Murchison Mountains Lesser Short Tailed Bat Monitoring

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Bex Jackson

Department of Conservation
Te Papa Atawhai

New Zealand Government

Cover: Mist-netting, Ettrick Burn. *Photo: Warren Simpson DOC*

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CONTENTS

1 Summary

After preliminary monitoring in November 2019 a study into the population size and trend of short tailed bats in the Ettrick Burn commenced in 2022. A new method of mark-recapture was trialled to see its effectiveness at providing population size and trend data with confidence. Transponder survival analysis studies give excellent long term data but are better suited to long term studies due to their invasive methods and slow initial data gathering. The new method worked well and a population estimate of 401 individuals was gained.

2 Introduction

A new population of southern lesser short tailed bats *(Mystacina tuberculata tuberculata)* was indicated in the Ettrick Burn, Murchison Mountains, Fiordland, using acoustic recorder data in 2018 (Jackson 2018). Before this, southern lesser short tailed bats were thought to remain in only two locations, Whenua Hou/Codfish Island and the Eglinton Valley, Fiordland. This was due to the extinction of other populations and left the Eglinton Valley as the only surviving mainland population.

Bats in New Zealand are vulnerable to introduced predators (rats, stoats, feral cats, possums) throughout the year (Pryde et al. 2005) and short tailed bats are only known to have stable or increasing populations where intensive predator controls occurs, such as the Eglinton Valley, or where they are present on predator free islands, such as Whenua Hou. Stoat trapping alone has been shown to be ineffectual in protecting STB colonies and large scale rat control is required for protection (Jackson and Pryde 2019). Limited, isolated populations makes species more vulnerable to inbreeding, disease and other stochastic events.

Short tailed bats are extremely hard to detect due to their nocturnal nature and small size. Additionally they spend most of their time foraging deep inside the forest and only emerge when it is well dark. This results in large gaps in the knowledge of where bats reside, and these information gaps are difficult to fill without substantial time effort and cost. The development of acoustic recorders by the Department of Conservation's electronics team that record both NZ bat species as well as birds has made surveying far more feasible and is greatly adding to the understanding of bat distribution. There is however no project aiming to survey New Zealand comprehensively for bat presence and recordings often come from other projects with other aims.

In 2018 the Save Our Iconic Kiwi (SOIK) programme put out 160 acoustic recorders over a large area of Fiordland to monitor kiwi abundance throughout the park. These recorders were also set to record bats in the hours after kiwi data was collected resulting in over 300,000 recordings that were analysed by two individuals organised by the Biodiversity Group DOC.

One recorder located in the Ettrick Burn, picked up 9 short tailed bat recordings in an area where short tailed bats had not previously been recorded and 40km away from the known Eglinton population. This was followed up by the deployment of a further 111 recorders in November and December 2018 resulting in over 2000 short tailed bat recordings. These were centred in the mid Ettrick Burn in an area of predominantly red beech forest and indicated a new population. The Murchison Mountains is a special

takahe protection area with a large scale stoat trapping network, however it has never had any form of rat control and this leaves the short tailed bat population at serious risk of decline.

3 Objectives

To estimate the population size of the Ettrick Burn colony using mark recapture. Secondarily, to gather roost emergence counts as another means to estimate population size. Thirdly to gather information on population relatedness between the two Fiordland colonies.

4 Methods

Bats were caught at communal roost trees with 4 markings sessions and 6 capture sessions taking place. Individuals were marked by trimming a small patch of fur on the back on the individual, and the age, sex and female reproductive status recorded. During capture sessions age, sex and female reproductive status were collected from all individuals

4.1 Mark recapture

Mark recapture was undertaken using fur clipping as a way of temporarily marking bats with the population being considered closed for the duration of the monitoring period (3 weeks). A small patch of fur was trimmed on the back using scissors and the marks were only used to identify marked vs unmarked bats (not to differentiate individual bats from each other or separating out different capture sessions). A series of marking sessions (4) took place at roost trees, where all unmarked individuals caught were marked with age, sex and female reproductive status recorded. This was followed by a series of capture sessions (6) at roost trees where the number of marked and unmarked bats was recorded, along with age, sex and female reproductive status of all individuals. The population was considered closed for the duration of the monitoring period.

5 Results

5.1 Mark Recapture

219 individuals were marked during four marking sessions with age and sex ratios found in table 1 below. Captures of adult females were low during the monitoring period, while the number of juveniles and adult males was high. Recapture data (appendix 1) was obtained from 6 capture sessions, with the number of captures each night ranging from 34-123.

