

New Zealand

FROGS

Pepeketua



By Rachael Goddard

CONTENTS

What are Amphibians?	2
Cane toads	3
The Giant Frog	5
Frogs in New Zealand	6
What's with the weird names?	12
Biology and life cycles	13
What they eat	14
Extinction	16
Frog identification	18
Research	20
Looking after frogs	22
Froggy cousins	23
Question and answer time	25
Jokes	25
Quiz	26
Glossary	28
Acknowledgements	29

Illustrations by Monica Peters.

Photographs by Professor Phil Bishop, Nga Manu Images,
Cheryl Reynolds, Kara Goddard and Rachael Goddard.



ISBN: 978-0-473-30459-1

Printed in New Zealand by Waikato Print on Colotech Silk, made from FSC mix credit pulp and recycled waste. Manufactured in a totally elementary chlorine free process.

HI, I'M
TAHI
TADPOLE!



WHAT ARE AMPHIBIANS?

Amphibians (am-fib-ee-ans) are animals that live on land and in the water. They are divided into three groups: frogs and toads, newts and salamanders, and caecilians (si-silly-ans). They are all cold blooded, have no hair, and can breathe through their nose as well as their skin.

Salamanders and newts are amphibians with tails, and look a bit like lizards. Caecilians have no legs or limbs and look a bit like worms or snakes.

Amphibians are vertebrates, which means they have a backbone. (Invertebrates, like worms, do not have a backbone.)

FREAKY FACT

The first amphibians appeared on the earth 360 million years ago having evolved from fish.



Frogs have been around for a very long time. They were the first vertebrates to develop webbed feet.



Common frogs are different from toads because they are more active, and are usually found near water. They also have smooth skin and fully webbed feet. Toads are a bit slower, live in drier places and have warty skin and less webbing on their feet.

CANE TOADS

In New Zealand we don't have toads, but poisonous cane toads have sneaked into New Zealand a few times in travellers' luggage and boots!



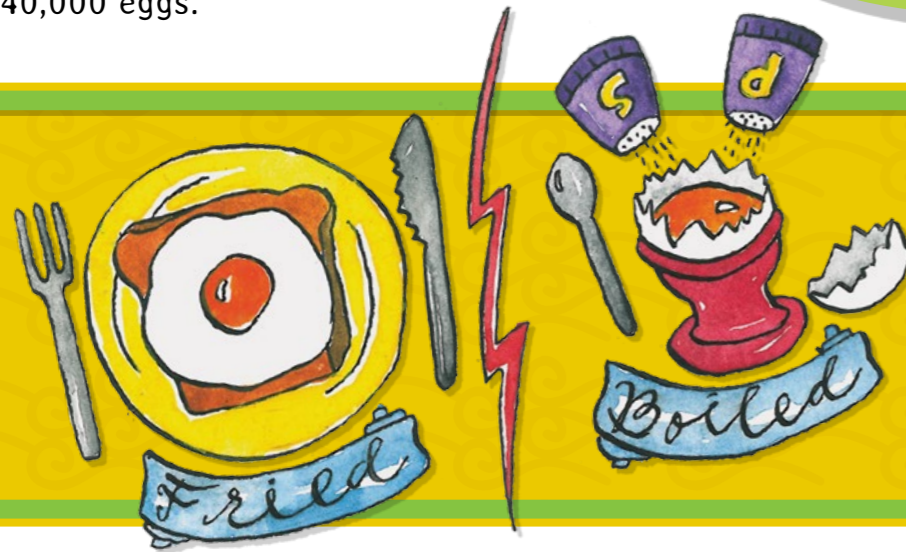
FREAKY FACT

There are over 7,300 species of amphibians in the world. About 6,500 are frogs and toads.

Cane toads have warty skin and glands on each shoulder. They can grow up to 15 centimetres long and are usually olive-brown to reddish-brown on their backs, with a brown flecked, pale white or yellowish belly.



