



Photo Credit: Chris Moore

Takahē Community Study 2019

A.S. 91158 Biology 2.6

Investigate a pattern in an ecological community


Context: An investigation into the impact of introduced mammals on the distribution of takahē in New Zealand.



Photo Credit: Sue Lum



Photo Credit: Andrew Hawke



**“New Zealand is as close as we
will get to the opportunity to
study life on another planet.”**

Jared Diamond

Source: Wikimedia Commons

Learning Outcomes

- ☐ To understand the uniqueness of New Zealand's endemic species
- ☐ To observe takahē (*Porphyrio hochstetteri*) and make links to adaptations
- ☐ To think about some aspects of interrelationships between species in the communities in which takahē live

New Zealand Endemism

(species found only in New Zealand)



Photo Credit: Tom Lynch



Photo Credit: Andrew Hawke

70 % of birds

80 % of trees

90 % of fish / insects

100 % of frogs / reptiles / bats



Photo Credit: Andrew Hawke

Unique NZ Species

Flightless birds

Giant insects

Living fossils

Trees that change shape



Photo Credit: Sue Lum



Photo Credit: Andrew Digby

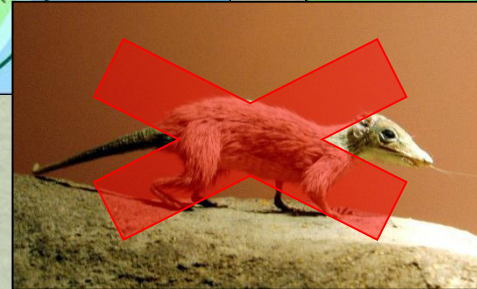
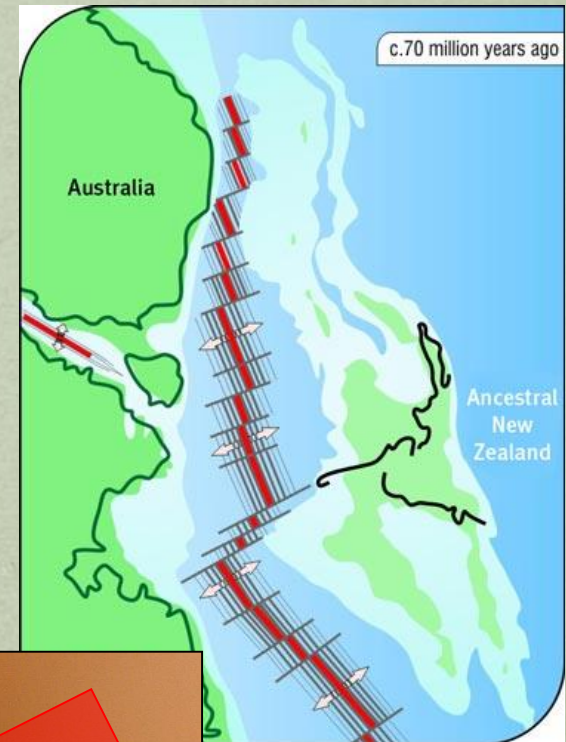


Photo Credit: Andrew Hawke



Photo Credit: Akos Kokai (Some right reserved) Attribution 2.0 CC

Separation from Gondwana and subsequent isolation



NO mammalian predators...



Photo Credit: Nga Manu Images ©



Photo Credit: Steve Attwood

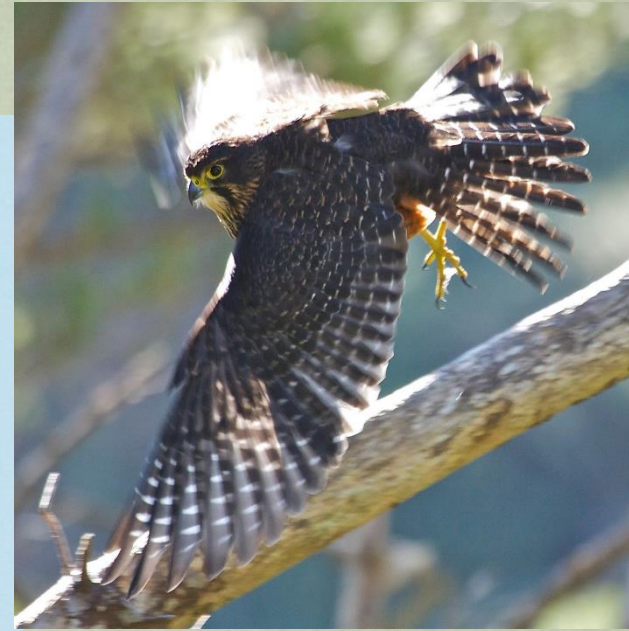
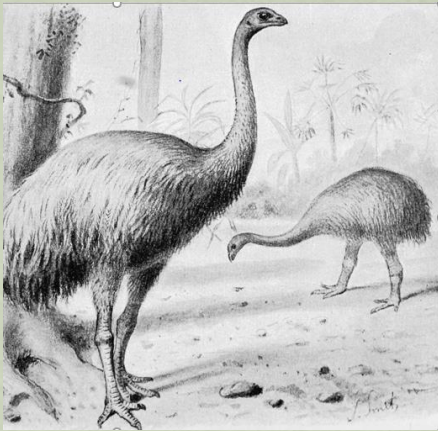


Photo Credit: Steve Attwood

...only
eyes in
the sky

Ecological Niche equivalents



Artist Credit: Joseph Smit Public Domain



Photo Credit: Shankar S [CC BY 2.0](#)

Mammals overseas
occupy a range of
ecological niches.



Photo Credit: Jo Moore



Photo Credit: Creative Commons Attribution-ShareAlike 3.0 Unported



Photo Credit: Sue Lum



Photo Credit: Ngā Manu Images ©

Which animals here in pre-human New Zealand occupied similar ecological niches to these overseas ones?

But then...



