Wairarapa Rodent Survey – Summer 2017

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Executive summary

Little is known about the rodent populations in the northern and eastern forest fragments of the Wellington region. Rodent monitoring is completed in many of the forests in and around Wellington City, and in both the Tararua and Aorangi Ranges as part of monitoring programmes run by Greater Wellington Regional Council, the Department of Conservation (DoC) and Operational Solutions for Primary Industries (OSPRI). No systematic study of rodent populations in the northern and eastern Wairarapa forests has been completed to date.

Chew cards placed on transects were used to survey rodents in two different forest types in the Wairarapa; conifer-broadleaf and manuka-kanuka-beech forest. The cards were left out for three nights and the chew marks of rats, mice, hedgehogs, possums and mustelids were recorded. The survey took place during late summer between 13/03/2017 and 07/04/2017. Significantly more rats were found in the conifer-broadleaf than in the manuka-kanuka-beech forests.

The higher rat densities recorded in the conifer-broadleaf forest were considered to be related to greater food availability. It was also found that old growth forests in the Wairarapa had rat densities that were comparable to those recorded in other old growth forests in the region. Rat predation is one of the main drivers of the decline in native forest bird species’ abundance. This study serves to provide an understanding of the abundance of rats in different habitats in the region which can be used for conservation purposes.

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1. Introduction

Regular and extensive rodent monitoring is conducted in many forests on the western side of the Greater Wellington region, however little is known about rodent populations in the eastern and northern forests of the region. Many of these forests are depleted and poorly conserved. The Wairarapa area is characterised by extensive loss of natural habitat, with very little of the remaining forests receiving any type of formal protection or predator control. Eastern Wairarapa has lost large areas of habitat with only *c*. 45 000 ha, or 11% of land area, retaining any of its natural cover. Of this only 1% occurs in any type of protected area (Beadel et al. 2004). Forest stand maturity and composition varies greatly throughout these areas, ranging from regenerating scrubland to mature conifer-broadleaf forest. Despite this loss, there is a large diversity of native bird species present in these forests (Uys and Crisp 2017).

This aim of this study was to provide information about the size of rodent populations in the eastern/northern Wairarapa forests and to provide insights into the pressure these forests face from largely uncontrolled rodent populations. Rat numbers are of particular interest due to the ability of this pest species to predate and browse on native fauna and flora. This preliminary investigation 'snapshot' of pest rodent populations in the Wairarapa northern and eastern forests will be useful for conservation planning purposes.

2. Methodology

2.1 Network design

Forty-five points were randomly selected from indigenous forest patches >500m in diameter in the eastern and northern parts of the Wairarapa using the Land Cover Database version 4.1 (LCDB v4.1). These forests were grouped into two broad vegetation categories using Singers' (2014) classification of New Zealand's potential terrestrial ecosystems. The intent of this study was to survey rodents in the two main woody vegetation types present in the area – conifer-broadleaf forest (CB) and regenerating manuka/kanuka/beech scrub (M).

Random bearings were assigned to each start point along which a 450m transect was established. Lines were not selected if they could not fit within a 50m buffer of the forest margin or if they were deemed to be inaccessible or dangerous. Access was denied to some sites leaving a final number of 35 transects, 16 of which were in conifer-broadleaf and 19 in manuka/kanuka/beech forest moasic.

The sampling network spanned from Matikona in the north, to Tora in the south, and as far west as Pukaha/Mt Bruce. The majority of the lines fell in the eastern Wairarapa forests, reflecting the large number of forest and manuka fragments remaining in the Eastern Wairarapa, (Figures 2.1 and 2.2).

2.2 Sampling design

Chewcards were chosen as the rodent detection device for this survey, as these cards could be rapidly deployed and retrieved across a range of habitat types. Ten plastic corroflute chewcards, embedded with a peanut butter lure were placed at 50m intervals along each of the 450m transects (Sweetapple & Nugent 2011). Transect lines were located at least 50m from the forest margin to reduce any effect from surrounding land uses. A straight peanut butter lure was chosen over a scented lure in an attempt to minimise attractiveness to non-target species which are known to prefer scented lures.

The survey was conducted from 13 March 2017 to 07 April 2017. Field staff deployed the cards using a hip-chain for measuring distance. Cards were folded and nailed to the base of trees, 20-30cm from ground level (see Figure 2.3). Each card was clearly marked with a unique line identifier and card placement number (1-10). Cards were left in place for three nights as this was deemed the optimal time frame for species detection across the range of habitats (Burge et.al 2016). Identification of chew marks for target rodents (rats and mice), were recorded, along with those of non-target species: possum, hedgehog, mustelid, and cat.

