Eglinton Valley
Lesser Short-Tailed Bat
Monitoring Programme 2017/2018

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Department of Conservation
Te Papa Atawhai

Eglinton Valley Lesser Short-Tailed Bat Monitoring Programme 2017/2018

Sanjay Thakur, Hannah Edmonds and Moira Pryde

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Cover image credit (Hannah Edmonds): Short-tailed bat, Eglinton Valley

Sanjay Thakur
Department of Conservation
Te Anau Office
PO Box 29 Te Anau 9600

Moira Pryde
Department of Conservation
Science & Policy
Nelson

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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 2018.

- Automatic readers and dataloggers were set up at all known occupied roosts and 1169 PIT-tagged bats were recorded (699 females, 470 males)
- The highest count of bats emerging from one roost tree, via video recordings, was 2947 (n=9).
- A proportion of the population (226 bats) were marked with PIT-tags, bringing the total PIT-tagged to 2582. Recaptures indicate we have PIT-tagged more than 50% of the current population.
- The new App developed by the DOC electronics team and successfully trialled last season has continued to perform well, allowing direct downloads from dataloggers to staff smartphones.
- The annual "Bats and Banana splits" event was held on the 26th of January 2018 and was once again very 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 the January 2016 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 2018.

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 nulliparous female bats and three male bats were caught on the first night (5 January) of the 2018 monitoring season, but given that breeding female bats are most likely to lead the monitoring team to communal roosts, the decision was made to not transmitter any of these five bats, and hope to catch a breeding female on the next attempt. Unfortunately the next night of mist-netting (8 January) only netted three males, and once again none were transmittered. The following day was spent scouting out old known roost trees hoping to stumble across and active roost by luck, but without success. That night two non-breeding female bats were mist-netted and the decision was made to transmitter both of them since for whatever reason we were having no luck catching lactating female bats.

The next day was not successful: only one of the signals was picked up, but after following it to the foot of a steep bluff area away from all previous known roosts it was decided to stop tracking as it seemed most likely the bat was solitary. Another attempt was made to mist-net a lactating female bat with two teams set up at Deer Flat and Plato Creek, however despite 10 bats being caught at Plato Creek none were lactating females. By this stage there was some consternation amongst the team as in previous seasons it was unprecedented to mist-net so many bats (20) without a single lactating female. The preceding spring and early summer had been unusually warm and dry and

there was some speculation that this may have affected the bat's breeding timing in some way.

Finally on 11 January the monitoring team had success when one of the transmittered bats was tracked to a new communal roost tree (M100) near Plato Creek. Harp-trapping this roost that same evening yielded 72 bats of which 40 were pit-tagged and two lactating females were transmittered. Unusually most bats remained in the roost while the harp-trap was in place.

Transmittered bats were tracked to two new roost trees (M101, M103) in the following days, although there were no obvious signs (squeaking or guano) that either of these roosts was communal. Since M100 had been vacated, another night of mist-netting was attempted with 5 bats caught across three mist net sites, and one juvenile male transmittered. On 16 January three bats were tracked to known roost M72 and one to a new communal roost (M102) in the Plato Creek area. Three more pit-tagging sessions were held (at M102 on the 17th and M72 on the 18th and 22nd) and a further 180 bats were pit-tagged, bringing the total for the season to 226 over four nights. This brings the total number of lesser short-tailed bats tagged in the Eglinton Valley to 2582. All previously PIT-tagged bats handled were healthy and the majority of tags were in the correct position, between the shoulder blades. Dataloggers and video cameras were also set up at all three communal roost trees (M100, M72 and M102) as well as at M101 which turned out to not be an active communal roost.

