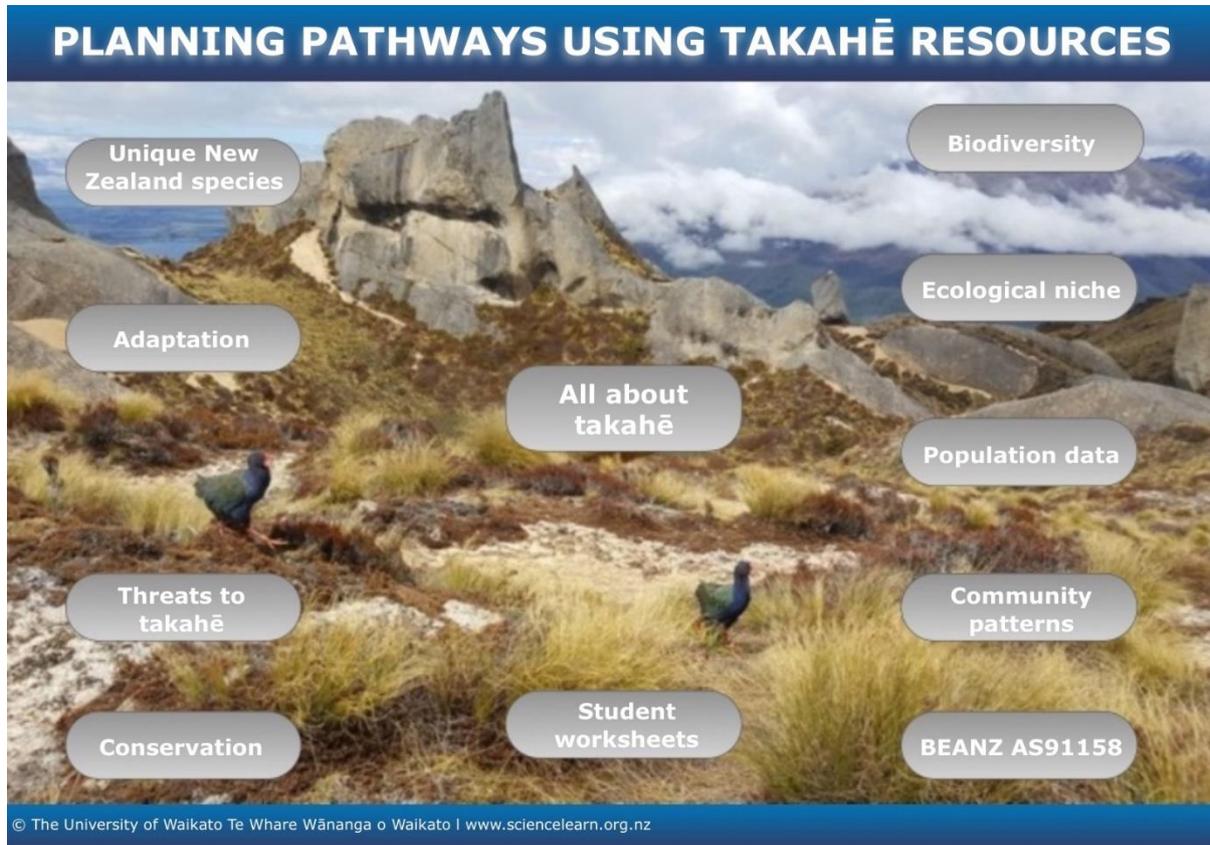


## Planning pathways using takahē resources

These interactive resources are all about takahe as well as supporting year 12 biology assessment AS91158.



This [interactive](#) groups Hub and ZEALANDIA resources into key science and teaching concepts that underpin takahe conservation. It makes use of ZEALANDIA resources designed for learning towards Achievement Standard 91158 Investigate a pattern in an ecological community with supervision. Most of the resources can also be used with a younger audience. If using the [online version](#), click on the labels for links to supporting articles, media, data and student materials.

ACKNOWLEDGEMENT: Background image courtesy of Alison Ballance, Radio New Zealand.

