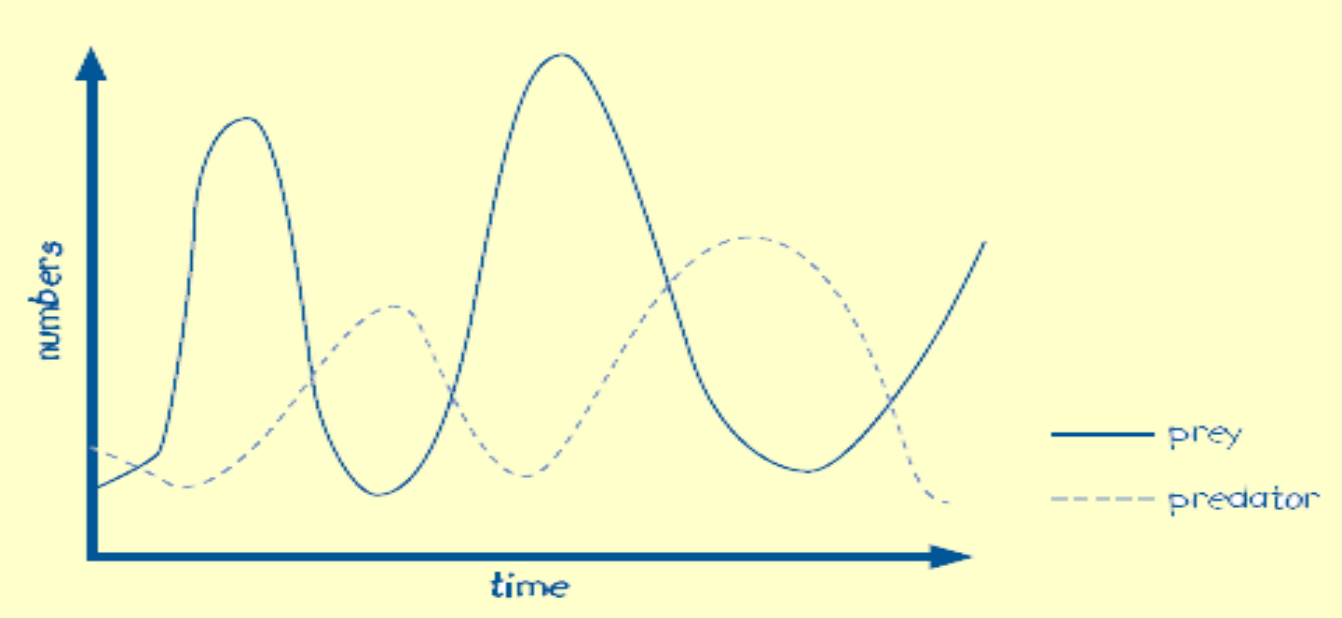
Worksheet 3: Interrelationships in the Murchison Mountains Community

The following sections relate specifically to takahē and their interrelationships within the communities in which they live. Whilst the data and examples used relate to takahē and stoat, these are by no means the only interrelationships. Other interrelationships to explore could include takahē and red deer, red deer and snow tussock, and takahē and snow tussock.

Population Modelling and Predator-Prey Statistics

Background Information

Predator-prey, herbivore-plant, interspecific competition and parasite-host interactions directly affect population numbers in an ecosystem. When the numbers of predator and prey species are plotted on a graph, a cyclical pattern is sometimes identified: predator numbers increase when prey numbers are high, prey are driven to low numbers by predation, predator numbers decline because their prey is scarce, prey numbers increase because of the decline in predator numbers and so the cycle continues. The graph below shows this generalised cycle.



Note: this worksheet has been adapted from 'Takahe – Back from the Brink' Ministry of Education Teacher 'Applications' Series.

The peaks and troughs are often offset because the effects of rising and falling predation take time to show through in prey data. For example, when predator numbers drop, it takes a certain time for the prey to breed and recover in numbers. In attempting to make sense of field data collected during population studies, you need to find out as much as possible about the **biology of all the species involved.**

This includes (but is not limited to):

- *their reproductive cycles* (for example, stoats have a very interesting reproductive system, which allows them to reproduce rapidly when conditions become favourable); food preferences, including how varied and abundant their diet is;
- *their mobility*, including their ability to forage effectively in specific habitats, for example by getting up trees, through tight spaces, through water, and so on – as well as their ability or inability to range quickly over wide territories;
- *their adaptations* for capturing specific prey in specific locations.

