



DNA tools that can assist wildlife management



Landcare Research
Manaaki Whenua

Current genetic services

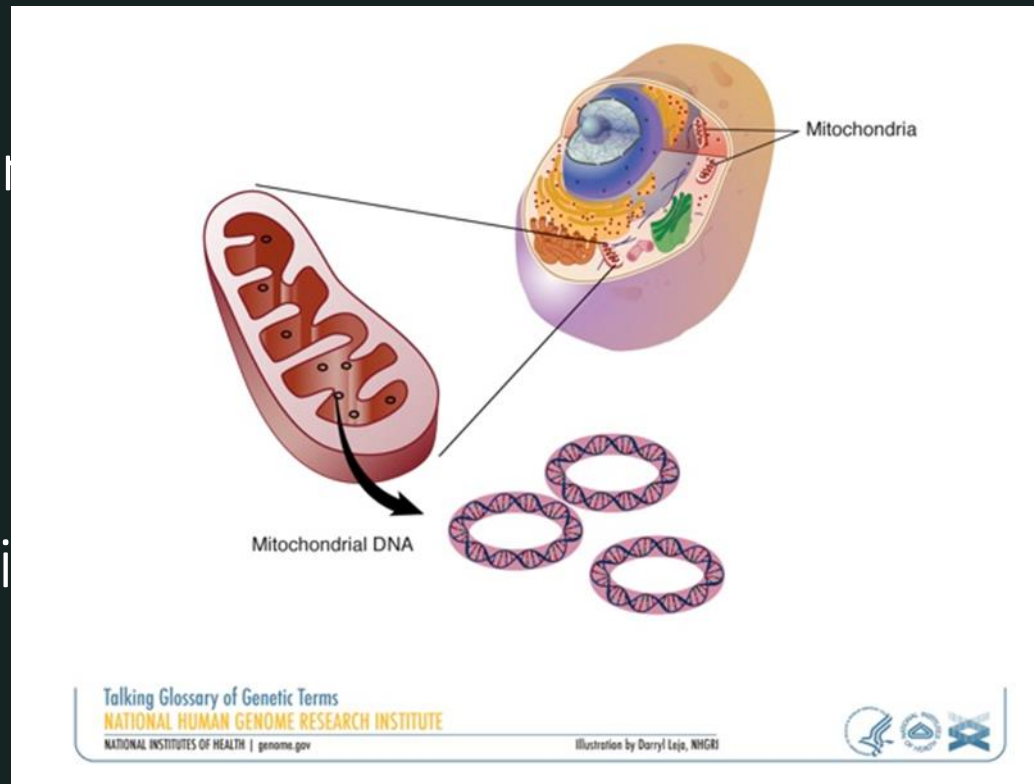
- Species identification
- Population genetics: genetic profiling using microsatellite markers (dog, cat, rat, mouse, stoat, ferret, rabbit, possum, skink, fantail, tui, kiwi, pateke, etc)
- Sex determination from feathers, scats, tissue, saliva (birds, mammals)
- Predator detection (multiplex assay for 19 mammals present in NZ)
- Disease screening (Chytrid, Avian malaria)

