EcoGene: DNA-based diagnostics for invasive animal management

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Biosecurity Bonanza
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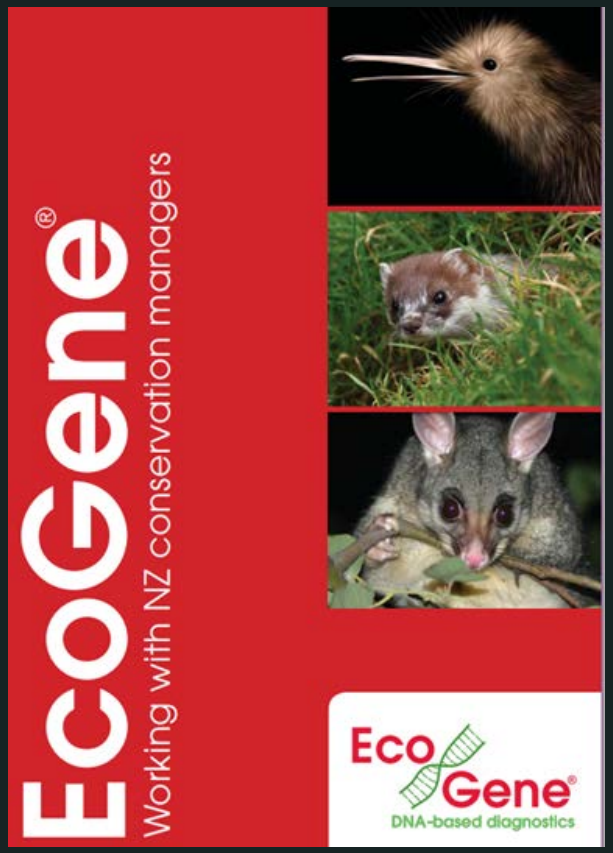
EcoGene® DNA-based diagnostics

LANDCARE RESEARCH
MANAAKI WHENUA

Introduction

- Species Identification
- Species Verification
- Predator Identification
- Gender determination
- Genotyping
- Disease screening



Tools for invasive mammal management

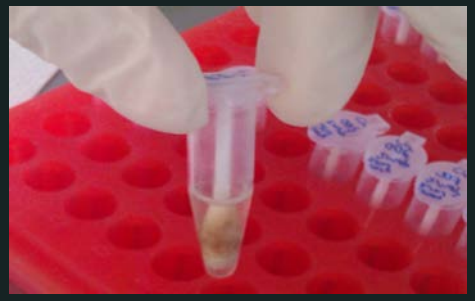
- Species ID:
  identify animals from a range of different materials.
- Predator ID:
  identify predators from trace amounts of DNA.
- Genotyping/DNA profile:
  pinpoint individual animals, assign to populations, eradication monitoring etc.