Mast Years - Background Information

'Mast years' are a problem for takahē and many other birds that live in or near the South Island beech forests. In a mast year, beeches produce far more seed than usual. All this food causes a breeding boom in rats and mice. Stoats benefit from all the extra rodent prey, and their numbers increase, too. Takahē come under pressure when seed levels and rodent numbers drop back, and the increased stoat population turns to native birds for food.

Mast-year Statistics 2000–2005

Year	Takahē Valley (Fiordland) annual seed fall (seeds/m^2)
2000	5423
2001	37
2002	1719
2003	152
2004	4308
2005	4632

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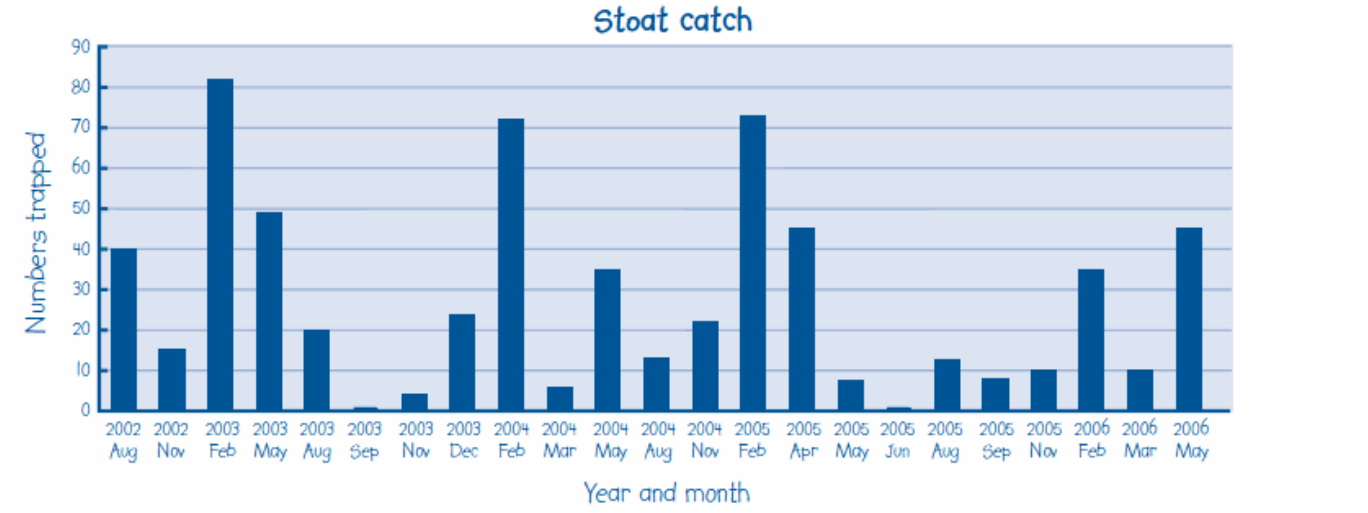

