A PRELIMINARY SURVEY OF THE BATS OF KING ISLAND, 2013

Report to King Island NRM and PWS
Lisa Cawthen, BirdLife Tasmania
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Executive Summary

Little is known about the bat communities of the Bass Strait islands. Between 20 November and 3 December 2013, bats were surveyed throughout the island of these islands – King Island. Using a combination of call surveys, captures and roost monitoring at 40 sites, a total of 2,336 bat call sequences were recorded, 50 bats captured and three roosts identified. From these data, three bat species were recorded: Gould's wattled bat *Chalinolobus gouldii*, chocolate wattled bat *C. morio* and lesser long-eared bat *Nyctophilus geoffroyi*. All three species varied in their distribution and occurrence on King Island, with lesser long-eared bats the most widespread and commonly occurring bat on the island; Gould's and chocolate wattled bats were less frequently reported. The distribution and abundance of suitable roost and breeding sites (ie hollow-bearing trees) is the factor most likely limiting the distribution and occurrence of these species on King Island. Management actions for the conservation of bats on the island should aim to retain, protect and promote hollow-bearing trees and other roosting habitats such as old-growth paperbark and Blackwood trees.

Lesser long-eared bat (*Nyctophilus geoffroyi*) in the hand, King Island.
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A preliminary survey of the bats of King Island, 2013

Introduction

King Island's blue gum forests and forest communities provide important habitat for bats, particularly for species dependent on hollow-bearing trees to roost and breed. Since European settlement however, 70% of the vegetation on King Island has been cleared, resulting in the loss of roosting, breeding and foraging habitat for bats. It is unknown whether this, in combination with other threats (eg introduced predators and fire) has resulted in the loss of bat species from King island, though it is possible, as several other fauna species have been lost from the island including the spotted-tail quoll (*Dasyurus maculatus*), wombat (*Vombatus ursinus*) and King island emu (*Dromaius ater*), Threatened Species Section (2012).

Knowing which bat species are present on King island and how they use the remaining forest remnants is important for the management of bats and their habitats on King Island into the future. There is little knowledge of the bats of King Island. This is particularly important for managing biodiversity values of the island given the recent declines and extinctions of bats on several Australian islands including Christmas, Lord Howe and Norfolk island (McKean 1975, Hoye 2011, Lunney *et al.* 2011).

Three bat species have been recorded on King island - two micro-bat species that are considered residents– the Gould's wattled bat (*Chalinolobus gouldii*) and the lesser long-eared bat (*Nyctophilus geoffroyi*), and one mega-bat species that is considered a vagrant – the grey-headed flying fox (*Pteropus poliocephalus*), Driessen *et al.* (2011). All three species have been identified from specimens found on the island, but no island-wide surveys have yet been undertaken to determine if other species are present or if indeed any of these species are residents.

This aim of this survey was to collect baseline data on the bats of King Island, including species composition, distributions and activity patterns to inform land management.

Methods

Between 21 November and 3 December 2013, bats were surveyed throughout King Island. Survey sites were selected based on an area containing suitable bat habitat (ie providing drinking, foraging or roosting habitat), previous observations of bats or a high density of hollow-using bird observations.

The later was a novel approach using the Birdlife Tasmania database for King Island; as all of Tasmania's bat species are hollow-users, it was predicted that bats may use similar habitats to hollow-using birds. Last, where possible, sites were selected so that all major vegetation communities on the island were surveyed to assess the importance of different types of vegetation to bats (Figure 1, Table 1).

Two methods were used to survey the bats. The two main methods used were bat capture and bat call surveys (Figures 2a and 2b). In addition, inspection of potential roost sites, including watching potential roosts at sunset, was undertaken. Members of the public were also asked to submit bat observations by e-mail and at public education events to inform survey site selection.

Bat captures involved setting harp traps along trails through vegetation. Traps were set at sunset and taken down at sunrise. Each trap was checked twice per night. All captured bats were identified to species using field guides (Taylor *et al.* 1987, Churchill 2009). Bats were then weighed, their gender determined, aged and reproductive condition assessed following the methods outlined in Churchill (2009).

