Detecting the presence of long-tailed bats (*Chalinolobus tuberculatus*) and morepork (*Ninox novaseelandiae*) on Banks Peninsula

by

Karina Hadden, Mike Bowie and Moira Pryde

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by

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1. EXECUTIVE SUMMARY

Objectives

1. To determine the presence of long-tailed bats/pekpeka on Banks Peninsula.
2. To determine the presence of new morepork/ruru sites on Banks Peninsula.

Methods

1. The presence or absence of long-tailed bats on Banks Peninsula was assessed using two methods:
   a) Placement of 50 acoustic recorders in habitat where long-tailed bats could reside.
   b) Data collection from the public through media releases, communication through email, and phone. As well as reviewing a previous study of long-tailed bats on Banks Peninsula.
2. The presence or absence of morepork on Banks Peninsula was assessed using 18 acoustic recorders.

Results

1. No recordings of long-tailed bats were recorded at any site across Banks Peninsula over the 14-day period.

2. Morepork were detected at four sites across Banks Peninsula. Two of the sites picked up frequent morepork passes over the 14-day recording period, and the other two produced very few morepork calls over the same period.

Conclusion

Although this study did not detect long-tailed bat, it is still possible that bats reside on Banks Peninsula in very low numbers. The absence of long-tailed bats may be due to habitat fragmentation, lack of roosting sites, or predation by introduced mammals. If long-tailed bats are persisting on Banks Peninsula or are to return in the future, then the control of introduced mammalian predators, protection and regeneration of native habitat and the protection of roost sites is imperative for future restoration of bats.

Morepork were present in low numbers with all sites being in valleys, away from harsher weather conditions. Two of the sites picked up morepork calls where it was not previously known to have morepork. Overall, relatively few recordings of morepork were detected over the course of this study. This may be due to small habitat resources at each site, predation by introduced mammals, human interference, or a number of other things.
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2. PROJECT DESCRIPTION

2.1 Introduction

Long-tailed bats

The long-tailed bat (*Chalinolobus tuberculatus*), also known as pekapeka by Maori (Te Ara – the Encyclopedia of New Zealand, 2007) is one of two endemic bat species which were common throughout New Zealand up until the start of the 1900’s (DOC, n.d.). Long-tailed bats have been in decline since then due to loss of habitat through deforestation, the loss of old-age trees, predation by introduced mammals such as possums, cats, rats, and stoats, as well as competition for roost sites with mammals, birds and wasps (DOC, n.d.). Predator population levels significantly affect the survival rates of long-tailed bats (O’Donnell, 2000, Pryde, O’Donnell, & Barker 2005). The long-tailed bat is currently listed as ‘Nationally Critical’ by the DOC. Since 2008 long-tailed bats have been listed as ‘vulnerable’ by the red list of the International Union for Conservation of Nature and Natural Resources (IUCN) (The IUCN Red List of Threatened Species, 2008). Small colonies of long-tailed bats are still scattered throughout New Zealand, with the closest colony residing in Peel Forest, South Canterbury (DOC, n.d.).

Long-tailed bats are aerial insectivores (King, 2005) which feed while in flight. They typically prey on flying insects such as mosquitos, moths and mayflies (Woods, 2005). Being nocturnal mammals their peak in activity tends to centre around dusk and dawn, making an average of four foraging flights per night (King, 2005). Their activity may vary depending on food availability, season, and temperature. Long-tailed bats use echo-location to detect objects. They call at a frequency of 40 kHz (Terra Nature, n.d.) sending out a series of ultrasonic bursts of energy, otherwise known as ‘clicks’ which are undetectable to the human ear.

The roosting behaviour of long-tailed bats varies depending on season, and location but in general they shift roosting sights nearly every night (King, 2005), rarely reusing the same roost in the same season. The reason for such frequent moving is unknown but in other bat species the change in roost site is usually to avoid predation or parasites. Old age trees are the preferred roosting sites for long-tailed bats; preferably New Zealand native trees such as kauri, beech, manuka, kanuka, and podocarp forests (King, 2005). In the absence of native trees bats may use exotic species such as willow, poplar, macrocarpa, and pine if they are reach an age to produce cavities suitable for roosting (DOC, n.d.).

A study on the presence of long-tailed bats on Banks Peninsula had been undertaken between 1994-1999 but no evidence of the species presence was found. However, due to a number of recent potential sightings of long-tailed bats on Banks Peninsula by members of the public the project was proposed as a Lincoln University summer scholarship project.