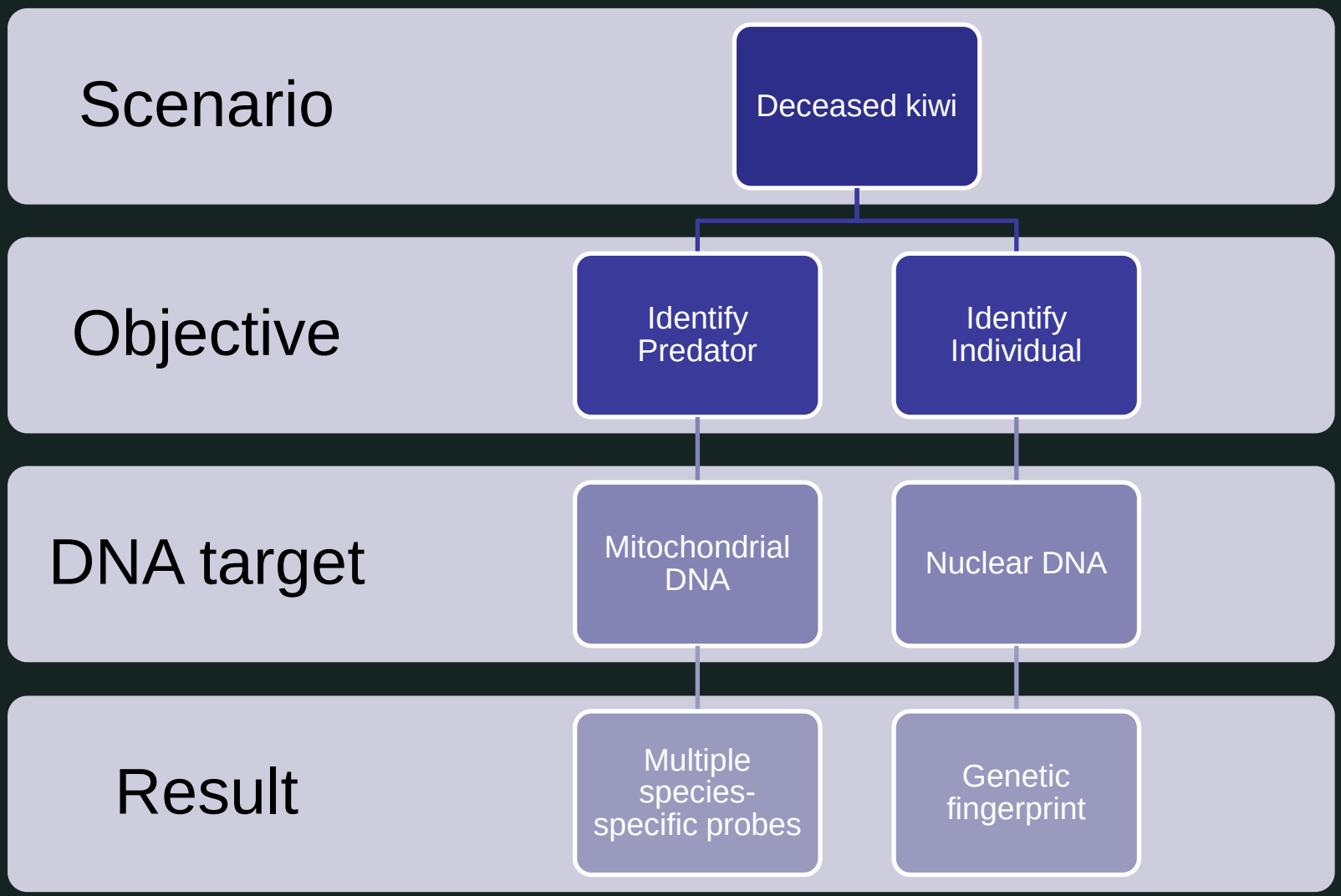
Tools for invasive mammal management

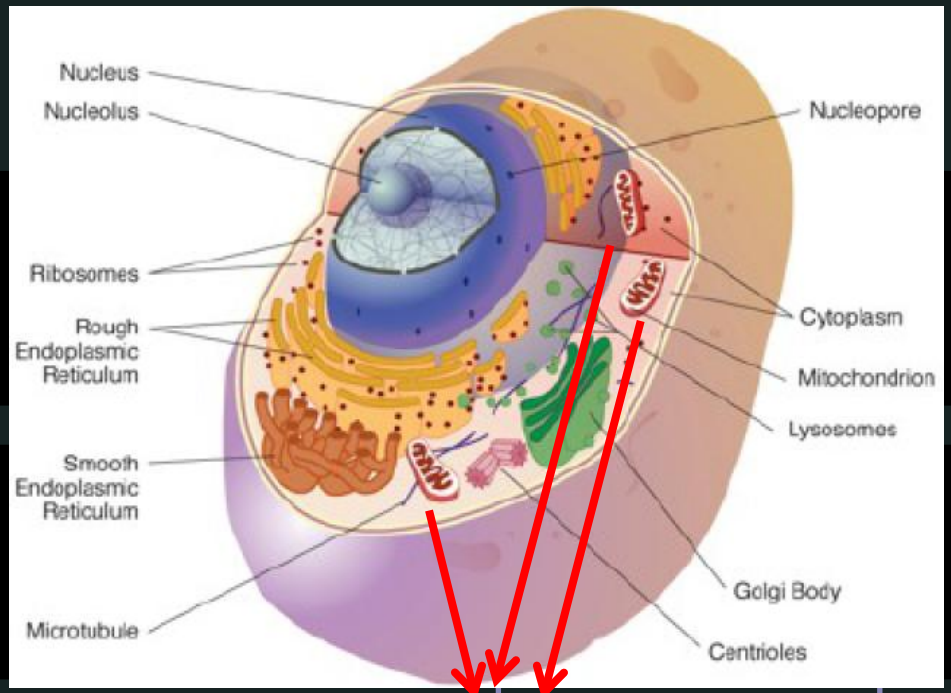
- The conservation of NZ unique ecosystems and native fauna require constant monitoring of invasive mammals.
- DNA profile databases available for invasive species, inc. mustelids and rodents.
- Population assignment, relatedness, parentage, eradication monitoring, genetic diversity etc.

