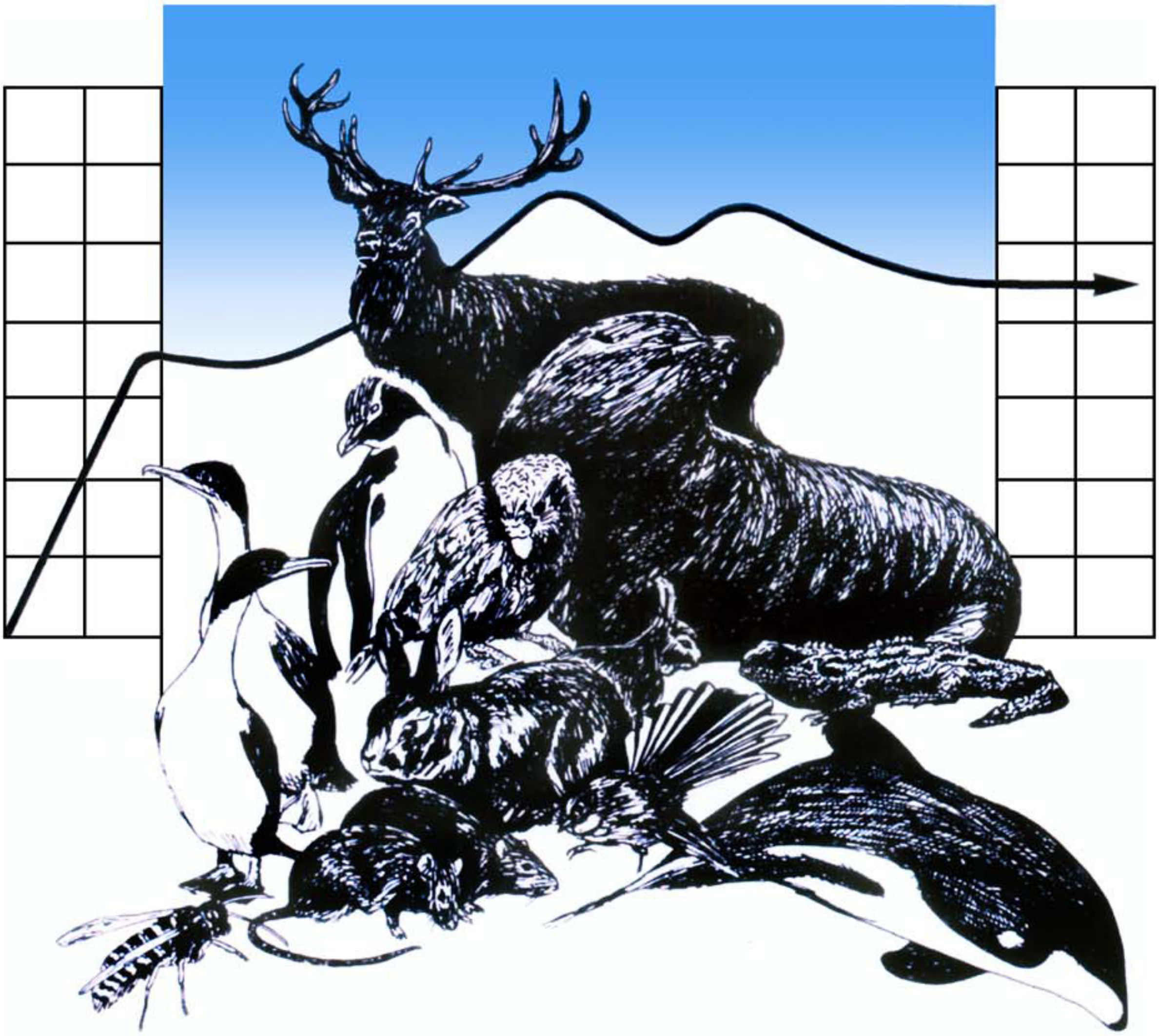
DEPARTMENT OF ZOOLOGY



WILDLIFE MANAGEMENT

The use of tracking tunnels to monitor the Mt Arthur giant weta (*Deinacrida tibiospina*)

Alison Anker

A report submitted in partial fulfilment of the
Post-graduate Diploma in Wildlife Management

University of Otago

2010

University of Otago
Department of Zoology
P.O. Box 56, Dunedin
New Zealand

WLM Report Number: 236

Student ID: 26761

The use of tracking tunnels to monitor the Mt Arthur giant weta (*Deinacrida tibiospina*)

