Tamahere Reserve Restoration Project

Long-tailed Bat Survey Results & Recommendations for Future Management

October 2013

KesselsEcology
SURVEY, ASSESSMENT AND RESTORATION

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Prepared by: Hannah Mueller, Patrick Stewart, Gerry Kessels & Dr. Jennifer Blair

Reviewed by: Dr Stuart Parsons

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Executive Summary

Waikato District Council, on behalf of the Tamahere-Mangaone Restoration Trust (TMRT), commissioned Kessels Ecology to implement pre-felling long-tailed bat protocols, developed by the Department of Conservation (DOC), as part of a proposal to fell a stand of mature pines on Tamahere Reserve. Following a stakeholder meeting it was agreed that Kessels Ecology undertake an initial survey for long-tailed bats at Tamahere Reserve to determine if bats were indeed present and if so, what the relative activity and patterns of habitat usage of bats were.

The TMRT proposes to establish a kahikatea swamp forest and requires the stand of pines be removed to facilitate ecological restoration of the gully.

This study clarifies the role of the site in terms of bat habitat utilisation and relative importance, as surrounding areas including different parts of this gully, and nearby gullies and the Waikato River are known bat habitat. All indigenous terrestrial ecosystems are severely depleted in the Hamilton Ecological District, meaning that habitat for indigenous fauna such as long-tailed bats is in short supply. Maintaining patches of habitat such as the Tamahere Reserve across the landscape is important for ensuring the persistence of long-tailed bats, even if this habitat is provided by exotic species such as pine trees.

Levels of activity recorded throughout the survey were very high, with moderate to high levels of feeding and social calls recorded. Activity levels and patterns, with peaks just after sunset and before sunrise, indicate that the pine trees are likely to provide roost sites for bats. Regardless of potential roost tree utilisation, the pines provide important foraging habitat. With an average activity level of 45.4 calls per detector per night, bat activity recorded during this survey was very high compared to other recent surveys in the Tamahere area. For example, a survey in a nearby gully within the Mangaone system in 2012 showed an average of 2.9 calls per detector per night in February and 2.7 calls per detector per night in March. A 2011 survey showed 4.9 bat calls per detector per night in the same gully. In a Mangaonua Stream gully, 0.6 calls were recorded per detector per night, and 4.6 calls per detector per night were recorded in a Mangaharakeke Stream gully.

The pine trees in the reserve thus clearly provide significant habitat for a nationally threatened species and are therefore an important component of habitat for bats in this locality, and possibly for bats within the city and it's peri-urban fringes as a whole.

Given the levels of bat activity recorded, scheduled removal of the pines for October/November 2013 as part of ecological restoration requires further consideration in terms of how the loss of this habitat will affect the local bat population. Any restoration of the Tamahere Reserve, in our view, needs to focus on protecting, maintaining and enhancing habitat for long-tailed bats as a primary objective, and that ideally any impact of the restoration should avoid impact on the pine trees.

If there is still a desire to remove the pines, a greater understanding of how important this stand is to the bat population is required. The sudden removal of these pines without suitable mitigation may result in a significant adverse effect on this population of bats even if the pre-felling protocols were correctly applied. In order to understand how bats are specifically utilising this stand within the reserve further studies to determine where the specific roost trees are, how vital the stand is in terms of foraging habitat and its usage over the seasons is required. This would take several more months of further study over the peak activity time; December through to April, and possibly longer. In addition, if the pines were to be removed, suitable replacement habitat must be created to offset for the loss of this existing habitat.

1 Introduction

Waikato District Council, on behalf of the Tamahere-Mangaone Restoration Trust (TMRT – formally the Friend of Tamahere Reserve), commissioned Kessels Ecology to implement pre-felling long-tailed bat[1] protocols, prepared by the Department of Conservation (DOC), as part of a proposal to fell a stand of mature pines on Tamahere Reserve (see Figure 1 for site location). Following a stakeholder meeting it was agreed that Kessels Ecology undertake an initial survey for long-tailed bats at Tamahere Reserve to determine if bats were indeed present and if so, what the relative activity and habitat usage of bats was within the reserve.

The TMRT proposes to establish a kahikatea swamp forest and requires that the stand of pines be removed to facilitate ecological restoration of the gully.

The location of the site is within a well vegetated gully/stream system meaning utilisation by bats is widespread throughout the year. In addition, the pine trees may also be roosting habitat, as confirmed in studies of this gully and other similar gully systems around Hamilton (e.g. Le Roux & Le Roux, 2012) and elsewhere (Borkin & Parsons, 2010).

The aim of the survey was to establish whether long-tailed bats are utilising the area, and if so, what kinds of activity can be observed and at what level. The study is intended to clarify the role of the site in terms of bat habitat provision, as surrounding areas and this gully are known bat habitat. This report outlines the results of the bat survey and the implications for restoration of the site.

Figure 1 **Map showing location of Tamahere reserve gully site in relation to Waikato River and southern fringe of Hamilton City**

[1] (Chalinolobus tuberculatus – Nationally Threatened species: Category 3 – nationally vulnerable; O'Donnell et al., 2010)

2 Methodology

Automated heterodyne bat detectors (automated bat monitors – ABMs; manufactured by DOC; Lloyd, 2009) were used to remotely and passively record bat echolocation pulses. ABMs record the ultrasonic echolocation calls emitted by bats (Griffin et al., 1960) and convert them to frequencies audible by humans (Parsons & Szewczak, 2009). Long-tailed bat (peak frequency 40 kHz; Parsons, 2001) and lesser short-tailed bat (peak frequency 28 kHz; Parsons, 2001) echolocation calls are recorded simultaneously on two separate channels making identification of species present relatively easy. Each echolocation pass (a series of calls separated from another series of calls by at least 1 second of silence; Thomas, 1998) is time (hour/minute/second) and date (year/month/day) stamped providing timing information for activity.

Detectors were calibrated to have the same time and date settings (NZST) and were pre-set to start monitoring 30 minutes before sunset until 30 minutes after sunrise. At each site, the distance between detector locations was at least 25 m to increase the chance of independent bat monitoring.

Weather conditions during the majority of the survey were suitable for bat emergence, activity and detection; minimum dusk temperatures during the survey were above 10°C (see Table 1 for a detailed temperature overview). There was one major rainfall event on 30/09/13 (25.6 mm of rain). The rest of the survey period was mainly dry with low to moderate wind speeds.