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## Transcript

### Biodiversity

The Murchison Mountains area is a 51,000 hectare peninsula on the western side of Lake Te Anau. Three sides are bordered by the lake, and the fourth side is somewhat protected by its remoteness. It is identified in Aotearoa New Zealand as a specially protected area. The area holds a range of unique flora and fauna. It has a rugged climate and landscape that is home to a number of increasingly rare native birds. Most famous is the takahē, but also present are mohua (yellowhead), whio (blue duck), kea, kākā, kākārīki, kārearea (New Zealand falcon), weka, tuke (rock wren), miromiro (tomtit), tūī, korimako (bellbird), pīwakawaka (fantail), tītipounamu (rifleman), riroriro (grey warbler), pīpipi (brown creeper), tauhou (silvereye), pīhoihoi (pipit) and kiwi.



Ludmila Ruzickova, 123RF Ltd

Related Hub resources:

- [Biodiversity](#) – article
- [Predation of native birds](#) – article
- [Introducing biodiversity](#) – activity
- [Biodiversity battleships](#) – activity
- [Threats to biodiversity](#) – activity

Related ZEALANDIA resource:

- [Compare and contrast takahē vs pūkeko visual organiser worksheet](#) – template for students to examine similarities and differences between pūkeko and takahē

### All about takahē

The takahē is endemic to Aotearoa New Zealand and has adapted to survive in some of our harshest landscapes. Once thought to be extinct, they were rediscovered in small numbers in 1948. Despite incredible conservation success since then, they are still vulnerable. Their survival depends on how we manage and protect the remaining populations and the environment they live in.



Department of Conservation, CC BY 4.0

Related Hub resources:

- [Takahē – an introduction](#) – article
- [The takahē's evolutionary history](#) – article
- [Takahē – question bank](#) – article

Related ZEALANDIA resources:

- [Where have all takahē gone?](#) supports the following learning outcomes:
  - Understand the uniqueness of New Zealand's endemic species.
  - Observe takahē (*Porphyrio hochstetteri*) and make links to adaptations.

- Think about some aspects of interrelationships between species in the communities in which takahē live.
- [Takahē and the Takahē Recovery Programme Fact Sheet](#)

## Ecological niche

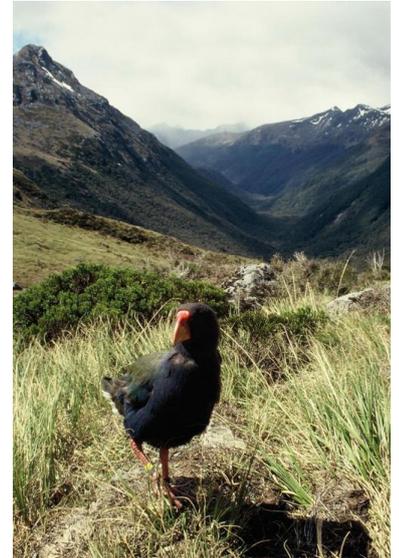
An ecological niche is the role and position a species has in its environment and how the environment supports the species' needs. In their natural alpine habitat, takahē get their food and shelter from alpine grassland species such as snow tussocks, sedges and rushes.

Related Hub resources:

- [Takahē – an introduction](#) – article
- [The takahē's ecological niche](#) – article
- [Abiotic and biotic factors for takahē](#) – activity

Related ZEALANDIA resources:

- [The ecological niche – takahē/habitat/adaptations information sheet](#) – summarising key considerations related to a habitat's physical conditions and resources and an organism's adaptations and interrelationships with other organisms
- [Ecological niche photos](#) – photos of a red deer, stoat, snow tussock and takahē that can be used alongside Ecological niches visual organiser worksheet.
- [Ecological niches visual organiser worksheet](#) – template for students to organise ideas related to habitat and ecological niches of red deer, stoat, snow tussock and takahē



*Chris Rance, Department of Conservation*

## Unique New Zealand species

The takahē is a large, flightless bird – the largest living rail bird in the world. Rails are a family of ground-living birds that live on every continent except Antarctica. Takahē are endemic to Aotearoa New Zealand, which means they naturally live here and nowhere else in the world. Takahē evolved without ground-dwelling predators. Like the kiwi, takahē adapted to this situation by developing a large body size, small wings and strong legs. On average, an adult takahē weighs 2–3.5 kg and stands about 500 mm high. This large body size is an advantage to species that live in cold environments.

