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Arboreal Relative Rat Density vs. Ground Relative Rat Density at Ark in the Park, New Zealand.

Is Ark in the Park harboring large populations of rats within its canopy?

Evaluation of Arboreal Rat Populations within Ark in the Park, Waitākere Ranges, New Zealand.

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Abstract

Ark in the Park (AiP) is a mainland sanctuary within the Waitakere Ranges, New Zealand. The AiP has reduced, but not eradicated it's pest populations. AiP uses ground based monitoring and pest eradication methods, but has never monitored within the forest canopy for rat activity. This study aimed to see if the canopy is harboring a large population of rats. As AiP tries to eradicate its entire rat population, it needs to know where to focus its resources. This study monitored for rats, in a small selection of trees, and found none within AiP.

Introduction

Rats, mice, possums and mustelids have plagued the New Zealand ecosystem since their introduction (Brockie, 1992). These animals have prospered in a country naturally defenseless to these predators (Wilson, 2004). This has led to the reduction of many of New Zealand's native and endemic species, and to the extinction of many others (Innes 2001; Bell, 1978). In an attempt to curb the decline in biodiversity in New Zealand, the Department of Conservation (DOC), has eradicated pests on several offshore islands; these islands greatly contribute to genetic diversity and serve as a haven for many species (Towns & Broome, 2003). After the success of these offshore islands, DOC has invested further time and money to develop 'mainland islands' of biodiversity (Innes, et al., 1995). Through the efforts of the Auckland City Council, Forest and Bird, and the work of many volunteers, a mainland sanctuary, Ark in the Park (AiP) has been created in the Cascades Kauri Park, Waitakere Ranges. Since the inception of AiP in 2003, the rat density has plummeted from 60%-90% to 1%-5% due to intensely ground based pest eradication methods (Poorter, 2010).

Rattus rattus, (R. rattus) is the most common rat species trapped at AiP. Of the 861 rats that had been trapped between 2003-2010, only one was ever found to be a *Rattus norvegicus*, (Colgan, 2010). *R. rattus* are excellent climbers (Innes, 1990). Radio tracked *R. rattus* have been found to be mostly arboreal, with 73% of tracked locations being above 2m (Dowding & Murphy, 1994).

The rodent and mustelid monitoring guidelines set forth by DOC (Gillies, 2002), only advise on the use of monitoring tunnels on the ground. Current literature on arboreal rat biology is sparse. AiP conducts its pest control methods via the ground. But as research has shown, *R Rattus* live and feed both on the ground and in trees (Innes, 2001). AiP has greatly lowered its rat population, but not eradicated it. This research aims to see if reinvasion is originating from the canopy. By getting a better understanding of arboreal rat abundance, we can better understand where the few remaining pests are surviving. Once we understand where they are surviving, more targeted pest control methods can be used and AiP can focus its limited resources in the most effective manner.

Materials and Methods

In order to establish the arboreal rat density within AiP, I followed the nationally standardized rodent and mustelids monitoring guidelines set forth by Gillies and Williams (2002). The guidelines are simple when carried out on the ground, but these basic procedures are quickly complicated once within the canopy. The AiP climbing group and myself monitored 20 trees within AiP (Figure 1). These trees were in three separate areas, near the Whatitiri stream, Waitakere Dam, and Anderson's track (Figures 2, 3, and 4 respectably). We also monitored 5 control trees in the Sharps Bush area, 2 km from AiP (Figure 5).