All recordings were analysed visually and acoustically using Bat Search Software 1.02 (DOC developed). Individual sound files were sorted into: 1) echolocation passes, defined as a series of two or more high frequency echolocation pulses emitted in sequence by flying bats (Parsons et al., 1997); and 2) non-bat sounds (i.e. wind, rain or insect generated noise) that were discarded. All passes were classified into one of two echolocation categories: 1) search phase pulses with low pulse repetition rates (mean inter-pulse interval of c. 104 ms) likely used for commuting and/or locating prey; and 2) feeding buzzes consisting of a series of rapidly emitted pulses (mean inter-pulse durations of c. 4.5 ms) used to determine the range of prey prior to capture (Parsons et al., 1997). If a file contained one or more feeding buzzes, it was classified as a single feeding buzz only. All echolocation pulses were recorded with a date (day/month/year) and time (hour/minute/second) stamp. By assessing the number, type and temporal peaks in nightly echolocation activity we were able to distinguish between three different ways in which bats were using habitats. Detected bat calls were thus classified into one of four behavioural categories (Le Roux 2010):

- Search (or commuting/flyover): calls emitted by bats moving from one location to another. A rapid fly-over echolocation call, dominating the 40 kHz zone;
- Feeding: calls produced by bats as they attempt to feed or as they approach objects in their path. A very rapid echolocation call, with components on both 28 and 40 kHz, indicating that the bat has caught an insect;
- Other or ‘social’: lower frequency calls which are likely to be used for intra-specific communication when bats are flying in group or near a roost site. Echolocation calls dominating the 28 kHz zone, but with some 40 kHz component; and
- Two or more bat echolocation passes recorded on the same file indicating multiple bats may be present at the same time.

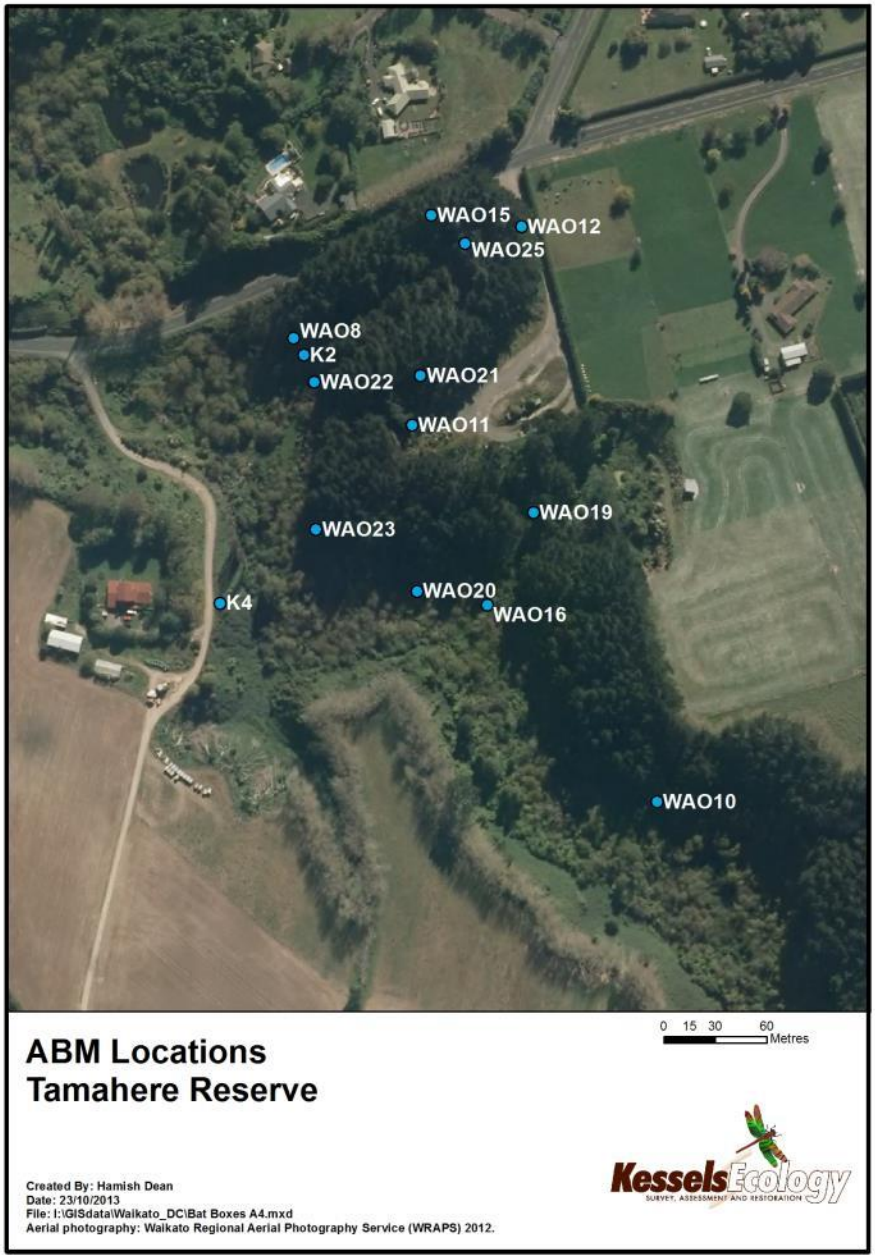

Figure 2 Overview of detector locations at Tamahere reserve

Table 1 Minimum temperatures (°C) at dusk, midnight and dawn during the survey, measured at Ruakura (NIWA Cliflo database, station 26117).

	7.00pm	12.00am	6.00am
25/9	14.7	12.8	12
26/9	12.6	12.9	12.2
27/9	14.4	13.9	11.4
28/9	11.4	12	10.4
29/9	12.5	11.1	10.3
30/9	11.7	9.2	6.6
1/10	11.4	6.1	2.3

3 Results and Discussion

Monitoring of bat activity took place between 25/09 and 01/10/13 at the locations of ABM K4, WAO11 and WAO21 for seven consecutive nights, and at all other locations for six consecutive nights within the same period.

Results showed high levels of activity throughout the survey period, as well as throughout the night at some locations. A very high level of activity was recorded at detector location WAO11, with a total of 2194 recordings over the survey period (see Figure 3 for an overview of monitoring results for each of the detectors). Bat activity was evident across the reserve, and all detectors showed a variety of types of calls. Appendix I provides a more detailed summary for activity patterns for individual ABMs.

Recorded bat activity included searching, feeding and social calls. Calls of multiple bats (multi) were recorded at five different locations (WAO11, WAO22, WAO23, WAO25 and WAO8). Moderate levels of feeding and social calling, as well as the frequent occurrence of multiple bats, especially at WAO11, indicate that the site provides significant foraging and possible roosting habitat.