Species Identification

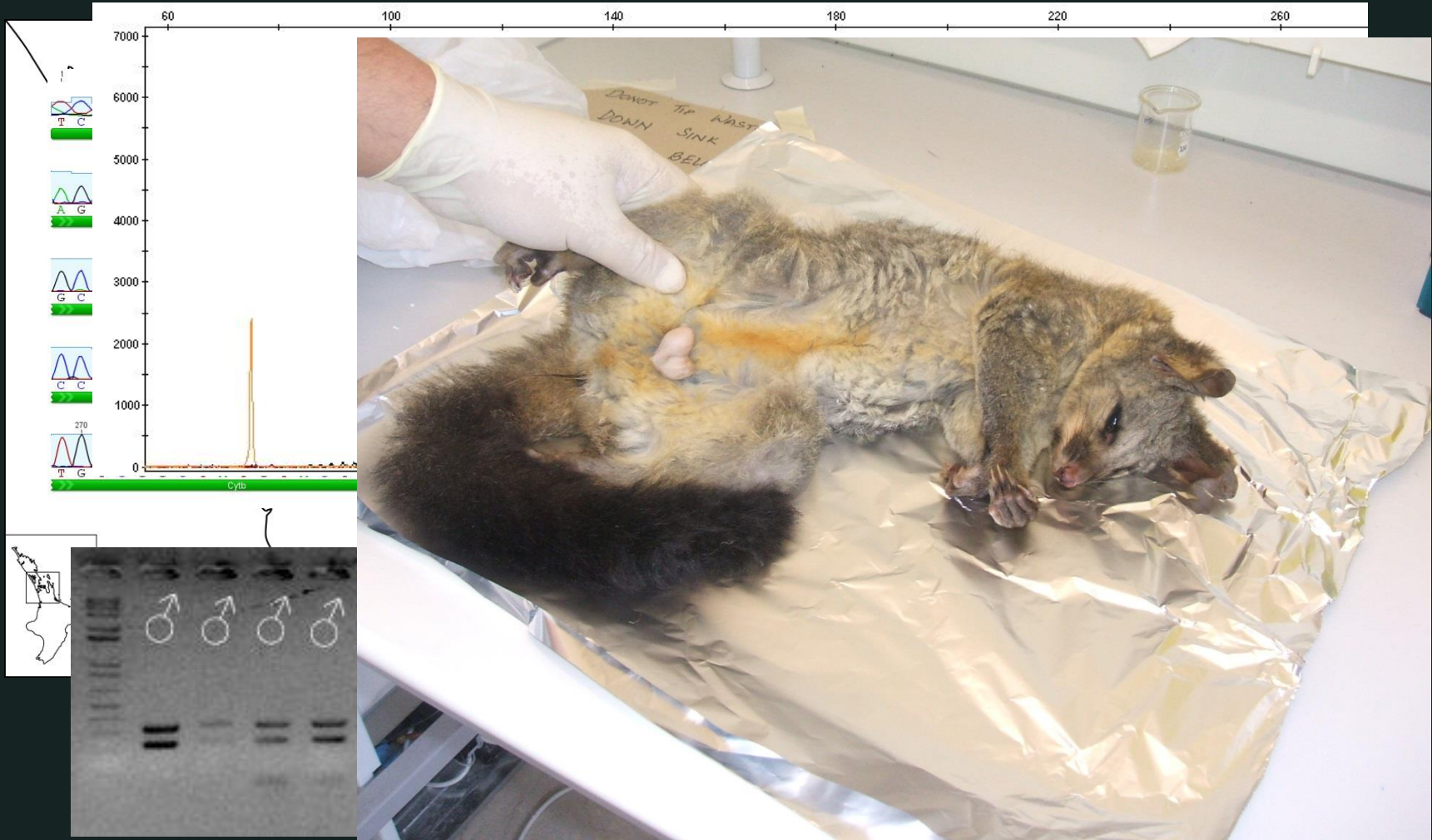
Genetic identification from tissue saliva, faeces, moulted hair, skin or feathers, urine.

New Zealand's fauna monitoring for marine distribution.

Genetic ID can assist



Migrant possum



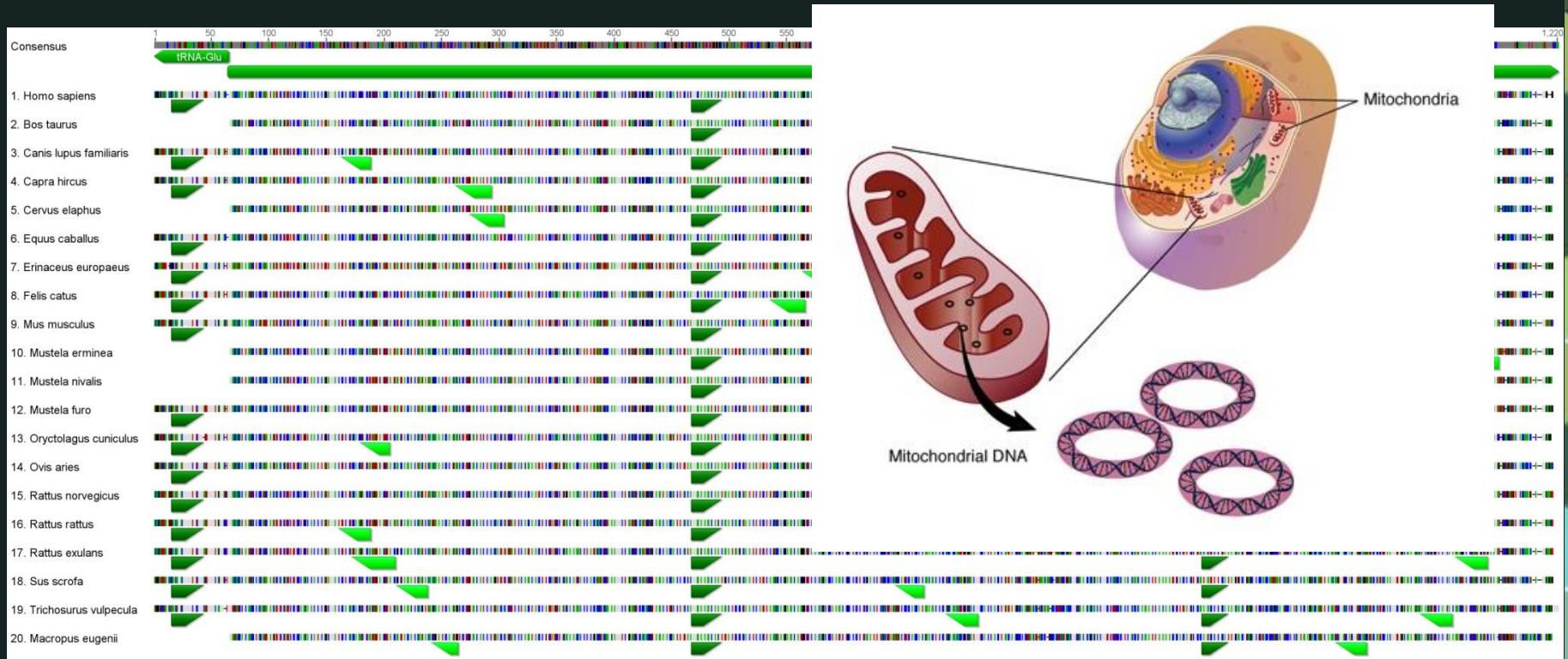
Species ID of trace samples

Difficult samples (e.g. degraded, low copy number and minor contribution in a DNA mixture).

