Using soundscapes to assess avian response to the presence of kauri dieback

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Background

One of the major issues with managing kauri dieback is asymptomatic detection. Asymptomatic detection is currently done through costly and time-intensive soil analysis or individual tree screening [1]. We wanted to know if there was an easier method of early detection.

There is not much known about how dieback affects the larger ecosystem, specifically there is minimal information on how fauna is affected. From global research we know that birds can be highly attuned to their environment and have been used as indicators of forest health [2]. We also know that kauri are a cornerstone of their ecosystems and have an impact on some of the flora around them [3].

This project seeks to grow our understanding of how the avian communities in kauri forests are affected by dieback and whether there is potential to use birds as an early detection system.

We will monitor bird presence through the soundscape using acoustic recorders and 5 minutes call counts.

Objectives

1) Determine the common avian community composition in kauri forests in the Waitākere Ranges

2) Assess whether the presence of kauri dieback affects the community composition

3) Assess whether the level of infection in an area affects the community composition.

4) Discover any potential avian indicator species for disease presence.

Location

With permission from Te Kawerau ā Maki and Auckland Council, this research will be done in six 40 x 50m plots in the Waitākere Ranges Regional Park. These six plots are long term study plots and are split between 3 sites, Cascades Kauri area, Huia, and Piha. At their establishment, these sites were symptomatic/asymptomatic pairs.
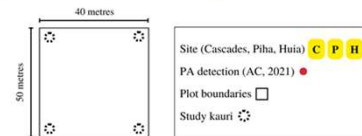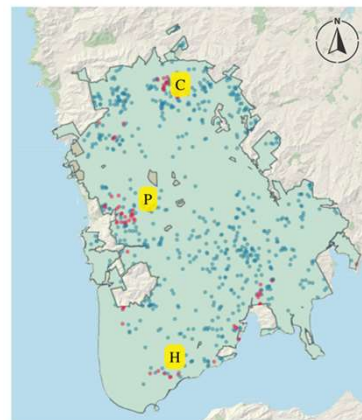
Map of sites in the Waitākere Ranges. Map made by Maisie Hamilton Murray

These sites have been closed to the public since 2nd December 2017 when a rāhui was placed over the Waitākere Ranges Heritage Area by mana whenua Te Kawerau ā Maki, though nearby tracks have begun to reopen across the Waitākere Ranges [5].

At last assessment [4], the pathogen has been detected within the Cascades and Huia "asymptomatic" plots. All plots have been assessed for pathogen presence and visual health status recorded to allow us to test for an association between the avian soundscape and the localised level of infection.
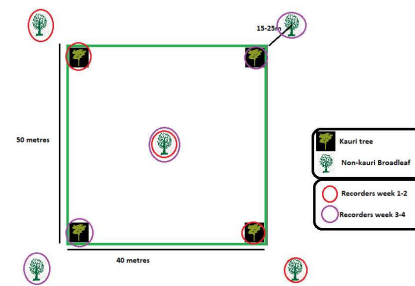
Method

The soundscape will be recorded using 33 acoustic recorders split between the 6 plots. During deployment of each recorder, a 5-minute call count will be conducted.

Recorders will run for two weeks, then rotated to new positions for a further two weeks.

This will be repeated four times over the year.

Each plot will be set up as follows:

Recorders will record 4 times each day for 1-2 hours: around sunrise, late morning, sunset, and late night.

These audio recordings will be analysed with AviaNZ using a combination of automatic and manual identification of species to establish presence or absence of species at each site, together with the computation of biodiversity indices.
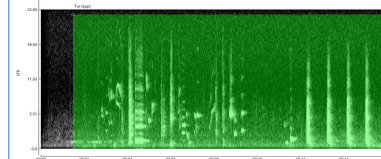
Spectrogram (above) of a tui making two distinct calls.
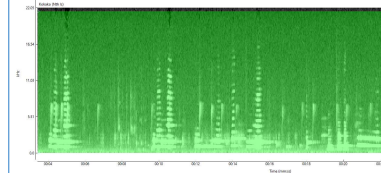
Spectrogram (above) of a North Island Kokako call

Potential Outcomes

This research will provide new information on the avian community in kauri forests within the Waitākere Ranges, which birds have a close relationship with kauri trees, and how kauri dieback is impacting the wider ecosystem.

If we can identify individual species that respond to the presence of dieback, it may allow a quicker, easier, and cheaper way to narrow down the identification of infected trees and reduce the risk of further spread.

References

[1] Bellgard, S. E., Padamsee, M., Probst, C. M., Lebel, T., & Williams, S. E. (2016). Visualizing the early infection of *Agathis australis* by *Phytophthora agathidicida*, using microscopy and fluorescent in situ hybridization. *Forest Pathology, 46*(6), 622-631.

[2] Simamora, T. I., Purbowo, S. D., & Laumonier, Y. (2021). Looking for indicator bird species in the context of forest fragmentation and isolation in West Kalimantan, Indonesia. *Global Ecology and Conservation, 27*, e01610.

[3] Wyse, S. V., Burns, B. R., & Wright, S. D. (2014). Distinctive vegetation communities are associated with the long-lived conifer *Agathis australis* (New Zealand kauri, Araucariaceae) in New Zealand rainforests. *Austral Ecology, 39*(4), 388-400.

[4] Provided by Luitgard Schwendenmann

[5] Retrieved 20/04/2023 from: https://aucklandcouncil.maps.arcgis.com/apps/webappviewer/index.html?id=090a929b13884cfdb17078f7bb41c8a4

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