Alison Anker

Department of Zoology, University of Otago,

P.O. Box 56, Dunedin, New Zealand

Abstract

The Mt Arthur giant weta (*Deinacrida tibiospina*) are a small species of weta found around central areas of North West Nelson Forest Park at low densities in scattered populations. Recently a study was carried out to test whether tracking tunnels could be used to monitor wetapunga (*Deinacrida heteracantha).* This method has yet to be tested on other species of weta and may aid in the conservation of *D. tibiospina.* This study aimed to test whether tracking tunnels can be used to monitor *D. tibiospina* and whether peanut butter is an effective bait. Tracking tunnels were set up at three sites in an area located on Mt Arthur. Only five sets of weta prints were found over the period of 27 days. Mouse prints were found at high frequencies throughout the sites. Peanut butter was not a successful bait as it increased mouse movement through tunnels making the detection of any other prints difficult. The results indicate that mouse activity decreases the occurrence of weta. I would not recommend using tracking tunnels for monitoring *D. tibiospina* as the rate of detection is extremely low, but I suggest that further study goes into the effects of mice on weta behavior and survival.

Introduction

Weta are endemic to New Zealand and many species have become threatened or endangered as a result of predation, habitat loss and a number of other human related causes (Sherley and Hayes 1993, Smith et al 2005). Many species are of high conservation value, though, there are few standard monitoring tools for assessing abundance and distribution (Watts et al 2008). The use of tracking tunnels has recently been tested, and was found to be effective in detecting the presence of *Deinacrida heteracantha,* a giant tree weta on Little Barrier Island. This method has yet to be tested on other species of weta and results may vary according to species habitat and behavior (Gibbs 1998). There is much room for improving and developing methods for monitoring weta, which may aid in understanding the conservation status of species across New Zealand.

Mt Arthur Giant weta (*Deinacrida tibiospina*) are reasonably small in comparison with other species of giant weta, measuring around 40mm in length. They live at high altitudes, above the bush-line in tussock and herb fields around central areas of North West Nelson Forest Park (Sherley 1998). They are currently protected under the seventh section of the wildlife act 1953 and are classified as sparse with small scattered populations (New Zealand Threat Classification System lists 2002), though it is unknown if this species naturally occur at low densities or if they have been limited by predation or other factors. Further monitoring is needed to determine distribution and abundance of *D. tibiospina*.

Developing accurate and practical monitoring techniques is part of the most recent threatened weta recovery plan and is important in creating more effective management strategies (Sherley 1998). Because weta are cryptic and nocturnal, carrying out manual searches can be time consuming, impractical and unreliable (Mcintyre 2001). Developing a standard technique can offer a reliable method for determining the presence or absence of *D. tibiospina*. However, these methods may have to be different for different species as weta display a variety of behaviours and habitat preference between species. Therefore, it is important to test methods of monitoring weta on the specific species before implementing them into conservation strategies. Developing such methods is becoming more urgent as more effort is going into conserving weta species. It is important to know the effectiveness of strategies, such as translocations or pest control, which can be measured through monitoring population densities (Watts and Thornburrow 2009).

The aim of this study is to determine whether tracking tunnels are a suitable and reliable method for monitoring the presence of *D. tibiospina*. The aim is also to determine whether peanut butter is an effective bait for attracting weta to the tunnels. I hypothesise that this method will have the ability to detect the presence of *D. tibiospina,* a ground weta, as it has done for *Deinacrida heteracantha*, an arboreal forest-living species and that peanut butter will be effective bait for attracting *D. tibiospina* into tunnels (Watts et al 2008).

Methods

Study site

The study site was located at Mt Arthur, Nelson, between 1300m and 1400m above sea level (6001000:2486000). Three sites were chosen, above the tree line in an area covered in tussock and small shrubs. There were also rock outcrops and various levels of wind exposure between sites, with site one being the most exposed and sites two and three being relatively less exposed. Site one was approximately 100m from the tree line, site two was around 200m from the tree line and site three was around 450m from the tree line.