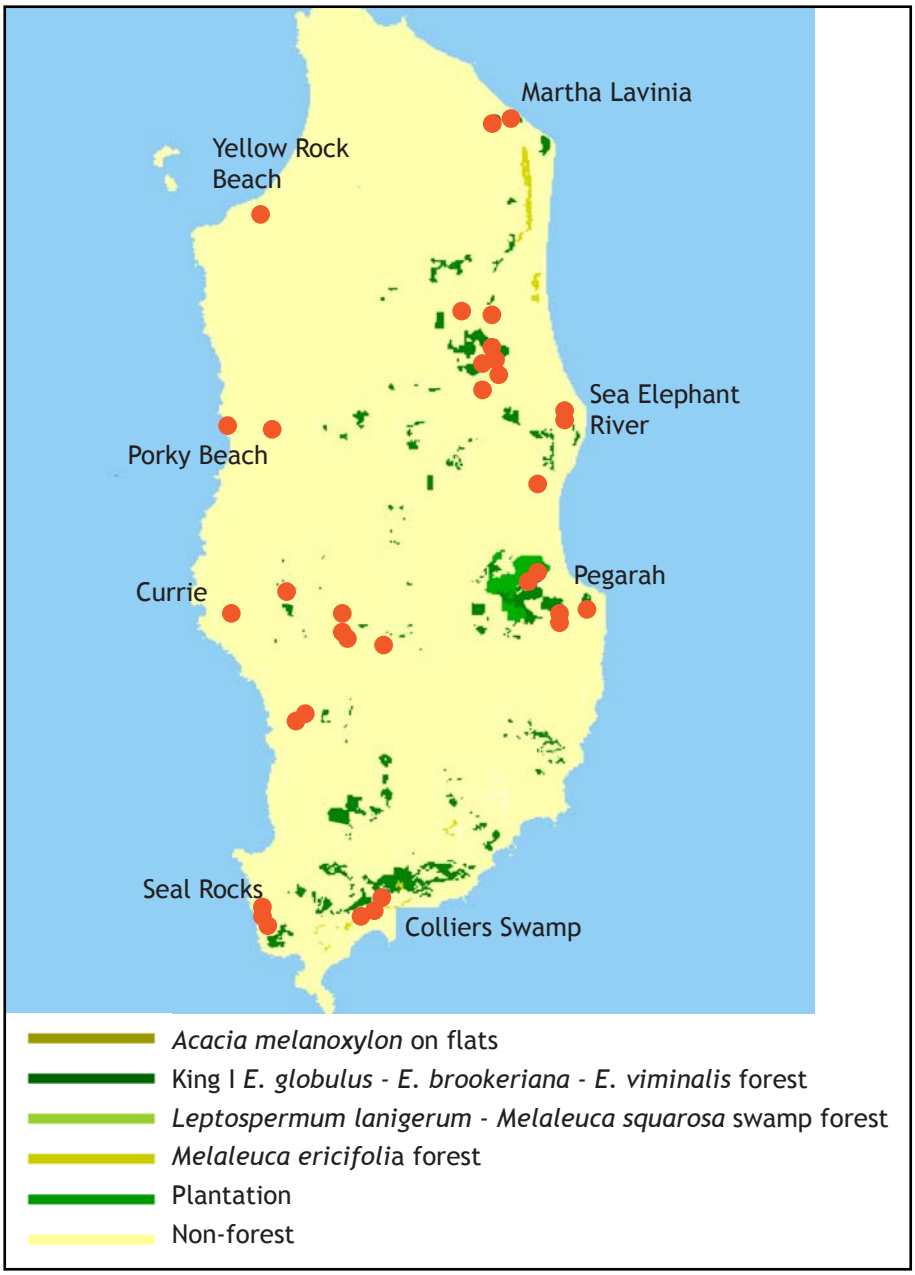

Figure 1.
Map of King Island showing vegetation on the island and bat trapping sites (orange symbols), November - December 2013. Selected place names are shown.

Bat call surveys involved using acoustic recorders (Anabat detectors) set at landscape features bats may utilise (eg water bodies, forests, tracks). Each acoustic recorder was placed in a waterproof PVC box. A microphone extension cable led from the PVC box up a 1.5m stake to the microphone attachment. The microphone attachment was angled up at 45° pointed into vegetation gaps of the habitat element being surveyed and enclosed in a PVC elbow for weatherproofing. Recorders were calibrated against each other using a bat chirp board (Nevada Bat Technology, Las Vegas, USA) to ensure microphone sensitivity was equal among recorders.

Bat call sequences were identified from bat call surveys using a combination of manual and automated identification. Automated identification was undertaken using the program AnaScheme, which automatically calculated the total number of bat call sequences recorded per 24h period (overall bat activity) and identified bat call sequences to species or species complexes (individual/ group bat activity) using a pre-defined Tasmanian bat call key (Cawthen 2014).