DNA Testing: General points

- Get the most out of your sample, preservation is key!
- Communicate your objectives.
- Custom projects, research and development capability.




Scenario
Deceased kiwi
Objective
Identify Predator
Identify Individual
DNA target
Mitochondrial DNA
Nuclear DNA
Result
Multiple species-specific probes
Genetic fingerprint



DNA target

Mitochondrial DNA

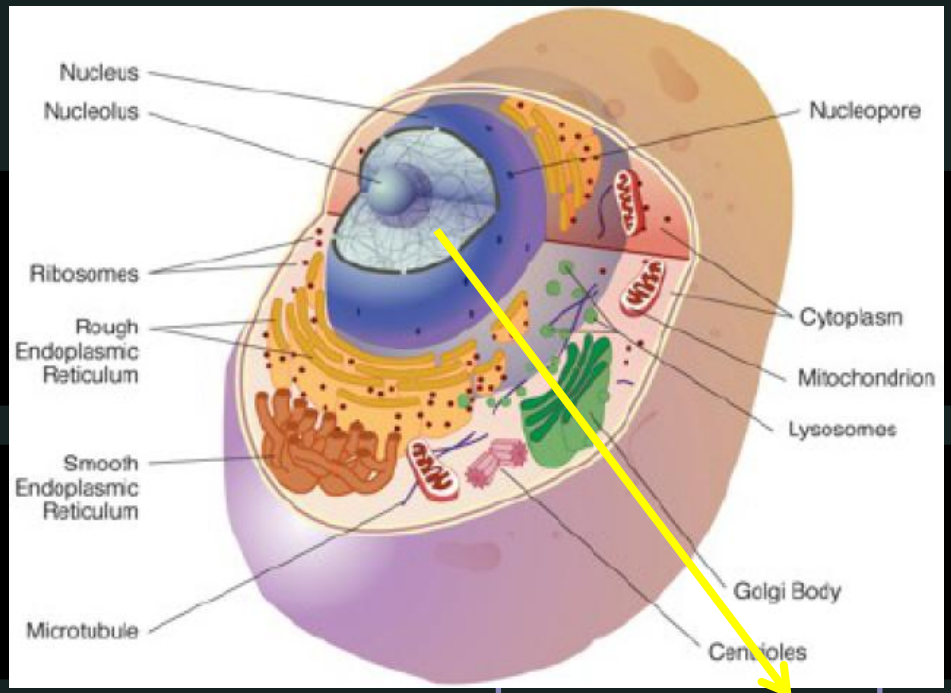
Nuclear DNA

Result

Multiple species-specific probes

Genetic fingerprint

Cell image: http://biology.about.com/od/cellbiology/ss/animal_cells.htm



DNA target

- Mitochondrial DNA
- Nuclear DNA

Result

- Multiple species-specific probes
- Genetic fingerprint

Cell image: http://biology.about.com/od/cellbiology/ss/animal_cells.htm

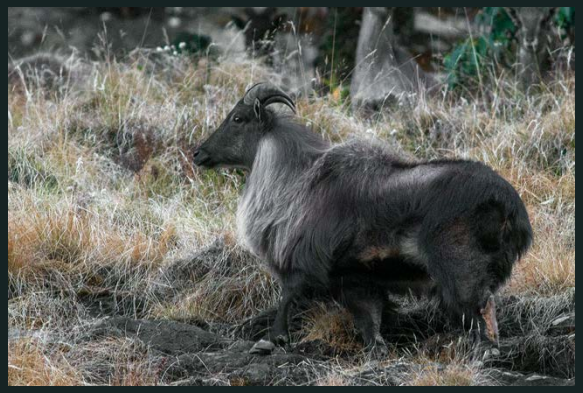
Species Detection vs. Genetic Profiling

- mtDNA
- Multiple DNA copies per cell.
- High chance of recovery, not very specific info.
- Can use to group individuals.