Related Hub resources:

- [New Zealand's unique ecology](#) – article
- [Native bird adaptations](#) – article
- [Takahē – an introduction](#) – article
- [The takahē's evolutionary history](#) – article
- [The takahē's ecological niche](#) – article



*Photo by Kane Fleury, Otago Museum, Dunedin*

Related ZEALANDIA resource:

- [Adaptations visual organiser](#) – template for students to organise ideas related to adaptations of red deer, stoat, snow tussock and takahē

Point of interest: The greasy marks on the skeleton are artefacts from the process used to prepare this skeleton for the museum.

## Threats to takahē

New Zealand birds evolved in isolation from natural predators for around 65 million years. When human settlers arrived, changes came rapidly and birds were poorly adapted to withstand threats to their survival. Hunting, loss of habitat and the introduction of predators all had disastrous effects on the state of our native birds, whose numbers declined rapidly.

The Department of Conservation has led many initiatives to reverse this decline. Regardless of the natural population numbers before human arrival, it is clear that we've created a number of threats to the takahē's continued existence.



Red deer by Malgorzata Litkowska, 123RF

Related Hub resources:

- [Threats to takahē](#) – article
- [Takahē conservation efforts](#) – article
- [Protecting native birds](#) – article
- [Threats to biodiversity](#) – activity
- [Population biology](#) – article

Related ZEALANDIA resource:

- [Interrelationships in the Murchison Mountains community](#) – worksheet exploring concepts of population modelling by supporting students to interpret trends in predator/prey and population graphs

## Population data

Collecting quality data to investigate and predict species interrelationships is vital to the decisions made in any conservation strategy, including the recovery of the takahē.

Data collection needs to include other species linked by interrelationships within the communities where takahē live, for example, the interrelationships between takahē and stoats, takahē and red deer, red deer and snow tussock, and takahē and snow tussock.



Alison Ballance, Radio New Zealand

Related Hub resources:

- [Population biology](#) – article
- [Population genetics](#) – article

Related ZEALANDIA resources:

The [worksheets](#) as detailed in the article [Takahē – a context for learning](#) and in this interactive planning pathway, can be used for Biology Achievement Standard 91158. They can also be used as stand-alone resources for learning about takahē biology and conservation.

Data appendices – information for AS91158

1. [Prehistoric distribution of takahē](#) – map
2. [Sightings of takahē in Fiordland \(1987–2008\)](#) – map
3. [Takahē population trends \(1981–2008\)](#) – line graph/Murchison/offshore islands
4. [Impact of temperature on adult takahē \(1981–1994\)](#) – line graph
5. [Impact of deer culling operations in the Murchison Mountains \(1963–2008\)](#) – line graph
6. [Stoat and rat trap kills \(2003–2018\)](#) – line graphs
7. [Latest takahē population trends \(2000–2017\)](#) – line graphs sanctuary/Fiordland
8. [Takahē population growth rate \(2000–2016\)](#) – line graph
9. [Takahē population recruitment versus mortality \(2006–2017\)](#) – line graph
10. [Takahē census results – Murchison Mountains 2014](#) – map
11. [Deer kills and helicopter hunting tracks in the Murchison Mountains](#) – map
12. [Murchison Mountains stoat traps 2019](#) – map
13. [Stoat and rat trap kills \(2006–2016\)](#) – line graph
14. [Relationship between the mean temperature and flowering in \*Chionochloa\* spp \(masting and global warming\)](#) – bar graph
15. [Effect of climate change on masting \*Chionochloa\* \(climate change/masting\)](#) – graphs on temperature and flowering
16. [Additional data from Takahē Recovery Programme \(DOC\) annual report 2017-18](#) – graph and tables
17. [Takahē adult survival in trapped and untrapped areas in the Murchison Mountains](#) – graphs and table

These thinking tools may also be useful:

- [Compare and contrast Murchison Mountains vs offshore islands visual organiser](#) – template for students to organise ideas related to similarities and differences between Murchison Mountains and offshore islands
- [Adaptations visual organiser](#) – template for students to organise ideas related to adaptations of red deer, stoat, snow tussock and takahē
- [Interrelationships in the Murchison Mountains visual organiser](#) – template for students to organise ideas related to the interrelationships between the takahē, stoat and red deer

## Community patterns

In order to plan for the recovery of the takahē population, studies investigating the interactions and interrelationships of takahē populations and the communities they live in are important.