Morepork

Morepork (*Ninox novaeseelandiae*), also known by the Maori name ruru, is a native owl endemic to New Zealand. They are common throughout much of New Zealand but numbers are sparse on the east coast of the South Island in Canterbury and Otago due to the dry
environment and lack of densely forested areas (New Zealand Birds Online, 2013). Morepork are classified as ‘not threatened’ by the Department of Conservation and as of ‘least concern’ by the red list of the International Union for Conservation of Nature and Natural Resources (IUCN) (The IUCN Red List of Threatened Species, 2016). However, due to a lack of robust monitoring methods and lack of resources, morepork numbers have not been accurately estimated in New Zealand. On Banks Peninsula, numbers are thought to be considerably lower than elsewhere but this is based on anecdotal evidence. Morepork are threatened by loss of habitat and predation by introduced mammals.

Morepork are nocturnal hunters whose diet varies depending on the availability of prey. Its natural prey is the long-tailed bat (King, 2005) but it also consumes a variety of other prey such as rats, mice, small birds, as well as large invertebrates such as moths, wetas, and spiders. Morepork have sharp hearing, and are able to attack prey silently due to the soft fringes on their wing feathers (DOC, n.d.). Their short wings allow for easy movement through densely forested areas when chasing prey.

Morepork reside in dense forest areas with high overhead coverage. They roost in cavities of both native and exotic trees, on branches, and on top of tree ferns (DOC, n.d.). During the breeding season in spring and summer, morepork nest in the hollows of old or dead trees, broken logs, and anywhere on the ground that is dark and secluded (New Zealand Birds Online, 2013). Nesting on the ground during the breeding season can be dangerous for females and chicks as they are more susceptible to predation by introduced mammals such as stoats, possums, and rats (DOC, n.d.).

Morepork have been the focus of a recent summer scholarship project undertaken by Carina Pohnke (Pohnke et al. 2015) as part of a three-year project undertaken by the Banks Peninsula Conservation Trust. Their study detected morepork at various sites around Banks Peninsula but were they were notably absent from some areas particularly at high altitude sites.

The availability of 18 acoustic recorders from DOC provided the opportunity to expand on this research and to learn more about their preferred habitat.

It was hoped that the results would contribute to providing advocacy and protection for morepork on Banks Peninsula, as well as the protection of habitat and roosting sites. Furthermore, this research will contribute to the ongoing work of the Banks Peninsula Conservation Trust, Christchurch City Council and Department of Conservation (DOC) to maintain and restore native habitat for a range of species across the peninsula.

### 2.2 Project Aim

The overall aim of this project was to detect the location of long-tailed bat and morepork across Banks Peninsula with the intention of protecting habitat and increasing survival rate. The aim is also to provide advocacy for both species, and promote their conservation with private landowners. The findings of this study will be able to complement future research.
studies of both long-tailed bats and morepork on Banks Peninsula and throughout New Zealand.

This study had two objectives:

1. To determine the presence of long-tailed bats on Banks Peninsula.
2. To add to the current knowledge of morepork distribution on Banks Peninsula.

3. METHODS

3.1 Methods used for Long-tailed bats

3.1.1 Acoustic Recorders.

Acoustic recorders (specifically known as frequency compression bat recorders) were used to determine whether long-tailed bats were present on both private property and reserves owned by the Department of Conservation, Joseph Langer Trust, and Christchurch City Council. A total of 50 sites across Banks Peninsula were studied for the presence of long-tailed bats using acoustic recorders. These sites were chosen as they were either covered areas of native bush, close to old age trees, or near gullies or streams where long-tailed bats may hunt for insects.

Figure 3: Study sites on Banks Peninsula that were assessed for long-tailed bat presence
using acoustic monitors.

Long-tailed bats call at a frequency of 40 kHz (Terra Nature, n.d.) and their clicks are undetectable to the human ear so acoustic recorders had to be used to observe whether there was a presence of bats. The recorders were set to pick up sounds of a low frequency, and would only record when it picked up sound that was in the right range. This allowed for an increased longevity of recording days, as well as the elimination of recordings that were not of the right frequency. The recorders were able to pick up sound in a range of 50m, and were turned on between the hours of 8pm and 7am. The recorders were attached to trees for a total of 14 days. The audio data collected was processed and analysed using ‘BatSearch3’ in which the audio files were converted into images of bat echolocation spectrograms. All the images from the 50 sites were then reviewed to observe for potential long-tailed bat passes.