Not all species could be accurately identified from other species of their genus (eg

Nyctophilus geoffroyi) so they were identified to a species complex (eg *Nyctophilus* spp.). Species that were considered especially problematic to identify were double-checked by manual identification of sonograms (eg *Nyctophilus* spp. whose calls can be misidentified as feeding calls of other species).

Figure 2a.
Harp trap set for bats on path through vegetation. ©Lisa Cawthen.

Figure 2b.
Bat call survey station showing microphone and bat detector. ©Lisa Cawthen.

Results

Species composition

Three bat species were recorded within 40 survey sites, using a combination of bat call surveys and bat capture. The species recorded were Gould's wattled bat (*Chalinolobus gouldii)*, chocolate wattled bat (*Chalinolobus morio*) and lesser long-eared bat (*Nyctophilus geoffroyi*). Information on survey site location and the data collected are detailed in Table 1, and the species are shown in Appendix 1.

Bat call surveys yielded 2,336 bat call sequences recordings, of which 59% (n=1377) were identified as being from bats belonging to the long-eared bat genus (*Nyctophilus spp.*), 4% (n=105) as Gould's wattled bat, and 0.04% as Chocolate wattled bat (n=1), Figure 3 and Appendix 2. The remaining call sequences were identified as containing bat calls but could not be confidently identified because they were poor quality (and were thus deemed to be unknown calls). Bat captures recorded a similar bat species composition, with the majority of bats captured identified as lesser long-eared bat (n = 50) and only a single chocolate wattled bat was recorded; no Gould's wattled bats were captured.

Potential roost sites inspections also provided species records. Three roost sites were located, of which two were identified as lesser long-eared bat roosts, and the occupants of the other roost could not be identified (Figure 4).

Bat species distributions

Of the sites surveyed, bat call sequences were recorded at 69% of sites (n =27). Of these sites, long-eared bats was the mostly commonly identified bat taxon (identified at 60% of sites) and the most widespread. In contrast, Gould's wattled bats was recorded at 31% of sites (n = 12), and only a single bat call sequence of the chocolate wattled bats was recorded. These two latter species were not recorded in the north of the island, with the northern most record of Gould's wattled bat recorded at Bootlace off Rekara Rd. The chocolate wattled bat was only recorded at the Pegarah Private Nature Reserve (Table 1, Figure 1).