Receipt of numerous predated carcasses, eggshells and suspected incursions in sanctuaries → adapted the already developed multiplex assay for 18 European mammals to NZ¹

¹ Tobe SS and Linacre AMT (2008). A multiplex assay to identify 18 European mammal species from mixtures using the mitochondrial cytochrome b gene. *Electrophoresis*, 29(2), 340-347.

New Zealand mammalian multiplex assay

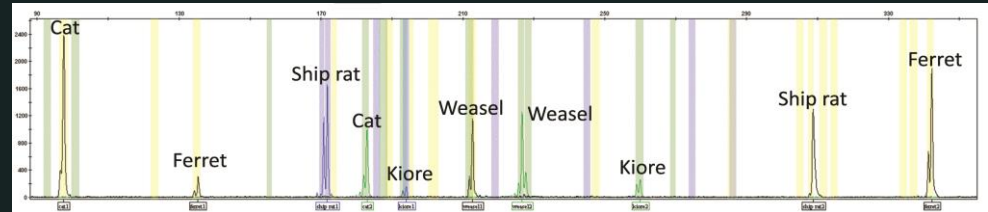


Cytochrome b (cytb) – mitochondrial gene, intraspecifically conserved, 19 terrestrial mammals present in NZ, 3 fluorescent universal primers + 37 species-specific reverse primers, 2 fragment/species expected

New Zealand mammalian multiplex assay

Advantages of this method:

- Multiple species ID
- Degraded samples
- Sensitive
- Self confirmatory
- Timely and cost-effective



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Research Article

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

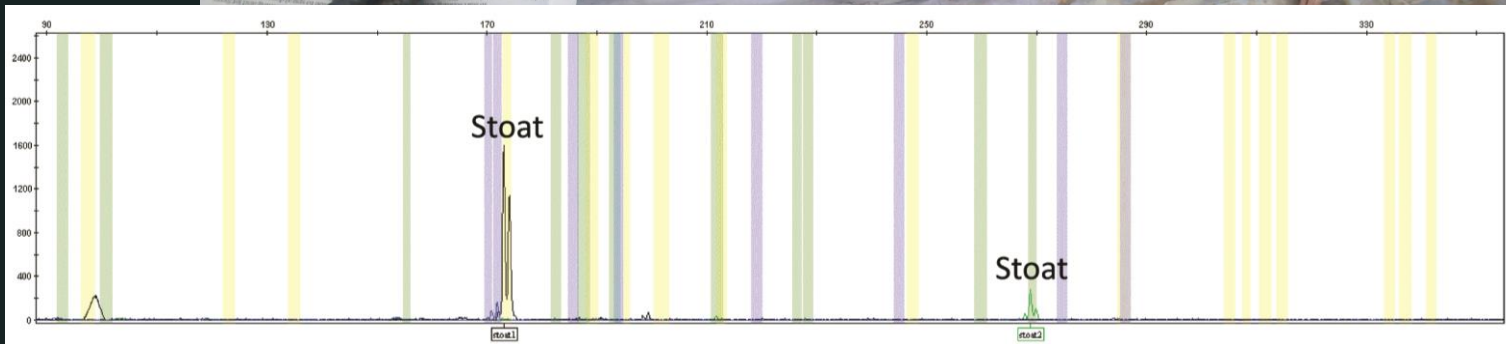
An identification assay has been developed that allows accurate detection of 19 of the most common terrestrial mammals present in New Zealand (cow, red deer, goat, dog, horse, hedgehog, cat, tamar wallaby, mouse, weasel, ferret, stoat, sheep, rabbit, Pacific rat, Norway rat, ship rat, pig, and brushtail possum). This technique utilizes species-specific primers that, combined in a multiplex PCR, target small fragments of the mitochondrial cytochrome *b* gene. Each species, except hedgehog, produces two distinctive species-specific fragments, making the assay self-confirmatory and enabling the identification of multiple species simultaneously in DNA mixtures. The multiplex assay detects as little as 100 copies of mitochondrial DNA, which makes it a very reliable tool for degraded and trace samples. Reliability, accuracy, reproducibility, and sensitivity tests to validate the technique were performed. The technique featured here enabled a prompt response in a predation specific event, but can also be useful for wildlife management and conservation, pest incursions detection, forensic, and industrial purposes in a very simple and cost-effective manner.