Cane toads can live for more than 16 years and breed twice a year laying up to 40,000 eggs.



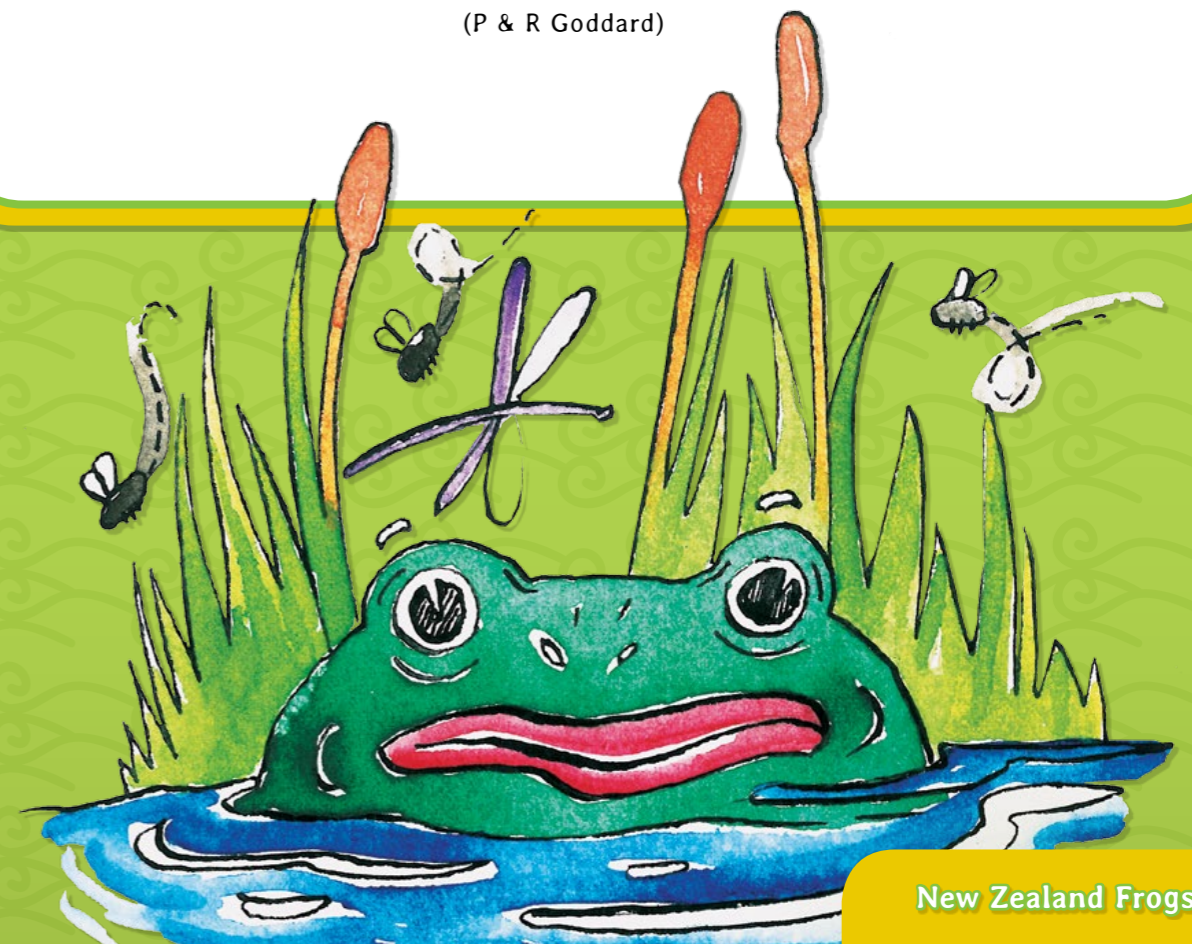
Cane toads are poisonous to humans and animals. When they become annoyed they produce a sticky white poison that can cause your eyes to sting. Even worse, your heart can slow down if you lick the cane toad! Some animals, such as pigs, dogs and cats, have been known to die after eating a cane toad. So don't go kissing toads!