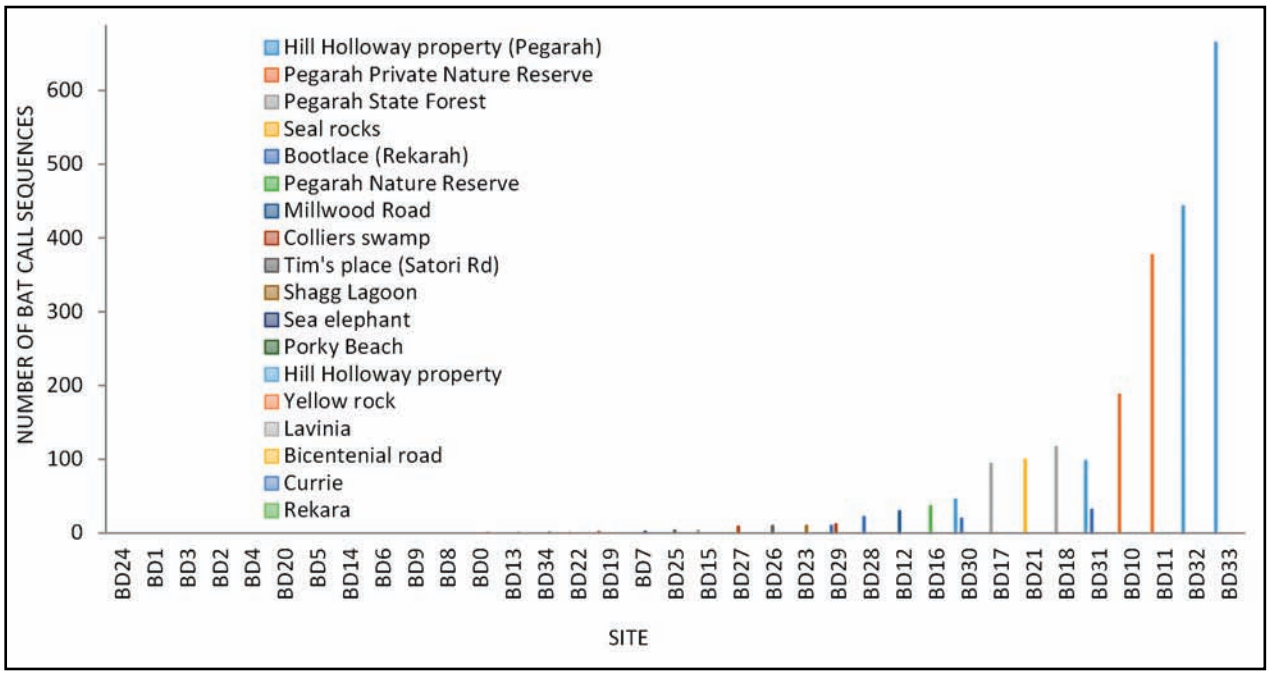

Figure 3.
Comparison of bat activity (expressed as the number of call sequences) at survey sites on King Island, 2013.

Bat activity and species diversity were greatest in the vicinity of Pegarah, in the south-east of King Island. This locality had the highest bat activity (655 bat calls in 1 night, Figure 3), capture rates (14 individuals in 1 night) and species diversity (3 species) of any locality surveyed.

Physical assessments of bats

Of the 50 bats captured, 31 were female and 18 male. The gender of a single individual could not be determined because it escaped before physical examination (Figure 4). All but two individuals were adults, the others were one sub-adult and one juvenile. The majority of individuals were reproductively active. Of the females captured, 45% (n = 14) were post-lactating, 39% (n = 12) lactating and 13% (n = 5) non-reproductive. Of the 18 males captured, 78% (n = 14) showed signs of sperm storage and 22% (n = 4) were non-reproductive.

The mean mass of adult males was less than that of females with lesser long-eared males weighing 9.6 ± 1.1g (range 8.5 - 11.5g) and females weighing 10.6 ± 1.1g (7 - 12.5g). The single female chocolate wattled bat weighed 9.5g. The lesser long-eared adult male forearm was 38.8 ± 1.2mm (range 38.6 - 40.2mm), females 39.3 ± 2mm (31.9 - 41.7mm). The single chocolate wattled bat female forearm was 36.9mm.

Potential roost site inspections

No roosts were located in natural potential roost sites (eg hollow-bearing trees or under bark). Three roosts were located in buildings (Figure 5). Two of these roosts were occupied by lesser long-eared bats. One roost was estimated to contain 16 individuals and the other at least 5 individuals..

Bats were also recorded by members of the public roosting in buildings at Currie and Naracoopa. In one instance these were identified as seven lesser long-eared bats that were found roosting in the wall of a house. These were identified based on a photograph provided by a member of the public. In particular, Naracoopa and to a lesser extent Currie had a number of bat colonies roosting in buildings recorded. In contrast, only individual bats were recorded roosting in buildings in the north of the island.