Hourly patterns of bat activity recorded during the survey also suggest that the site provides significant bat habitat. Figures 4 and 5 provide an overview of activity patterns recorded throughout the night. Monitoring results show a bimodal activity pattern with activity peaks after sunset and before sunrise. Social calls peaked just after sunset, whereas multiple bat calls show a peak just before sunrise. Feeding calls were recorded throughout the night but were most common in the few hours after sunset. These results suggest that bats are roosting within, or in very close proximity to, the Tamahere Reserve and that it represents a significant foraging habitat for them.

With an overall average activity level of 45.4 calls per detector per night, bat activity recorded during this survey was very high compared to other recent surveys in the Tamahere area (refer to Figure 6). For example, a survey in 2012 in a nearby gully within the Mangaone system showed an average of 2.9 calls per detector per night in February and 2.7 calls per detector per night in March (Mueller et al. 2013). A 2011 survey showed 4.9 bat calls per detector per night in the same gully (Le Roux, 2012). In a Mangaonua Stream gully, 0.6 calls were recorded per detector per night, and 4.6 calls per detector per night were recorded in a Mangaharakeke Stream gully (Le Roux, 2012).

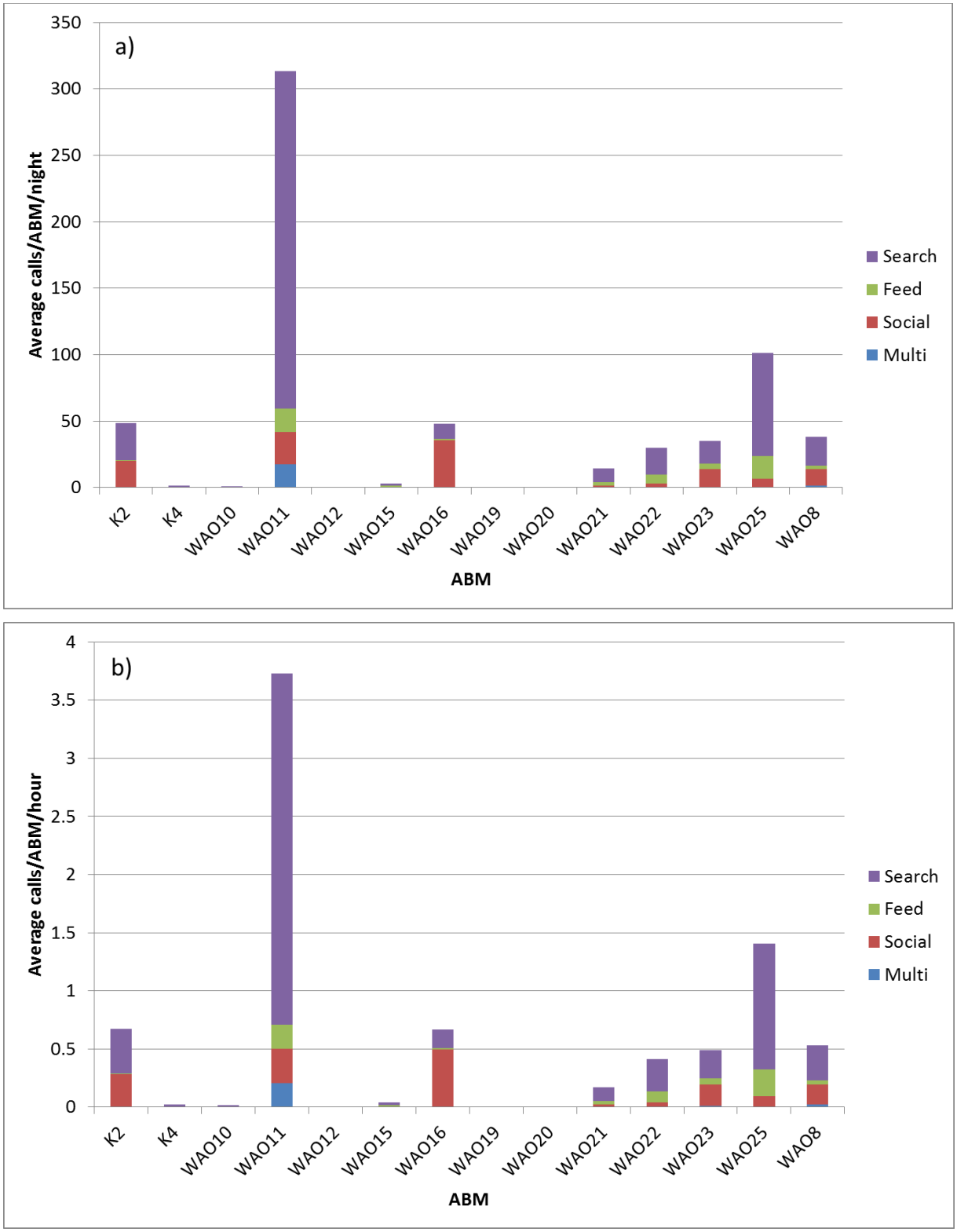

Figure 3 **Summary of bat activity for each ABM over the survey period. (a) average calls per detector per night; (b) average calls per detector per hour.**