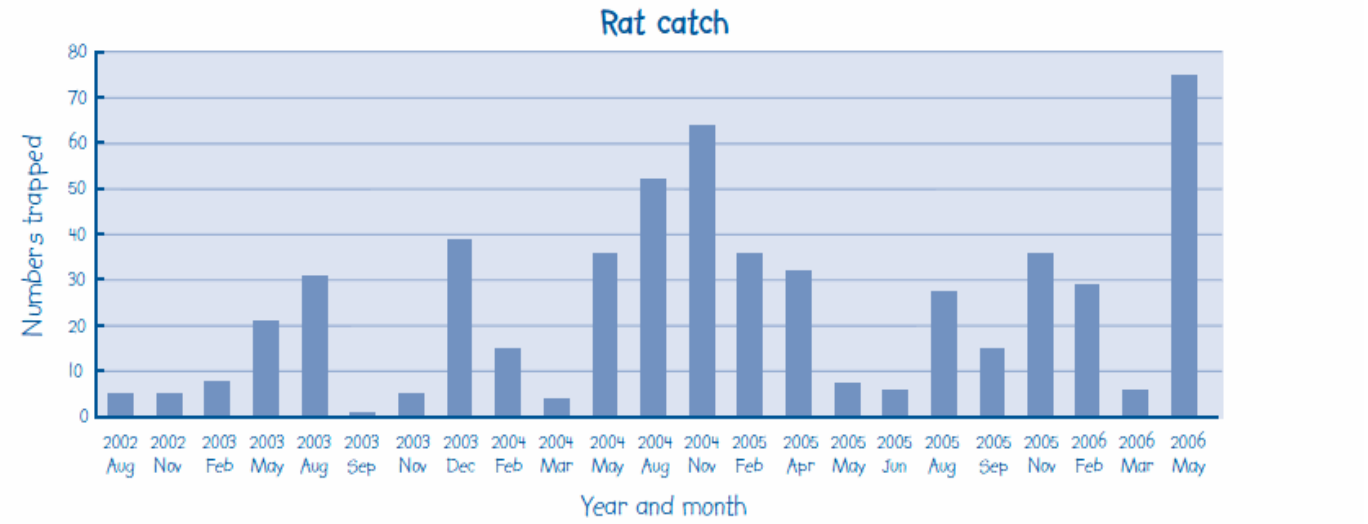

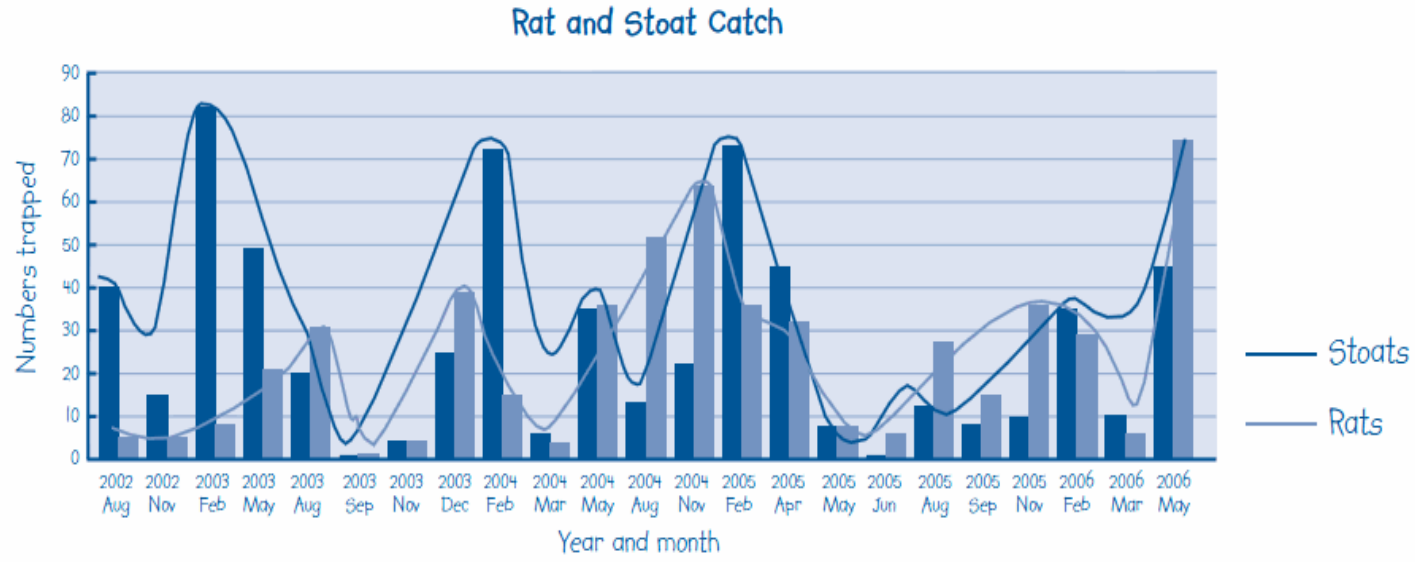

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Ministry of Education Teacher 'Applications' Series.

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Analyse and discuss the data sets shown in the graphs, and table above, either in groups and/or as a whole class.

Can you see any patterns in the rise and fall of rat and stoat numbers?

Is the pattern consistent, or are there some periods in which the changes in rat and stoat numbers don't appear to be linked?

Can you come up with possible explanations for any links you see?

Look at the graph Takahē Population trends on the next page. Your teacher will provide you with a full size copy.