Field work

In this study 'Black Trakka' footprint tracking tunnels (Gotcha Traps, 2 Young Street, RD2, Warkworth) were used to detect the presence of weta and other animals. At site one, each tunnel was individually numbered then set up roughly 10 meters apart along 5 parallel transects of 6. Pre-inked tracking cards (Gotcha traps) were placed in the tunnels with roughly a teaspoon of peanut butter put in the centre so an animal would have to walk over the ink to reach it. These were left for one night and checked for prints the following day. If prints were partially or fully covering the tracking card or weta prints were found it would be replaced. Peanut butter was reapplied to the centre of the tracking cards after being checked or replaced. They were then left for 3 nights then the previous method of replacement was repeated, accept no bait was used. All tracking card were then collected and 20 tunnels were set up in the second site, 30 meters apart along two transects which were also 30m apart. Tracking cards were placed in tunnels (without bait) and checked after four nights. Another 20 tunnels were set up in the third site, 20m apart, along two transects which were also 20m apart. All 40 tunnels were checked after 3 nights and then the tunnels at site 3 were checked after 5 nights. All tunnels were checked again 1 day later and then again after 6 days.

Analysis

Each tracking card that was collected was analysed for prints recording the presence of weta prints, mice prints and other insect prints (Gillies and Williams, Watts et al 2008). It was recorded whether mice prints were heavily covering a tracking card, determined by whether it was possible to distinguish individual prints, this becoming more difficult with increased mouse activity in the tunnels. A tally was made for each date a site was checked using Microsoft Excel showing presence or absence of each print type for each tunnel. This tally was then used to find a percentage of occurrences of the different print types within a site for that date.

Results

The occurrences of mouse prints were relatively high at all three sites. Site one had the highest occurrence of mice (without bait) at 96.7% over 3 nights, and site two reaching 70% over three nights and site three reaching 35% over three nights. The longer the tunnels were left the higher the occurrence of mice with site two reaching 100% after 6 nights.

No Weta prints were found at site one. At site two, from the 20th of November to the 3rd of December only 1 weta print was detected. When tunnels were run again in January for 6 nights no weta prints were found. At site three four tunnels were found to show weta activity over the first 3 nights giving a 20% occurrence at that site. No further weta prints were found after this.

The use of bait had no effect on the occurrence of weta, with no weta prints being found in baited tunnels. There appeared to be an increase in the occurrence of mice prints when peanut butter was used as bait, but the percentage of tunnels which were heavily printed decreased when no bait was used. Mice prints occurred in 73% of tunnels over one night when bait was used and occurred in all tunnels over the 4 days bait was used. When bait was removed the occurrence of mice still remained high at 97% though the number of tracking cards which were heavily marked with mouse prints decreased from around 77% to 3%.

Table 1: A table of the percentage of tracking cards displaying weta and mouse prints detected for a site on separate dates. It also shows the percentage of tracking cards which were heavily marked my mouse prints, as well as the duration which is measured in nights, and whether bait was used.

date	Nov 12-13th	Nov 13th-16	Nov 16-19th	Nov 20-24th	Nov 24-27th		Nov 27th-2nd Dec	Dec 2nd-3rd		Jan 16-22nd	
Site	1	1	1	2	2	3	3	2	3	2	3
Duration (nights)	1	3	3	4	3	3	1	1	1	6	7
bait used	peanut butter	peanut butter	none	none	none	none	none	none	none	none	none
% weta prints	0	0	0	5	0	20	0	0	0	0	0
% mice prints	73.3	96.7	96.7	95	70	35	65	95	73.7	100	95
% heavy mice	13.3	76.6	3.3	5	0	0	0	0	0	0	0

Discussion

The results show that *D. tibiospina* do use tracking tunnels and prolonged monitoring was able to show that they do occur in certain parts of the study area. However, the use of tracking tunnels did not prove to be a reliable method for monitoring *D. tibiospina* as weta detection counts were extremely low. Peanut butter was found to be unsuccessful at improving the reliability of tracking tunnels for monitoring *D. tibiospina,* though, the study was unable to effectively test whether *D. tibiospina* were attracted to the bait due to interference by mice. Though only a small number of weta tracks were found, their frequency did seem to support the idea that *D. tibiospina* are more active further from the tree line and in areas and times mice were less active.

There are a number of possible factors which cause *D. tibiospina* to be difficult to monitor using tracking tunnels. These include there rarity and low densities. With lower densities the chance that a weta will encounter a tunnel is very low decreasing their detectability. On top of this *D. tibiospina* may display low levels of activity due to the low temperatures of their environment, which will exaggerate there low detectability (Mellanby 1939). Little is known about *D. tibiospina* so it is difficult to say whether this is a factor. Some weta species have displayed reduced activity on cooler nights and prolonged inactivity sometimes lasting up to five months in Alpine species (McIntyre 2001, Leisnham et al 2003). This is important to consider when choosing what time of year to monitor weta using the tracking tunnel method as detection relies on the weta present to be active.