Keywords:

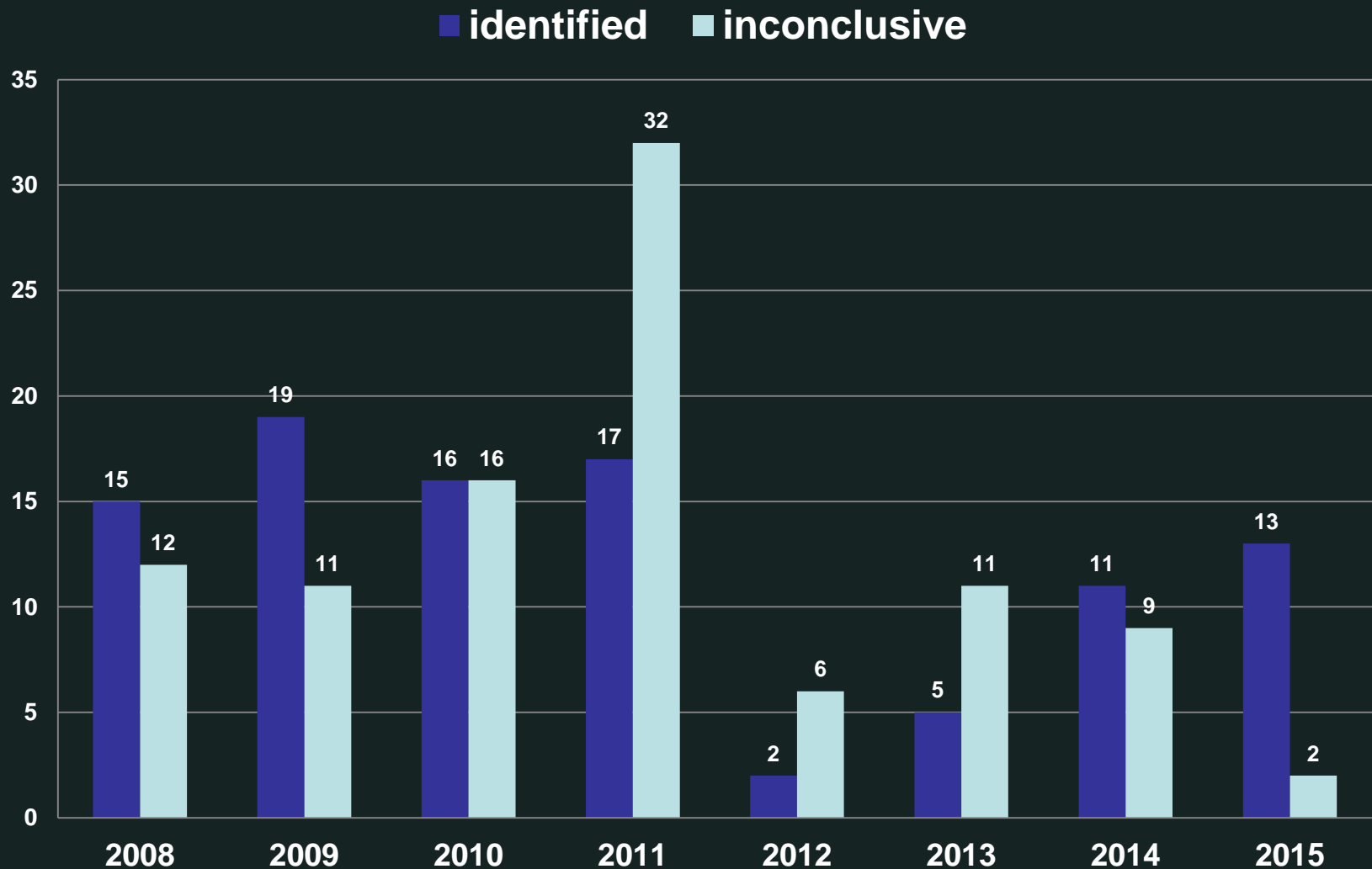
Cytochrome *b* / DNA mixtures / Multiplex / Pest detection / Species identification
DOI 10.1002/elps.201300324

Kiwi predation case

1.890 kg - Marunui (eastern Brynderwyns, Northland)