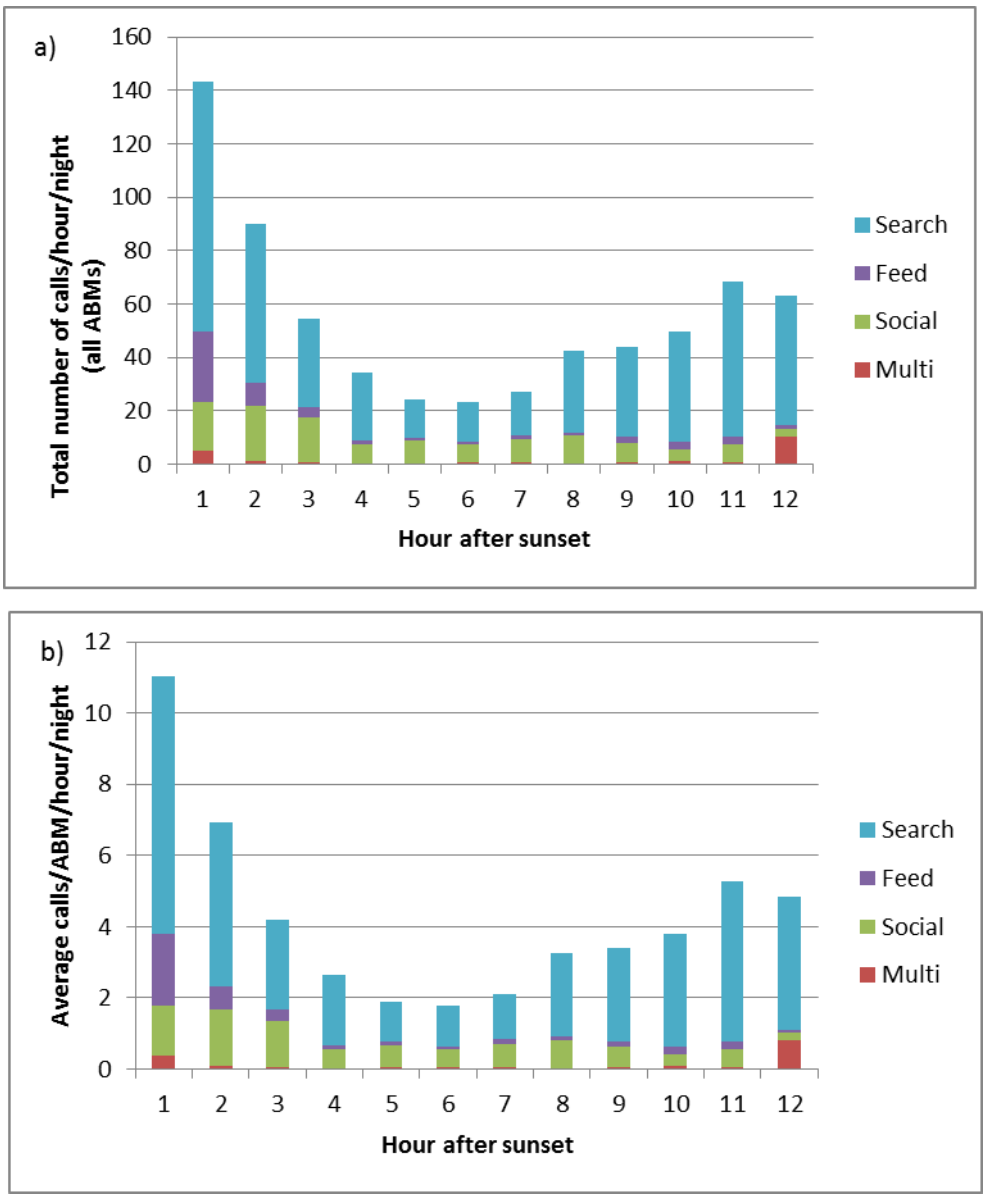

Figure 4 Summary of types of activity recorded throughout the night. (a) Total number of calls detected in each hour across all ABMs; (b) calls per ABM per hour per night.

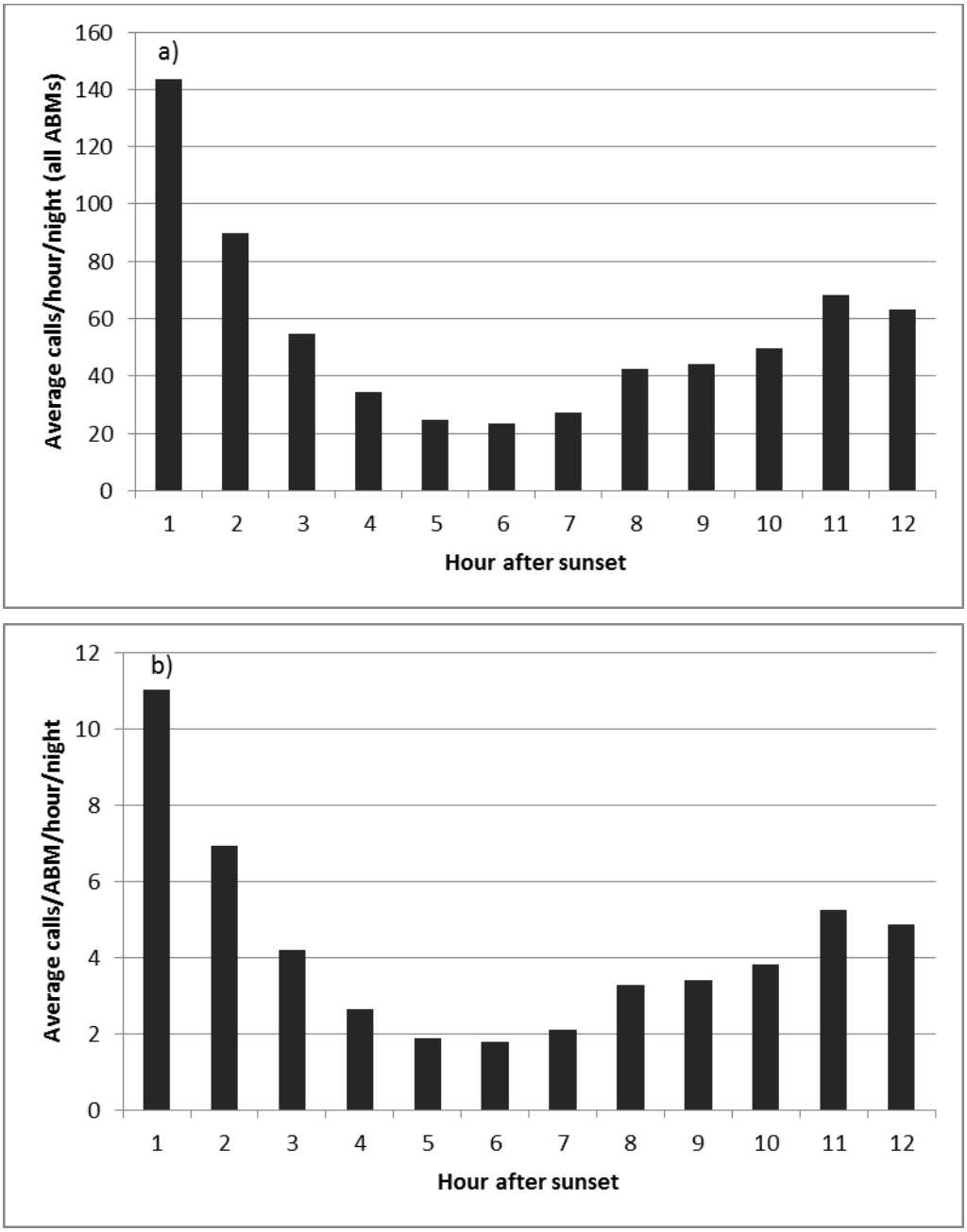

Figure 5 Average number of calls recorded throughout the night. (a) total calls measured across all ABMS per hour per night; (b) average calls per ABM per hour per night.

