley is currently the only known population in existence on mainland South Island, being actively protected by pest control and studied
- Outcome monitoring of the lesser short-tailed bats complements the suite of threatened species monitoring in the Eglinton Valley, resulting in a unique project with one of the longest histories and the broadest scope in the country
- Annual marking of a proportion of the lesser short-tailed bat population is required for the mark-recapture method
- Annual monitoring of the lesser short-tailed bat population in the Eglinton Valley is essential to test whether there are any long-term effects of 1080 and pindone poisons

7. Acknowledgements

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Appendix 1. Map of lesser short-tailed bat roost trees and 2016 aerial 1080 operation area