Genetics in Conservation and Biosecurity: Tales from the Lab

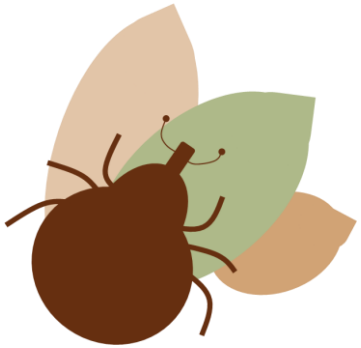
Hester Roberts & Talia Brav-Cubitt

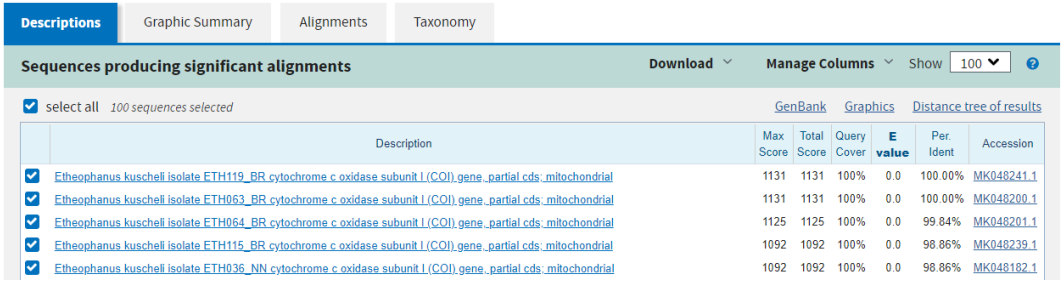
Manaaki Whenua
Landcare Research

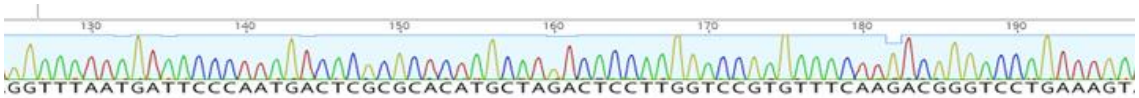
EcoGene®
DNA-based diagnostics

November 19

Species identification







Coconut Rhinoceros Beetle ID – Vanuatu (*Oryctes rhinoceros*)

- Major pest of coconut and oil palm
- Controlled successfully by *Oryctes rhinoceros* nudivirus (OrNV) until recently
- Outbreak of OrNV tolerant type in Guam in 2007
- Recently found in Vanuatu

Coconut Rhinoceros Beetle ID – Vanuatu

- Our role: confirm species, determine OrNV susceptibility
- Using work by Marshall et al. (2017), we confirmed that the beetles were CRB, and matched the OrNV susceptible type from Papua New Guinea

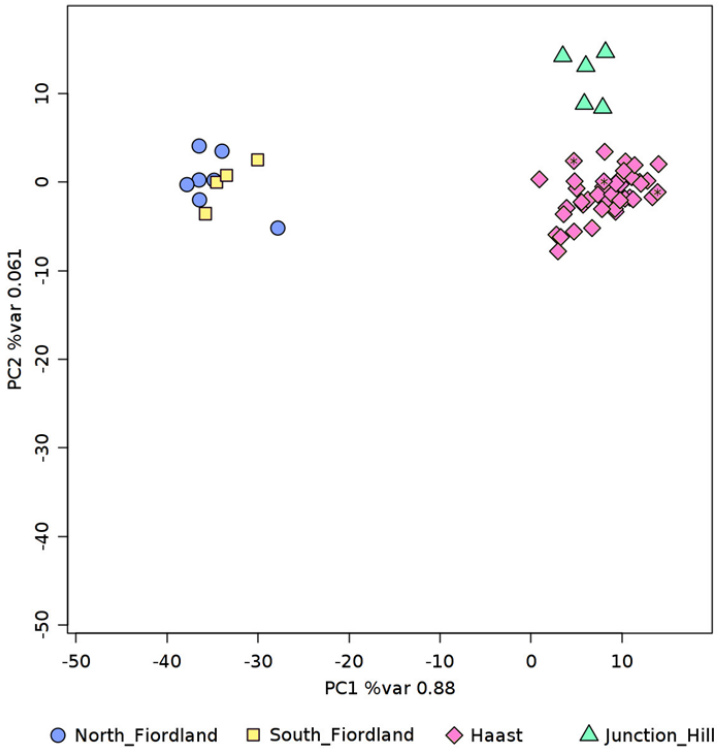
Marshall, S. D., Moore, A., Vaqalo, M., Noble, A., & Jackson, T. A. (2017). A new haplotype of the coconut rhinoceros beetle, *Oryctes rhinoceros*, has escaped biological control by *Oryctes rhinoceros* nudivirus and is invading Pacific Islands. *Journal of Invertebrate Pathology*, 149, 127-134.