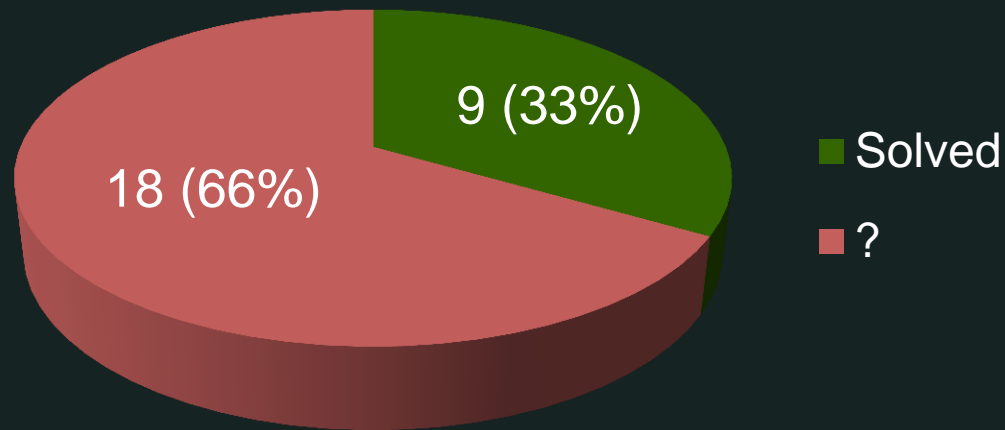


Success rate of predator detection of avian species



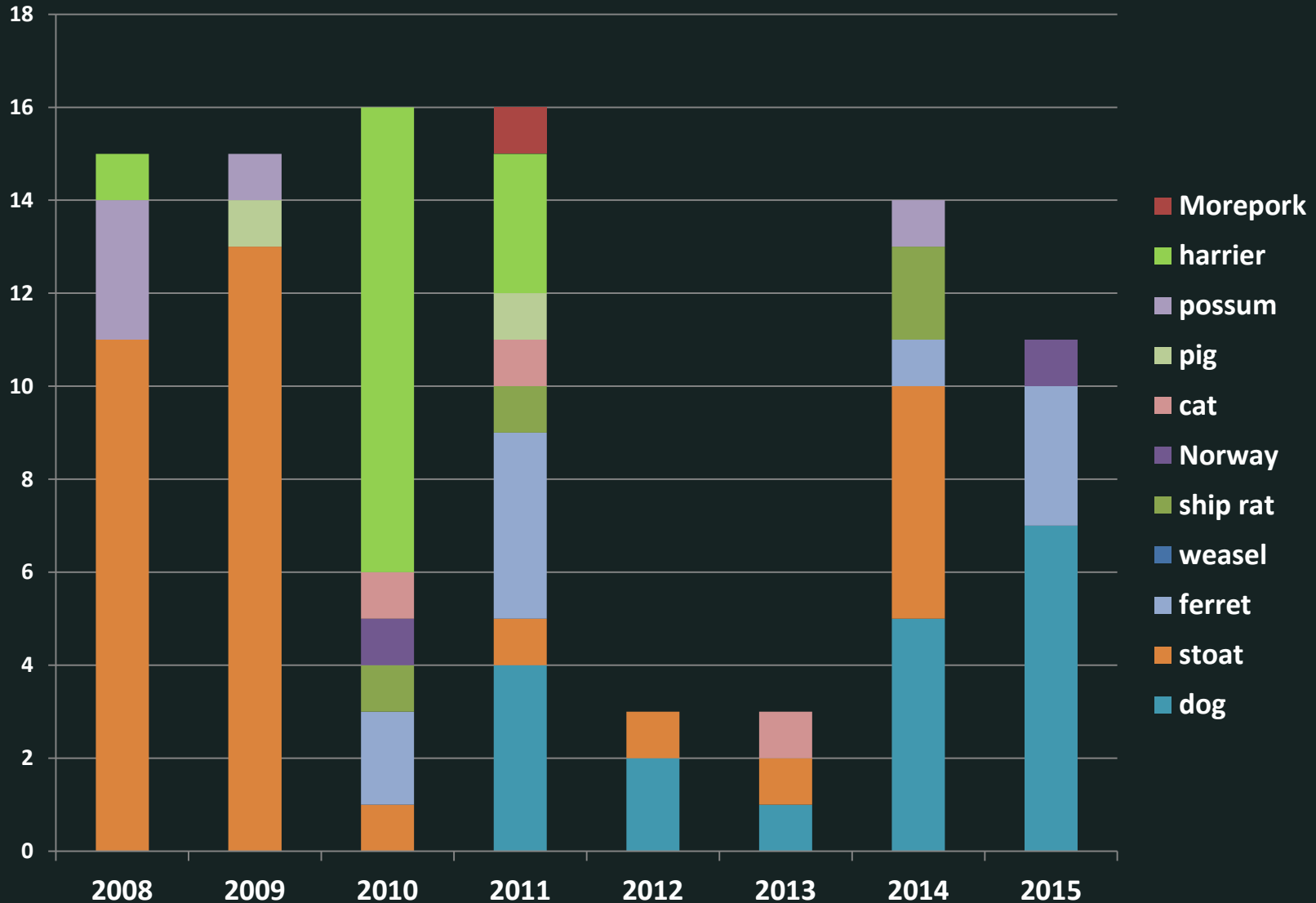
Greater predator identification success

Previous unsolved predation cases

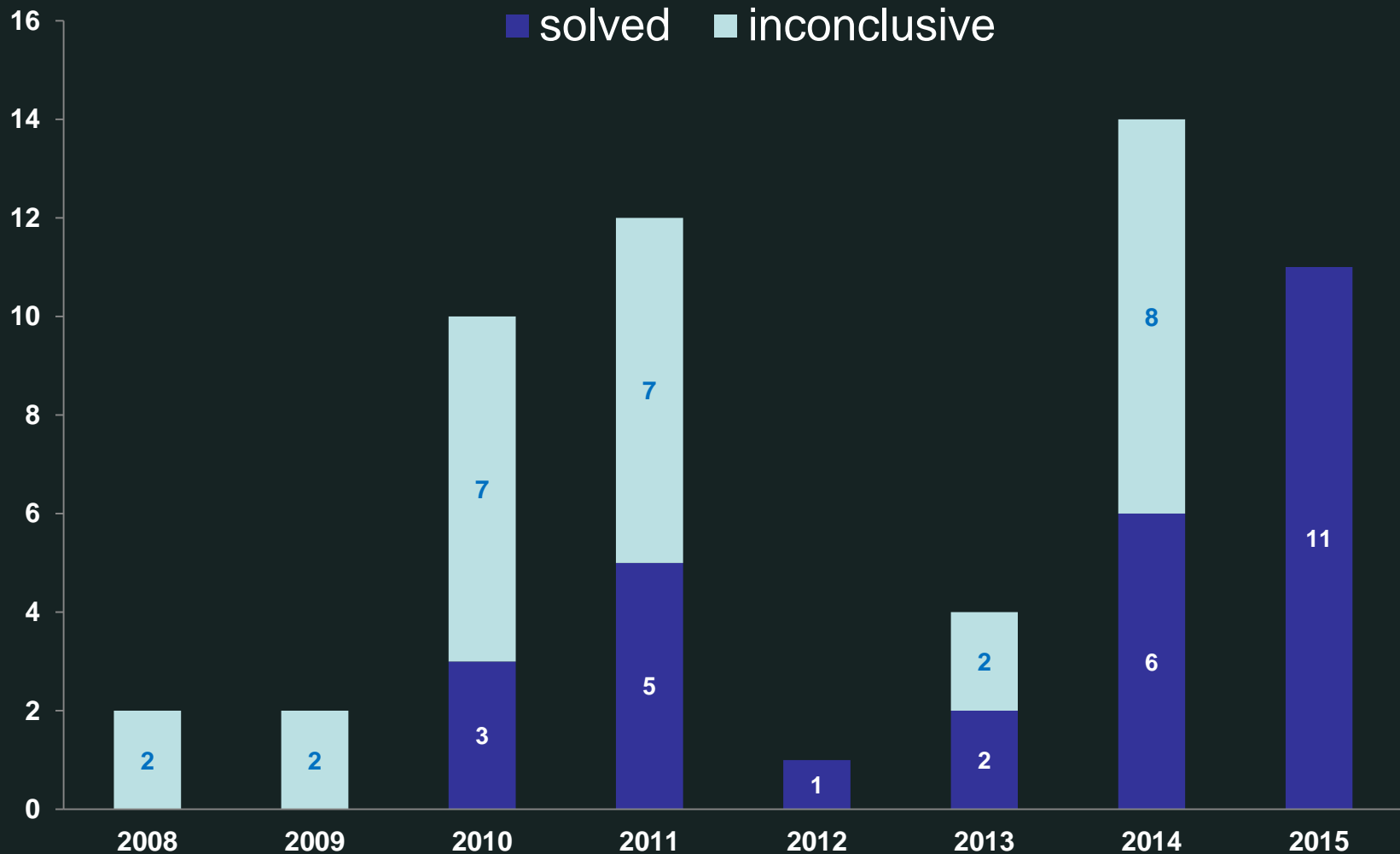


Year	Location	prey	Post mortem or DNA id result	Multiplex result
2008	Whangarei	kiwi	host	dog
2009	Kawau Island	weka	host	ship rat and dog
2009	Kawau Island	weka	host	dog and cat
2010	Otago	grand skink	host	stoat
2010	Tongariro	bat	human	cat
2010		black stilt	host	cat
2011	Ruapehu	kiwi	suspected cat or mustelid / host	stoat
2011	Geraldine	wrybill eggshells	host	cat
2011	Mana Island	shore plover	host	Norway rat