Figure 4: Long-tailed bat acoustic recorder.

3.1.2 Collecting data from the general public

Information regarding the location of potential long-tailed bats was facilitated through receiving information from the public.
Media releases were put out to raise awareness to the public about long-tailed bats, and their current status on Banks Peninsula. Articles about the long-tailed bat project and its aims were published in the Akaroa Mail, Lincoln University website, and Christchurch City Councils website.

Additional information from the public relating to long-tailed bat sightings were received though verbal communication, and emails to the DOC, and Lincoln University.

3.2 Methods used for morepork

3.2.1 Acoustic Recorders.

Acoustic recorders were used to determine whether morepork were present on private property and reserves. A total of 18 sites across Banks Peninsula were studied for morepork presence by placing out acoustic recorders. These sites were designated as potential habitat for morepork as there were covered areas of native bush, and the majority were in areas that produced little human activity so were unlikely to get reported. The sites were also determined by looking through a previous morepork study (Pohnke, Evans, & Bowie, 2014) to find sites that had not been monitored for morepork presence and placing out the recorders accordingly.

Figure 1: Study sites on Banks Peninsula assessed for morepork presence using acoustic monitors.
Recorders are a preferred method of detecting presence of birds because they can record over long periods of time, they are less intrusive, and they are a passive way of observing the presence of birds (Taylor, Huang, & Yao, 2016). They also provide a more accurate depiction of the presence of morepork as their normal activity is not altered due to the presence of a person. The acoustic recorders picked up sound to a maximum radius of 250m (M. Pryde, personal communication, February 22, 2017) and were programmed to pick up sounds between 0-16 kHz, with morepork calling at around 1 kHz. The recorders were placed out for a period of 14 nights and were programmed to record sound from 8pm to 7am. The data was recorded on an SD card and downloaded into the program ‘Freebird’ for analysis. Not all of the data was viewed due to time restraints, instead the data was subsampled. All the sites initially had 7 nights’ worth of data reviewed. This was done because morepork call on most nights and if no calls were picked up within 7 days then it could be assumed that there was no presence of morepork (M. Pryde, pers. comm., January 13, 2017). This also saved time as there was a limited amount of time to look through the data. If sites did happen to show a presence of morepork within those 7 nights, then that data was fully examined for all instances of morepork calls.

*Figure 2: Morepork Acoustic Recorder.*
4. **RESULTS**

4.1 **Long-tailed bat Acoustic Recorders**

Of the 50 sites, three recorders did not record any data. The first was due to human error (site 23), one was due to faulty equipment (site 34), and the third was due to water damage (site 16). The remaining 47 functioning recorders did not record the presence of the long-tailed bat.

*Figure 5: Number of morepork passes recorded per night over the 14-day recording period at Stoney Bay (38).*
Figure 6: Number of morepork passes recorded per night over the 14-day recording period at Prices Valley (13).

Figure 7: Number of morepork passes recorded per night over the 14-day recording period at Kaituna Valley (51).
Figure 8: Number of morepork passes recorded per night over the 14-day recording period at Hickory Bay (33).

4.2 Morepork Acoustic Recorders

Of the 18 recorders used, two did not record. One was due to human error (site 23) and the second was due to a memory card default (43). Of those four locations where morepork were detected, Stoney Bay (38) and Prices Valley (13) recorded frequent calls (Figs 7 & 8) and two at Kaituna Valley (51) and Hickory Bay (33) recorded less frequent calls (Figs 9 & 10). The Stoney Bay site (38) was at an elevation of 38m, Prices Valley site (13) was at an elevation of 73m, Kaituna Valley site (51) was at an elevation of 61m, and the Hickory Bay site (33) was the outlier at an elevation of 668m. The majority of calls were at low elevation sites. The results also showed that three out of the four sites that detected morepork were situated at relatively low elevations. The Stoney Bay site (38) was at an elevation of 38m. The Prices Valley site (13) was at an elevation of 73m. The Kaituna Valley site (51) was at an elevation of 61m, and the Hickory Bay site (33) was the outlier at an elevation of 668m.
5. DISCUSSION

No long-tailed bats were detected at 47 sites during early summer on Banks Peninsula, and only 4 of 18 sites detected morepork. Long-tailed bats may persist in low numbers but not able to be detected is likely to be largely due to limitations of the time spent sampling.