Junction Hill kiwi population

- New population of Haast tokoeka discovered by DOC at Junction Hill
- Five feather samples sent to us to see how these birds fit in with other tokoeka

Junction Hill kiwi population

- Microsatellite marker panel used – previously determined to be effective for discriminating between kiwi species/lineages
- Fits in with Haast tokoeka – but genetically distinct



Analysis: Andrew Veale

Ramón-Laca, A., White, D. J., Weir, J. T., & Robertson, H. A. (2018). Extraction of DNA from captive-sourced feces and molted feathers provides a novel method for conservation management of New Zealand kiwi (*Apteryx* spp.). *Ecology and Evolution, 8*(6), 3119-3130.

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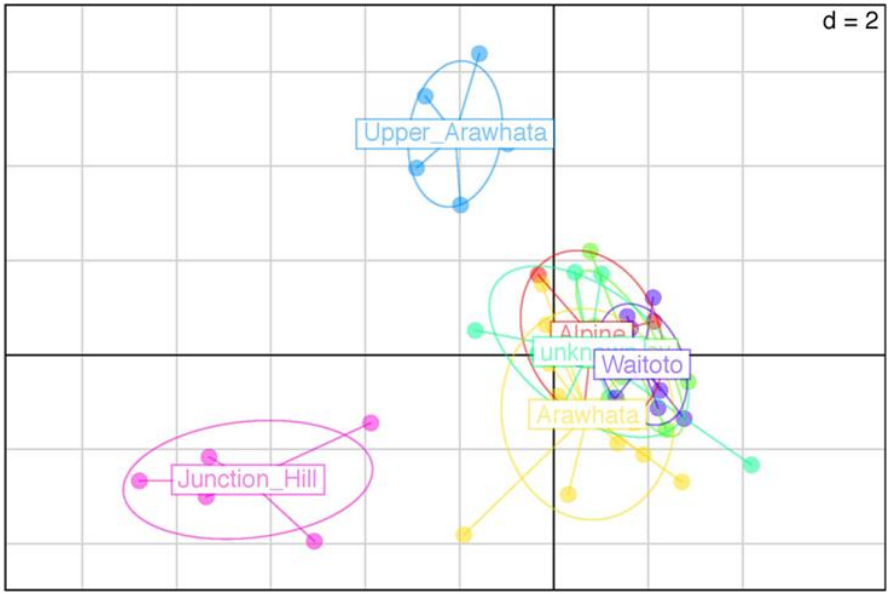

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White, D. J., Ramón-Laca, A., Amey, J., & Robertson, H. A. (2018). Novel genetic variation in an isolated population of the nationally critical Haast tokoeka (*Apteryx australis* 'Haast') reveals extreme short-range structure within this cryptic and flightless bird. *Conservation genetics, 19*(6), 1401-1410.