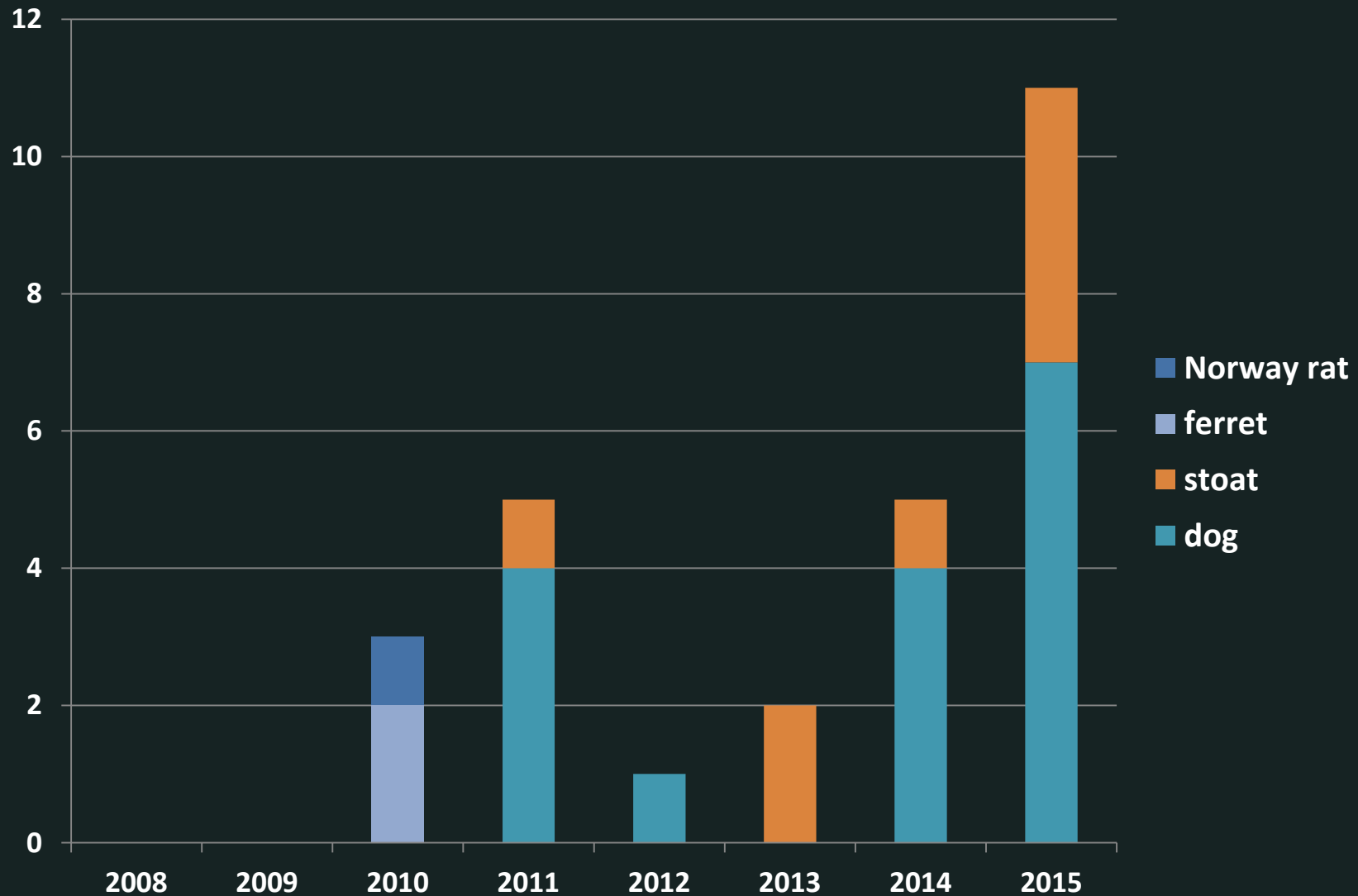
Species identified from avian predations



Success rate of predator detection of kiwi

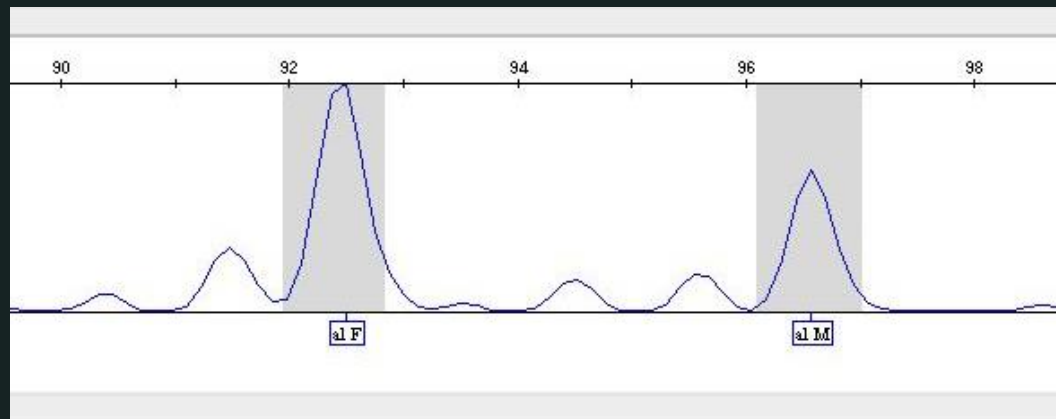


Species identified from kiwi predations

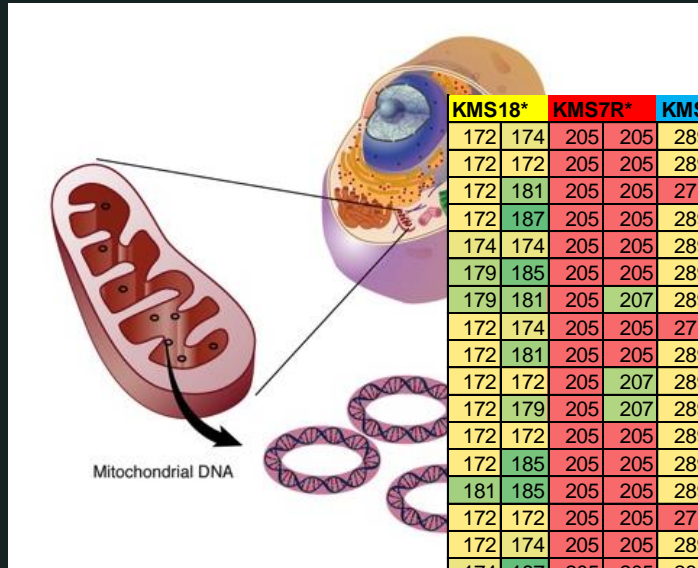


Gender determination

- Decomposed specimens (e.g. rats)
- Sexual monomorphism (sex ratio)
- Juveniles (breeding facilities)