THE GIANT FROG

The frog in the duck pond's a whopper
With huge goggling eyes like a car
He jumps like a giant grasshopper
Only higher and three times as far
He squatted on the edge of the water
I think he was having a poo
His great black round eyes bulged up at me
He was using the pond as his loo!
He looked all clammy and slimy
Like his skin was all covered in grease
And his mouth was as big as a dustbin
But I don't think he had any teeth
I wondered how long he'd stay still for
With one sudden leap he was gone
And all that was left of my frog friend
Were the ripples he made in the pond!

(P & R Goddard)



FROGS IN NEW ZEALAND: PEPEKETUA

Before we get onto our very own special rare frogs, let's have a look at some visitors who have moved here.

We have three introduced colourful Australian frogs in New Zealand. The first is the green and golden bell frog *Litoria aurea*. These guys are smooth and green with some gold spots.



The southern bell frog *Litoria raniformis* is a warty green and gold frog with a green mid-stripe.



The brown tree frog *Litoria ewingii* is from Tasmania. The sound they make is a bit like a cricket chirping.



These Aussie guys can lay between 300 and 5,000 eggs. The egg hatches into a tadpole and lives underwater. When the tadpole develops legs, the tail is reshaped into the body to help turn the tadpole into a frog.



LET'S TALK
ABOUT MY
WHĀNAU...



Our native frogs are all rare and are known as living fossils because they haven't changed much over millions of years.

The ancient ancestors of our native frogs have been in New Zealand for 80 million years. They were thought to have walked, not hopped!

New Zealand has four tiny native frogs; the Archey's frog *Leiopelma archeyi*, Hamilton's frog *Leiopelma hamiltoni*, Hochstetter's frog *Leiopelma hochstetteri*, and the Maud Island frog *Leiopelma pakeka*.

The Archey's frog is the smallest of them all. This guy is tiny – not much bigger than a \$2 coin. The Hochstetter and Maud Island frogs are slightly bigger, around 48mm, and the Hamilton frog ranges from 43-50mm.



Archey's frog
Leiopelma archeyi



Hamilton's frog
Leiopelma hamiltoni



Hochstetter's frog
Leiopelma hochstetteri



Maud Island frog
Leiopelma pakeka



All our native frogs are very well camouflaged with brown (or sometimes green or red) blotches so that they blend in well with the rocks and leaves.

**THERE'S A
FROG HERE
SOMEWHERE**

Our native frogs are not found in gardens or ponds. They are only found in damp, quiet, native bush habitats, and sometimes near streams in pine forests. Introduced frogs can be found in New Zealand gardens, if there is a pond and shelter for them.



HOCHSTETTER'S FROG

- Only found in the northern half of the North Island and Great Barrier Island
- Up to 48mm long
- No eardrum
- Dark brown and well-camouflaged
- Nocturnal
- Webbed feet
- Has a tadpole phase



HAMILTON'S FROG

- Only found in the Marlborough Sounds on Stephens Island
- One of the rarest frogs in the world
- No eardrum
- No tadpole stage
- Male sometimes carries offspring on his back
- Nocturnal
- Doesn't croak



ARCHEY'S FROG

- Only found in Coromandel and Te Kuiti at high altitudes
- 30-37mm long
- No eardrum
- No tadpole stage
- Male sometimes carries offspring on his back
- Nocturnal
- Doesn't croak
- Light to dark brown with blotches
- The Archey's frog is the most endangered



MAUD ISLAND FROG

- Found in Marlborough Sounds, Motuara and Maud Islands
- No eardrum
- No tadpole stage
- Male sometimes carries offspring on his back
- Nocturnal
- Doesn't croak



BIOLOGY AND LIFE CYCLES

New Zealand native frogs usually lay their eggs on land (under a rock or a piece of wood), whilst the introduced species tend to lay theirs in a pond.