			Male		Female			
Site	Date	Total	Adult	Juvenile	Adult nulliparous (NP)	Adult post-lactating (PL)	Juvenile	Recaptures
ME6	Various	3	0	2	1	0	0	0
RE8	14/2/22	68	24	18	3	3	20	0
RE10	16/2/22	68	31	17	7	2	11	37
RE10	17/2/22	65	20	4	17	19	5	63
RE11	20/2/22	15	13	0	2	0	0	64
TOTAL		219	88	41	30	24	36	

Table 1. Number of individuals marked (note ME6 is a mist net site)

Site	Date	Number caught			Marked					Unmarked				
					Male		Female			Male		Female		
		Total	Marked	Unmarked	A	J	A NP	A PL	J	A	J	A NP	A PL	J
RE12	21/02/2022	39	20	19	6	12	1	0	1	7	0	8	3	1
RE15	22/02/2022	34	27	7	17	4	3	2	1	3	0	2	2	0
RE17	23/02/2022	52	33	19	20	4	3	3	3	4	0	9	6	2
RE18	24/02/2022	123	87	36	31	23	15	2	16	18	1	6	9	2
RE3	27/02/2022	91	49	42	23	12	2	2	10	15	1	15	10	1
RE3	28/02/2022	86	55	31	24	7	5	1	18	13	1	12	4	1

Table 2. Recapture data

Population estimates were gained in the programme MARK using a Mark-Resight, logit-Normal model. They were analysed individually for each demographic class with a total population estimate of 401 (95% confidence interval (CI) 334-518).

	Pop estimate (N)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Adult male	131	121	144
Juvenile male	43	42	46
NP female	83	67	107
PL female	104	66	178
Juvenile female	40	38	43
Total population	401	334	518

Table 3. Population estimates by demographic class

Analysis of all the demographic classes together gives a lower population with much narrower confidence intervals, however this is considered to be less true due to the known difference in detection probabilities between demographic classes. Adult females having far lower catch rates during the monitoring period.

	Pop estimate (N)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Total population	343	324	366

Table 4. Population estimate without demographic classes

16 new roost trees and one existing roost were found over the season. Roosts covered an area over 1.5km, all on the true right of the river. Roost occupancy was very short with communal roost trees being occupied on average for 2 nights.

Tree	Dates occupied	Communal/Unknown
RE6	11/2/22	Communal
RE7	11/2/22	Unknown
RE8	12/2/22- 15/2/22	Communal
RE9	15/2/22	Unknown
RE10	16/2/22-18/2/22	Communal
RE11	18/2/22-20/2/22	Communal
RE12	21/2/22	Communal
RE13	21/2/22, 23/2/22	Unknown
RE14	21/2/22	Unknown
RE15	22/2/22	Communal
RE16	22/2/22	Unknown
RE17	23/2/22	Communal
RE18	24/2/2	Communal
RE19	25/2/22	Unknown
RE20	26/2/22	Unknown
RE3	27/2/22-28/2/22	Communal
RE21	1/3/22	Unknown