Living parts of an ecosystem are called biotic factors, while the environmental factors that they interact with are called abiotic factors. Because living things both respond to and are influenced by their environment, it is important to study both factors together to get a full picture.

Biological communities are an interacting group of various species in a common location. The composition of a community is often grouped into their feeding or trophic levels – producers or consumers.

Investigating patterns in an ecological community will highlight multiple interrelationships and interactions. Often this is the data that will drive decisions in regard to conservation initiatives. In the case of the takahē, population data about stoats, red deer and snow tussock grass show significant interactions and identify threats.

Related Hub resources:

- [Population biology](#) – article
- [Takahē – a context for learning](#) – article
- [Population genetics](#) – article
- [Abiotic and biotic factors for takahē](#) – activity

Related ZEALANDIA resources:

- [Compare and contrast Murchison Mountains vs offshore islands visual organiser](#) – template for students to organise ideas related to similarities and differences between Murchison Mountains and offshore islands
- [Adaptations visual organiser](#) – template for students to organise ideas related to adaptations of red deer, stoat, snow tussock and takahē
- [Interrelationships in the Murchison Mountains visual organiser](#) – template for students to organise ideas related to the interrelationships between the takahē, stoat and red deer

Image: [South Island Takahē, \*Porphyrio hochstetteri\*](#), collected 11 December 1949, Takahē Valley, Fiordland, New Zealand. Field Collection 1948 - 1966. Te Papa Tongarewa (OR.000546).



Te Papa Tongarewa, CC BY-NC-ND 4.0 1

## Conservation

Takahē once lived throughout Te Waipounamu South Island but were officially declared extinct in 1898. People thought that the takahē had experienced the same fate as the moa and the moho (North Island takahē).

After some detective work and a carefully planned search, takahē were rediscovered in Fiordland's Murchison Mountains in 1948. The location was declared a special area and closed to public access. For more than 65 years, takahē have been a focus of conservation efforts and have pioneered world-recognised conservation techniques.



*Photo courtesy of the Orbell family*

There have been four national recovery plans in place for takahē. The main objective of the fourth plan (2007–2012) was to increase the takahē population by 25%. The current national Takahē Recovery Programme (2012–2026) is guided by the following aims: increase the population growth rate to greater than 5% per year; a minimum of 90 breeding pairs at secure sites; maintain the Murchison Mountains as a key habitat for takahē; establish at least one new recovery site; and share the story of the takahē as a conservation icon.

Related Hub resources:

- [Takahē conservation efforts](#) – article
- [Threats to takahē](#) – article
- [Protecting New Zealand's treasures](#) – article
- [Captive management for conservation](#) – article
- [Conservation rankings](#) – article
- [Conservation ranking in action](#) – activity
- [Ethics in bird conservation](#) – activity

Related ZEALANDIA resources:

- [Management options for the continued survival of takahē](#) – template for students to organise ideas related to the advantages and disadvantages of various management options for takahē
- [Takahē Recovery Plan 2007 to 2012](#) – worksheet to help students interpret information from the [Takahē Recovery Plan](#)

[Can we make New Zealand pest-free?](#) introduces a comprehensive suite of resources by ZEALANDIA supporting schools to explore New Zealand's pest-free vision.

## Student worksheets

ZEALANDIA has produced a series of worksheets for a unit 'Where have all the takahē gone?' The worksheets support senior biology and are specifically designed for learning towards Achievement Standard 91158 Investigate a pattern in an ecological community with supervision.

Many of the materials can be used as stand-alone resources for learning about takahē biology and conservation. Links to many of the other resources, including additional student thinking tools, can be found in the article [Takahē – a context for learning](#) or throughout this interactive planning pathway.