Introduced frogs like the Australian green and golden bell frog can lay between 300 and 5,000 eggs in the spring. In summer the eggs hatch into tadpoles and they spend four months in a pond or stream before metamorphosing (changing) into an amphibious frog.

Three of our native frog species are unique as they do not have a tadpole stage. The adult frogs lay eggs and the young frogs develop inside the egg sac. Then, after hatching, the young climb onto their father's back to complete the last weeks of metamorphosis.

Our fourth native Hochstetter's frog is different. These frogs lay eggs near a stream and hatch into tadpoles. They do not climb onto Dad's back for a free ride!



WHAT'S WITH THE WEIRD NAMES?

All known living things (fungi, algae, animals, plants and bacteria) have Latin names. Our native frogs were named after the people who found them, or the places where they were found.

The Latin names *in italics* are used to help identify plants and animals all over the world, as the common names given to some may be different in each country. For example the 'cabbage tree' in New Zealand isn't anything like a cabbage, and although other countries use the name 'cabbage tree' it is for a completely different plant.

The naming system is called scientific classification, or the binomial classification system. The first name is the genus and starts with a capital letter. The second name is the species and starts in lower case. The Latin names are written in italics or underlined.

Some organisms are named after the person who found them, like the Hochstetter's frog *Leiopelma hochstetteri* which was found by the Austrian geologist Ferdinand von Hochstetter. Other examples are the tree *Pseudopanax lessonii* named after Pierre Lesson, surgeon and botanist, and *Astelia banksii* named after Sir Joseph Banks, the botanist on Captain Cook's ship.



New Zealand native frogs do not have webbing between their toes – the Hochstetter's frog is only partially webbed.

They don't hear very well and don't croak like other frogs. They make a little squeaking noise instead when they are wounded or annoyed.

SPEAK UP, YOU SOUND AS THOUGH YOU HAVE A FROG IN YOUR THROAT



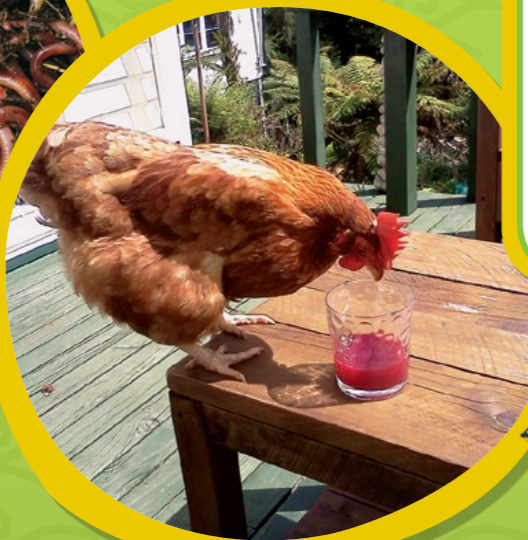
WHAT THEY EAT

Frogs eat all sorts of invertebrates, (invertebrates means no backbone) like flies, slaters, slugs, beetles, bugs and worms, preferably alive!



Chickens are not invertebrates, which reminds me to tell you a funny joke later...

DON'T EVER call me SPINELESS!



Bell frogs are mainly diurnal feeders. This means they feed during the day. They eat grasshoppers, crickets, cockroaches, flies and even small frogs and tadpoles!

DON'T EVEN THINK ABOUT IT!



NZ FROGGY FACTS

There are four species of native frogs in New Zealand.

Frogs breathe through their nose as well as their skin.

Native frogs do not have a tadpole phase, except the Hochstetter's.

New Zealand frogs do not have webbed feet.

Frogs do not have real teeth, just ridge-like cones.

EXTINCTION

All of our native frogs in New Zealand are the most primitive frogs in the world, and all of our frogs are rare.

All four species of our frogs are listed internationally as species that have urgent conservation status. Our Hochstetter's and Maud Island frogs are listed as vulnerable. The Hamilton frog is endangered, and the poor Archey's frog is critically endangered.