- nDNA
- One genome per cell.
- Lower chance of recovery, very specific info.
- Can use to create a genetic fingerprint.

Ungulate SpID

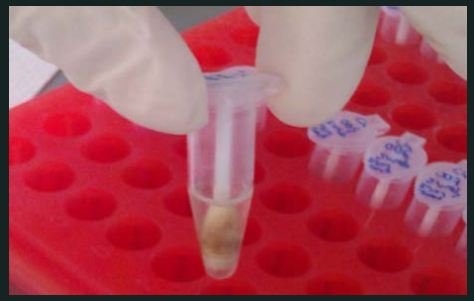
- Established wild populations.
- Damaging effects on native habitat.
- Difficult to accurately monitor.



[1]By Dmano at English Wikipedia, CC BY-SA 3.0; [2]By Coolstock - Deer Licks its Chops, CC BY 2.0, [3]By Dibyendu Ash - The species Himalayan Tahr had been photographed at Kedarnath Musk Deer Sanctuary in Uttarakhand, India on 30.11.2015.

Ungulate SpID

- Monitoring ungulate sp. in the field.
- Trace DNA, highly specific and accurate.
- Field-friendly, comparable results.



Images: A. Ramón-Laca

Reliable Discrimination of 10 Ungulate Species Using High Resolution Melting Analysis of Faecal DNA

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Predator Detection

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Research Article

Identification multiplex assay of 19 terrestrial mammal species present in New Zealand