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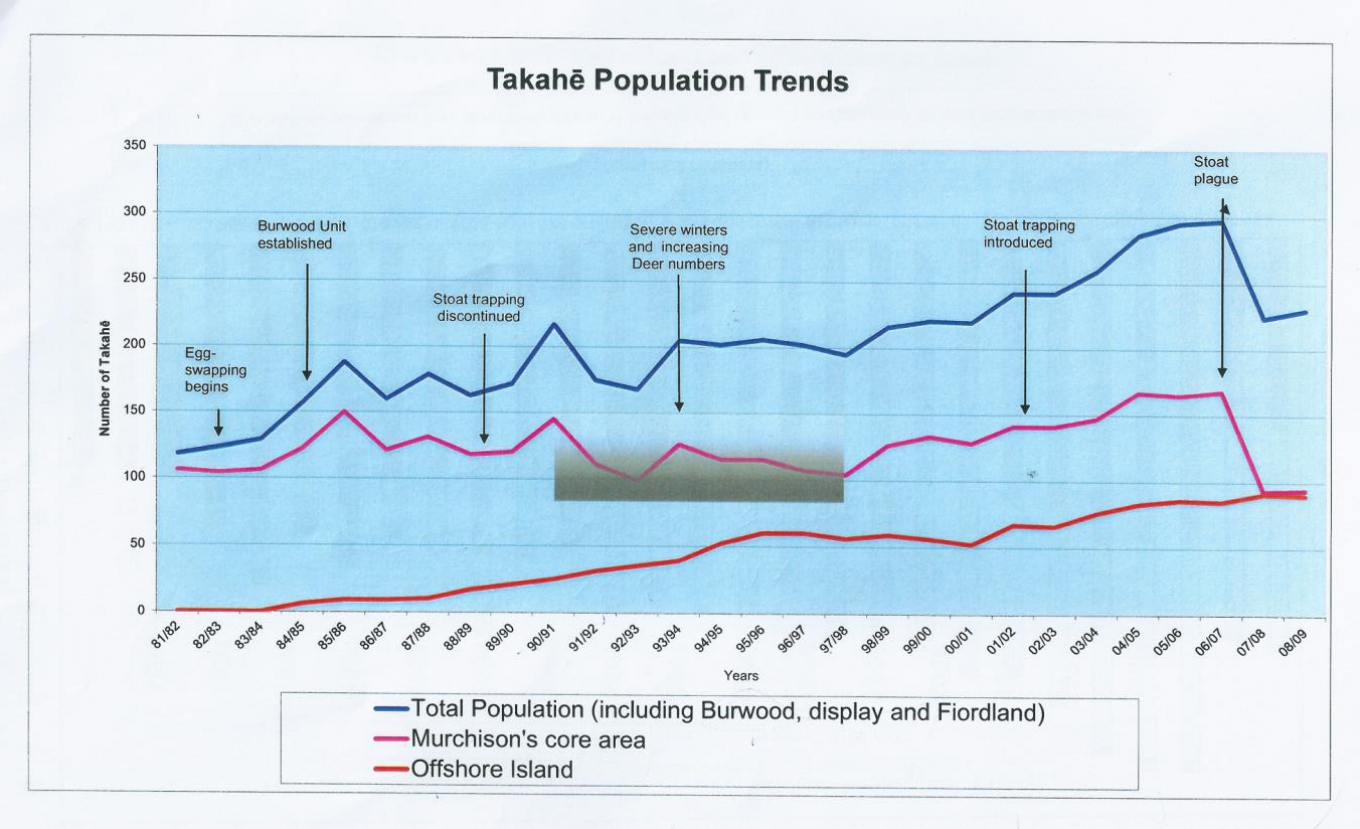

Source: Source: Takahē Recovery programme DOC (Te Anau Area Office) 2012

What disastrous event occurred? What was its effect on the takahē population numbers?

You might decide to research the biology of stoats and rats in order to come up with possible leads about how their interactions might affect takahē.

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You could also gain a more rounded picture by further researching the takahē's terrain. Focus on how varied the habitats are within the territory. Also think about other plant and animal species present, for example, mice, which are seed-eating competitors with rats and alternative prey for stoats.

Think also about how red deer might add to the picture. They are not involved in the mast dynamics, as they don't eat seeds or fall prey to stoats, but they are significant competitors and habitat destroyers where takahē are concerned.

In which months and years would you suggest that takahē might come under particular pressure from stoat predation? Why?

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Note: Given the limited information you have, you are not expected to come up with the scientifically correct answers for all of the above questions, which would be impossible. The point of the exercise is to think creatively, but logically, in order to develop plausible explanations. In a real research context, these explanations could later be tested.

(Note: DOC's NZ Threats Classification System List identifies endemic species that are at risk of extinction and records the level and nature of that risk. This comprehensive register of the conservation status for New Zealand birds was last updated in 2016. See the Department of Conservation.)