Around 2,000 years ago New Zealand had seven species of native frogs, but three have become extinct since the arrival of humans and rats.



There are a scary number of extinctions of many species of amphibians. Thirty-five species become extinct every year around the world. In Australia, 15 species of frogs have not been seen since the early 1980s. Some have disappeared in just the past two or three years. In fact, more than one in three of all amphibians are threatened.



HEY!
look after
me
Please!



IN NZ WE ARE LOSING FROGS BECAUSE OF:

- Introduced predators such as rats, ferrets, hedgehogs, stoats and cats. Even fish are predators. The introduced mosquito fish eats tadpoles and frog eggs.
- Habitat modification (humans knocking down bush and clearing land).
- Toxic chemicals in the environment from spills, fertilisers from agriculture, sprays from horticulture, as well as herbicides sprayed near waterways.
- Increased UV radiation from the sun and damage to the ozone layer. UV radiation damages the frogs' DNA causing cell mutations and death.
- The lethal amphibian chytrid fungus, which has been spread around the world by human activities.



The amphibian chytrid (kit-rid) fungus is a yucky thing which invades the frog through its skin and grows by feeding on the skin cells. This fungus has caused the extinction of some frogs and has hit our Archey's frog badly in the Coromandel. The Archey's frog is now critically endangered. This means that it is at risk of extinction.

Some of our frogs, such as the Hamilton's frog have been placed on other islands, so if disease or fire wipes out one population there will be survivors elsewhere.

Frogs are sensitive environmental indicators. They tell us about the quality of the environment.



FROG IDENTIFICATION

The three Aussie frog species in New Zealand make loud calls around ponds to attract females and protect male territories. These species belong to the genus *Litoria* and are easy to spot from our native protected species (*Leiopelma*), which are rare, silent and live in undisturbed native bush.

The key below helps identify frogs. Each question has two options and you must decide which option to follow. The number at the end of each option tells you which question to go to next. Continue to follow the correct option for your frog and you will eventually arrive at the correct identification.

FROG IDENTIFICATION KEY:

1. Frog produces a loud mating call – go to question 5. Frog does not produce a loud mating call – go to question 2.
2. Frog has an obvious external eardrum – go to question 7. Frog has no external eardrum – go to question 3.

DON'T YOU
KNOW WHO
I AM!



3. Frog from nose to rear is larger than 60mm – go to question 9. Frog is less than 50mm – go to question 4.
4. Frog has the ends of its toes or fingers expanded into pads or suckers – go to question 7.
Frog does not have suckers on its fingers or toes – *Leiopelma* species
Note: These frogs are protected by law, please do not capture or disturb them. Note their exact position and pass this information on to the Department of Conservation.
5. The call is a set of harsh grunts or groans – go to question 6.
The call is a cricket-like trilled creak or whistle – *Litoria ewingii* (the brown tree frog).
6. The call is set of simple harsh croaks – *Litoria raniformis* (the southern bell frog).
The call is a long, descending three-syllabled drone – *Litoria aurea* (the green and golden bell frog).
7. The frog is in the genus *Litoria*, use the following questions to determine which species it is. Frog has a distinct green or pale stripe down the mid-line of its back – *Litoria raniformis* (the southern bell frog).
Frog does not have a distinct line down its back – go to question 8.
8. Frog has pads on the ends of its fingers that look like swollen finger tips. It is small (<60mm), with an overall brown back, usually with a broad dark stripe from the nostril, through the eye to the armpit, and has orange thighs – *Litoria ewingii* (the brown tree frog).
Frog has slightly-to-poorly-developed toe or finger pads, it usually has an overall green colouration with a silver or white stripe or ridge running from eye to groin area and blue thighs. Adults can be quite large (>70mm) – go to question 9.
9. Frog has many prominent bumps or warts on its back and very poorly developed toe or finger pads – *Litoria raniformis* (the southern bell frog).
Frog has a very smooth back, with expanded tips to its fingers and toes which are one and a half times wider than toes or fingers – *Litoria aurea* (the green and golden bell frog).