ZEALANDIA's student worksheets:

- [Biodiversity in New Zealand](#) This worksheet supports students' understanding of New Zealand's biodiversity. It highlights biological definitions, predator-prey relationships, flightlessness and the impact of humans.
- [Takahē at ZEALANDIA](#) This worksheet supports students when they visit ZEALANDIA to find out more about takahē. It also could be used when visiting any sanctuary that has takahē.
- [Interrelationships in the Murchison Mountains community](#) This worksheet explores concepts of population modelling by supporting students to interpret trends in predator/prey and population graphs.
- [Takahē Recovery Plan 2007 to 2012](#) This worksheet helps students interpret information from the 2007–2012 [Takahē Recovery Plan](#).
- [The demography of takahē](#) This worksheet uses the article [Demography of takahe \(\*Porphyrio hochstetteri\*\) in Fiordland: environmental factors and management affect survival and breeding success](#) by Hegg et al. and the Stuff article [Stoats decimating takahe in Fiordland](#) to explore challenges faced by takahē.
- [Stoats and takahē](#) This worksheet uses information from the Stuff article [Stoats decimating takahē in Fiordland](#), the map in [Sightings of takahē in Fiordland \(1987–2008\)](#) and the graphs in [Takahē adult survival in the Murchison Mountains in both trapped and untrapped areas](#) to look at interrelationships between stoats and takahē.
- [Interspecific relationships impacting takahē](#) This worksheet supports students to record and sort information about interspecific relationships impacting takahē.
- [Takahē video review template](#) This worksheet supports students to record and sort ideas while watching the video documentary [Project Takahē](#).
- [Milestone checkpoints for AS91158](#) A checklist and list of resources for students working towards AS91158.
- [Final help sheet for AS91158](#) An in-depth help sheet with notes for students working towards AS91158.
- [Resource dot jot sheets for evaluating research](#) This is a generic worksheet for recording and evaluating information from sources like newspapers or websites.



*Alison Ballance, Radio New Zealand*

[Evaluating data recording sheets](#) This worksheet, looking at data, is for recording source information, explaining data and recording ideas from others.

## Adaptation

Adaptation is an evolutionary process whereby a species becomes increasingly well suited to living and successfully breeding in a particular habitat. These are changes that usually occur over many, many generations. Scientists categorise adaptations into three types – structural (or morphological), behavioural and physiological.

Takahē have adapted to living on the forest edge and in the open tussock plains. They have vestigial wings and cannot fly. They have evolved a larger body size with short, thick-set legs. Takahē have strong beaks that can strip the high nutrient food off the tussock grasses and not create lasting damage to the plant. They have a large range and are territorial.



Martin Sanders

### Related Hub resources

- [Native bird adaptations](#) – article
- [Takahē – an introduction](#) – article
- [The takahē's evolutionary history](#) – article
- [The takahē's ecological niche](#) – article
- [Population genetics](#) – article
- [Population biology](#) – article
- [Takahē – a context for learning](#) – article

### Related ZEALANDIA resource:

- [Adaptations visual organiser](#) – template for students to organise ideas related to adaptations of red deer, stoat, snow tussock and takahē

## BEANZ AS91158

ZEALANDIA in collaboration with the Department of Conservation's Takahē Recovery Programme has produced a set of resources tailored to support senior biology, in particular Biology 2.6 Achievement Standard 91158 Investigate a pattern in an ecological community, with supervision.

- [Suggested teaching programme for year 12 ecology - Where have all the takahē gone?](#) – This outline is a suggested approach for teachers using the ZEALANDIA resources that covers key ecological concepts along with supporting content, resources, learning activities, assessment ideas and vocabulary. Links to the related resources can be found in the article [Takahē – a context for learning](#).
- [Student introduction to task AS91158 – Where have all the takahē gone?](#) – This information sheet describes what students will investigate in relation to the plight of the takahē and assessment requirements.



Biology Educators Association of New Zealand

- Assessment materials (QAAMed), including marking scheme, assessment schedule, rubric and student exemplars can be found on the [BEANZ](#) (Biology Educators Association of New Zealand) website.
- BEANZ has assisted in getting the assessment materials QAAMed. Use of Quality Assured Assessment Materials (QAAM) means biology educators can be confident in their use as they are approved quality assessments.