Identifying Individuals

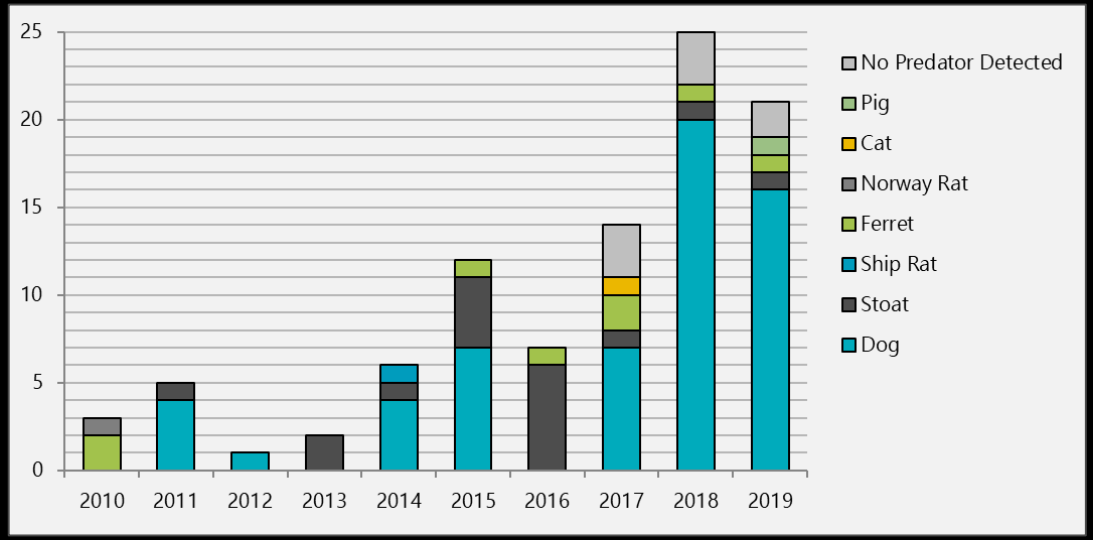
DNA profiling can be used to identify individuals from many species of interest to New Zealand







CSI: Wildlife - Kiwi Predators



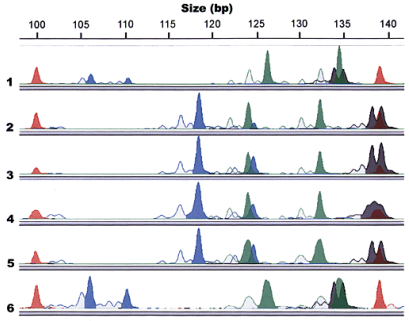
Three cases of dog attacks on kiwi are currently in the legal system

Photo: MWLR Innovation Stories

* Also predations on Petrel, LBP, Weka, and more!

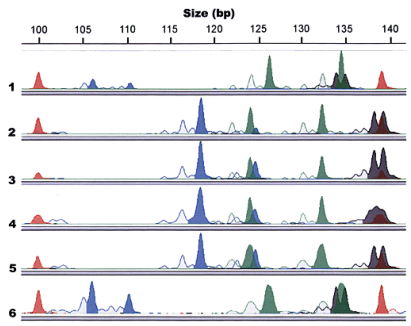
Predator Dog Identification

- **DogFiler:**
- A forensic tool for dog crimes developed in the USA
- Kiwi Rescue introduced tool to use in NZ
- Run by EcoGene®
- Used by DOC for attacks on native wildlife, and Regional Councils for attacks on stock or domestic animals to solve dog attacks, including predations.



Predator Ferret Identification

- **FerretPlex:**
- A forensic tool AND a population tool
- Developed by Dr Robyn Howitt (MWLR)
- Run by EcoGene®
- Used for attacks on native birds
- Used by MWLR and OSPRI to estimate Ferret population size and dispersal for TB Freedom.