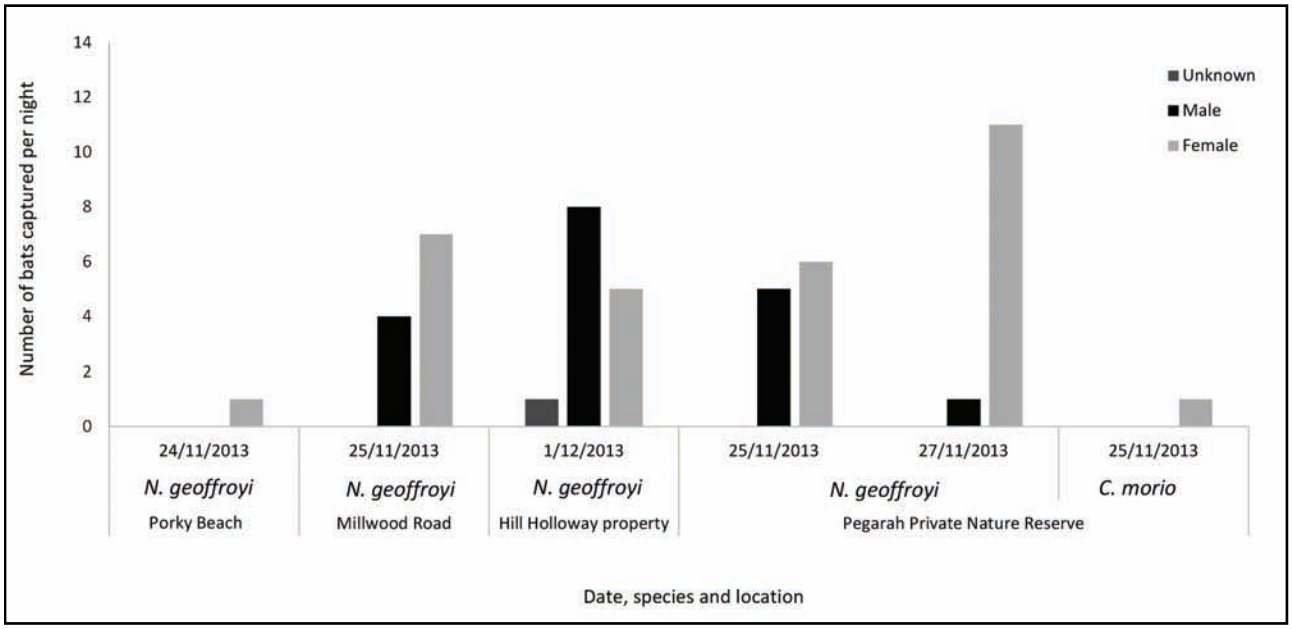

Figure 4.
The composition of bats captured at various sites on selected dates, November 2013, King Island.

Figure 5.
Bat roost sites located on King Island – two lesser long-eared roosts in buildings and a third roost located in hessian bags within a shed (species unknown); arrows indicate roost entrances. All images ©Lisa Cawthen.

Discussion

King Island provides an island refuge for bat species that occur both on mainland Australia and Tasmania. Eight bat species are known to occur on mainland Tasmania, of which three were recorded on King Island: the lesser long-eared, Gould's wattled bat and chocolate wattled bat. Of these three species, the lesser long-eared bat is the most common and widespread species, whereas the Gould's wattled bat was absent from the north and north-west of the island.

Only a single chocolate wattled individual was captured and only one call recorded. This suggests that unlike the lesser long-eared bat and Gould's wattled bat, there may be only a small population of this species on the island, or this species has a very restricted distribution on King Island. It is also possible that the individual captured was a vagrant and not a resident of the island. No flying-foxes were observed on the island during the survey. It is however possible that other species of bats may be resident on the island in patches of habitat not surveyed during this visit, or are episodic vagrants.

Bat call surveys and captures revealed that bats were more active in areas containing potential roost sites, such as exfoliating bark, tree cavities and sea caves such as Pegarah and Seal Rocks. Where none of these were present, bats were less active, suggesting that areas without these elements did not provide suitable habitat for bats, and as a consequence were less frequently used. Like their mainland conspecifics, the King Island bats are likely roosting in the tree cavities of eucalypts (*Eucalyptus globulus*, *viminalis* and *brookeriana*) and to a lesser extent blackwood (*Acacia melanoxylon*), and under the bark of swamp paper bark (*Melaleuca ericifolia*).

Though the species recorded on King Island are rarely known to use caves, observations by King Island residents of piles of 'mice-like faeces' and bats in sea caves and rocky escarpments indicate these may also provide roosting habitat.

Of the two most commonly recorded species, the lesser long-eared bat was found to be more widely distributed on King Island than the Gould's wattled bat. This could be because the lesser long-eared bat is known to roost under exfoliating bark, and so may take advantage of the exfoliating bark on swamp paper bark retained in shelter belts around the island (Churchill, 2009). This was certainty evident from trapping, with lactating, post-lactating and juvenile bats captured in shelter

belts on pasture comprising of swamp paper bark, suggesting these areas may be used as maternal roosts for this species.

In contrast, the Gould's wattled bat was far less common on King Island. This may be because this species roosts in tree cavities rather than under bark. Tree cavities were located in eucalyptus forest, of which there are only small remnant patches on the island. In contrast, potential roosts under bark are far more common on the island.

Though no tree hollow roosts were located, residents described finding bats in felled eucalypt and blackwood trees, indicating that bats do use these trees for roosting. It is also possible that this species, and or the lesser long-eared bat are utilizing sea caves at Seal Rocks, and rocky escarpments at Grassy. Several residents reported piles of mice-like guano in sea caves and one resident reported seeing bats flying around inside a sea cave. Another resident reported finding ten or less bats roosting on a rocky overhang near a dam at Grassy several years ago.