Table 1. Captures of short-tailed bats in the Eglinton Valley 2006-2018

Year	total recorded	recaps	New	AF	AM	JF	JM	unknown
2018	1169	943	226	71	49	38	68	0
2017	699	544	158	66	29	24	38	1
2016	1030	777	244	54	13	87	90	0
2015	965	734	228	42	21	80	85	0
2014	894	648	246	78	71	45	52	0
2013	756	550	206	124	31	25	26	0
2012	831	607	221	70	35	45	71	0
2011	663	436	226	91	41	49	45	0
2010	559	309	249	91	44	56	58	0
2009	375	229	141	50	53	16	14	8
2008	239	90	146	50	48	22	26	0
2007	284	6	279	133	59	48	39	0
2006	12	0	12	5	2	4	1	0
Total pit-tagged			2582					

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.

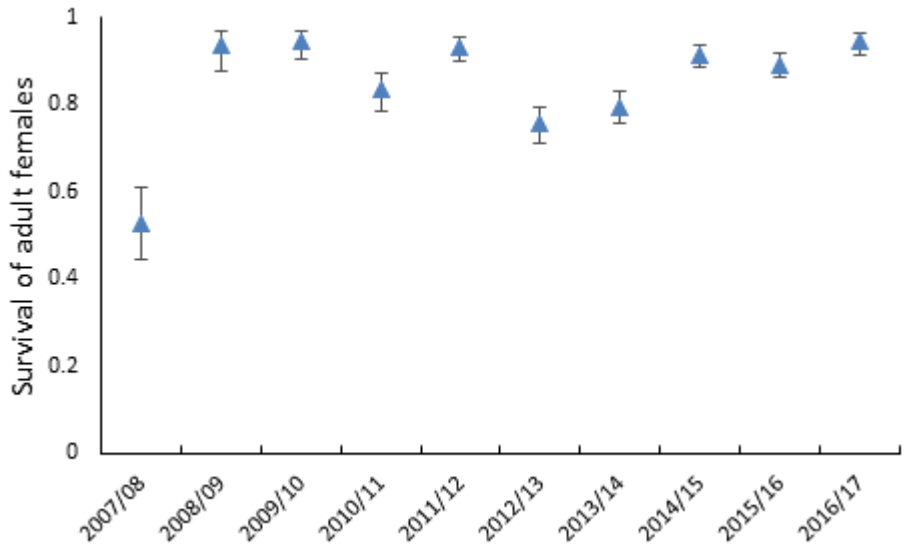

Figure 1. Annual survival of adult females with 95% confidence intervals from 2008-2017.

Emergence was recorded from three roost trees over 9 nights in January (two roosts were occupied simultaneously over one night). The largest count was 2947 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.