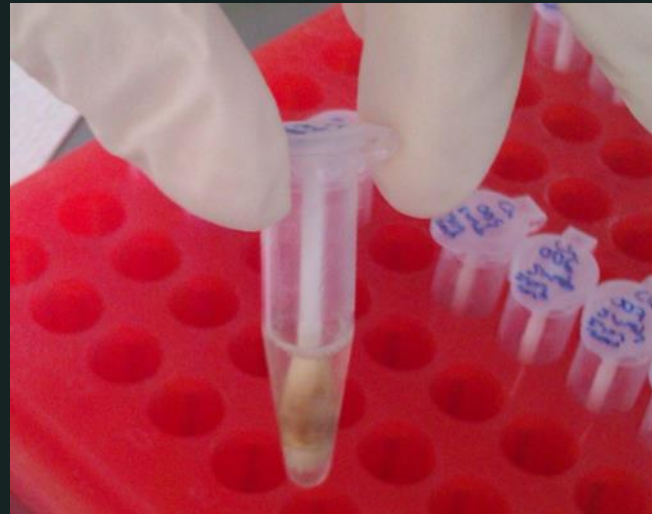
Population genetics



	KMS18*		KMS7R*		KMS14B*		KMS37*		KMS30*		KMS1*		Apt29^		Apt59^		Apt37^		Apt35^		Apt68^	
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	172	172	205	205	289	328	146	146	343	347	156	156	91	101	145	147	149	149	157	159	203	203
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Population genetics

- Genetic diversity assessment
- Population structure
- Eradication monitoring
- Population assignment
- Parentage



Genetic profiling and population genetics

Rodents database: population assignment

Mustelids database: population assignment

Pateke (brown teal) genetic diversity assessment

Relatedness of ferrets/stoats/rats/mice found on
pest free areas

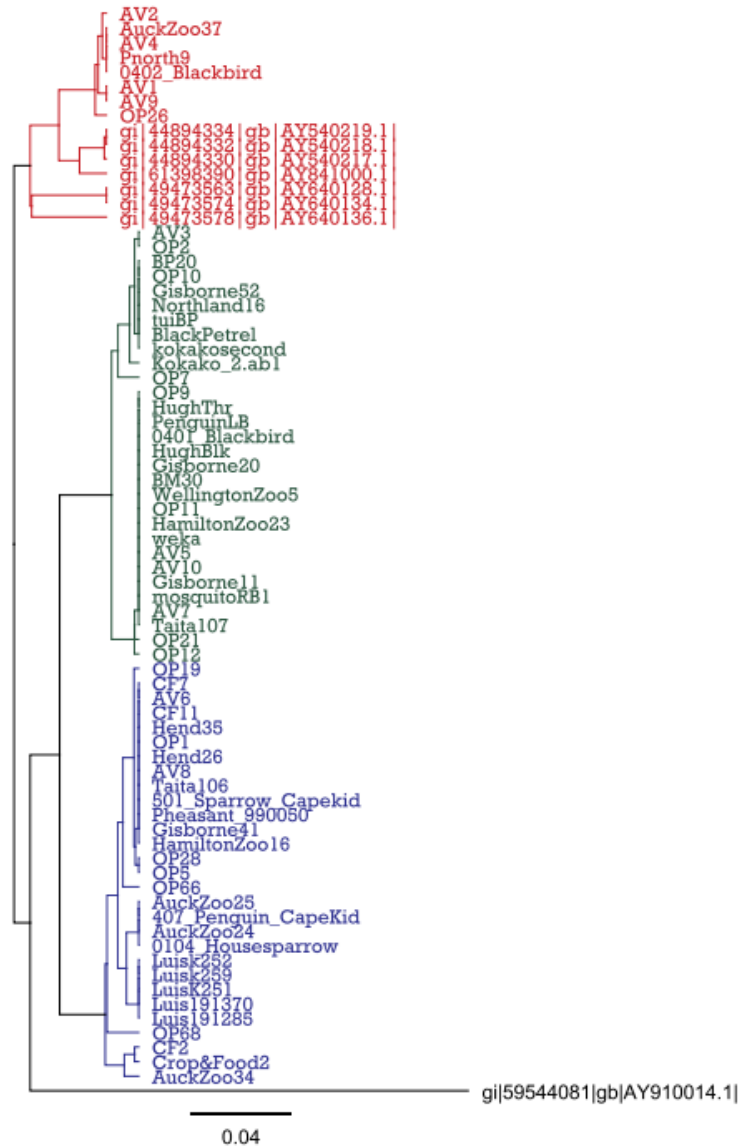
Disease screening

Chytrid fungus dete



Image from www.reptiles.org.nz

Avian malaria





Thanks



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