The AiP climbing group had established climbing routes within twenty AiP trees before I began this project. The AiP climbing group chose these trees with the idea of monitoring for geckos. The climbing trees were composed of kauri, rimu, kahikatea, pukatea, tawa, miro, rata and radiata pine. Fifteen of these trees had monitoring tunnels within their canopy and we put the remaining five up within the canopy. I placed ground-monitoring tunnels within 3 m of the base of each tree. I set up five additional trees for the control in the Sharps Bush area (Figure 5??). I attempted to duplicate the species variety of the initial climbing trees for the control area. The tunnels were placed at various heights, based on climber accessibility, height of tree and a suitable location to place the tunnel (Table 1). The monitoring tunnels were not used for at least 3 weeks, as rats are neophobic

The black trakka monitoring tunnels were modified to withstand being left in the canopy for an extended period of time (Figure 6). The tunnels were secured to a wooden plank, which was fastened to the tree with rope. Tire tubing was attached to this rope for additional tension. Due to the canopy being windier than the ground, I paper clipped the inkpads into the tunnels and I fastened the lure, peanut butter securely within the tunnel (Figure 6).

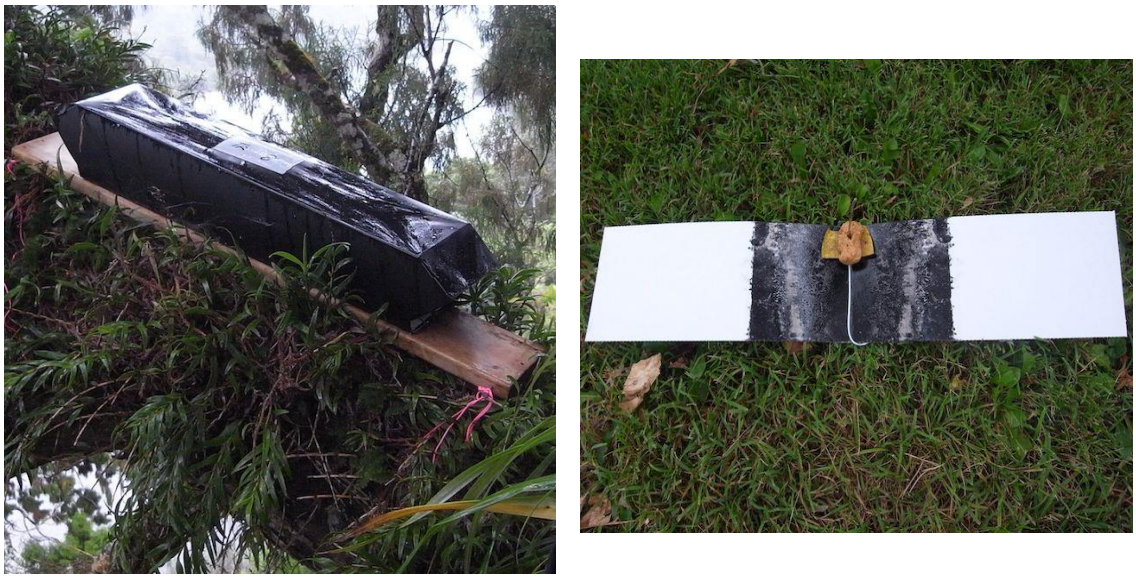

Figure 6. Monitoring tunnel secured to a tree and peanut butter securely fastened to an ink card.

I received climbing training before carrying out this research project. I had two days of climbing training from an experienced climber, and one day of practical. The AiP climbing group has a strict safety protocol, which requires there be at least 2 trained climbers and a safety person for all climbs. The AiP climbing group supplied the climbing gear for this project. To set a tree up for climbing, an initial thin line is hand thrown or shot over the safest looking branch. This thin line is then used to pull up builders line, which is then used to pull up the two thick climbing lines. Once the two climbing lines are in place, weight tested and securely tied off, the climber can begin their accent.