Buildings are also important roosts for bats on King Island. Several house owners reported bats roosting in their premises year round, and had a long history of bat utilisation (several years). This may be because of a lack of suitable hollow-bearing trees or roosting patches on the island, or that the buildings provide preferred roosts compared to natural roosts.

It is important to note that this survey provides only a preliminary snapshot of the species composition, activity and distribution of King Island bats during a single period of time: late spring to early summer 2013. It is possible that bats vary in their habitat use and in species composition throughout the year on King Island, as has been documented on mainland Tasmania (Cawthen 2014).

Concluding comments

King Island's remnant forests provide crucial habitat for bats as a place to roost, breed and forage. As a consequence the management of remnant forest, particularly those that contain roosting habitat, is crucial for the persistence of bats on King Island. Though bats are widespread, not all species are common and it is likely that the species present vary in their susceptibility to forest loss and clearance.

Management strategies, such as fencing off shelter-belts from cattle to improve remnant condition, and recruiting new roosting habitat into the landscape will be beneficial for bats on King Island by retaining and protecting roosting and breeding habitats.

Acknowledgements

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List of Appendices

Table 1. Description of survey sites and an overview of data during a survey of the bats of King Island, November 2013. * indicates a trapping locality.

Date	Site ID	Geographic location		Bat call sequence					Location details
		Easting	Northing	Total #	Nyctophilus spp.	C. gouldii	C. morio	Unknowns	
22/11/2013	BD0*	747668	5601003	1	1	0	0	0	Yellow Rock Farm – over edge of paper bark forest strip by creek
22/11/2013	BD1	249326	5606375	0	0	0	0	0	Penny's Lagoon – by lagoon edge in scrub
22/11/2013	BD2	248448	5606272	0	0	0	0	0	Martha Lavinia Rd - in scrub (flooded)
22/11/2013	BD3	747716	5600961	0	0	0	0	0	Yellow Rock Farm – by paddock water trough
23/11/2013	BD4	248199	5594079	0	0	0	0	0	Council hill - lowlands in scrub with scattered banksias
23/11/2013	BD5	248690	5590376	0	0	0	0	0	Rekara Rd – in scrub
23/11/2013	BD6	246493	5594450	0	0	0	0	0	Rekara Rd – in scrub
24/11/2013	BD7	252758	5588028	2	1	0	0	1	Sea Elephant - by estuary in woodland strip
24/11/2013	BD8	252770	5587737	0	0	0	0	0	Sea Elephant - in scrub
24/11/2013	BD9	251161	5583561	0	0	0	0	0	Sea Elephant – in banksia woodland
24/11/2013	BDTS*	231731	5587163	1	1	0	0	0	Porkys Beach – lucky bay – inland in clearing surrounded by scrub
25/11/2013	BD10*	252536	5575653	188	150	8	1	29	Pegarah Private Nature Reserve – blackwood forest trail
25/11/2013	BD11	252450	5575366	377	311	2	0	64	Pegarah Private Nature Reserve – paper bark and blackwood forest
25/11/2013	BD12*	254220	5575702	30	22	0	0	8	Millwood Road – garden surrounded by eucalypt woodland
26/11/2013	BD13	749355	5576786	1	0	0	0	1	Hill Holloway property – pond surrounded by paperbark on 1 side
26/11/2013	BD14	247628	5589435	0	0	0	0	0	Bicentennial Road – creek surrounded by paper bark and
26/11/2013	BD15	251047	5577832	4	0	0	0	4	Pegarah state forest – in eucalypt forest near large hollows
26/11/2013	BD16	755425	5574199	37	31	0	0	6	Pegarah nature reserve – eucalypt wood land
27/11/2013	BD17	250958	5577909	94	39	31	0	24	Pegarah state forest –edge of eucalypt forest
27/11/2013	BD18	250639	5577445	117	79	0	0	38	Pegarah state forest - Lappa Rd/Zwa link intersection – edge of eucalypt
27/11/2013	BD19*	252536	5575653	2	0	1	0	1	Pegarah Private Nature Reserve – blackwood forest
28/11/2013	BD24	750037	5569550	0	0	0	0	0	Tim's place - Satori Rd – Private forest reserve – forest by creek

Table 1, continued. Description of survey sites and an overview of data during a survey of the bats of King Island, November 2013. * indicates a trapping locality.