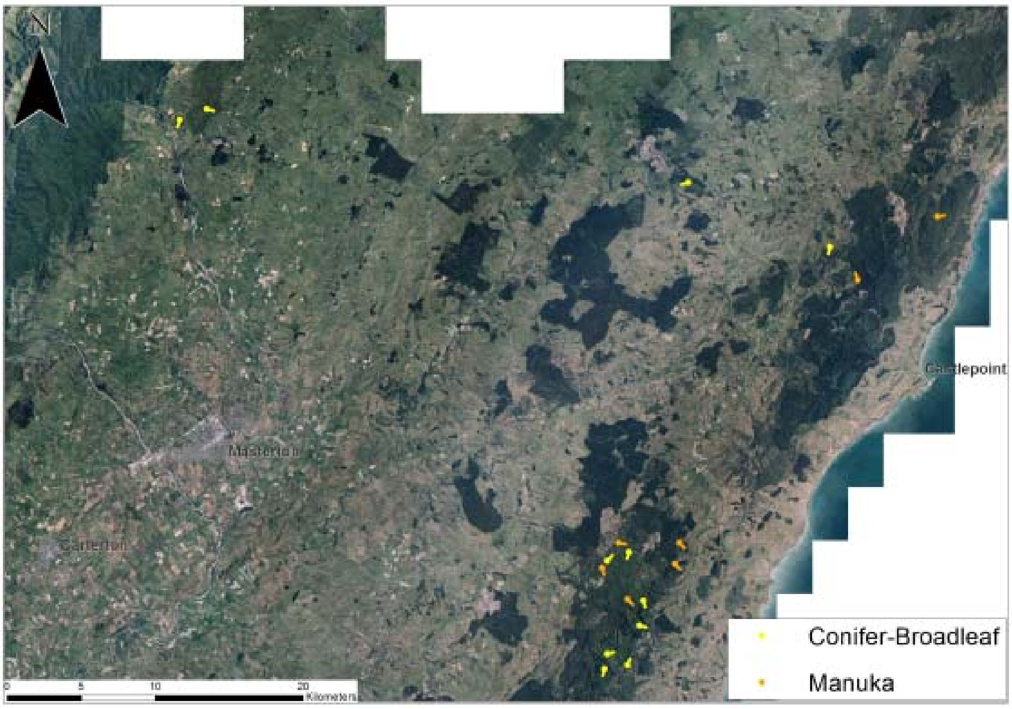

Figure 2.1: Location of Wairarapa rodent survey lines (North)