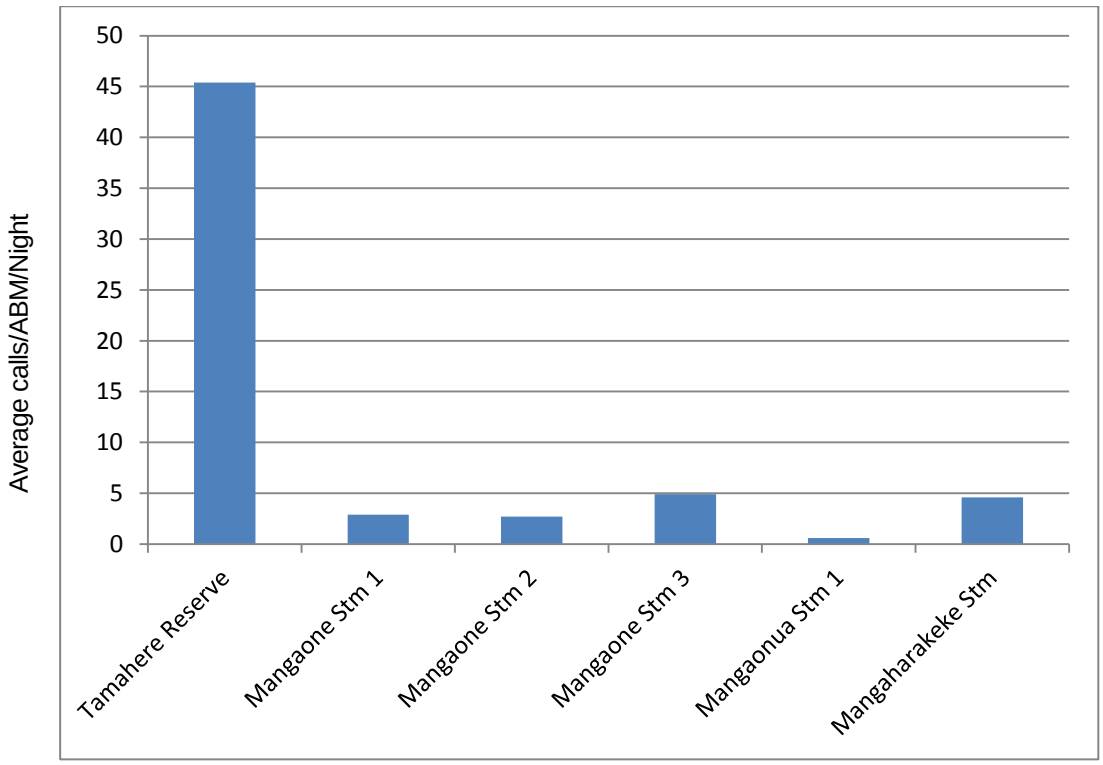

Figure 6 Average number of calls recorded per ABM per night for a range of gully habitats in southern Hamilton.

4 Conclusions and Recommendations

The results of the survey indicate a very high level of bat activity at the Tamahere Reserve compared to nearby areas. Not only are bats moving around within the site, but they are also using the reserve for foraging. In addition, the high incidence of social calls and the peak in calls immediately after sunset and before sunrise suggest that these trees, or trees in very close proximity, are providing roost habitat. The pattern of activity and types of calls produced also shows that the pines are an important foraging habitat within the gully.

All indigenous terrestrial ecosystems are severely depleted in the Hamilton Ecological District (Leathwick et al. 1995), meaning that habitat for indigenous fauna such as long-tailed bats is in short supply. Maintaining patches of habitat such as that found within the Tamahere Reserve across the landscape is important for ensuring the persistence of long-tailed bats, even if this habitat is provided by exotic species such as pine trees.

The pine trees in the Tamahere Reserve clearly provide significant habitat for a nationally threatened species and are therefore an important component of the existing ecological values at the site. The position of the reserve adjacent to the Mangaone Gully, itself an important corridor and habitat for bats within a highly modified landscape, means its roosting and foraging habitat is very important for sustaining local bat populations.

Consequently, any restoration of the Tamahere Reserve, in our view, needs to focus on protecting, maintaining and enhancing habitat for long-tailed bats as a primary objective, and that ideally any impact of the restoration should avoid impact on the pine trees.

If there is still a desire to remove the pines in the future, a greater understanding of how important this stand is to the bat population will be necessary. The sudden removal of these pines without suitable mitigation would likely result in a significant adverse effect on this population of bats even if the pre-felling protocols were correctly applied. In order to understand how bats are specifically utilising this stand within the reserve further studies to determine where the roost trees are, how vital the stand is in terms of foraging habitat and its

usage over the seasons is required. This would take several more months - December through to April, and possibly longer - of further study over the peak activity time. Capture and tag studies (telemetry and/or light) may also be required. Until such studies have been undertaken specific management recommendations are difficult to make. In addition, if the pines were to be removed, suitable replacement habitat will be required to be created to offset for the loss of this habitat.