Table 5. Roost occupancy

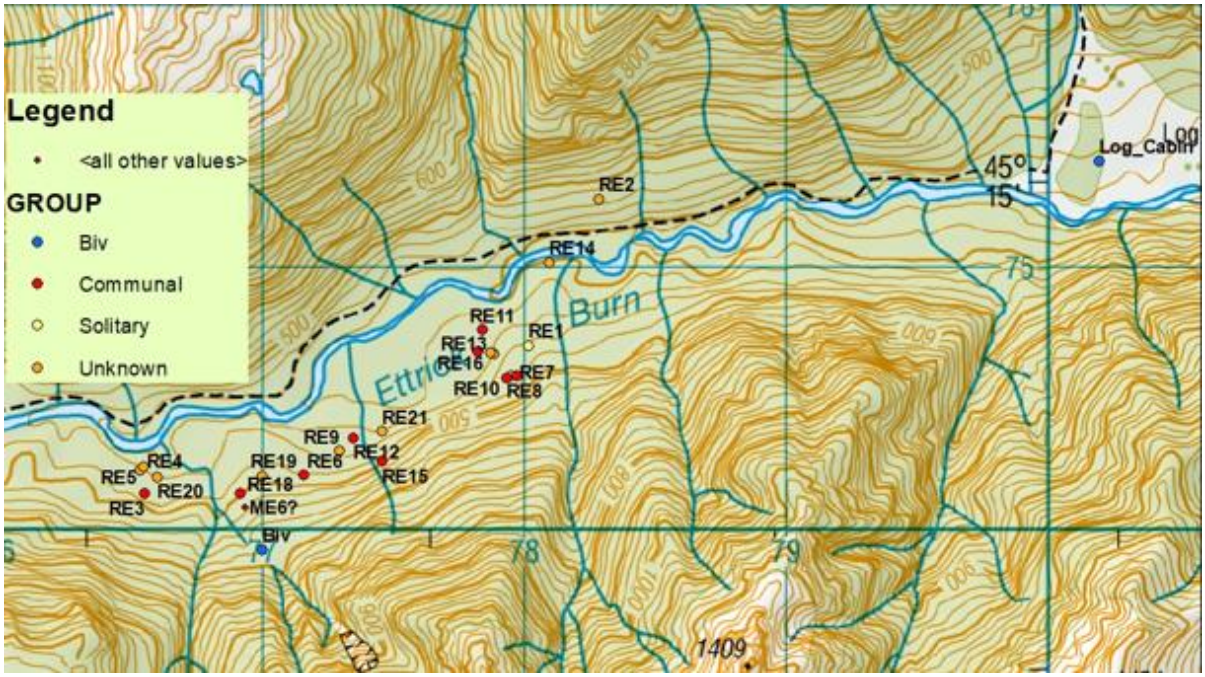

Figure 1. Short-tailed bat roost locations in the Ettrick Burn, Fiordland.

5.2 Roost emergence counts

A roost emergence count of 220 was obtained from RE8 on the 13/2/22. However in general roost emergence counts were not undertaken during the season so that effort could be focused on mark recapture.

5.3 Search for tagged bats

During recapture sessions all bats were scanned for PIT tags with none being detected. It was decided early on in the season not to put antenna and data loggers on roosts to reduce workload.

6 Discussion

Following on from preliminary monitoring in November/December 2019 more in depth monitoring was initiated this year. The focus of this monitoring was to obtain a population estimate that was quantifiable, repeatable and undertaken in a non invasive way. The two main existing methods, roost emergence counts and survival analysis, used to monitor populations trends over time were considered undesirable for this 5 year project. Roost emergence counts are variable and only represent very long-term trends in a crude manor whilst survival analysis using pit tag data is very accurate but takes several years of monitoring to show a trend and pit tagging is an invasive method of monitoring more suited to long term studies.

Mark recapture using temporary marks (fur clipping) was trialled as a non invasive method with the potential to give reasonable population estimates in small bat populations. The population was considered closed for the monitoring period and no differentiation between individuals marked on different evenings was made. This

simplified method of mark recapture using fur clipping had never been used in New Zealand (previous attempts had been made using a more complicated mark recapture model) but this study has shown it to be an effective tool in small to medium sized short tailed bat populations.

The total population estimate of 401 (95% CI 334-518) shows the population to be small but viable. Accuracy of the population estimates varied between demographic classes with some very accurate, particularly juvenile males (N=43, 95%CI 42-46) and juvenile females (N=40, 95%CI 38-43). Conversely adult female populations had inaccurate estimates i.e., NP females (N=83, 95%CI 67-107) and PL females (N=104, 95%CI 66-178). The low accuracy of the adult female population estimates is because of the low number of these individuals caught. Adult females were in low numbers in the maternal roosts post breeding season, 2022 in particular was an early breeding season which would have led to lower numbers of adult females in maternal roosts in February.

Using pooled analysis results in a far narrower, and lower, population estimate than using un pooled data. However the unpooled analysis shows that all individuals do not have the same probability of detection, and thus it is considered to be the best method for obtaining a population estimate.

Initially the project aimed, if conditions and time allowed, to also undertake roost emergence counts and put antenna and data loggers on roost trees. This work was abandoned during the season to allow all effort to be put into the mark recapture. It is recommended that these continue to be not undertaken in future years. The search for pit tagged bats from the Eglinton population, was undertaken by hand scanning all captured bats. No tagged bats were found, further indicating that the population has been separate from the Eglinton population for a long time.

Due to the location of the colony and distance to existing bivies in the valley, a further bivy was relocated closer to the colony to be a home base for bat monitoring. This was located on the true right of the Ettrick River, where the majority of the roost trees are found. This proved to be an excellent investment and reduced travel time to roost sites considerably as well as removing most river crossings, increasing safety.

7 Recommendations

1. Continue monitoring the population for at least five years to form a good understanding of the population and how it is responding to pest management
2. Instigate landscape scale rat control during the next beech masting event
3. Undertake genetic analysis

8 Acknowledgements

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9 References

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