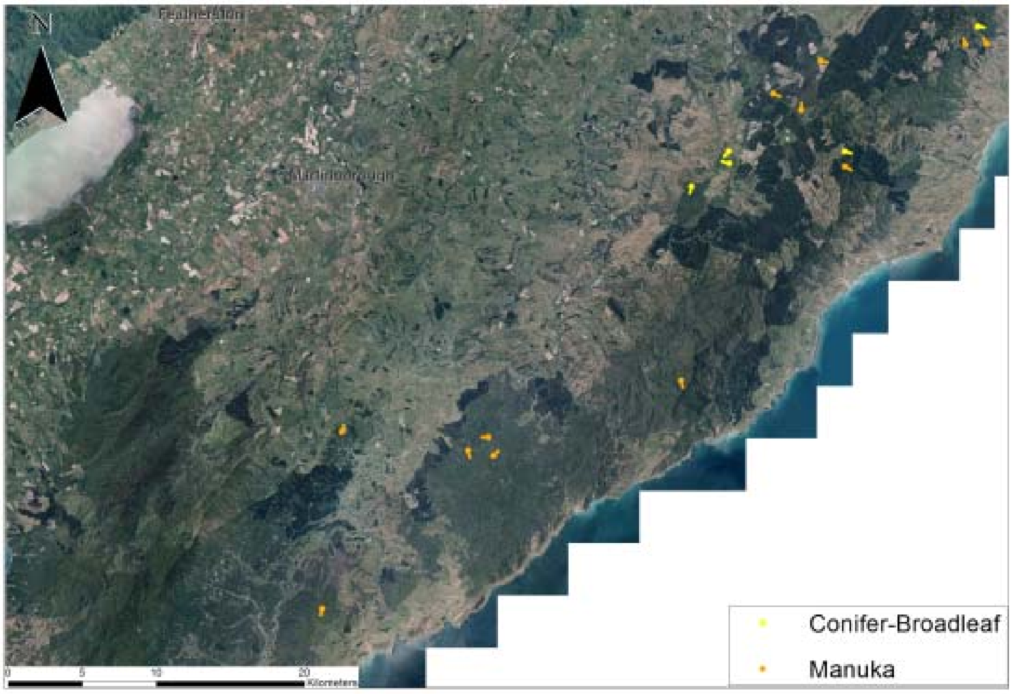

Figure 2.2: Location of Wairarapa rodent survey lines (South)

Figure 2.3: (L) Placement of card at base of tree, note hip-chain cotton
(R) Labelled and folded card in place

2.3 Analysis methods

A rodent chew index was calculated for each line using the percentage of cards chewed per line. This was then averaged across all transects. Note that the method used only provides a coarse index of the relative abundance of rodent populations and is not a direct measure of their population density. The results from the two forest types present, manuka-kanuka-beech (M) and conifer-broadleaf (CB) were calculated and compared.

Non-parametric (Mann-Whitney) testing was used to compare means between the two forest types (M and CB). Presence/absence data was also investigated by calculating the percentage of lines chewed by each species for each forest type.

Lidar data was overlaid on the plot network and a canopy height category assigned to each line. A linear model was created to investigate relationships between canopy height classes and rodent presence. This was conducted for each forest type.

3. Results

A total of 350 chewcards were placed along 35 lines over the course of the survey. Of these, 146 (42%) showed chew marks of either rats (18.9%) and or mice (40%), with only 52 cards (14.7%) displaying chew marks of non-target species, (Table 3.1).

Table 3.1: Total number of chew marks per species across all lines (n=258)

	Rat	Mice	Possum	Hedgehog	Mustelid	Cat
sum	66	140	38	1	11	2
%	19	40	11	0.5	3	1

A comparison of the abundance of rodent chewed cards between the two forest types, manuka-kanuka-beech (M) and conifer-broadleaf (CB), showed that higher numbers of rat chewed cards were found in the conifer-broadleaf forest (CB=34%) than the manuka-kanuka-beech forest type (M=7%), (Table 3.2). Rat abundance was found to be significantly higher (<0.01) within the conifer-broadleaf forest (p=0.0001, U=267.5, N=35).

Similar results to those found for rats were seen for mice chew marks when comparisons were made between the two forest types (CB=52%, M=30%), (Table 3.2). Using a Mann-Whitney test, mice abundance was found to be significantly different (<0.05) between the two forest types (p=0.012, U=220, N=35).

Non-target species encountered varied between the two forest types. Hedgehogs and cat chew marks were only found in the manuka-kanuka-beech forest. More mustelid chewed cards were recorded in the manuka-kanuka-beech areas (6%) than the conifer-broadleaf areas (0.5%). Possum detections remained more or less consistent between both manuka-kanuka (12%) and conifer-broadleaf (10%), (Table 3.2).

Table 3.2: Percentage and standard error of total cards chewed by each species, displayed by forest type; conifer-broadleaf (CB) and manuka-kanuka-beech (M)

	Rat	Mice	Possum	Hedgehog	Mustelid	Cat
CB						
%	34	52	10	0	0.5	0
SE	6.0	6.3	2.0	0	0.6	0
M						
%	7	30	12	0.5	6	1
SE	2.9	5.6	3.9	0.5	2.2	0.7

Presence/absence data (calculated per line) was also investigated because of the large variance within the data set, (see Table 3.3). Higher detection rates were found again for rats in conifer broadleaf (94%) compared with manuka-kanuka-beech (26%). There was no statistically significant difference for mice between forest types however, with presence/absence per-line being more or less constant between CB (94%) and M (89%). Results for non-target species showed the same pattern seen in the previous analysis (using percentage chews per line).

Table 3.3: Percentage of lines where a species was detected for conifer-broadleaf (CB) and manuka-kanuka-beech (M) forest types

	Rat	Mice	Possum	Hedgehog	Mustelid	Cat
CB						
% Lines	94	93	68	0	6	0
M						
% Lines	26	89	53	5	36	10

A comparison of the relationships between forest types for the percentage of lines chewed by rats and for the percentage of cards chewed is shown in Figure 3.1. Both analysis methodologies showed that the relative abundance of rats in the conifer-broadleaf forest was more than three times that in the manuka-kanuka-beech forest.