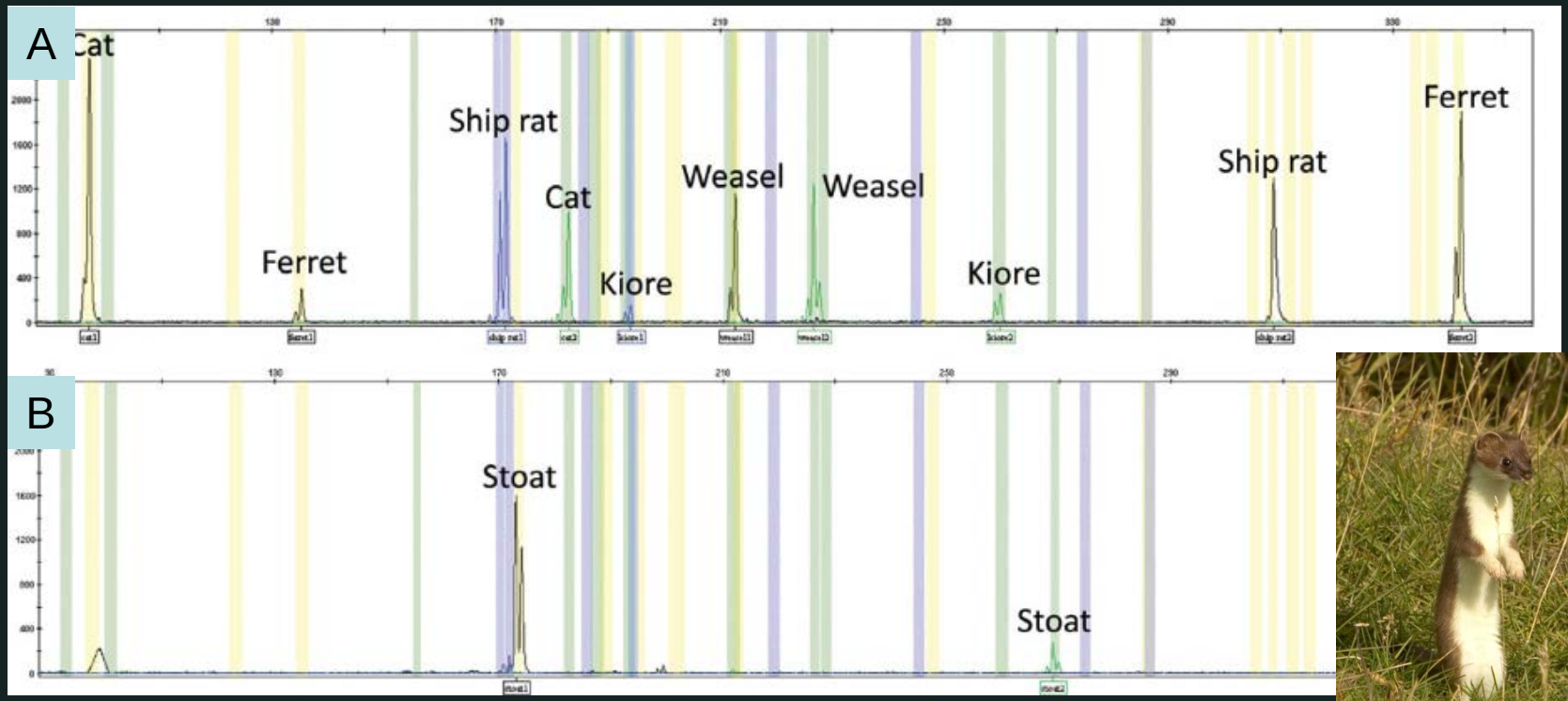
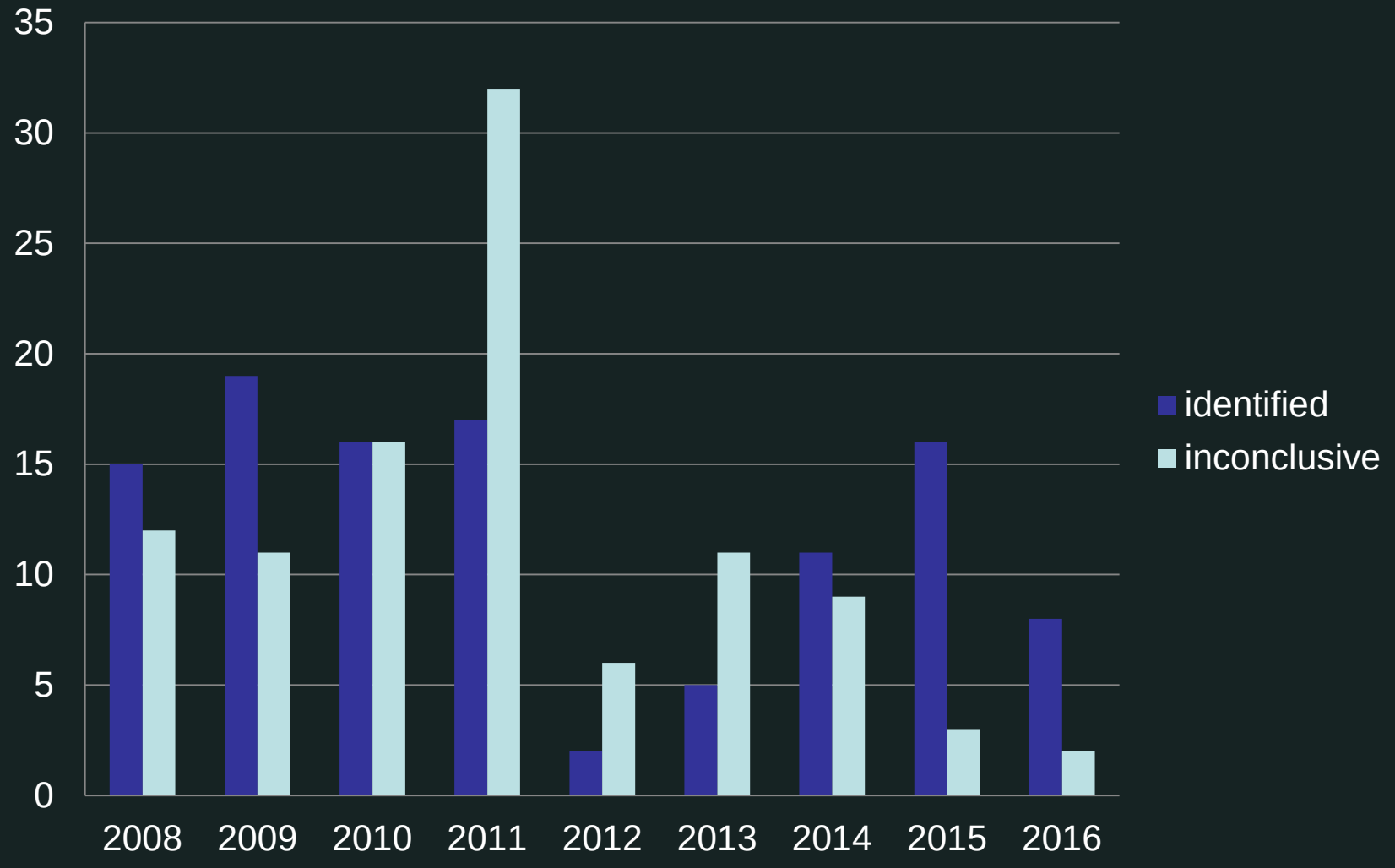