High levels of mouse activity may be a factor for reduced or absent levels of weta activity (Bremner et al 1989). This is suggested by the evidence that weta were recorded most in the site where there was the lowest level of mouse activity, and that the nights which detected the highest activity levels of weta also detected the lowest activity levels of mice. However, it was not possible to make statistically accurate comparisons of mouse or weta activity between sites one and sites two and three, as tunnels were left out on different nights and for different lengths of time. There were also not enough samples taken over the same period of time to statistically compare the results from the different sites. Further sampling may allow more accurate comparisons to strengthen these findings along with more in depth studies as to how mice affect the behavior and other factors of weta ecology. A study using pitfall traps showed increasing numbers of the cook straight giant weta *(Deinacrida rugosa)* being caught after mice were eradicated from Mana Island (Newman 1994). Mice have been known to eat weta (Jones and Toft 2006), but no studies have been carried out to investigate any other effects they might be having. If mice are disrupting the natural behavior of weta, there could be multiple negative effects on weta survival and reproduction. If it is true that mice do have a negative effect on weta, an increase of mice numbers due to a recent beech mast may have caused a decline in weta. It may be that further monitoring will show an increase in weta numbers and activity in tunnels as the mouse population declines.

Using bait may have increased the chance that a weta will enter a tunnel, however, this study found that it greatly increased mice activity through tunnels. As well as making it difficult to see any clear prints on the tracking cards it also may have reduced weta activity in these areas. This study has proven that without the use of bait, monitoring weta at such low densities is difficult and inefficient. The density at which weta can be detected may improve as mice numbers decrease. Little research has been carried out on possible baits weta may be attracted to, but it may be possible to find new baits which could be used for monitoring. It is thought that weta are able to use pheromones for sexual communication and to detect other weta over long distances. The ground weta *Hemiandrus pallitarsis* has been observed depositing a foul smelling anal secretion onto the substrate. A similar liquid has frequently been seen on leaves where weta have been mating (Watts and Thornburrow 2009). It may be possible to collect this secretion from weta and apply it to tracking tunnels, or place weta inside tunnels for a time before they are placed in the field. However, the strong smell of weta has increased their vulnerability to mammalian predators and so may only be suitable for attracting weta to monitoring stations on predator free Islands (Watts and Thornburrow 2009). This method may also prove to be difficult and impractical as pheromones are species specific and may be difficult to extract (Gibbs 1998), but has some potential to be highly effective.

Currently tracking tunnels are only able to determine the presence of weta, as little is known about their movements and identifying individual weta from their footprints has proven difficult (Watts 2008). To more effectively monitor rare weta, further research into weta behavior and ecology needs to be carried out. Radio telemetry may give a greater understanding *D. tibiospina* activity which may enable a more effective use of tracking tunnels if key times and habitat can be determined. It may also help to know what conditions weta are most likely to be active during. Other studies on rare weta, such as the study on the transfer of the tusked weta, used techniques such as artificial cover objects (ACO) which aimed to mimic their natural habitats, plot searches, and micro-transmitters used to lead searches to other untagged weta (Stringer and Chappell 2008, Trewick and Morgan-Richards 2000). From these methods the study found that plot searches were the best at locating weta though the ACOs were most cost and time effective. ACOs may be difficult to use with *D. tibiospina* as the tusked weta live in underground tunnels while *D. tibiospina* burrow into the base of a tussock which may be difficult to replicate (Stringer and Chappell 2008, Sherley and Hayes 1993). Mark-recapture methods have also been used on weta but also require manual searches, but can give useful details about weta populations (Jamieson et al 2000).

In conclusion, it would not currently be sensible to use tracking tunnels as a tool for monitoring *D. tibiospina.* Although*,* With some adaptations, such as a reduction in the mouse population and the use of a more effective bait, as well as further research, tracking tunnels may be successfully used for monitoring *D. Tibiospina.* I suggest that a study is carried out which aims to determine the minimum detectability level of weta using tracking tunnels. This may help to determine which weta species are good candidates for the use of tracking tunnels as a monitoring tool. I would also suggest that a yearlong study be undertaken on a weta which tracking tunnels has already been successful to monitor to determine whether weta are more or less active at certain times of the year. Before including tracking tunnels as a monitoring tool in the conservation of a weta species it is important that factors such as population densities and rodent levels should be considered.