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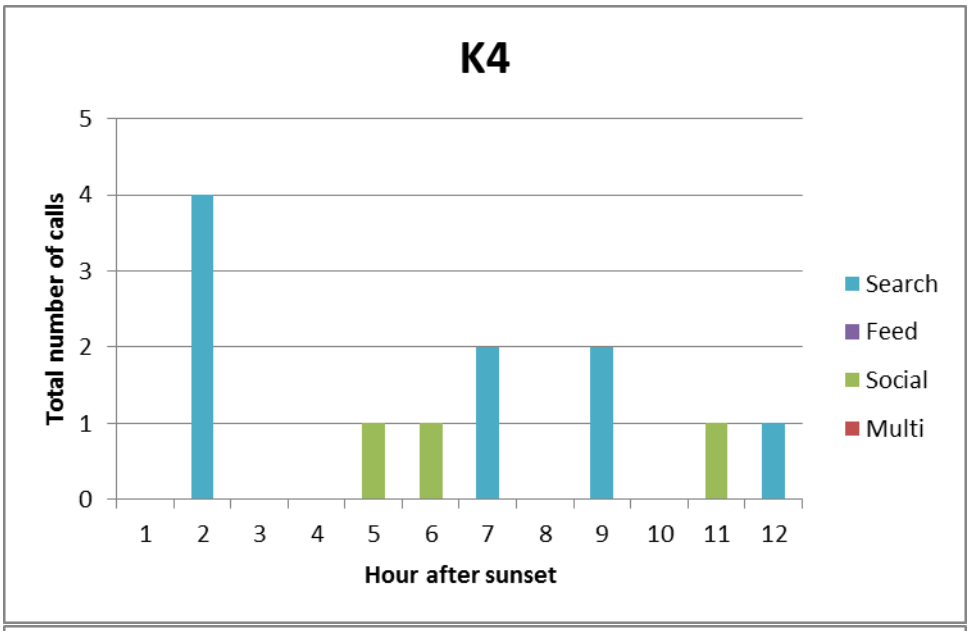
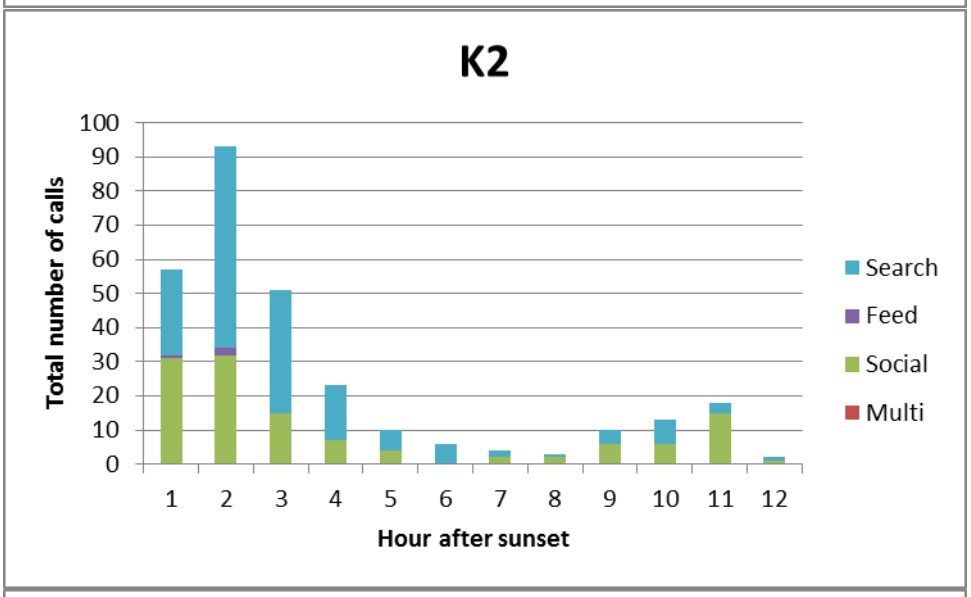
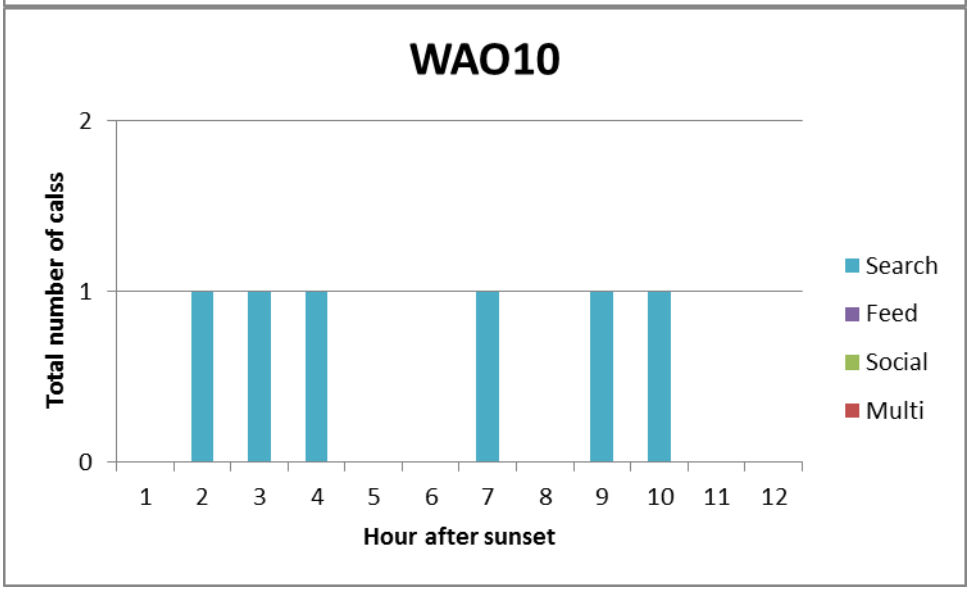
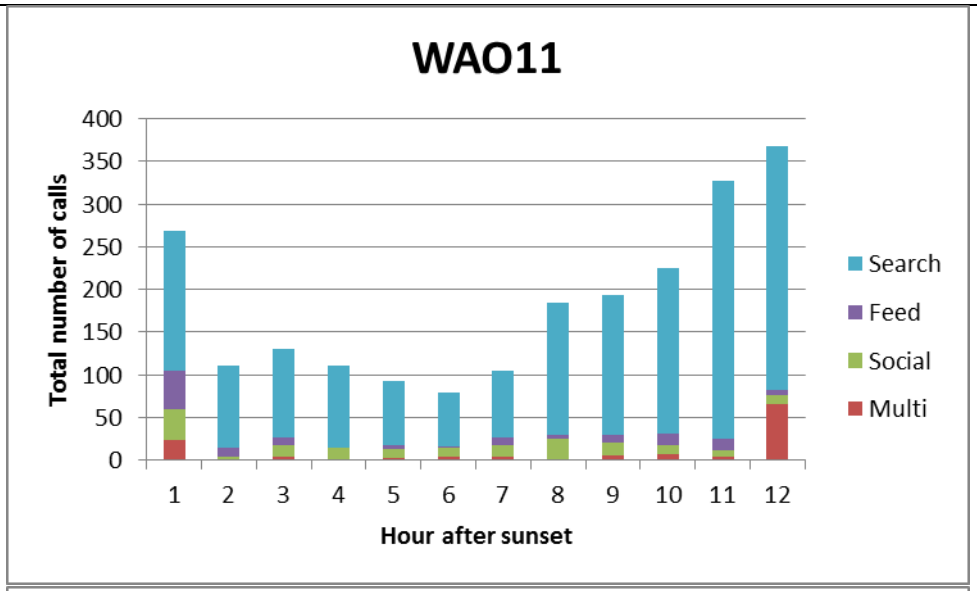
Appendix I