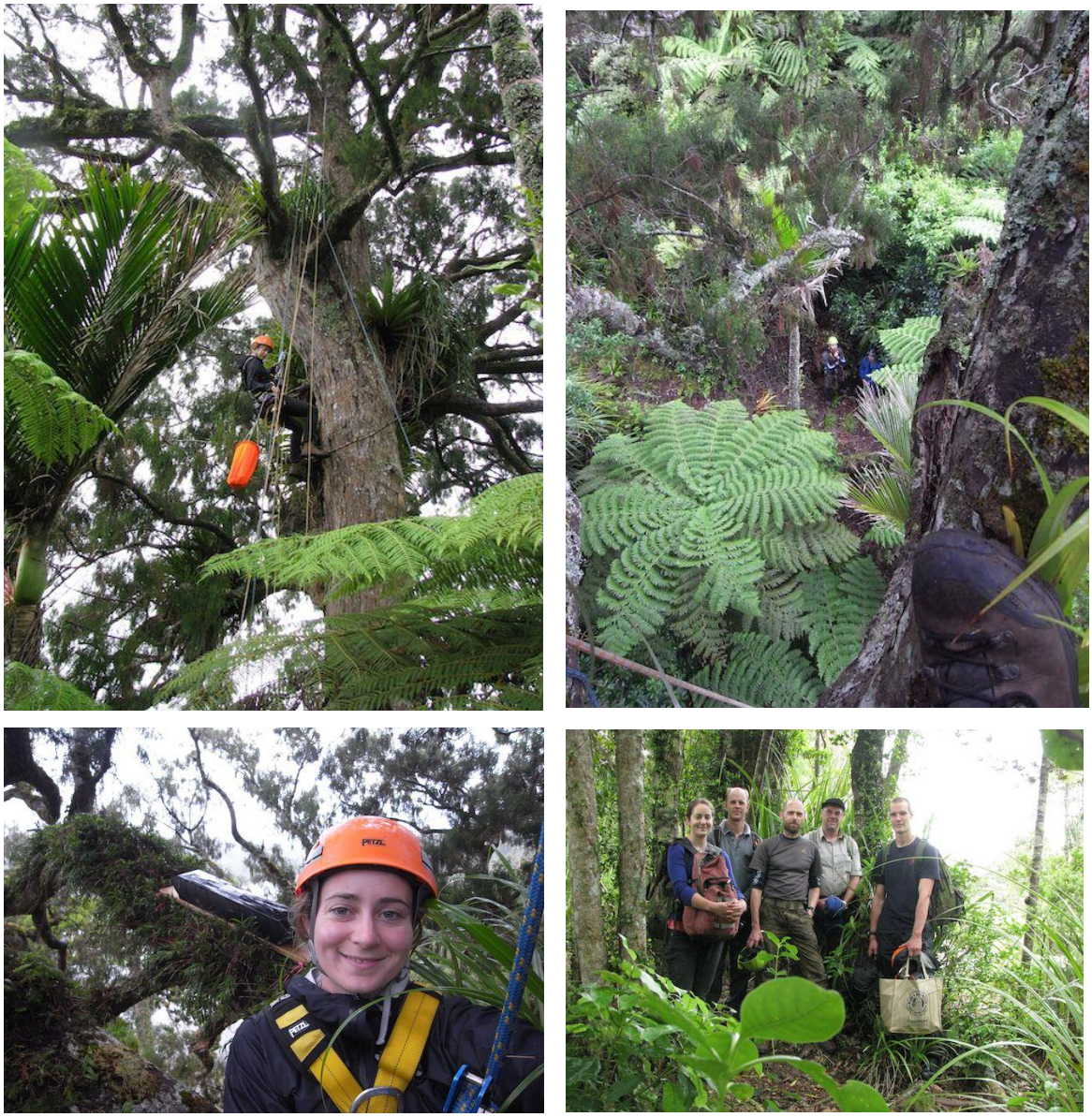

Figure 7. Clockwise from top left, myself descending a radiata pine (photo courtesy of Stuart Park), view from the top, a few of the AiP climbing team and a tunnel secured in place.

Results

This project found no rats tracked in the canopy, or on the ground within AiP (Table 1 and 2). One rat was tracked in the canopy, and 3 rats tracked on the ground within the control area (Table 1 and 2). Also, for comparison, the data from AiP's quarterly monitoring, carried out over the 14th and 15th of January 2012 is included (Table 3). Volunteers monitored 170 tunnels within AiP, 10 control tunnels in each Sharps Bush, Spraggs Bush and Wainamu Bush Track.