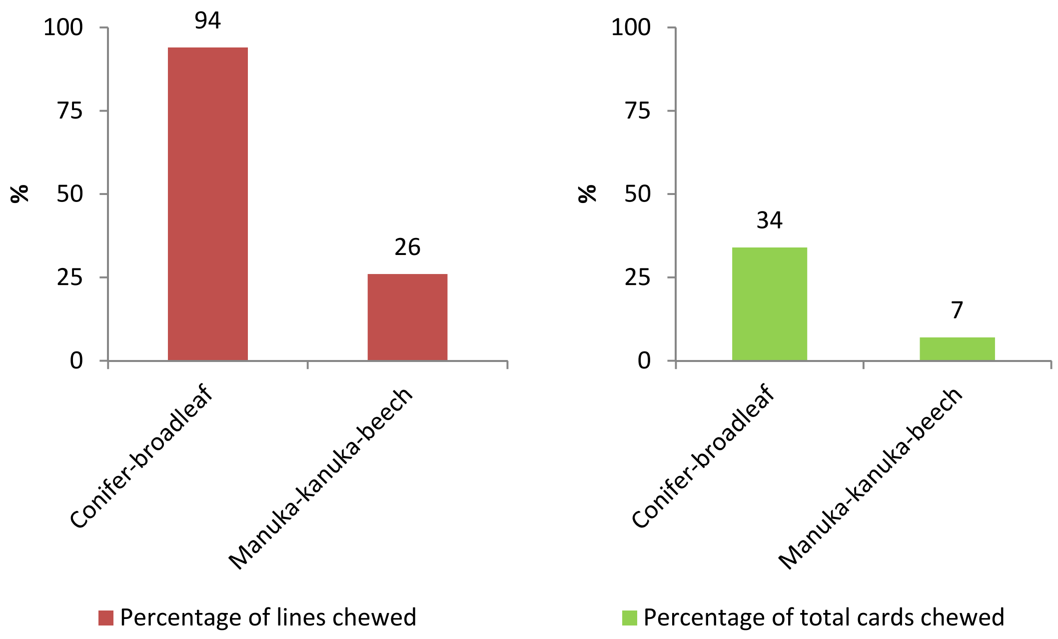

Figure 3.1: Percentage of cards chewed and percentage of lines chewed displayed for conifer-broadleaf and manuka-kanuka-beech. Number above bar donates percentage of chews.

Results from canopy height investigations revealed a moderate correlation (r^2=0.5679) between canopy height and percentage of cards chewed within conifer-broadleaf forest (Figure 3.2).

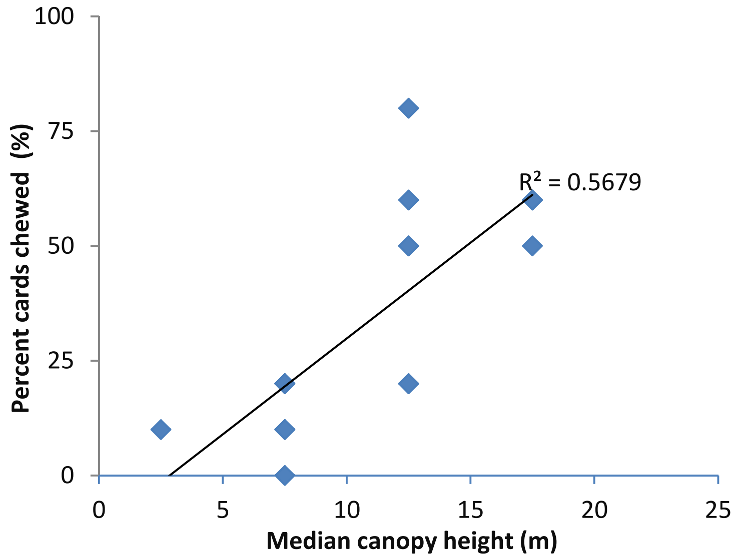

Figure 3.2: Relationship between total cards chewed and canopy height for conifer-broadleaf forest type

This was contrasted by the absence of any relationship (r^2=0.07) observed between percentage of cards chewed and canopy height within the manuka-kanuka-beech forest type (Figure 6).

