Assessment of Environmental Effects of tree removals and habitat restoration activities on lizards at Te Tātua-a-Riukiuta

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Report information

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Cover photograph: Copper skink (*Oligosoma aeneum*).
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Contents

1. Introduction

This is a herpetological desktop assessment of environmental effects on removal of exotic trees and habitat restoration activities at Te Tātua-a-Riukiuta. In 2014, this maunga was returned to the Tāmaki Makaurau collective of mana whenua as part of a Treaty Settlement. This maunga is owned by the Taonga Trust and governed by the Tūpuna Maunga Authority.

2. Project scope

A wide range of tree removal methods are proposed. See Treescape (2018) for details on each method and locations that each method will be used.

A planting programme has been prepared to restore the original native ecosystems of the maunga. The objective is to restore culturally appropriate plant species assemblages, enhance habitat values, and restore representative threatened and rare ecosystem types. The planting plan prepared by Te Ngahere also aims to enhance the quality of habitat for skinks (Mairs *et al.* 2018). These include WF7 Pūriri broadleaf ecosystem type on maunga slopes and lower growing native species, such as pōhuehue (*Muehlenbeckia complexa* var. *complexa*) and harakeke (*Phormium tenax*) on the terrace formations, depending on compatibility with archaeological values and maintenance of historic defensive sightlines.

3. Lizard impact assessment methodology

The Department of Conservation's Bioweb Herpetofauna Database and the Auckland Council Fauna Database were accessed by EcoGecko Consultants Ltd in September 2018 to retrieve lizard records within the immediate vicinity of the maunga. However, when using literature and databases to evaluate the potential presence of lizards at a specific location, it is important to remember that the records accessed do not capture the true extent of lizard distribution, nor do they indicate the full diversity of species that may be present. The database records are heavily reliant on lizard sightings being reported to the Department of Conservation (DOC) and Auckland Council; records may be incomplete due to the lack of lizard sightings being reported.

During September 2018 a site assessment was also undertaken at Te Tātua-a-Riukiuta to assess the lizard habitat values present on the maunga. ***It is important to note that this visit was not a lizard survey.*** A true assessment of the potential presence of native lizards at any location cannot be made in the absence of a field survey effort using suitable methodology and tools and undertaken by an experienced herpetologist holding an appropriate DOC Wildlife Act Authority.

Note: Within New Zealand, all native lizard species are afforded absolute protection under the Wildlife Act 1953, and it is an offence to disturb or kill native herpetofauna without permission from DOC. Any vegetation clearance potentially poses a threat to resident native lizard populations.

4. Herpetological and habitat values of Te Tātua-a-Riukiuta

4.1. Lizard records

Neither the DOC Bioweb Herpetofauna Database nor the Auckland Council Fauna Database had any records for lizards on Te Tātua-a-Riukiuta. However, during the site assessment, a copper skink (*Oligosoma aeneum*) was found, residing underneath a scoria rock underneath the forest canopy in the southwestern corner of the maunga. This find confirms that copper skinks are present on Te Tātua-a-Riukiuta. Copper skinks are a native lizard species and are legally protected. They are classified as "Not Threatened" under the New Zealand Threat Classification System (Hitchmough *et al.* 2016).

Plague skinks (*Lampropholis delicata)* were recorded onsite during the site assessment. This species is considered a pest species; it is classified as an "Unwanted Organism" by MPI Biosecurity, and "Introduced and Naturalised" by DOC's Threat Classification System.

4.2. Habitat values

The major habitat types present and available for native lizards at Te Tātua-a-Riukiuta consist of kikuyu (*Pennisetum clandestinum*) grasslands, other exotic grasses, *Tradescantia*, harakeke, ground cover objects such as fallen trees and branches, and scattered scoria bombs. These habitats provide some protection from predators for terrestrial lizards such as copper skinks and ornate skinks (*Oligosoma ornatum*). However, the amount of protective habitat was not considered particularly extensive at Te Tātua-a-Riukiuta. It was noted that the grasslands were not particularly deep, and it is likely that native lizard populations are sparse as a result. Efforts to control *Tradescantia*, an environmental weed, have removed some of the last remaining protective habitats on-site for copper skinks. Some protective terrestrial habitat, in the form of rank grassland, *Tradescantia* and deposits of scoria bombs, however, does remain on the tihi slope at the south end; there are also other scoria deposits elsewhere on Te Tātua-a-Riukiuta.