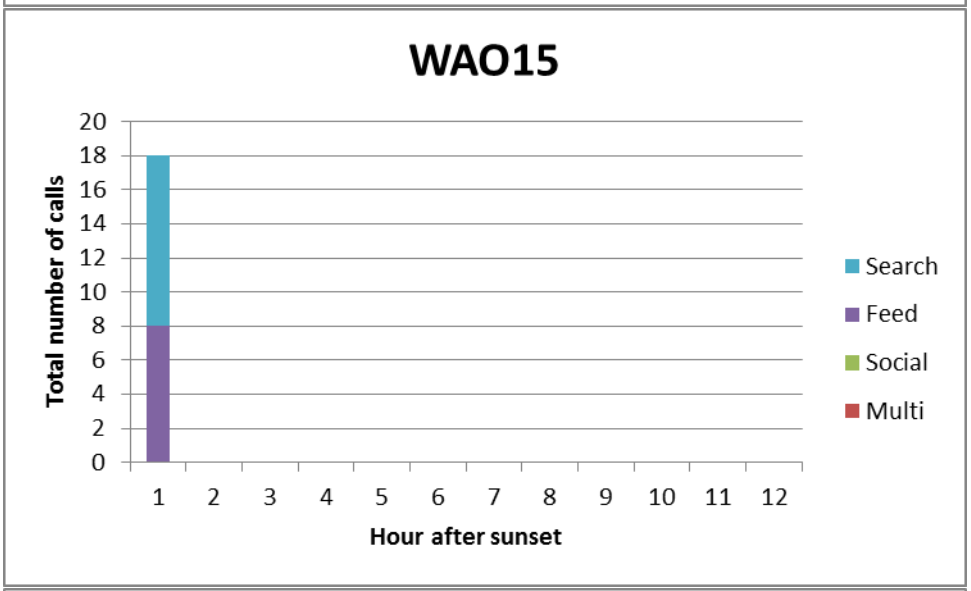
Summary of bat activity for each ABM

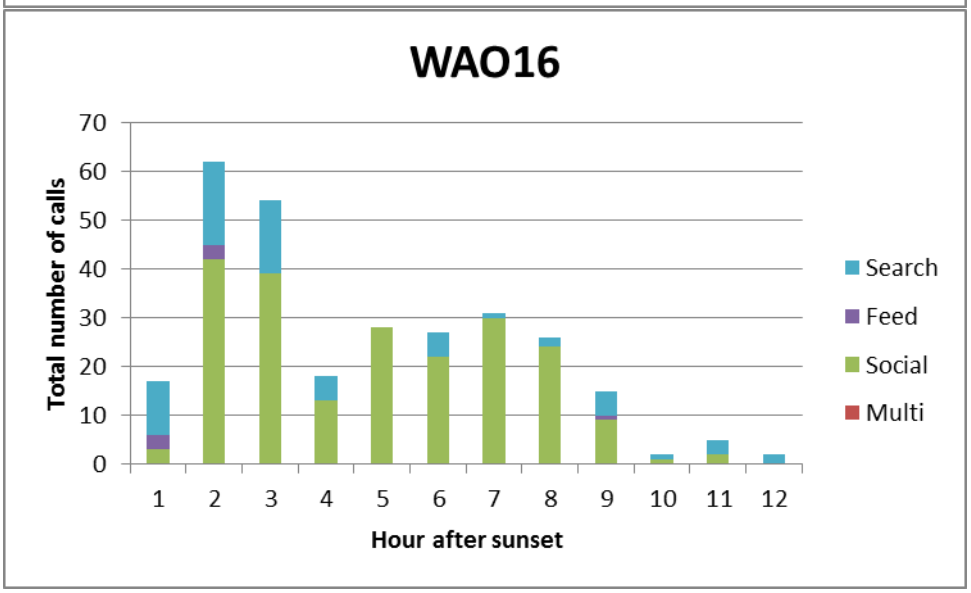







WAO11
Total number of calls
400
350
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12
Hour after sunset
Search
Feed
Social
Multi


WAO15
Total number of calls
20
18
16
14
12
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10 11 12
Hour after sunset
Search
Feed
Social
Multi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Total number of calls
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30
20
10
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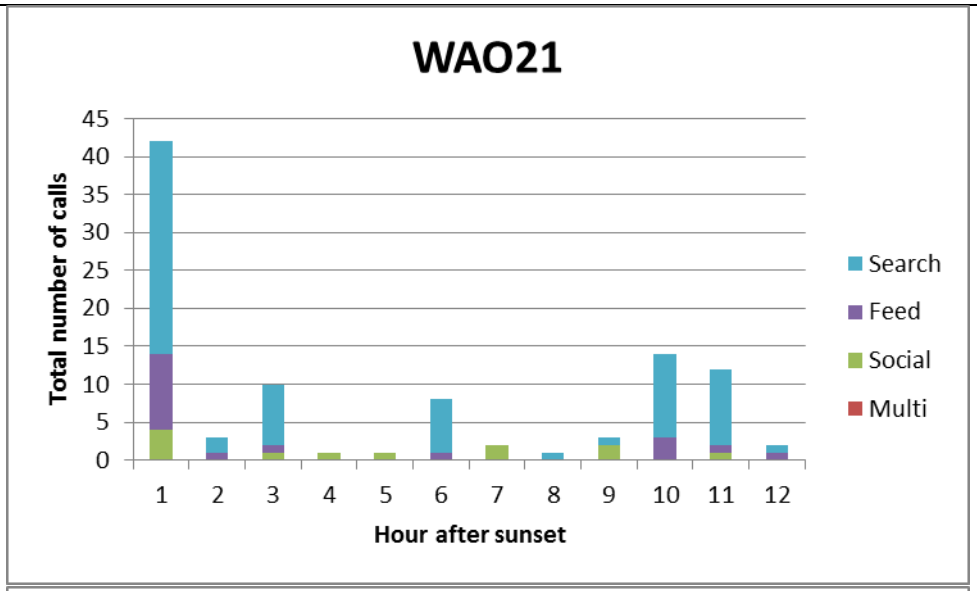
1 2 3 4 5 6 7 8 9 10 11 12
Hour after sunset
Search
Feed
Social
Multi