Photo Credit: Andrew Hawke



Photo Credit: Museum of New Zealand Te Papa Tongarewa Collections

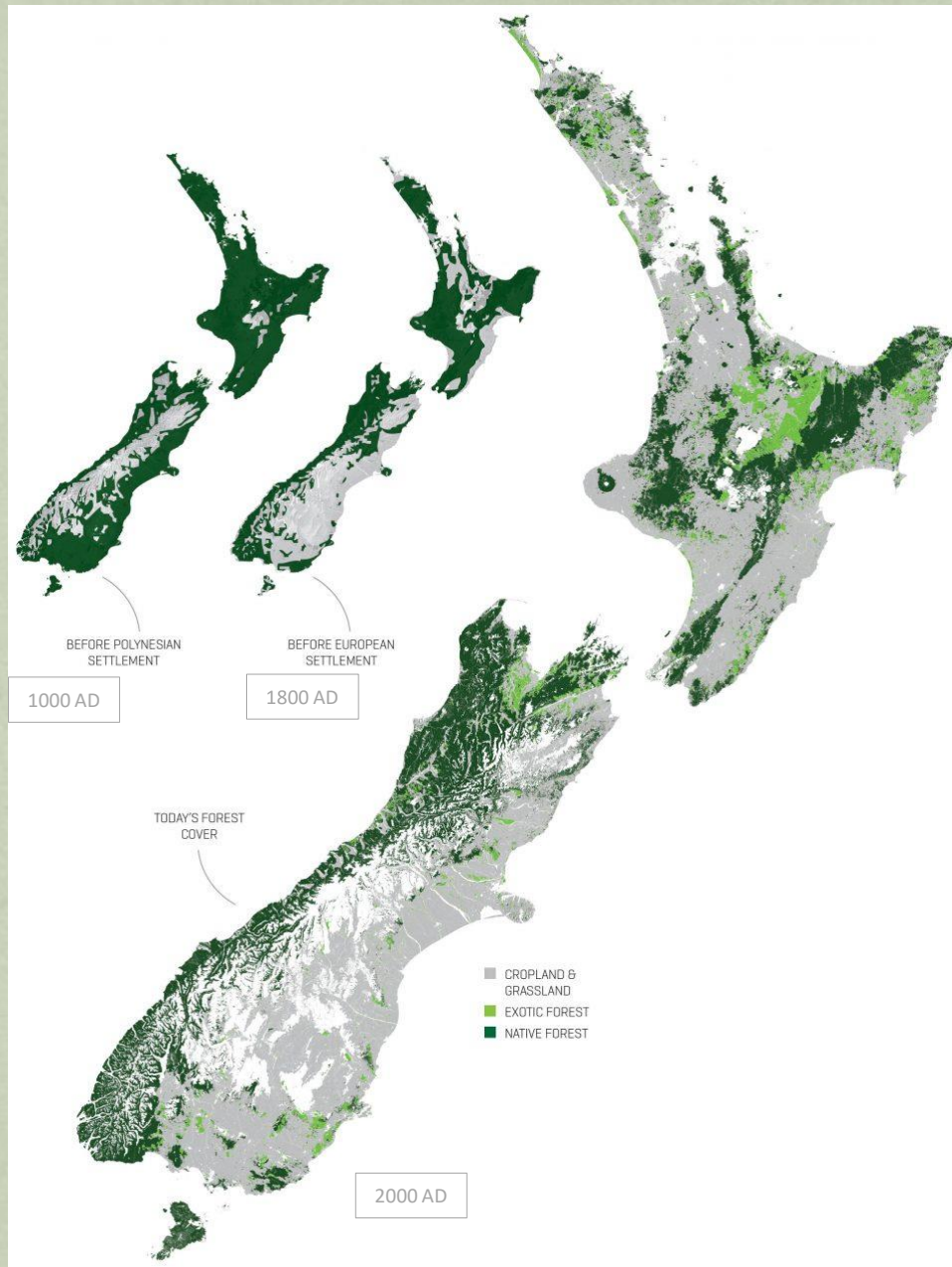


Photo Credit: Nga Manu Images ©

Human Impact

Since Polynesian and later European settlement, native forests have been reduced to under 30% of the original bush cover.

As a result of this habitat loss, a number of endemic species have become extinct.



Source: New Zealand Geographic (2014)

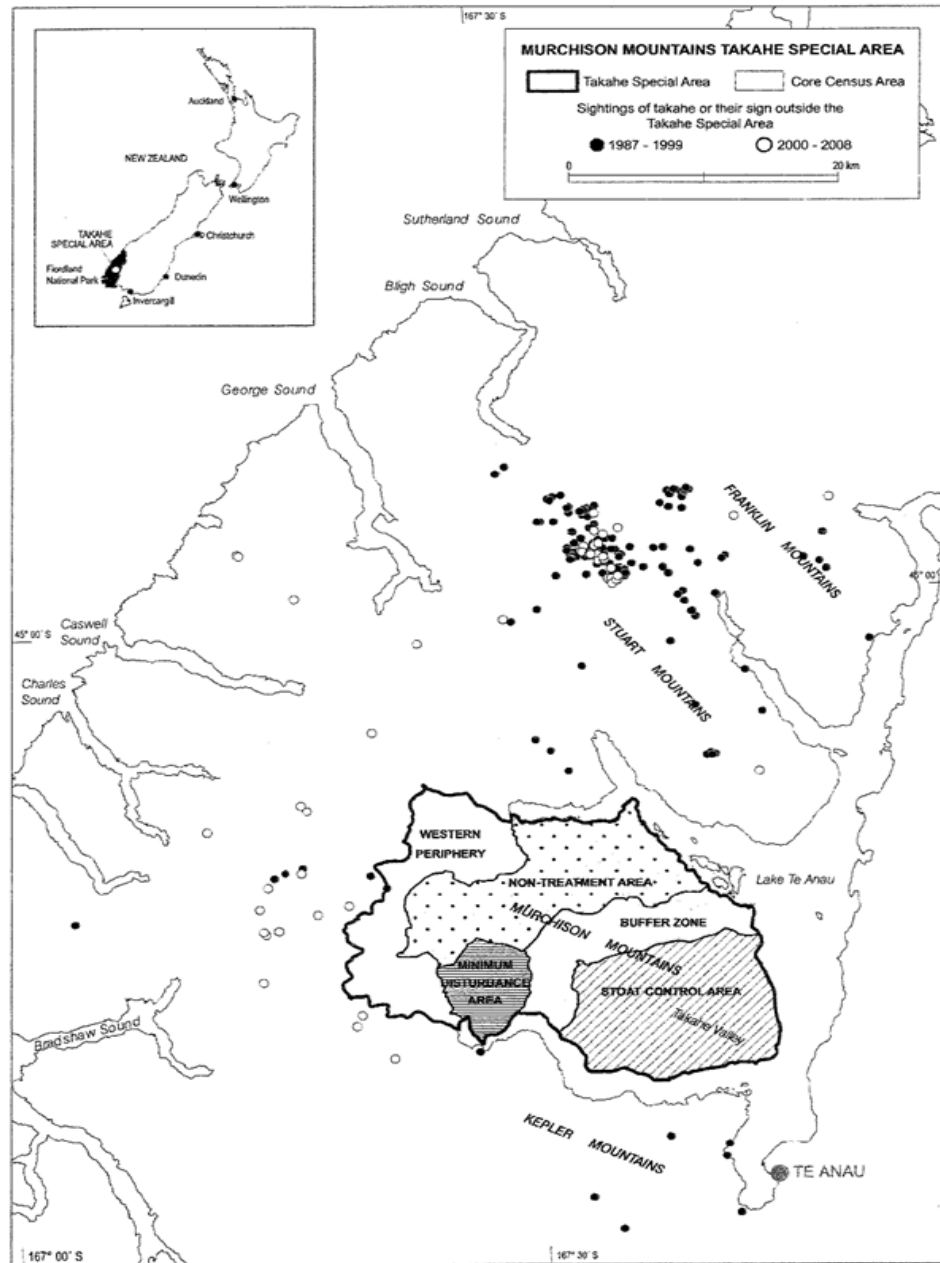
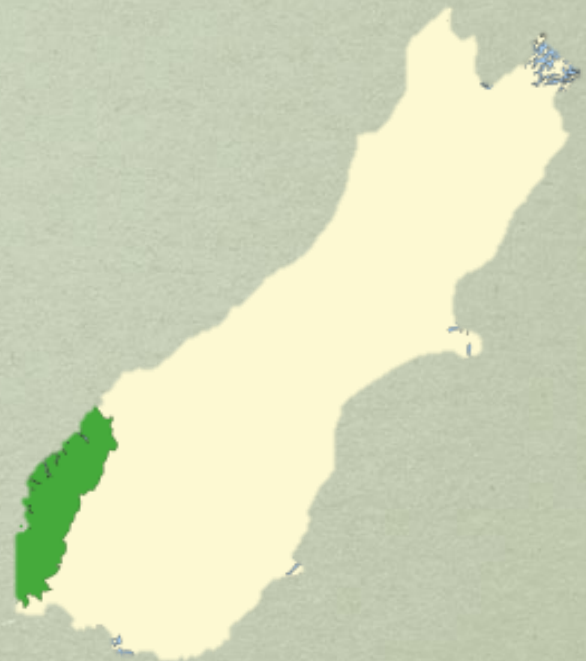


Figure 1. Takahe (*Porphyrio hochstetteri*) distribution in Fiordland, including the Murchison Mountains Takahe Special Area (showing extent of the area under stoat control during stoat trapping trial, c. 15 000 ha) and sightings of takahe outside the Murchison Mountains (between 1987 and 2008).