The length of time allowed for this study may have played a role in the results shown in this research. The acoustic recorders for both the morepork and long-tailed bat studies were only placed out in the field for 14 days at each site, and weren’t able to be placed out again for follow-up recordings of morepork. This was due to the time restraints of this project as it was only running for 10 weeks. This was a very short amount of time for acoustic recorders to pick up sound and it should be noted that the results gathered from this study do no necessarily reflect the true presence of morepork and long-tailed bats on Banks Peninsula.

There were also physical limitations involved in the placement of both morepork and long-tailed bat monitors. Areas initially designated as good habitat for both species were not easily reached in person due to factors such as gorse bushes, dense vegetation, and terrain that was impassable.

The length of time allowed for this study played a role in the analysing of morepork data. Because of the short time allowed for this study there was not enough time to look through every nights’ worth of data. This meant that only 7 nights’ worth of recordings were checked for morepork calls. Therefore, there may have potentially been positive results of morepork on the nights that were not analysed.

To increase the probability of detection, the length of time sites are monitored, the number and type of sites monitored will need to be increased. A longer-term study over the entire summer period may detect the presence of long-tailed bats. Native bush or forest was sampled that may have inadvertently lead to a bias in the results. If recorders were placed at sites that had more exotic species such as old age pines, willows or poplars, or near lights that attract insects such as at the Lyttleton Port, there may have been instances of bat recordings (DoC, n.d.).

Similarly, morepork are known to inhabit man-made places such as parks or even exotic tree species such as pine forest (Birdling West Coast, 2015), so if acoustic recorders were placed at sites such as these then more morepork may have been recorded. There is a trade-off between the number of sites that can be visited and the cost of travel and processing results. While increasing the number of sites may increase the probability of detecting both long-tailed bats and morepork, increasing the time that recorders are active is a more cost effective option.

Seven of the fourteen nights of data were looked through initially for evidence of morepork, and if no evidence presented itself within those seven nights then it was assumed that there was no presence of morepork (M. Pryde, personal communication, January 13, 2017). This
decision may have meant that some morepork calls were overlooked because the data was not fully examined.

Acoustic recorders only pick up noise in a 50m radius so the recorders only have a limited area for detection. The radius of sound in which the recorders pick up may occasionally be limited in areas of differing terrain, or dense forest coverage where sound can be muffled.

This study supports previous surveys that both long-tailed bats and morepork are scarce on the east coast of New Zealand, Canterbury. As the results from this study only indicated a presence of morepork at each site, further research could be undertaken to find the specific population size of morepork at sites. This information may be useful as it would contribute to a broader understanding about morepork on Banks Peninsula.

As morepork were absent from high elevation sites but were present at low elevation sites, a future study may gain further understanding of this by addressing the relationship between morepork and elevation on Banks Peninsula.

It would also be of interest to investigate the home ranges of the morepork observed in this study as was done by Pohnke et. al. (2014). Radio tracking devices attached to those morepork would measure the size of the range each morepork occupied and would expand the knowledge about morepork found on Banks Peninsula.

Returning yearly to record each site found to have morepork may be of interest as it would quantify how many years morepork spent in a given area. This may be of interest as a further research study.

Undertaking both the morepork and long-tailed bat study at a different time of the year or season may lead to different results about the presence of both species on Banks Peninsula, and may be of interest as a study in the future.
6. ACKNOWLEDGEMENTS

This summer research study would not have been possible without the help of the following people and organisations:

Christchurch City Council
- Brenda Greene for providing the funding for this research project, her guidance and editing assistance.

Department of Conservation
- For providing the acoustic recorders and computer programmes needed for detection of bats and morepork.
- Also special thanks to Tom McTavish for finding contact details of landowners, and helping in the field.
- For providing the photo of the bat monitor.

Land Owners
- For allowing me to place both bat and morepork recorders on their property.

Fraser Gurney & Colette and Lyndon Hadden
- For their help placing out both bat and morepork recorders across Banks Peninsula.

Alison Evans
- For helping decide sites to place morepork recorders, and reporting the project in the Akaroa Mail.
- Reviewing a draft of this report.
- For providing the morepork recorder photo.

Lincoln University AGLS Department (Ecology)
- For providing equipment and vehicles needed to undertake fieldwork.

Bruce Mahalski
- For permission to use his morepork drawing.