Images: Trapinator, MWLR

Bolstering the War on Goats: Taranaki Mounga

Taranaki Mounga Project: Andrew Macalister and Jared Coombs

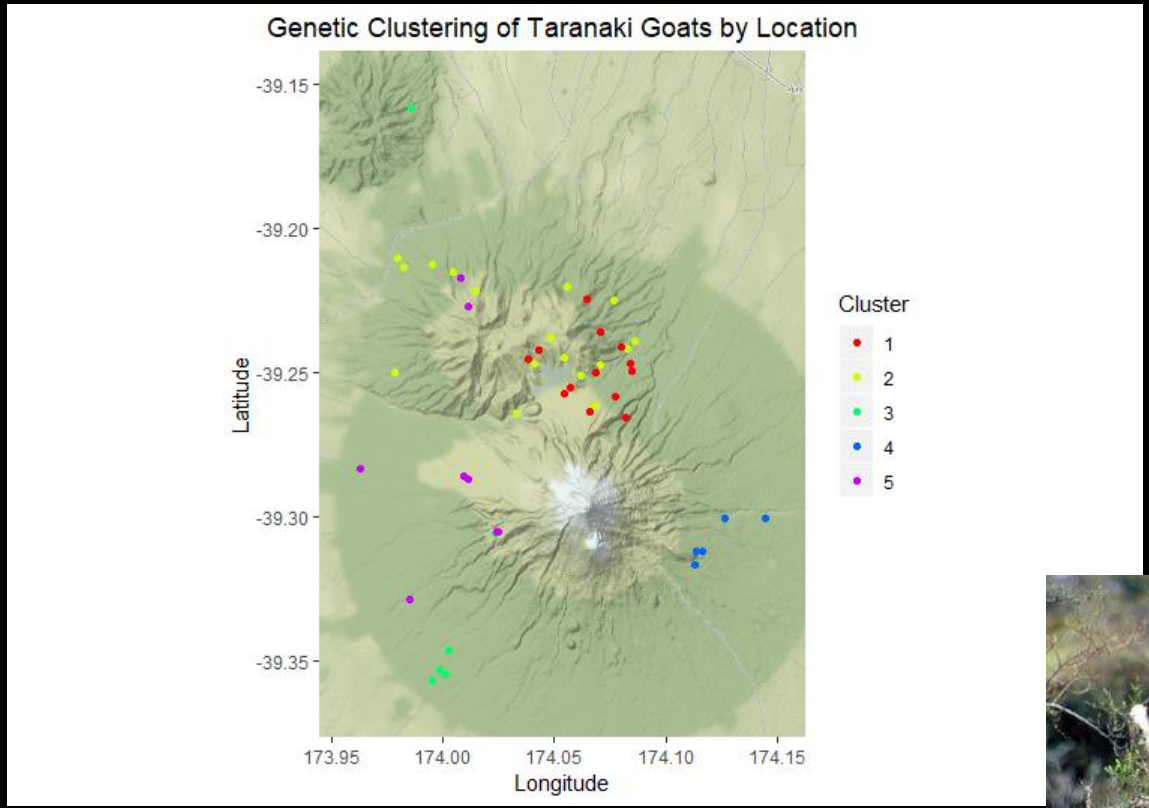


Photo: DOC Animal pests

Applications

- Species ID/verification/detection
- Individual ID by DNA profiling
- Disease and resistance screening
- Wildlife monitoring (detecting individual movements, diet analysis)
- Inferring relationships (parentage, sibling tests)
- Developing new tests
- Genetic data generation (DIY Analysis)
- Contract Research

Legal Matters

- Sometimes you might need more than a scientific report…
  - CITES Violations
  - Illegal releases
  - Attacks on protected species
  - Attacks on domesticated animals

- In these cases, we work with you to provide the results of our testing in a way that fits within the legal framework

We can help you plan your projects!

- Advice on project design
- Sample sizes and collection methods
- Forensic DNA Sampling Workshops


Talia Brav-Cubitt


Hester Roberts


Robyn Howitt


Duckchul Park


Andrew Veale


Frank Molinia


Ana Podolyan (Plant Genetics, Lincoln)

EcoGene® and the Ecological Genetics lab provide and encourage links with the wider MWLR research family

A bit of trivia

- Since 2015, EcoGene® has undertaken 183 different projects for DOC, at a value of more than $300,000
- Our collection of DNA at the Auckland Site alone contains over 20,000 samples from hundreds of different species!
- Each month, our sequencing facility produces over 1200 DNA sequences – around half of these for MPI

We would love to hear from you!

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