Sightings of wild takahē outside the takahē 'special area' between 1987 and 2008



Source: By Costello - self-made, based on Image: NZ Locator Blank.png, CC BY-SA 3.0,

Mammalian Pests in New Zealand



Photo Credit: Gordon Roberts Department of Conservation



Photo Credit: Steve Attwood



Photo Credit: Nga Manu Images ©



Photo Credit: Nga Manu Images ©



Photo Credit: Kim Hansen Creative Commons Attribution-ShareAlike 3.0 Unported



Photo Credit: Brisbane City Council



Photo Credit: Nga Manu Images ©

Consider the ecological niches of these species in the Murchison Mountains



Photo Credit: Andrew Hawke



Photo Credit: Gordon Roberts Department of Conservation



Photo Credit: Steve Attwood



Photo Credit: Sue Lum

Endemism and Extinction



Extinction is forever.
Does it matter?

Artwork by Emma Rowell

Takahē

- Takahē are the world's largest flightless rail species.
- Previously thought to be extinct, they were rediscovered in 1948.
- The Department of Conservation and Ngāi Tahu have been working together to bring takahē 'back from the brink'.



Photo Credit: Sue Lum

Takahē and their cousins

Takahē are thought to have arisen from an ancestral pūkeko-type bird which flew to New Zealand from South Africa



Photo Credit: Andrew Hawke



Photo Credit: Andrew Hawke

Pūkeko are a much later arrival via Australia and are much more closely related to Moho (the extinct North Island takahē) than South Island takahē

Where in the world are they?

Until recently takahē were only found in the wild in the remote alpine valleys of Fiordland.



Photo Credit: Helen Dodson Department of Conservation



Their rediscovery kickstarted one of the longest standing species conservation programmes in New Zealand.

Where in the world are they?

- As at 31st September 2018 population numbers was estimated at 376 and as a result, takahē are now considered 'threatened - nationally vulnerable'.
- In March 2018, the first small group of takahē were translocated to Goulund Downs in Kahurangi National Park from where they have been absent for over 100 years.



Photo Credit: Martin Genet Department of Conservation

Why are they not found elsewhere?

- Habitat destruction
- Presence of introduced mammals



Photo Credit: Andrew Hawke



Photo Credit: Andrew Hawke



Photo Credit: Emma Rowell



Photo Credit: Dave Jenkins Department of Conservation



Photo Credit: Andrew Hawke



Photo Credit: Andrew Hawke



Photo Credit: Sue Lum

#imnotapukeko

ZEALANDIA
TE MĀRA A TĀNE

Same or different?



Photo Credit: Bernard Spraggs NZ



Photo Credit: Tony Fluerty (Boney Whitefoot Photography)



Photo Credit: Bernard Spraggs NZ



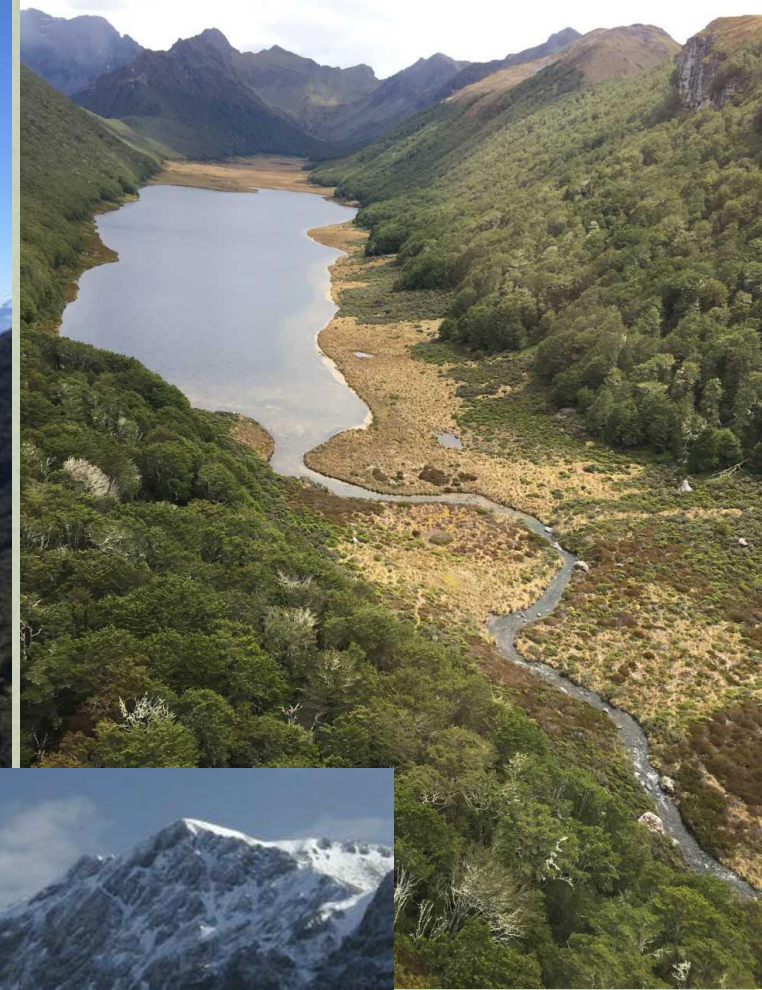
Photo Credit: Nga Manu Images ©



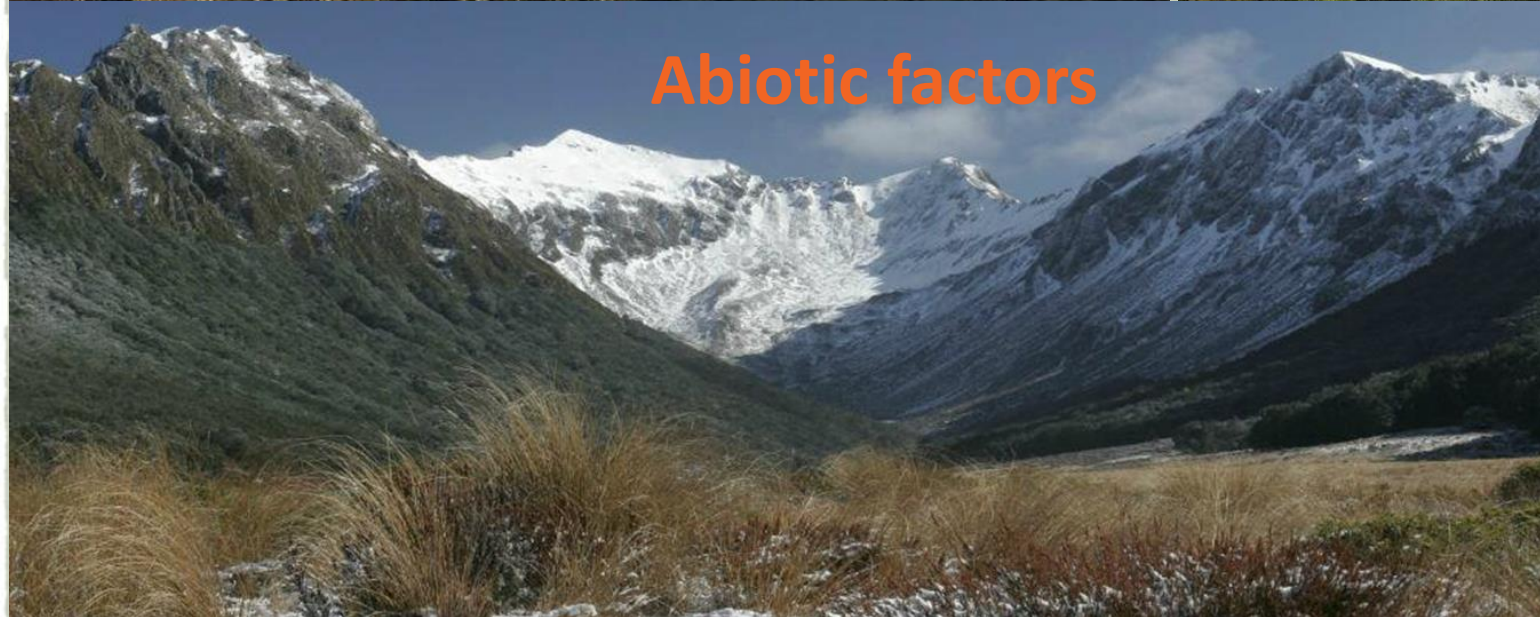
Photo Credit: Nga Manu Images ©



Photo Credit: Bernard Spraggs NZ



Abiotic factors



Burwood Takahē Centre June 2018



Photo Credit: Sue Lum



Photo Credit: Department of Conservation



Photo Credit: Sam Haultain Department of Conservation

Monitoring

Sky Ranger™

- Smart transmitters allow remote monitoring via aircraft with receiver
- About half the wild birds carry transmitters
- GPS recorder logs location and 'state' of each bird
- 'Ground truthing' by small groups of rangers