8. APPENDICES

11.1 Appendix A: Morepork Acoustic Recorders- Raw Data

Table 1: Raw data of the detection of morepork presence and absence on Banks Peninsula.

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<th>GPS Code</th>
<th>Coords</th>
<th>Elevation</th>
<th>Date</th>
<th>Presence</th>
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## 11.2 Appendix B: Long-tailed Bat Acoustic Recorders- Raw Data

Table 2: Raw data of the detection of long-tailed bats presence and absence on Banks Peninsula

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<td>497 m</td>
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11.3 Appendix C: Location Map

Figure 9: Google Earth image showing the satellite image of Banks Peninsula, Canterbury, South Island, New Zealand.
11.4 Appendix D: Akaroa Mail Article

Article published in the Akaroa Mail – 16th December 2016.

Going in to Bat on Banks Peninsula

Prepared by Alison Evans

Student and bat enthusiast Karina Hadden wants to know whether there are still bats on Banks Peninsula.

Although the usual fascination with bats starts with Halloween or with horror movies featuring vampires, it turns out that bats in New Zealand are a bit more discrete. These interesting little creatures do have sharp little teeth but they only eat insects and spiders, preferring a shy and retiring lifestyle.

Bats (or pekapeka) are quite special to New Zealand because they are the only land based mammals that are native to our country. There used to be three species but only the short tailed bat and the long tailed have survived. Both species are vulnerable and at risk of extinction with a majority of populations declining at a disturbing rate.
Student Karina Hadden has been awarded a summer scholarship from Lincoln University and is working with Lincoln ecologist Mike Bowie and Department of Conservation scientist Moira Pryde to see if there are any bats still living in forests remnants or caves on Banks Peninsula. For the next few weeks Karina will be putting out bat detectors which pick up the ultrasonic calls given out by bats as they echolocate. These signals are detected at around 40 kHz which is considered a short distance call and is typical for forest dwelling bats that only need to detect what is happening at close range.

The last known record of long tailed bats on Banks Peninsula was during the 1960’s. A survey of Banks Peninsula in the 1990’s failed to find any trace of the bats which were once been widespread in the area. However, with improvements in the technology and several possible sightings, it is definitely possible that there could be a small population hanging on somewhere. Literally!

“Although we haven’t had any definite sightings, they are cryptic species and difficult to detect without the right equipment,” Karina explained. “One of the places of interest is Le Bon’s Bay where there has been a possible report, but the recorders will be put out all around the peninsula,” Karina added.

Bats are gregarious creatures and live together in roosts but they frequently move between different roosting sites, thinking nothing of travelling 10 to 20 km in any given night. Long tailed bats roost in holes in trees in the same way some of our native birds such as morepork and kaka nest. This makes them extremely vulnerable to predation by introduced animals. Recent studies from Fiordland and Geraldine suggest a number of causes of decline, including loss of foraging and roosting habitats through clearance and logging of lowland forests, predation by introduced mammals, birds and wasps, and human disturbance at roost sites.

They are surprisingly long lived creatures and under optimal conditions, it is not unusual for them to live for 35 years or more. They only give birth to one batling each year and the mother produces milk for them while carrying them around between roosting sites, which is quite a feat considering the little batlings can weigh up to 66% of the adults weight (which is around 11 g). That is the equivalent of an adult human carrying a 40-50 kg baby!

Unlike the short tailed bats, which are now restricted to offshore islands and a few remote sites in the North Island, long tailed bats are more common with the nearest colony to Banks
Peninsula restricted to rocky outcrops near Geraldine. “It is really important that large old trees with roosting holes are protected and the habitat for bats is restored through creating covenants, protecting their food supply and by controlling predators,” said Karina. Karina will have a busy few weeks ahead putting out around 50 bat detectors around Banks Peninsula. While she is on the job, she is also putting out 18 acoustic recorders that will ‘listen out’ for morepork which share similar habitats. This will add important information to the study on morepork already being undertaken by the Banks Peninsula Conservation Trust. All of the recorders will be collected back up after two weeks and the data downloaded into a computer program.

“We are all hoping that we find some evidence of their presence but couldn’t resist putting some bat recorders at Coffin Rock and Devil’s Gap, surely that is where any self respecting bat would be!” Karina said with a smile.

Potential sightings of bats can be reported to DOC Technical Advisor, Moira Pryde. Email mpryde@doc.govt.nz.