WAO21
Total number of calls
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5
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25
30
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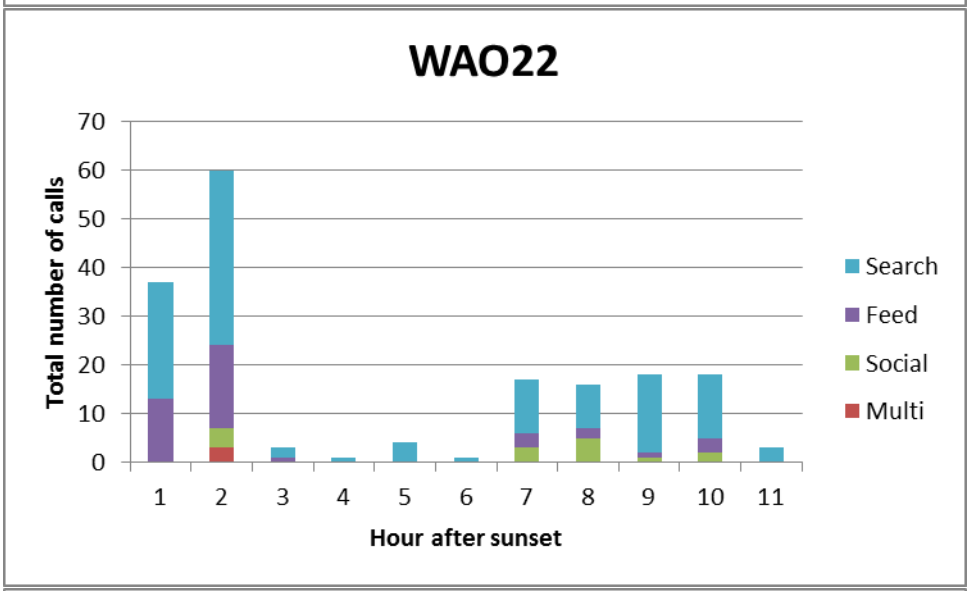
Hour after sunset
Search
Feed
Social
Multi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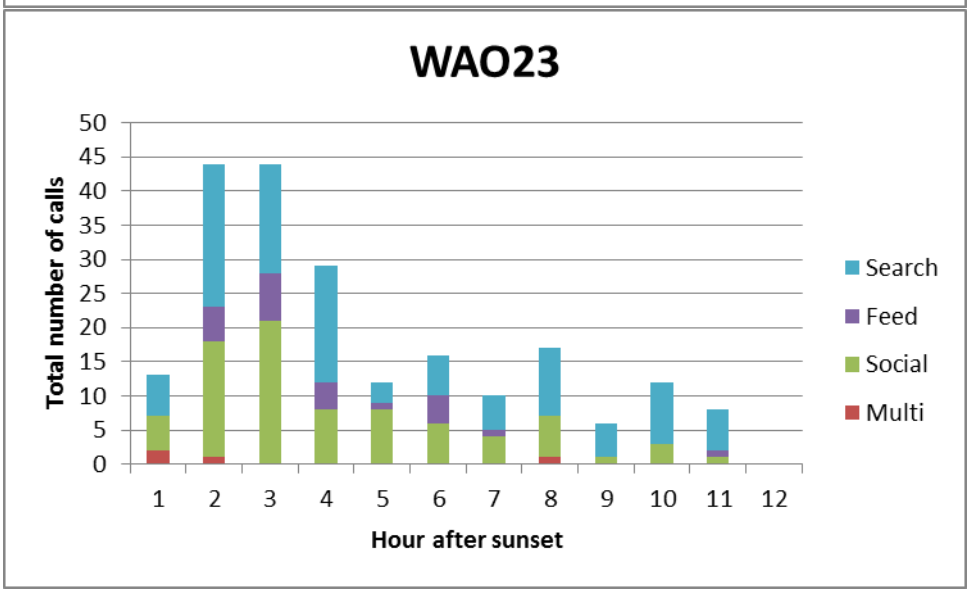
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Total number of calls
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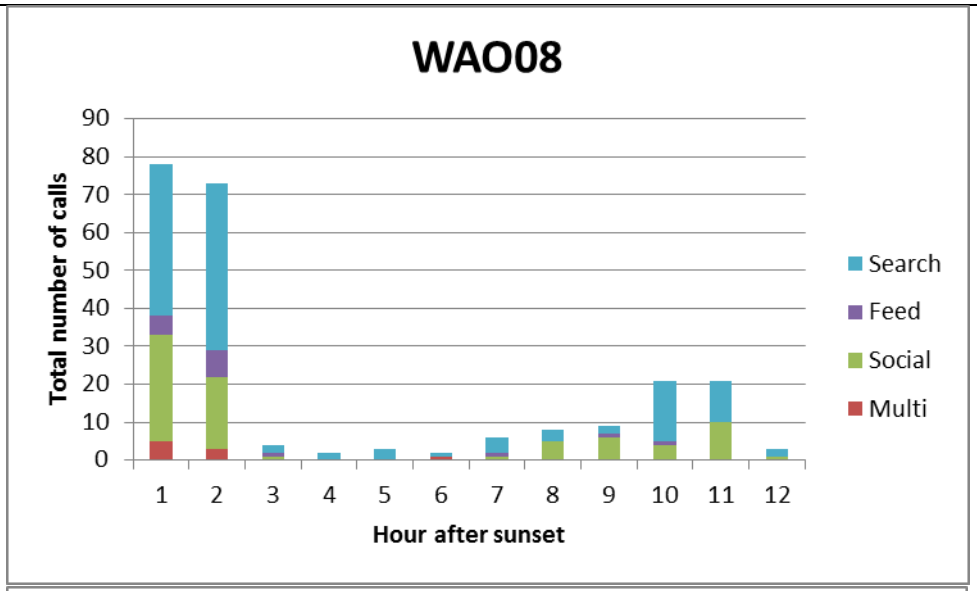
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Total number of calls
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Hour after sunset
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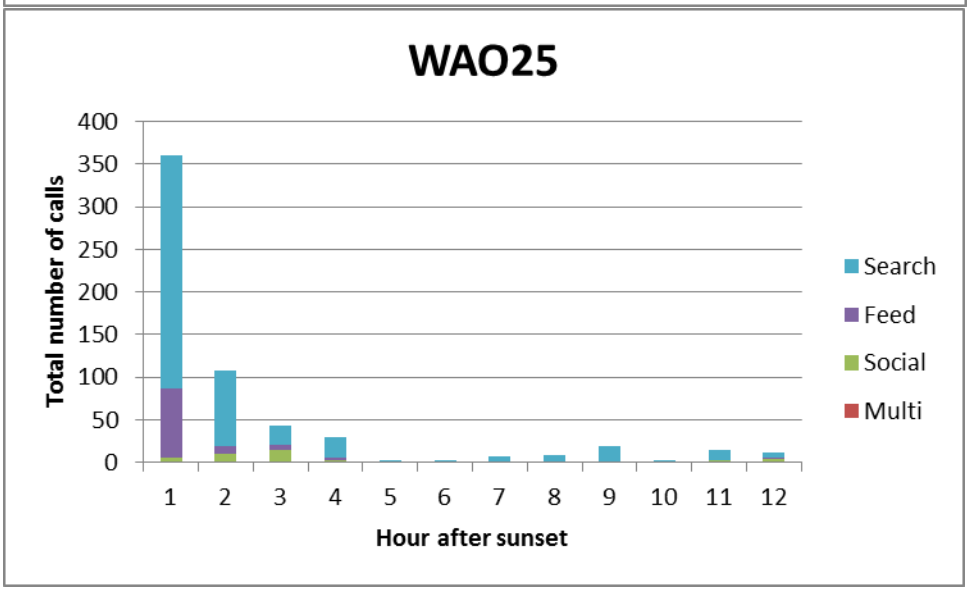
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Hour after sunset
Search
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Social
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