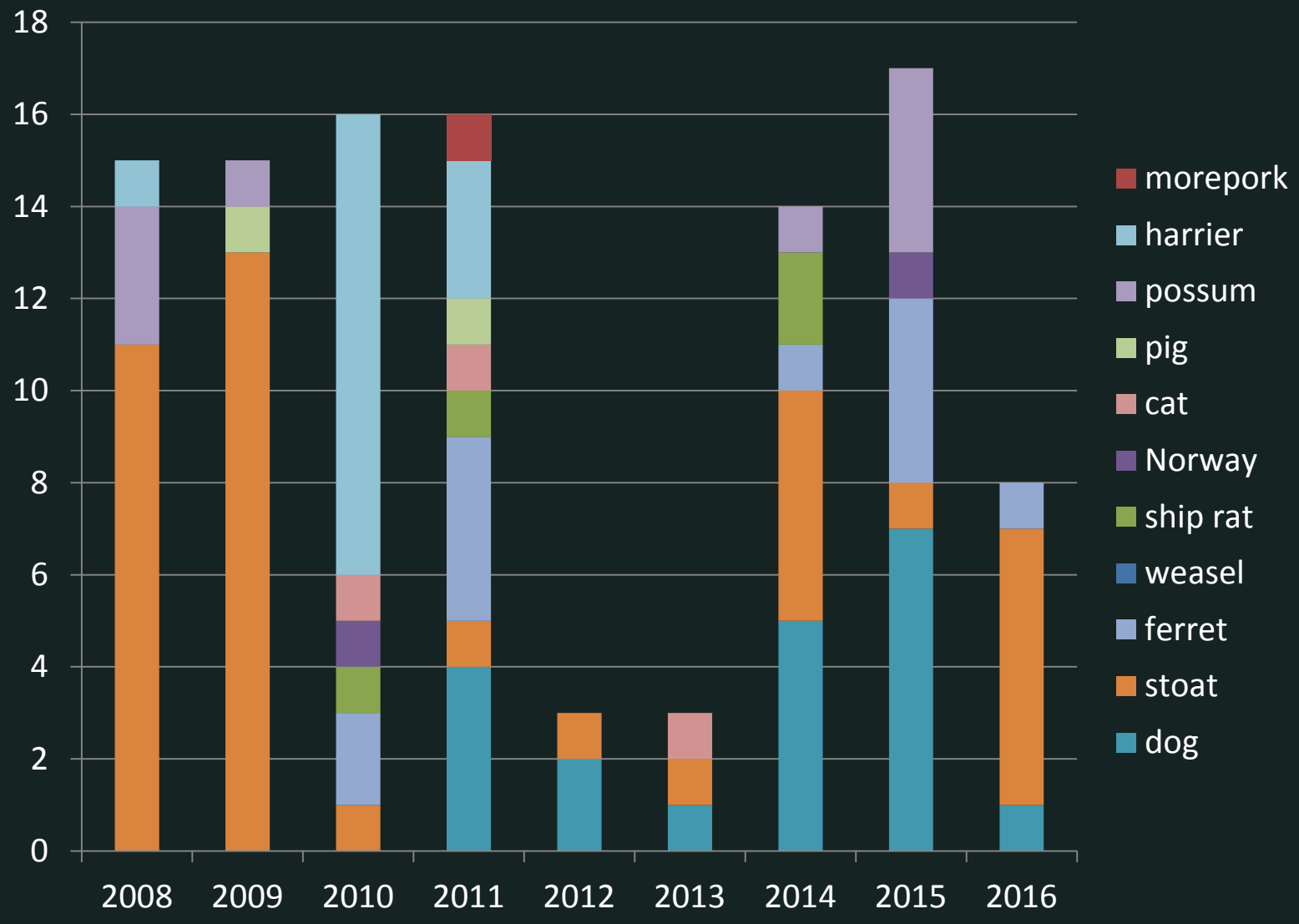