There is a dominance and mix of native tree species at Te Tātua-a-Riukiuta. Native species present consist of pōhutukawa (*Metrosideros excelsa*; 30% of all trees), kānuka (*Kunzea ericoides*; 7%), māhoe (*Melicytus ramiflorus,* 5%), pūriri (*Vitex lucens*, 4%), and karo (*Pittosporum crassifolium*, 4%) (Treescape 2018). Natives account for 69% (n=440) of the trees present at Te Tātua-a-Riukiuta (Treescape 2018). The 197 exotic trees are dominated by flowering cherry (*Prunus* sp., 9%), privet (5%), monkey apple (*Syzgium smithi*, 3%) and red flowering gum (*Corymbia ficifolia*, 3%), along with smaller numbers of various other exotic tree species. The likelihood that arboreal geckos are present in these exotic trees is considered low.

Figures 1a (top) & 1b (bottom). Contrast in terrestrial ground cover underneath native forest. Fig. 1a shows a degraded forest understorey, where it is difficult for native lizards to persist in the presence of predatory mammals such as rats. Fig. 1b shows a more complex terrestrial habitat (flax leaf bases, scoria rock, leaf litter) which significantly assists in retaining and increasing local lizard values. Harakeke, wharariki, pōhuehue, pukupuku and toetoe are plants suitable for establishing the complex ground habitat necessary for the survival of lizards.

5. Potential impacts of the project on lizards

5.1. Positive effects

A draft planting programme has been prepared by Te Ngahere (Mairs *et al.* 2018). This planting plan intends to restore highly modified areas on the maunga through revegetation to a historically accurate ngahere ecosystem. The establishment of a WF7 Pūriri Ngahere will restore some of the original habitat values for lizards on site (quarried scoria rock will have been lost forever). In addition, further lower plants and ground ferns are to be included in the WF7 Pūriri Ngahere restoration with specific intention to develop highly complex terrestrial lizard habitats, particularly around the ngahere edges and understorey.

The plant species to be planted over a 5-year programme as described in the Te Tātua-a-Riukiuta Planting Plan (Mairs et al. 2018) include; tītoki (*Alectryon excelsus*; 120 to be planted), toetoe (*Austroderia fulvida;* 800), karamū (*Coprosma robusta*; 370), karaka (*Corynocarpus laevigatus*; 25), rasp fern/pukupuku (*Doodia australis;* 680), kohekohe (*Dysoxylum spectabile;* 45), māhoe (*Melicytus ramiflorus*; 500), pōhuehue (*Muehlenbeckia complexa*; 1190), māpou (*Myrsine australis;* 200), tōtara (*Podocarpus totara*; 65), harakeke (*Phormium tenax*; 1200), wharariki (*P. cookianum* spp. *hookeri;* 1350) and pūriri (*Vitex lucens*; 110).

This work will significantly increase the habitat values and complexity for native lizards at Te Tātua-a-Riukiuta. For specific details on the restoration programme, see the (draft) Te Tātua-a-Riukiuta Planting Plan prepared by Te Ngahere (Mairs *et al.* 2018).

5.2. Negative effects

Tree felling by manual dismantling (i.e. tree removal not undertaken using helicopter or crane removal) may cause injuries or deaths to individual lizards in the drop zones. However, the proposed felling methodology is likely to have limited impacts on native lizard populations, particularly if the lizards are sparse. Adverse effects on lizards will at the individual level, not at the population level. Staging the tree works is unlikely to have significant effects on lizard values.

5.3. Plague skinks

Plague skinks are present on the maunga, however any adverse effects due to the work programme on the species is considered inconsequential. This is because the species is not protected by law and is also classified as an Unwanted Organism.