Table 1. Tree number, species, group, tunnel height and number of arboreal and ground rat prints, respectively.

Tree Number	Tree Type	Tree Group	Tunnel Height (m)	Arboreal Rat Prints	Ground Rat Prints
1	Kauri	Whatitiri	17.9	0	0
2	Kauri	Whatitiri	13	0	0
3	Kauri	Whatitiri	11	0	0
4	Kahikatea	Whatitiri	9.1	0	0
5	Pukatea	Whatitiri	7.6	0	0
6	Kauri	Whatitiri	12.2	0	0
7	Kauri	Whatitiri	15.2	0	0
8	Miro	Whatitiri	10	0	0
9	Tawa	Whatitiri	8.4	0	0
10	Pine	Anderson	13	0	0
11	Pine	Anderson	14.8	0	0
12	Rimu	Dam	10.1	0	0
13	Rimu	Dam	8.5	0	0
14	Rimu	Dam	10.2	0	0
15	Rimu	Dam	9.2	0	0
16	Rimu	Dam	9.8	0	0
17	Rata	Dam	12.2	0	0
18	Rata	Dam	9.1	0	0
19	Kauri	Dam	10	0	0
20	Rimu	Dam	8.1	0	0
C 1	Rimu	Control	14.7	0	0
C 2	Kauri	Control	9.1	0	0
C 3	Miro	Control	13.1	0	1
C 4	Kauri	Control	9.5	0	1
C 5	Rimu	Control	12.5	1	1

Table 2. Calculation of rat presence

Calculation of rat presence = (tunnels tracked / total number of tunnels) X 100
AiP arboreal rat presence = 0% AiP ground rat presence = 0%
Control arboreal rat presence = (1/5) X 100 = 20% Control ground rat presence = (3/5) X 100 = 60%

Table 3. Calculation of rat presence from quarterly AiP monitoring data, January 2012 (Courtesy of AiP monitoring archives).

AiP = (5/170) X 100 = 3%

Control area = (18/30) X 100 = 60%

Discussion

The project confirmed that the AiP canopy is not harboring a large population of rats. The presence of rat prints within the arboreal tunnels in the control area confirms the monitoring technique used was successful. I have included the AiP quarterly monitoring data (Table 3). This shows a 60% rat presence in the control area, the same rat presence I found in my ground control area. There is a strong correlation between these datasets, showing that even the small scale of this project has yielded reliable data. However, the very small scale of this project, means only a small proportion of trees were monitored within AiP. Gillies and Williams (2002) suggest 150 tunnels for monitoring 2000 hectares; this project only monitored 20 trees within AiP's 2000 hectares. I believe further arboreal monitoring would be advantageous to understanding this little understood and complex habitat.

AiP's climbing group chose the climbing trees within AiP before I started my project. Some of the climbing trees had large masses of epiphytes, and habitat suitable for rats, while others were relatively bare, with no protected area for a rat to linger. In future studies, I recommend monitoring trees with epiphytes, as they provide more potential rat habitat. Due to the logistically complicated nature of conducting any survey within the canopy, I think it would be beneficial to maximize potential rat harboring areas. I also recommend monitoring for 7 nights, as much work is required for arboreal monitoring. Monitoring over a longer period of time would yield a better picture of what is happening in the canopy, while climbing time.

The monitoring was conducted over three consecutive weekends, January 14th, 15th, 21st, 22nd, 28th and 29th, 2012. The monitoring was only possible with the help of volunteers, and as such monitoring days were depicted by their schedule. However, the canopy monitoring coincided with the AiP quarterly monitoring on January 14th and 15th, 2012. The weather was not ideal, but quarterly rat monitoring within AiP is volunteer run, and is conducted regardless of weather. The project attempted to monitor on 'fine nights,' but due to volunteer availability, this was not always possible.

Acknowledgements

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