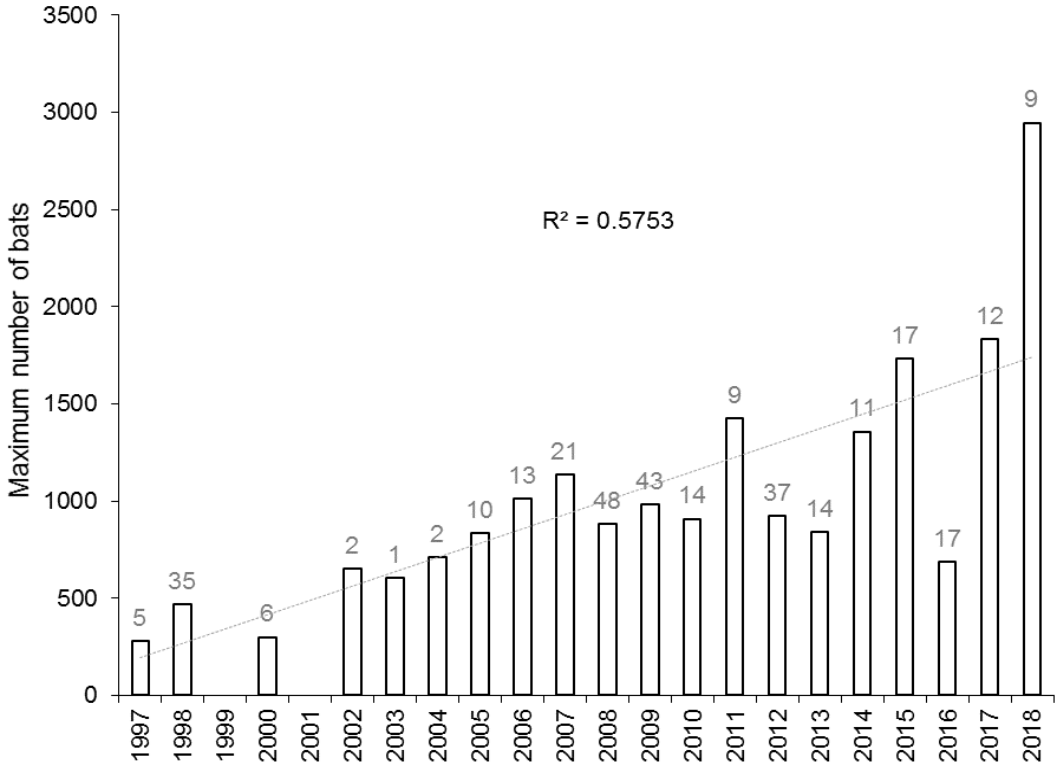

Figure 2. Graph showing maximum number of bats exiting roosts per year. Maximum number is the highest count recorded that year at either a single roost tree or the sum of roosts occupied simultaneously. The figure above each bar is the number of video counts. Note this method is an index only, it is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

5. Discussion

After a slower than normal start to the season in which it took over a week to locate our first communal roost tree, the 2017/18 monitoring programme ended on a high note with a record number of bats (2947) recorded emerging on a single night.

In total 1169 short-tailed bats were logged during the season: 699 females and 470 males. A total of 226 bats were transpondered:

71 adult females (38 lactating)
49 adult males
38 juvenile females
68 juvenile males

It is surprising that there appears to be an uneven proportion of juvenile females to males. There is no obvious reason why there should be more juvenile males than juvenile females caught and processed during harp-trapping sessions. After some discussion, the monitoring team have decided that in future seasons all bats handled will be sexed (previously only juvenile bats were sexed) and the reproductive status will be recorded for all adult females.

New technology

The bluetooth datalogger App developed by the DOC electronics team and used for the first time in 2017 continued to work well in 2018, providing a more efficient process that can handle more data and run for a longer time. The monitoring team is also continuing to benefit from improvements in battery life and size which 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 2017/2018 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.

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 (M100, M102 and M72) but there was only one night when bats were present in multiple observed roosts (M102 and M72 on January 17th). The highest total for the season ended up coming from a single tree (M72) on the 24th when 2947 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 the 2016 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
- All bats handled should be sexed and the reproductive status will be recorded for all adult females, with all new data entered and cross-checked with existing data in the Eglinton short-tailed bat database.

7. Acknowledgements

Thank you to all who were involved in this season's fieldwork: the lesser short-tailed bat monitoring team of Bex Jackson, Warren Simpson, Moira Pryde, Sanjay Thakur and Hannah Edmonds; thank you to our PIT-tagger Linda Kilduff, handlers Chloe Corne and Monique Jansen van Rensburg, scribes Chris Pascoe and Heather Barnes, and also to members of the Eglinton Valley long-tailed bat monitoring team for their much appreciated support during pit-tagging sessions: Dane Simpson, Sina Sibler, Michael Jones, Samantha Gale and Isabell Oldfield. Thanks also to Monique van Rensburg and her multiple teams of contractors for controlling pests in the valley. Thank you to Lindsay Wilson and Em Oyston for management support. Thank you to Moira Pryde for data analysis and technical support and to Stu Cockburn for ongoing technological support.

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Appendix 1. Map of lesser short-tailed bat roost trees and 2017 pindone bait station operation area