Photo Credit: Jo Ledington Department of Conservation

Your task with the takahē today

- ☐ Spend some time observing the takahē
- ☐ Think about adaptations which fit them for living in their current wild environment
- ☐ Think about which factors / relationships affect this species
- ☐ Think about what makes takahē vulnerable to predation and competition



Photo Credit: Andrew Hawke

Takahē observations (in person or on film)

- ☐ Sit quietly and watch the birds.
- ☐ Note down what they are doing, how they interact with each other.
- ☐ How do they use their beak and feet for feeding?
- ☐ What do you notice about their colouration, their feathers, their size?



Photo Credit: Andrew Hawke



Photo Credit: Andrew Hawke

Note down anything else interesting you observe.

Unpacking the Standard

Once you have

- done your research,
- made your observations
- and analysed your data,

you need to communicate your findings clearly and succinctly.

To do this you need to understand what is required, connect your ideas logically and present them concisely.



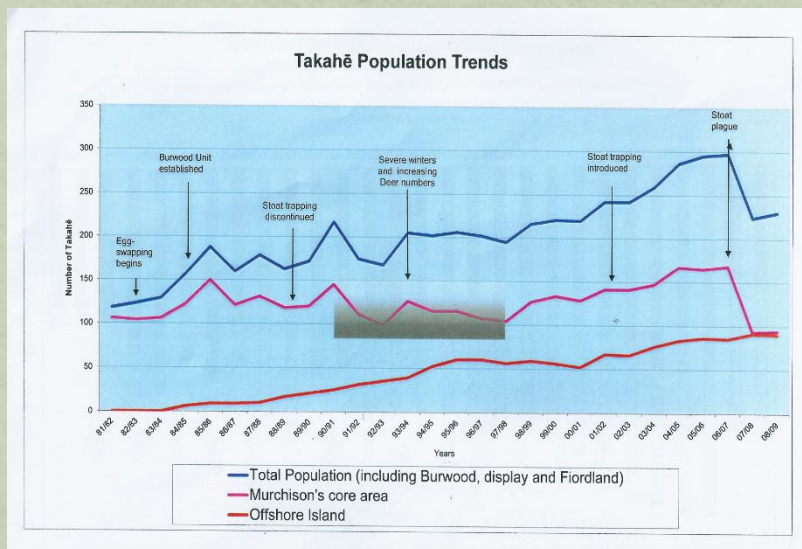
Investigating a pattern in an ecological community (A)

Investigate a pattern means you need to:

- ☐ Identify a pattern in an ecological community
- ☐ Relate the pattern to an environmental factor - abiotic (e.g. climate) or biotic (e.g. presence or absence of introduced mammals)
- ☐ Describe how the environmental factor might affect the chosen species (e.g. takahē, stoat, deer, snow tussock)

Linking observations and data or findings to describe a pattern

- ❑ Have sufficient data about your chosen species to be able to describe a pattern or trend
- ❑ Research and make observations about the biology of your chosen species



Source: Takahē Recovery programme –Department of Conservation Te Anau Area Office 2012



Photo Credit: Andrew Hawke



Photo Credit: Sue Lum

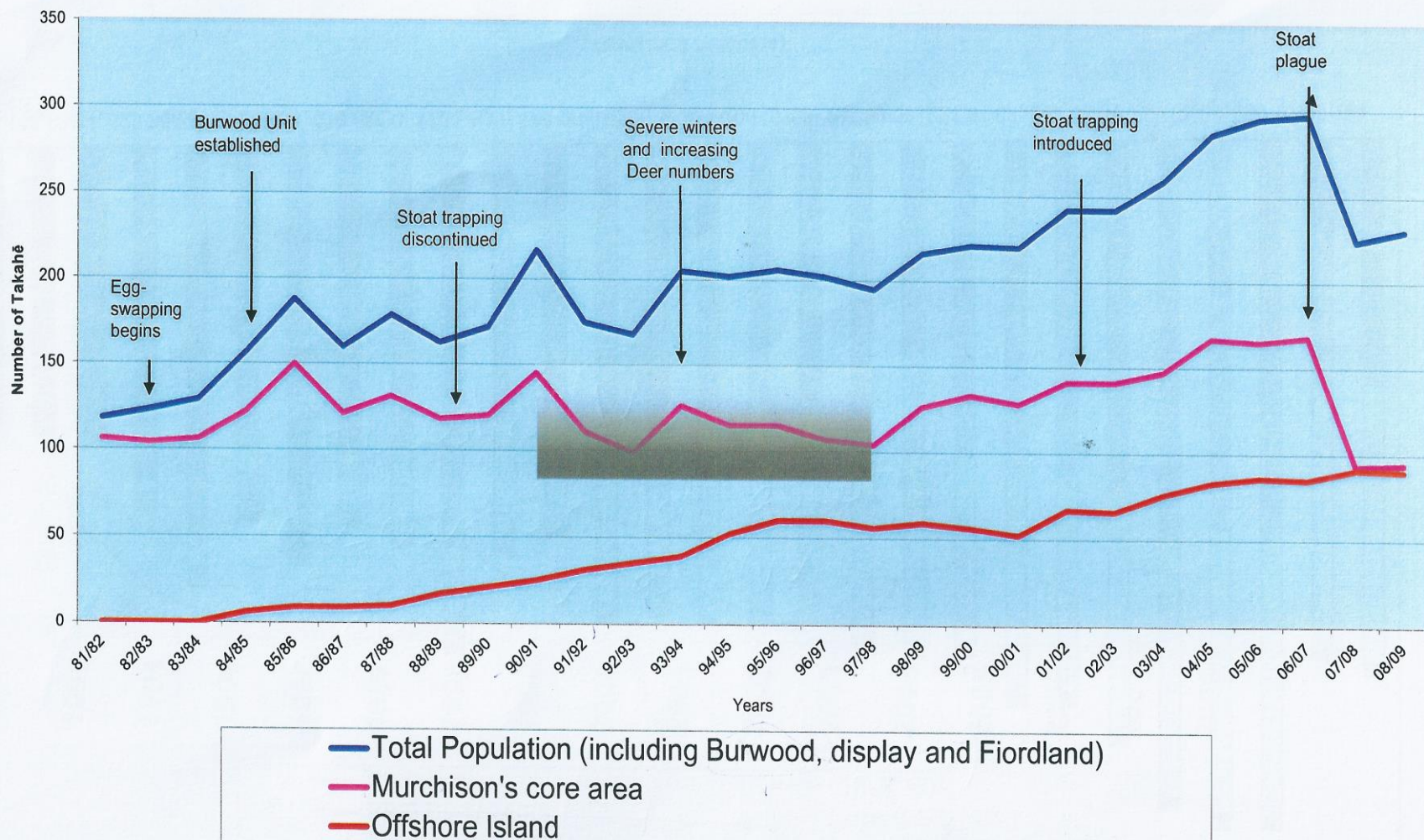
Important ideas!



Source: Takahē Recovery programme Department of Conservation
Te Anau Area Office 2012

- ☐ What are the communities you are studying and what species do you have data for?
- ☐ What is a pattern? What does your data show? Your pattern needs to be able to be described quantitatively and show a comparison between different communities.
- ☐ What environmental factors are present or absent in your communities? (clue: there are biotic and abiotic factors)
- ☐ How could the environmental factor(s) explain the pattern in your data?