Date	Site ID	Geographic location		Bat call sequence					Location details
		Easting	Northing	Total #	Nyctophilus spp.	C. gouldii	C. morio	Unknowns	
28/11/2013	BD25	749948	5569574	4	4	0	0	0	Tim's place - Satori Rd – Private forest reserve – forest by fire trail
28/11/2013	BD26	750309	5569668	10	0	0	0	10	Tim's place - Satori Rd – Private forest reserve – forest by track
28/11/2013	BD27	232042	5575446	0	0	0	0	0	Currie – outside shed surrounded by paddock
29/11/2013	BD28	744922	5557742	0	0	0	0	0	Seal Rocks – edge of cliff at look out
29/11/2013	BD29	745893	5557132	100	40	32	0	28	Seal Rocks – creek edge on road surrounded by paper bark forest
29/11/2013	BD30	746124	5556603	1	1	0	0	0	Seal Rocks - Calcified Forest car park surrounded by scrub and forest
29/11/2013	BD31	748339	5587588	10	10	0	0	0	Shag Lagoon – paddock edge by lagoon with paper bark strip
30/11/2013	BD32	754799	5557631	9	3	0	0	6	Colliers Swamp - scrub
30/11/2013	BD33	754064	5557354	0	0	0	0	0	Colliers Swamp - paperbark forest (flooded)
30/11/2013	BD34	755344	5558588	12	4	0	0	8	Red Hut Road – scrub and dry eucalypt woodlands
1/12/2013	BD35	752880	5574862	46	20	1	0	25	Hill Holloway property – eucalypt forest edge
1/12/2013	BD36	752835	5574907	98	90	1	0	7	Hill Holloway property – drainage line in eucalypt forest
1/12/2013	BD37	752807	5574951	443	294	6	0	143	Hill Holloway property – eucalypt forest
1/12/2013	BD38*	752687	5575991	665	228	11	0	426	Hill Holloway property – trail through paperbark forest
2/12/2013	BD39	248105	5591349	22	12	2	0	8	Bootlace – eucalypt forest
2/12/2013	BD40	248218	5591349	10	1	4	0	5	Bootlace – eucalypt forest
2/12/2013	BD41	248295	5591901	20	19	1	0	0	Bootlace – eucalypt forest edge
2/12/2013	BD42	247846	5591167	32	17	4	0	11	Bootlace – homestead near dam

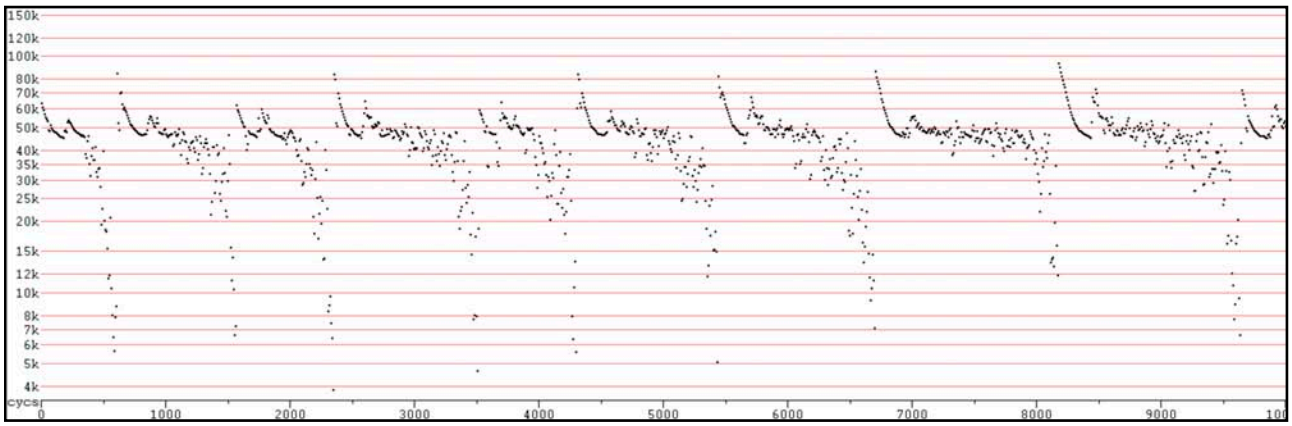
Appendix 1 - Bats of King Island.