6. Recommendations

The ecological restoration programme has the intent of retaining and increasing native herpetological values at a population level. The implementation of the following actions is recommended when aiming for a net positive effect on native lizards at Te Tātua-a-Riukiuta:

- Establish lower plants and ferns such as pukupuku in WF7 Pūriri Ngahere edges and understoreys.
- Where possible, cut logs on-site to leave as permanent lizard habitat in appropriate locations.
- Where possible, mulch on-site debris to create immediate terrestrial forest edge and understorey habitat and relocate this mulch to WF7 Pūriri Ngahere restoration sites.
- Implement a holistic predator / pest control programme.

Further details are provided in the sections below.

6.1. Establishing lower plants throughout the WF7 Pūriri Ngahere

The establishment of lower plant species, such as pōhuehue, harakeke, pukupuku or similar species within WF7 Pūriri Ngahere forest edges and understorey is strongly recommended to increase habitat complexity necessary for the survival and persistence of terrestrial lizards. It has been proposed that approximately 2550 harakeke or wharariki, 1190 pōhuehue, 800 toetoe, and 680 pukupuku are to be established throughout the maunga, subject to archaeological approval. To establish highly valuable protective habitat for lizards, the following is recommended:

- Low planting of pōhuehue, harakeke, toeotoe, pukupuku and similar lower plants around forest edges to establish complex, basking habitat for terrestrial skinks. Sites identified: All (i.e. throughout Te Tātua-a-Riukiuta).
- Terrace planting of pōhuehue, harakeke, wharariki, toetoe and pukupuku in open sites around the maunga, subject to archaeological approval. Sites identified: Terraces.
- Dense planting of ground cover plants such as harakeke and pukupuku is strongly recommended to establish a thick understorey for lizard populations to establish within the WF7 Pūriri Ngahere. Sites identified: All.

Further detail on planting habitat suitable for terrestrial lizard species on the maunga is provided in the draft Te Tātua-a-Riukiuta Planting Plan (Mairs *et al.* 2018).

6.2. Cutting logs on-site

In addition to the habitat restoration programme, it is strongly recommended that wood from the felled exotic trees is utilised to create lizard habitat during the debris processing stage. The utilisation of wood increases the habitat complexity necessary for survival and establishment of terrestrial lizards.

Where possible, instead of removing trees from the site, logs should be cut on-site and left in situ within the WF7 Pūriri Ngahere to create highly suitable lizard habitat. In other site assessments of maunga, it was noted that copper skinks found are often found residing underneath wood cuts of exotic trees that had previously been felled or had naturally fell to the ground. Decaying wood provides protective refugia for lizards, creates a damp microclimate and attracts arthropods and spiders on which the lizards feed on. Cuttings should be systematically placed throughout to establish intermediate lizard habitat until habitat underplanting in the WF7 Pūriri Ngahere sites has established, and a deep leaf litter has accumulated. This should be established both in habitat edges and throughout the forest understorey.

6.3. Mulching on-site

Where possible, coarsely mulching logs and branches on-site and spreading this mulch around the WF7 Pūriri Ngahere forest edges and understorey would immediately create a more complex understorey, while the lower plants and ground ferns take time (several years) to establish a suitably complex understorey for lizard survival and persistence. As the large mulch decays over time and the ground plant cover increases, the two factors combined will create a deeper and richer soil hummus, which also attracts arthropods and spiders on which the lizards can feed. This mulch would need to be very coarse (each piece a minimum of 10 cm x 20 cm x 5 cm) to be of utility for lizards as habitat.

6.4. Predator / pest control plan

A key management tool to strengthen the viability of lizard populations is predator control. Key predators are rats (*Rattus rattus*, *R. norvegicus),* mice (*Mus muscula*), feral cats (*Felix catus*), hedgehogs (*Erinaceus europaeus*) and mustelids (*Mustelea* spp.: ferrets, stoats, weasels). Holistic predator control is considered essential for the recovery of lizard populations. Control of mesopredator/prey species, such as mice (also a lizard predator) or rabbits, reduces the carrying capacity for higher predators on the maunga, such as rats and mustelids (see Appendix 1).