Takahē Population Trends



Impact of temperature on adult takahē

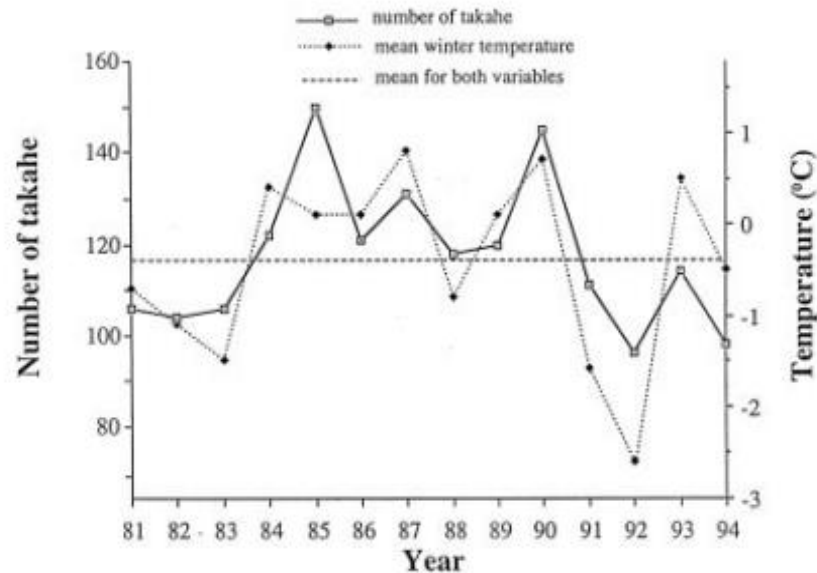
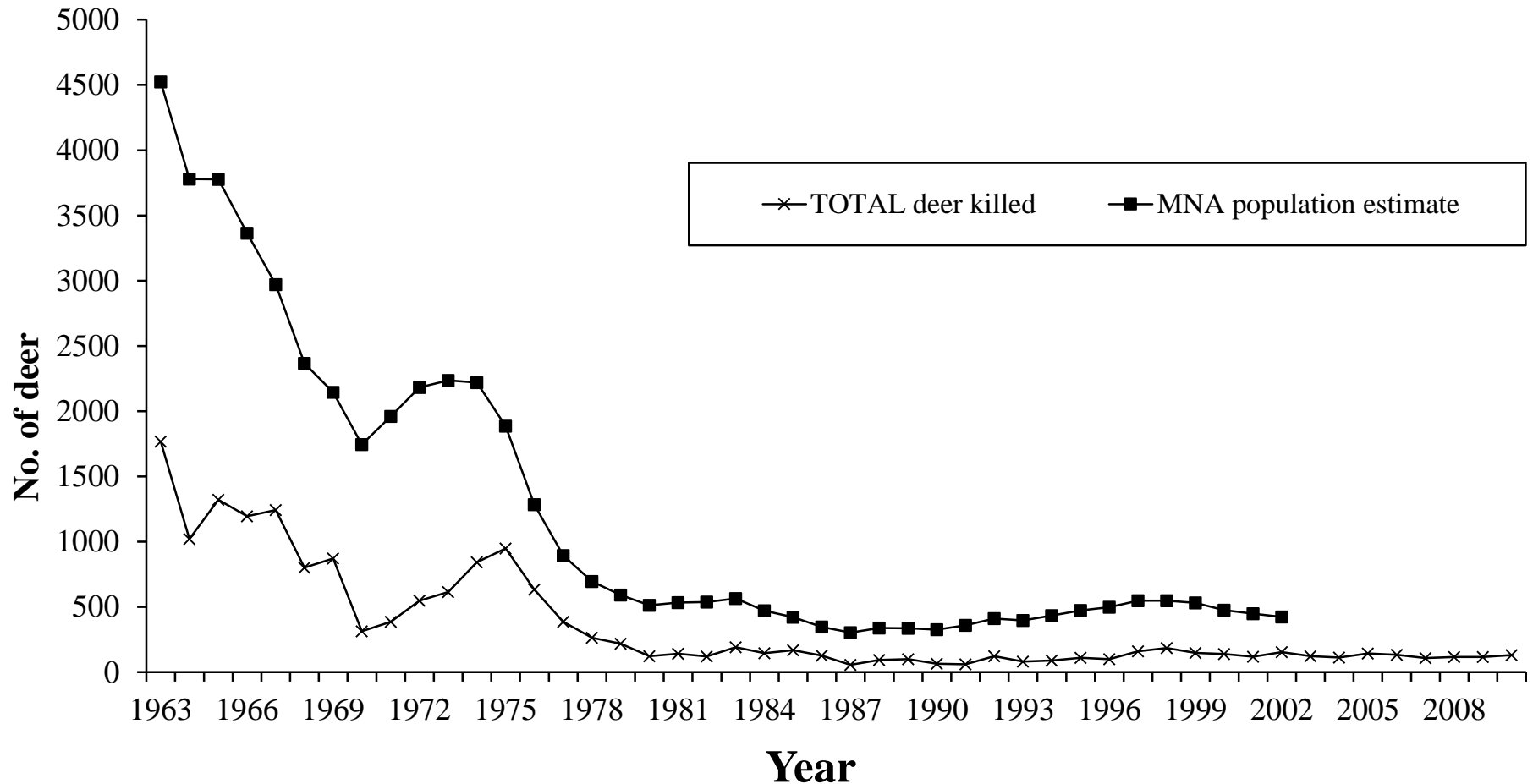


Figure 3. Changes in adult Takahē population size (excluding captive-reared birds) and mean temperature over the 3 coldest months of winter for the Murchison Mountains between 1981 and 1994.

Conservation Biology
Volume 11, No. 3, June 1997

Source: Maxwell, J. M. and Jamieson, I. G. (1997) Survival and recruitment of captive-reared and wild-reared takahē in Fiordland, New Zealand
https://www.otago.ac.nz/threatenedbirdgroup/Publications_files/Maxwell&Jamieson_1997.pdf