Photo: Wikipedia

Success rate of predator detection of avian species



Species identified from predated birds



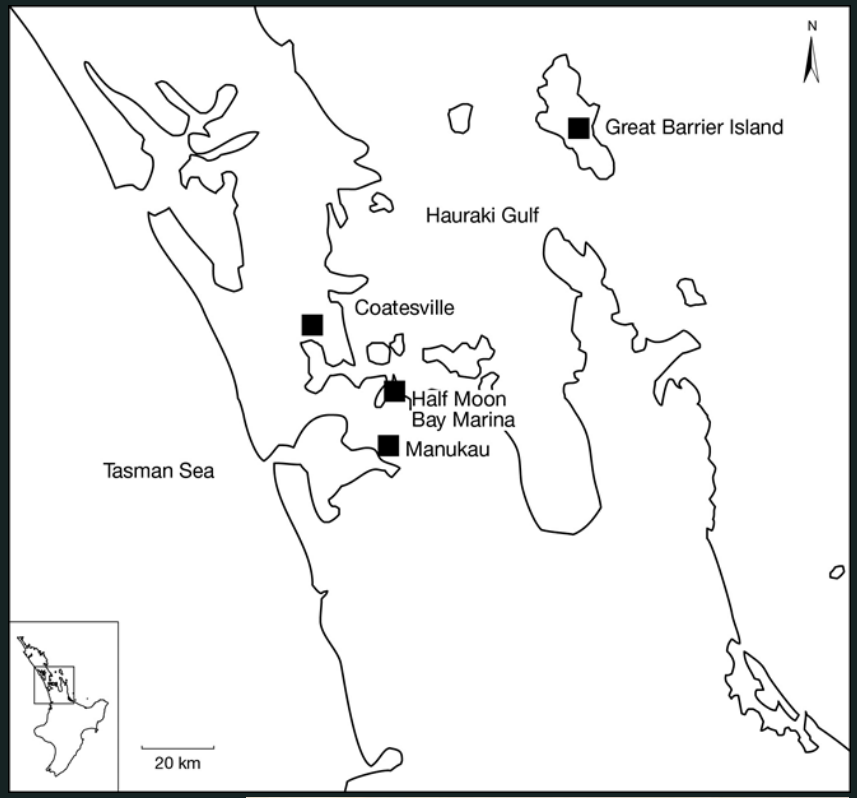
Possum on GBI?

Species ID:
- Confirmation of possum.

DNA profile (ref and scene):
- Pop. origin assessment
- Gender determination

DNA profile (candidate):
- DNA profile match.

Outcome:
- No expensive eradication response required.



Stoat on Kapiti Island?

- Stoat sighting, confirmed with DNA.
- 3 stoats trapped, bird carcasses and scats analysed.
- Genotypes revealed that the stoats were related.
- Determined a single incursion, rather multiple or an established pop.

Thank you for listening

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References:

Ramón-Laca, A., Gleeson, D., Yockney, I., Perry, M., Nugent, G., & Forsyth, D. M. (2014). Reliable Discrimination of 10 Ungulate Species Using High Resolution Melting Analysis of Faecal DNA. PloS one, 9(3), e92043.

Ramón-Laca, A., Linacre, A. M. T., Gleeson, D. M., & Tobe, S. S. (2013). Identification multiplex assay of 19 terrestrial mammal species present in New Zealand. Electrophoresis, 34(24), 3370-3376. doi: 10.1002/elps.201300324