A pest management plan should be prepared that includes control of predatory mammals. The plan should target high value lizard habitat, which is at present mainly rank kikuyu grassland and native forest but should eventually include new lizard habitat through the establishment of edge and understorey habitats (created using cut logs, coarse mulch, and establishment of lower plants and ferns) in the WF7 Pūriri Ngahere.

The pest control programme requires careful consideration on the strategy used to manage rats and mice on-site, with recommendations for (a) continued/press suppression of rats, and (b) periodic/pulse suppression of mice during an optimal time period to be defined for maximum effectiveness (either summer or autumn).

Due to the high public use of the maunga, along with the urban setting, careful consideration of the pest management programme and how it is to be implemented is also needed. It is recommended that consent conditions on pest control should be set for rats only, while an investigation is undertaken on safe methodologies for other pest species, such as mice and hedgehogs.

7. Conclusion

With the implementation of restoration and enhancement of lizard habitat along with a pest control programme, the tree removal of exotic trees on the maunga is considered to have less than minor effects on the lizard fauna. The most direct impact will be injuries and deaths to individual lizards that are within the drop zone, due to tree felling, and the use of heavy machinery, causing crush injuries and deaths if the machinery is allowed to move across rank grassland habitats. Avoidance of rank grassland habitat, such as kikuyu, during clearing is key to minimisation of such adverse effects on the resident lizard fauna.

A pest control programme will have a positive effect on the lizard populations, provided mice numbers are also managed, and a habitat enhancement programme through cutting logs, coarse mulching and establishing lower plant and ferns will also allow lizards to spread and establish in new sites across the maunga.

8. References

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Appendix 1. Notes on pest management

- Rodent control to reduce numbers of ship rats (*Rattus rattus*) and Norway rats (*Rattus norvegicus*) could potentially cause increased mice (*Mus musculus*) numbers, as rats predate on, and compete with, mice for resources. This could have with unforeseen outcomes for indigenous fauna, such as lizards (Courchamp *et al.* 1999, Tompkins & Veltman 2006, Caut *et al* 2007, Goldwater *et al.* 2012, Norbury *et al.* 2013, Norbury 2017). Mice are a known lizard predator in New Zealand (Pickard 1984, Newman 1994, Wedding 2007, Norbury *et al.* 2014, Nelson *et al.* 2016). Being small, mice may access lizard retreats, and become a threat to lizards, particularly during the autumn and winter months when the weather is cooler and lizards are more susceptible to predation. Controlling mesopredators such as mice (and rabbits) also reduce the carrying capacity of the environment for higher order predators such as rats, mustelids and cats. This activity is known as "bottom-up" pest management (Norbury 2017). Therefore, mice should ideally be included in the pest management programme.

- The use of anticoagulant rodenticides (e.g. brodifacoum, bromadiolone, diphacinone) in bait stations is not expected to have a negative (lethal) impact on lizards (except for pindone), although research into sub-lethal effects is required (Weir *et al.* 2016). There is some evidence that lizards will ingest bait (Freeman *et al.* 1996, Hoare & Hare 2006, Marshall & Jewell 2007, Wedding *et al.* 2010), and there is also likely to be a secondary poisoning pathway through the consumption of affected invertebrate prey (Erickson & Urban 2004). However, to achieve acute toxicity (mortality) by pesticide would require consumption of a quantity of bait that a lizard is not likely able to accommodate in its stomach (Weir *et al.* 2016). The use of kill traps baited with peanut butter (or similar) is also not expected to have a major negative effect on lizards, although some larger lizards may occasionally set off traps, and be killed in the process. However, the number of lizards with sublethal effects from poisoning, or killed in predator traps is probably lower than the number killed by predatory pests themselves – in other words, the positive aspects of a pest control programme is likely to outweigh the potential risks of by-kill of lizards.

- There are some considerations relating to the high public access of maunga that make developing effective and efficient pest management programmes difficult. These should be considered, and expert advice may be necessary.