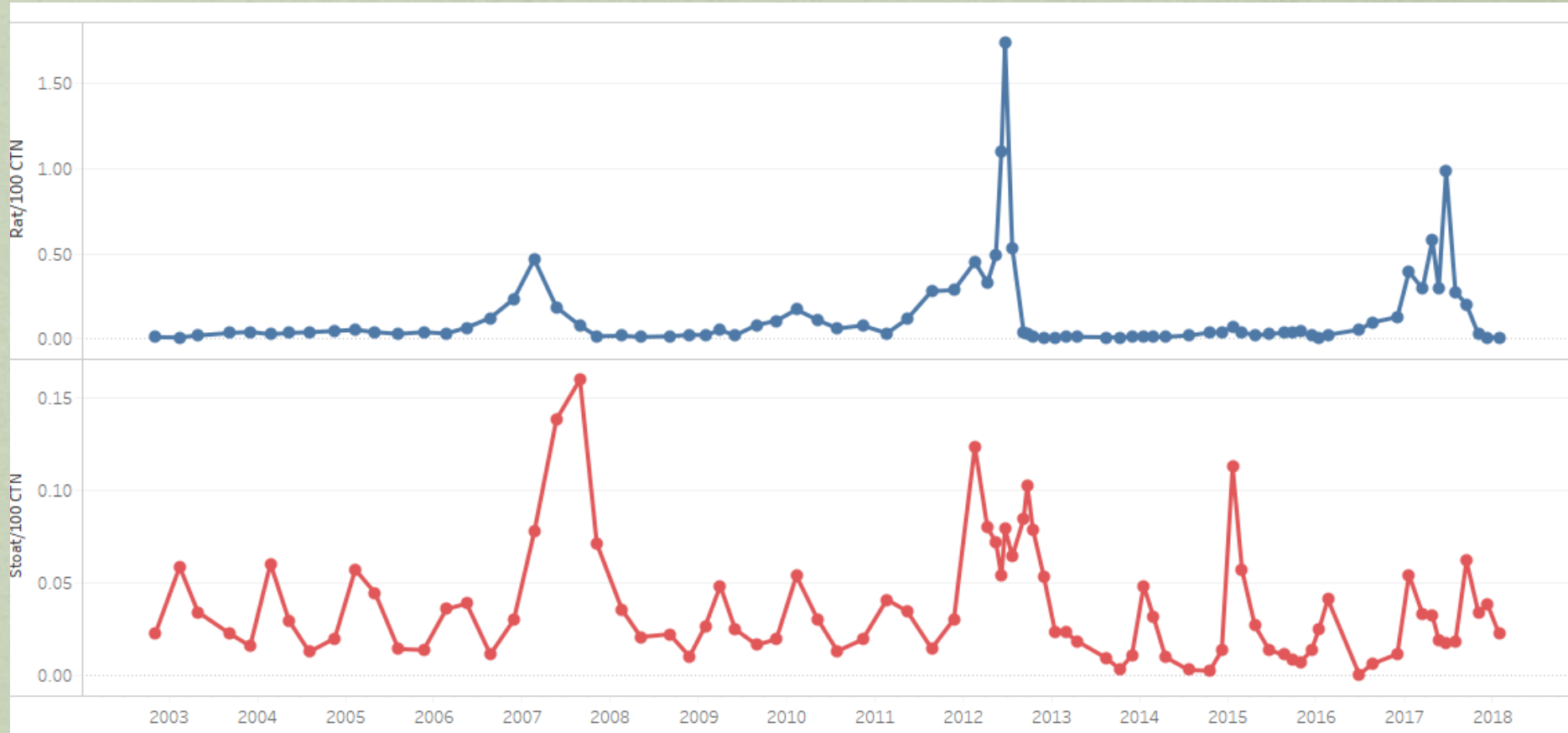
Impact of deer culling operations in the Murchison Mountains



Source: Kill data: Department of Conservation Te Anau Area Office 2012

MNA = Minimum Number Alive, estimate derived from Fraser & Nugent Landcare Research, report number LC 0203/178

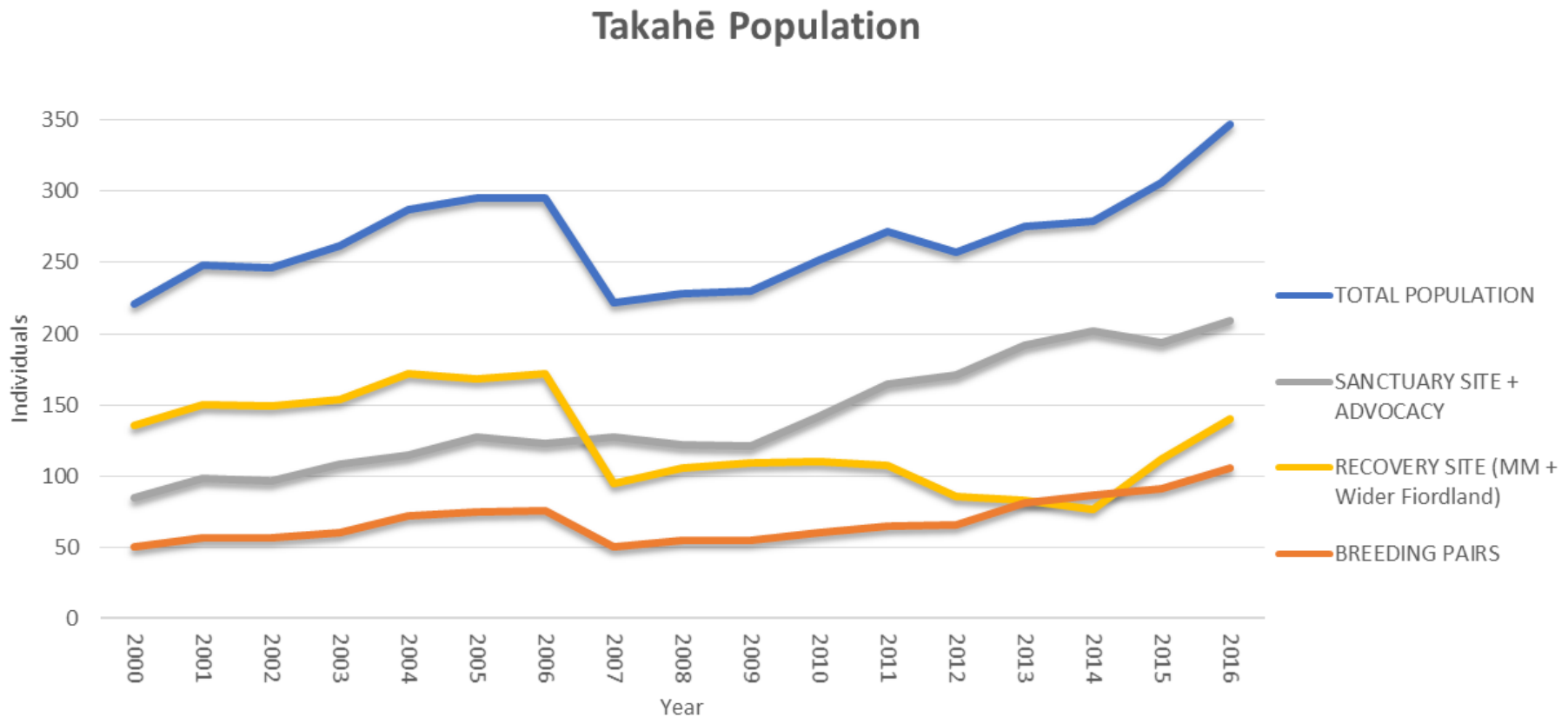
Stoat and rat trap kills



Source: Takahē Recovery Programme – Department of Conservation Te Anau Area Office 2018