Acknowledgments

This study would not have been completed without the help and direction I received from Ian Miller. I would also like to thank Ian for providing me with me with all the equipment I need and the staff at the Motueka DOC office for insuring my safety during the study.

References

Bremner A.G., Barratt, B.I.P., Butcher C.F., Patterson, G.B. 1989. The effects of mammalian predation on invertebrate behavior in South West Fiordland. *New Zealand Entomologist.* 12:72-75.

www.doc.govt.nz. New Zealand Threat Classification System lists - 2002 - Terrestrial invertebrate - part one.

Gillies C., Williams, D. A short guide for identifying footprints on tracking tunnel papers. Department of Conservation, New Zealand (unpublished report).

Gibbs, G.W. 1998. Why are some weta (Orthoptera: Stenopelmatidea) vulnerable yet others are common? *Journal of Insect Conservation.* 2:161-166.

Gwynne, D.T. 2009. Reproductive Behavior of ground weta (Orthoptera: Anostostomatidae): drumming behavior, nuptial feeding, post-copulatory guarding and maternal care. *Journal of the Kansas Entomological society.* 77: 414-428.

Jamieson, IG., Forbes, M.R, McKnight, E.B. 2000, Mark-recapture study of mountain stone weta *Hemideina maori* (Orthoptera: Anostostomatidae) on rock tor 'island'. *New Zealand Journal of Ecology.* 24:209-214.

Jones, C., Toft, R. 2006. Impact of mice and hedgehogs on native forest invertebrates: a pilot study. *Research and Science unit, Department of Conservation.*

Leisnham, P.T., Cameron, C., Jamieson, I.G. 2003. Life cycle rates and longevity of an alpine weta *Hemideina maori* (Orthoptera: Anostostomatidae) determined using mark-recapture analysis. *New Zealand Journal of Ecology.* 27: 191-200.

McIntyre, M. 2001. The ecology of some large weta species in New Zealand: The biology of wetas, king Crickets and their allies.*CAB International.* 12:225-241.

Mellanby, K. 1939. Low temperature an insect activity. *Proceedings of the Royal Society of London.* 127: 473-487.

Miller, I. 2009. Personal communication. Department of Conservation, Nelson.

Newman, D.G. 1994. Effects of a mouse, *Mus musculus,* eradication program and habitat change on lizard populations of Mana Island, New Zealand, with special reference to McGregor's skink, *Cyclodina macgregori. New Zealand Journal of Zoology.* 21: 443-456.

Sherley, G.H., Hayes, L.M. 1993 The conservation of a giant weta (Deinacrida n. sp. Orthoptera: Stenopelmatidae) at Mahoenui, King Country: habitat use, and other aspects of its ecology**.** *New Zealand Entomologist.* 16: 55-68

Sherley, G.H. 1998. Threatened weta recovery plan. *Research and Science unit, Department of Conservation.*

Smith, H.V., Jamieson, O.G., Peach, R.M.E. 2005. Importance of ground weta (*Hemiandrus* spp.) in stoat (*Mustela erminea*) diet in small montane valleys and alpine grasslands. *New Zealand Journal of Ecology.* 29: 207-214

Stringer, I.N., Chappell, R. 2008. Possible rescue from extinction: transfer of a rare New Zealand tusked weta to islands in the Mercury group. *Journal of Insect Conservation.* 12: 371-382.

Trewick, S.A., Morgan-Richards, M. 2000. Artificial weta roosts: A technique for ecological study and population monitoring of Tree Weta (*Hemideina*) and other invertebrates. *New Zealand Journal of Ecology.* 24: 201-208.

Watts, C.H., Thornburrow, D., Green, C.J., Agnew, W.R. 2008. Tracking tunnels: a novel method for detecting a threatened New Zealand giant weta (Orthoptera: Anostostomatidae). *New Zealand Journal of Ecology.* 32: 92-97.

Watts, C., Thornburrow, D. 2009. Where have all the weta gone? Results after two decades of transferring a threatened New Zealand giant weta, *Deinacrida mahoenui. Journal of Insect Conservation.* 13: 287-295.