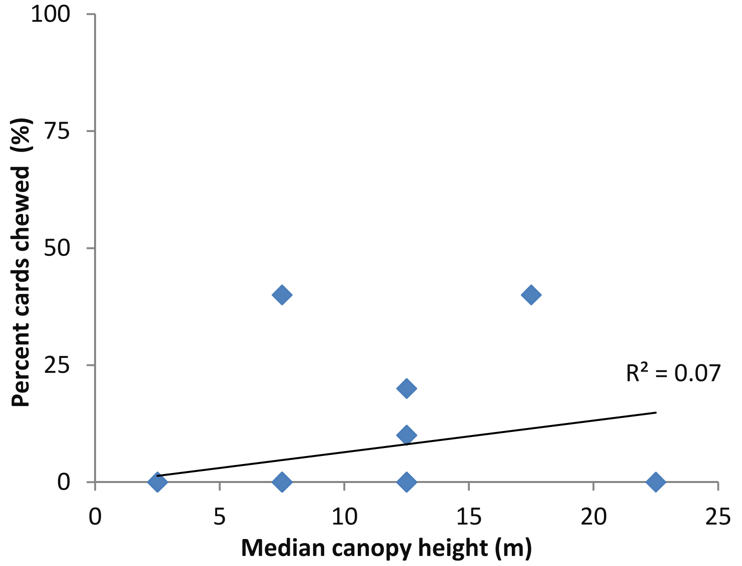

Figure 3.3: Relationship between total cards chewed and canopy height for the manuka-kanuka-beech forest type

4. Discussion

Differences in rat detections between the two forest categories used in this study were pronounced. Rat abundance was significantly higher in the conifer-broadleaf forest type than in the manuka-kanuka-beech forest. This may be explained by the increased availability of fleshy fruits present within the conifer-broadleaf forest. Environmental factors such as forest maturity and cover may also be a factor in the differences in rat abundance detected. Investigations into the effect of canopy height on rat numbers showed a moderate relationship within the conifer-broadleaf forest type, but not in the manuka-kanuka-beech forest. This information provides an understanding of not only abundance of rat populations, but also provides data related to the relative predation pressures on fauna in different parts of the Wellington region.

It was of interest that cards chewed by hedgehogs, mustelids and cats were found more frequently within the manuka forest patches, than in the conifer-broadleaf forest. This may be because there is better foraging habitat for these predatory species in the manuka forest type, but it was noted that these patches were generally nearer areas of pasture than was the case for the conifer-broadleaf forest.

Rodent control was not in place in any of the forests sampled, with the exception of the transect in Pukaha, though the survey at the latter site took place three months after a 1080 operation and rodent numbers had increased since that operation had been completed. While tracking tunnels are used to collect data in the western forests, the results of chew card and tracking tunnel methodologies are not too dissimilar. It was of interest to find during this survey that high rat numbers were recorded on lines placed in habitats with the greatest vegetative diversity (e.g. around 80% in Rocky Hills, Pukaha). These levels are comparable to that seen in the non-treament area of Wainuiomata water collection area (Uys 2017) and in lowland Tararuas where rodents are monitored as part of Project Kaka (Department of Conservation 2013).

It is likely that the manuka-kanuka-beech forest type contain fewer rats as there would be fewer denning sites and less food available in this forest type. Recent studies have shown that rats prefer larger fruit, as would be found in the conifer-broadleaf forests (Grant-Hoffman & Barboza 2010). Older growth forests will also provide a greater abundance of large fruit, increasing the availability of this food source for pest species such as rats. Predation by rats is one of the main causes of decline of bird species in the region.

The older growth forests are of prime importance for the native forest bird species of the region. The largest forest tracts provide breeding habitat for these bird species, with rifleman, whitehead and tomtit populations only being recorded in these areas (Uys and Crisp 2017). The small forest fragments in the region, e.g. on the valley floors in the Wairarapa and Kapiti Coast, provide foraging habitat for bird species with strong dispersal abilities such as tui, bellbird and kereru, but the majority of breeding habitat occurs in the older growth forests of the Tararua/Rimutaka/Akatarawa Ranges in the west, and the Aorangis and larger forest fragments in the eastern Wairarapa. Smaller forest bird species with poorer dispersal abilities, including rifleman, tomtit and whitehead are often absent from smaller, more isolated forest fragments, (Nikki McArthur *pers comm*). This study aids our understanding of rat populations across the region and will ultimately be useful for modelling of rat habitat for conservation purposes.

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