/100 CTN = corrected trap nights. A measure of abundance

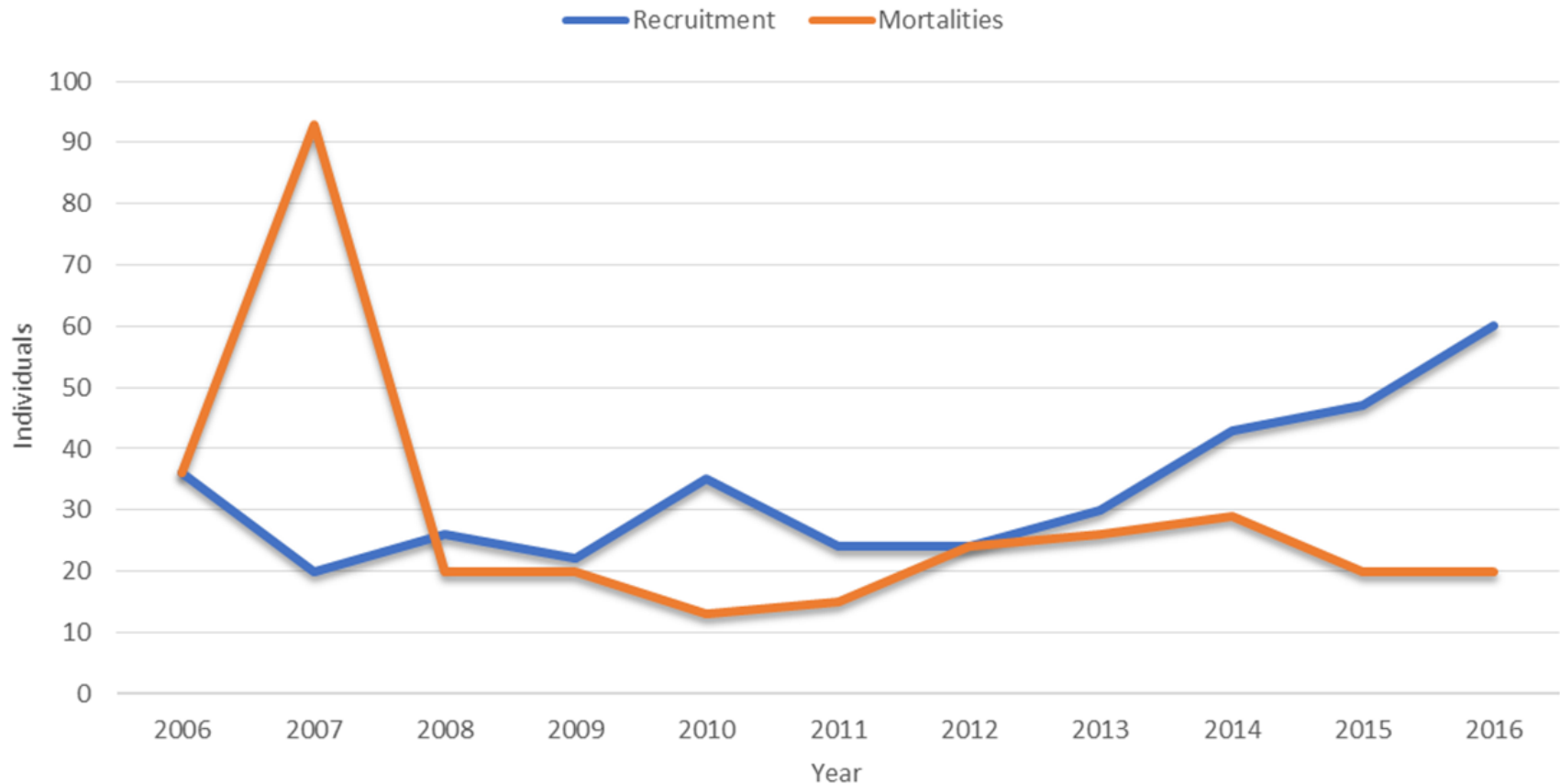
Latest population trends



Source: Takahē Recovery Programme – Department of Conservation Te Anau Area Office 2017

Takahē population recruitment versus mortality

Recruitment vs Mortality



Source: Takahē Recovery Programme – Department of Conservation Te Anau Area Office 2017

Investigate a pattern in an ecological community (M)

Investigate in depth (i.e. Achieved PLUS) means you need to:

- ☐ Give reasons **how or why** the biology of ONE of the chosen species relates to the pattern

Note: The biology involves adaptations related to the environmental factor **and** to an interrelationship with an organism of another species

Important ideas - the biology...

- ☐ Adaptations can be structural, behavioural and / or physiological
- ☐ What are your chosen species' ecological niches?
- ☐ What interrelationships exist in the community?
(including competition, predation and herbivory)



Photo Credit: Steve Attwood



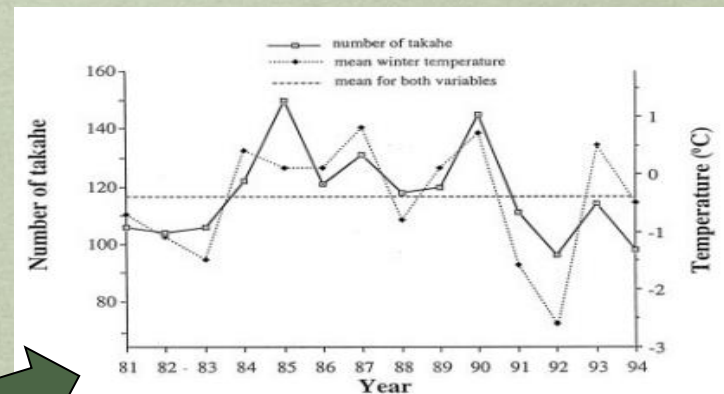
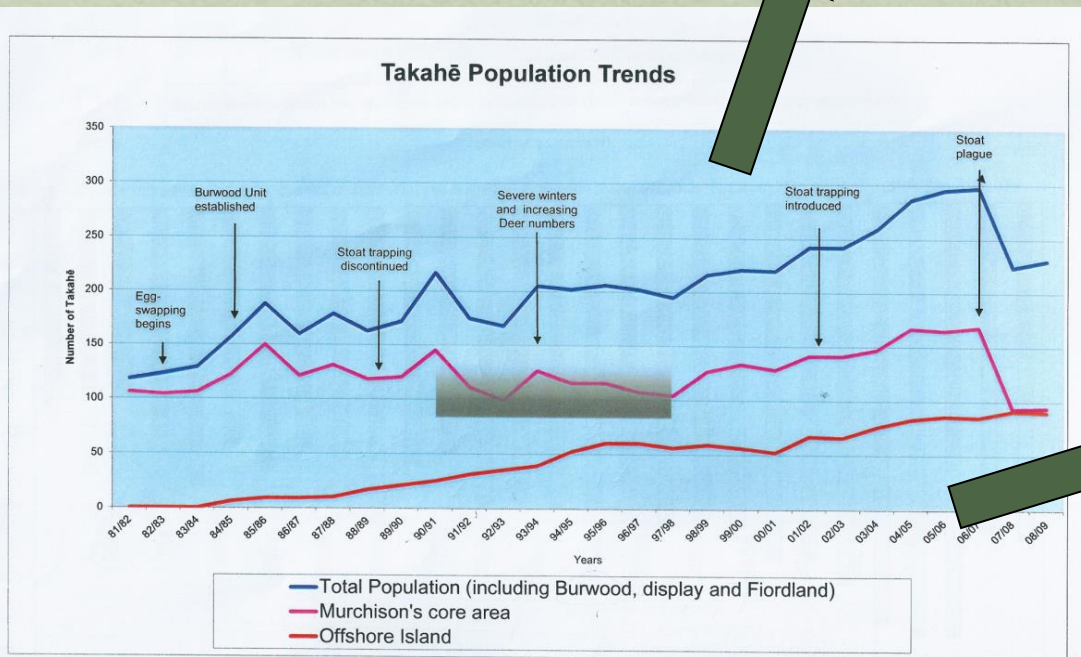
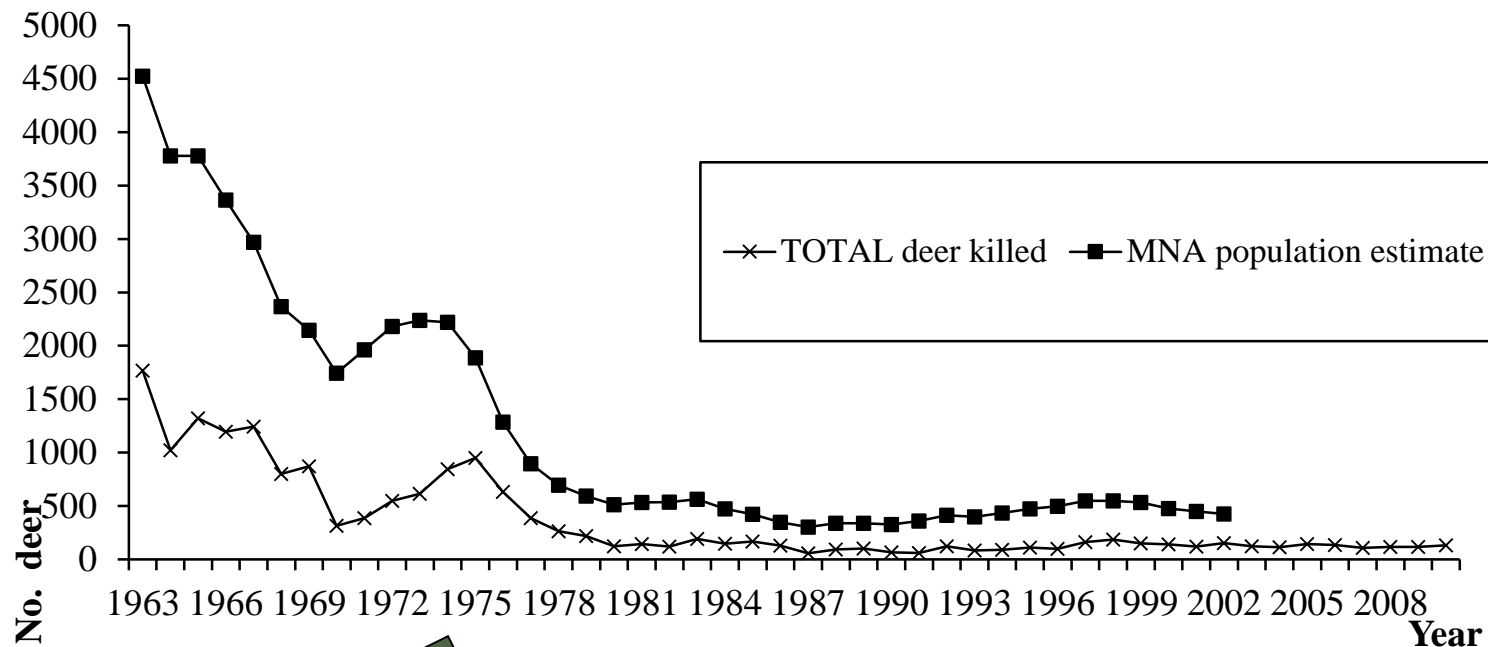
Photo Credit: Gordon Roberts Department of Conservation

