

Hearing on Far North District Council Proposed Plan Change # 18 & Whangarei District Council Proposed Plan Change # 131 Genetically Modified Organisms (PPC18/PPC131).

Expert Witness, NGAIRE HIRIA HART for GE Free NZ.

A handwritten signature in black ink, appearing to read 'Ngaire Hart', written in a cursive style.

Ngaire Hiria Hart
Date: May 31, 2016

Ngaire Hiria Hart
851 Owhiwa Road
RD1, Mt. Tiger
Whangarei, 0192

31 May 2016

Whangarei District Council
Private Bag 9023
Whangarei, 0148

Dear Chair and Council Members,

I wish to present a summary of my research on New Zealand's native bees and their habitats to the committee. This includes an overview of the current population of status of native bees, at three communities around the Whangarei region. As an expert witness for GE free NZ, my discussion will also focus on the:

1. Main factors contributing to declines in populations of native bees (both here and abroad), and the consequences of such losses.
2. Possible impacts of accidental or intentional releases of GMO's, on populations of native bees and their habitats. Including, the possible cumulative impacts from other environmental stresses currently impacting bee communities.
3. Challenges associated with bee-monitoring, in addition to the methods used to quantify changes in the diversity and abundance of communities of native bees, and their habitats.
4. Future planning and technical considerations regarding the implementation of methods to measure changes in native bee communities, within a local or national context.

Sincerely,

Ngaire Hiria Hart

A handwritten signature in black ink, appearing to read 'Ngaire', written in a cursive style.

*Monitoring New Zealand's native bees: a collaborative approach
using image analysis*

Ngairé Hiria Hart, Doctoral Thesis

Synopsis: New Zealand has around thirty different species of native bees. They are pollinators of wild and cultivated plants, and are important to the health of ecosystems.

Most species are solitary ground nesting bees; individual females construct their nests in the ground. During the active flight seasons, thousands of bees will nest alongside each other to form large communities. Although much is known about the biology of native bees, there is much to learn about their diversity and population status.

To address this problem, a method to monitor native bees using digital images was proposed. While it was difficult to acquire images of individual bees, it was straightforward to photograph nests. Furthermore, the number of nests could provide an indicator of native bees community health and population. For these reasons, the images of active nests are processed in the research.

Surveys were conducted over six years (2009–2014), at three communities of native bees located in Whangarei (Northland, New Zealand). Monitoring data were collected across five years (2010–2014). Fundamental ecological data including manual nest counts were collected; digital images of active nests were acquired and processed.

Nest counts derived from the automated imaging methods were compared with manual- field and manual-image counts. There were good agreements between those methods. Results suggested image-centric monitoring methods could replace manual-field nest counting methods. Data by manual and automatic techniques both indicated the number of active nests have decreased over five years.

The image-centric design was fully documented and was supported by open source software and off-the-shelf tools. Therefore, the system could be immediately adapted for other environments and provide the tools to gather much needed information about the health of important background pollinators.

Full text available at <http://aut.researchgateway.ac.nz/handle/10292/9617>