Chocolate wattled bat (*Chalinolobus morio*) ©*Lisa Cawthen*

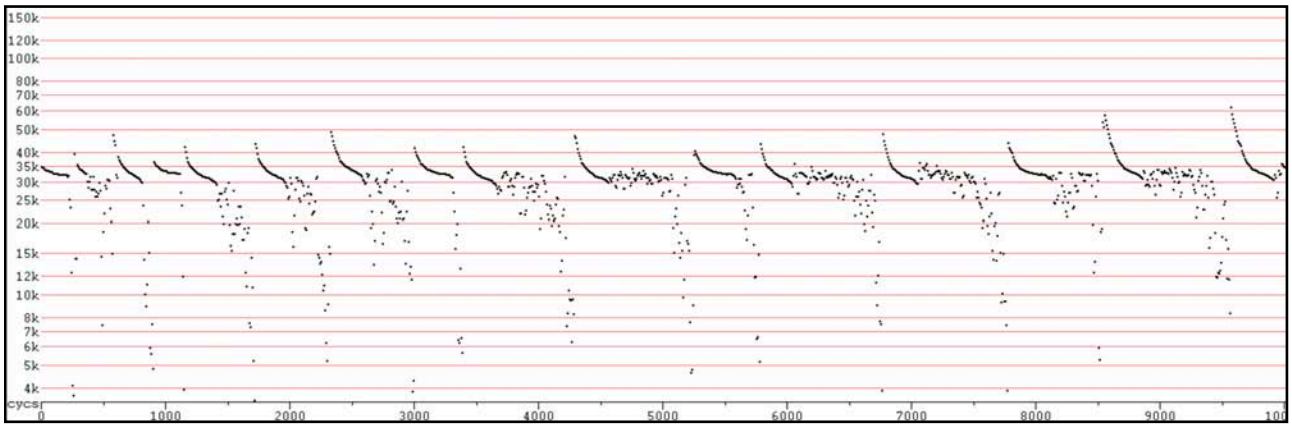
Lesser long-eared bat (*Nyctophilus geoffroyi*) ©*Lisa Cawthen*

Gould's wattled bat (*Chalinolobus gouldii*) ©*Lisa Cawthen*

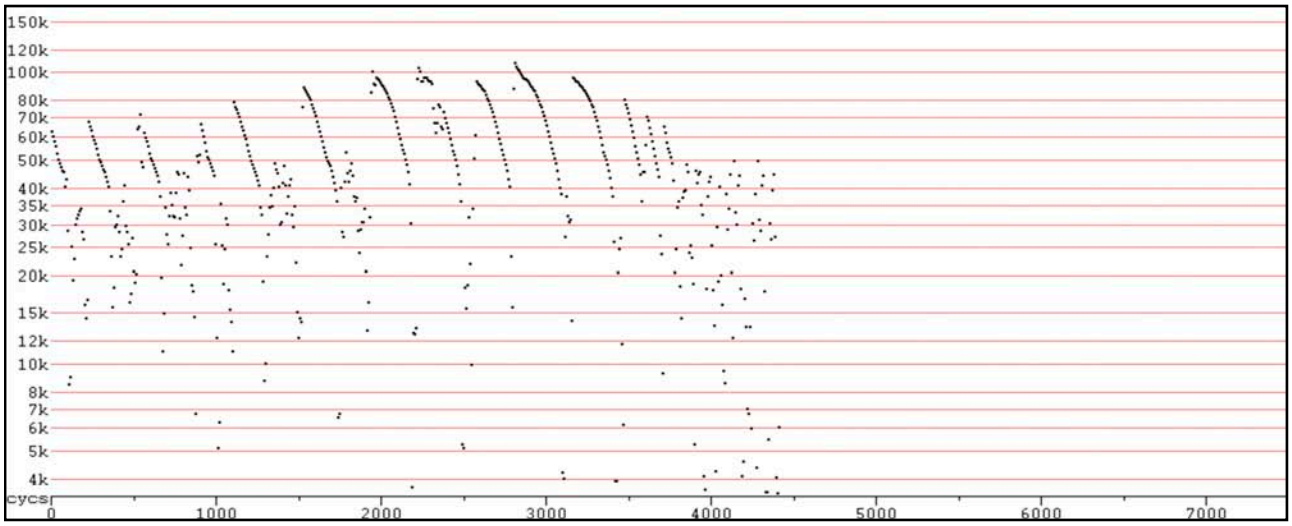
Appendix 2 – Bat call sequence sonograms.



(a) A bat call sequence identified as the chocolate wattled bat (*Chalinolobus morio*)



(b) A bat call sequence identified as the Gould's wattled bat (*Chalinolobus gouldii*)



(c) A bat call sequence identified as a long-eared bat (*Nyctophilus spp.*)