Investigate a pattern in an ecological community (E)

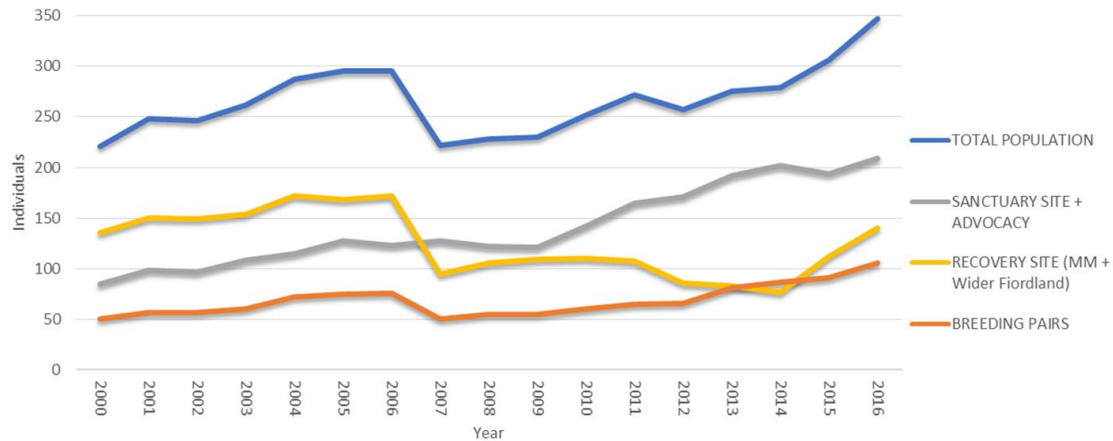
Comprehensively investigate (i.e. Merit PLUS) means you need to be able to:

- ☐ Explain the pattern by using an environmental factor **AND** the biology of interrelated organisms of different species
- ☐ This requires **in-depth analysis** of your data, **comparing and contrasting** data, **evaluating and justifying** your explanations.

How do these graphs relate?

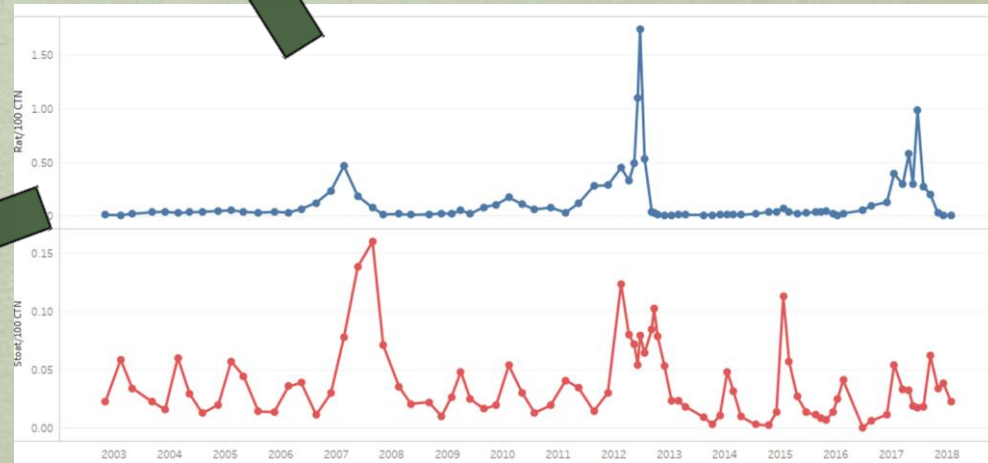
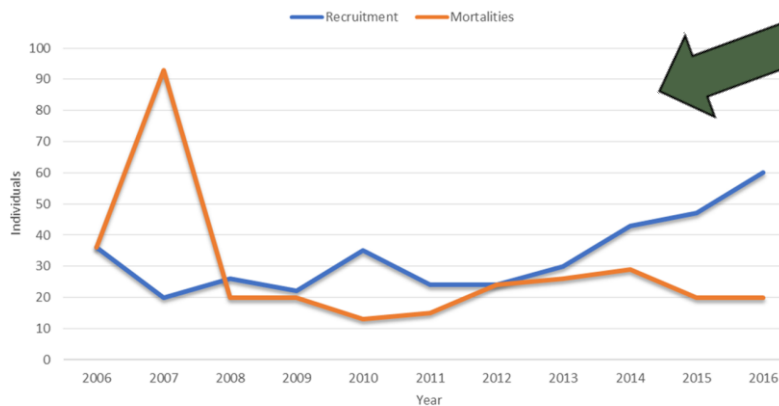


Takahē Population



Or these?
What
correlations
can you see?

Recruitment vs Mortality



Your tasks to complete

- ☐ Analyse the data provided or researched
- ☐ Describe adaptations from your observations
- ☐ Research the biology of your chosen species
- ☐ Look at the interrelationships between the species present in the community/ies you are studying

Food for thought?

“Stoats, avalanches, unforgiving habitat and food of poor nutritional value, in addition to a natural mortality estimated at eight percent per year –little wonder that some ecologists have been questioning whether the takahē belong in the Murchison Mountains at all”

Derek Grezelwski, NZ Geographic (2012)

Extra for experts!



Photo Credit: Sue Lum

- If takahē are naturally found in alpine environments, why are they not normally found at sea level? How do they cope in island environments?
- Why are the off shore island populations not growing exponentially in the absence of predators?
- What factors might limit their potential?

What happens on the islands?

- In island populations, relatively low numbers in a population can mean there is low genetic variation.
- This may lead to inbreeding depression, expressed in infertile eggs, failure to hatch and poor chick survival.
- Low population numbers and endemism make it difficult to increase genetic diversity.



Photo Credit: Sue Lum

How does DOC manage the problems associated with small populations?

- Records are kept for all managed breeding pairs
- Restrictions are made on the 'types' of pairings and the number of offspring from a particular 'line' or parentage
- Birds are translocated around the country to different breeding sites, to 'mix things up'



Photo Credit: Minnie Clark Department of Conservation

Infographics from Takahē recovery Programme

<http://www.doc.govt.nz/our-work/takahe-recovery-programme/takahe-story-visualization/>

Acknowledgments

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- It would not have been possible without the support of the Department of Conservation's Takahē Recovery Programme, and in particular the Te Anau Area Office for their generosity in sharing their time, expertise and resources.
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