THANKS PROFESSOR PHIL BISHOP, OTAGO UNIVERSITY

RESEARCH

Lots of people research and monitor frogs in New Zealand: many of our universities; Auckland Zoo; Hamilton Zoo; Department of Conservation; Landcare Research; NZ Herpetological Society; some consultants; scientists; and loads of students too.

Oh!
Does that make me a
HERPETON?



HERPETOLOGY

Herpetology is not a disease, it is the study of amphibians and reptiles. It comes from the Greek word herpeton meaning crawling things. A herpetologist studies amphibians and reptiles.

A DAY WITH A HERPETOLOGIST

So
what's your
DAY Like with
frogs?

TAHI TADPOLE
INTERVIEWS
PROFESSOR
PHIL BISHOP

TAHI: SO PROFESSOR B, WHAT'S YOUR DAY LIKE WITH FROGS?

The day begins with 'the rounds'. There are more than 100 frogs in captivity, so it can take some time to see them all! Today is a little different, as HZQ5 – a female Archey's frog, diagnosed with the terrible chytrid fungus six years ago, is now looking a little unwell. When frogs are sick, they sometimes sit around and mope. HZQ5 has been moping for a week, so she gets put into a lovely bath of calcium gluconate (a chemical) for an hour and then she is dried off with a paper towel and given her antibiotics, which are dropped onto her skin and she absorbs them. She might just be getting old, only time will tell.



Professor Phil Bishop
(pictured right)

The other frogs are all doing well. Some hide away by burying in the soil and leaves, some jump out at you asking for more food, and some just sit there, not moping, but staying still and thinking that you can't see them! After lunch, I go on a field trip to survey the streams in Orokonui Ecosanctuary. We are hoping to find streams that are suitable for some Hochstetter's frogs. If we need to rescue them from their natural habitats in North Island forests that are being felled or destroyed by road construction, we will be ready to put them in a safe and suitable place immediately.

Finally, after a long day, I return to my house and spend a bit of time with my Japanese fire-bellied newt called "Freddy" and a rescued southern bell frog called "Nelson" who lost his eye in a fight with a cat.

LOOKING AFTER FROGS

The frogs that you might catch in a stream or pond are either the Aussie green and golden bell frog, or the southern bell frog. It is neat watching tadpoles turning into frogs.

YEAH OBVIOUSLY



Do not release pet frogs anywhere in New Zealand. The amphibian chytrid fungus is affecting native frogs – do not allow it to spread further!



If you want to keep frogs at home, they will need fresh water, ventilation (fresh air), and things to hide under such as bark and stones. They will eat lots of live things including worms, crickets, flies, spiders and moths. However, they don't like the taste of slaters or green shield bugs.

Our native frogs are protected. If you ever happen to stumble across any: **DO NOT MOVE THESE FROGS.**

Report the location to the Department of Conservation
www.doc.govt.nz
or the New Zealand Frog Research Group
www.nzfrogs.org

FROGGY COUSINS

FREAKY FACTS

Frogs and toads can lay up to 40,000 eggs. The eggs have jelly around them to protect them. Even though loads of eggs are laid, only a few survive to adult stage. Birds love eating tadpoles!



KEEP YOUR BEAK OUT OF THIS



Frogs shed their skin as they grow. Usually the shed skin is eaten.

BURP!

Frogs absorb water through their skin so they don't need to drink.

Under the water, a frog's eyes are protected by an transparent eye lid.





YUK!

Most frogs feed using their long tongue, which whips out at high speed and snaps up whole invertebrates. The prey is squeezed between the tongue and the eyeballs, which are drawn down inside the head. The food is then digested through a simple digestive system.

Captive common frogs can live for up to 12 years. Some Maud Island frogs are known to be over 40 years old!

LOOK AT ME
I'm all GROWN UP now!



Some frogs can jump 50 times their body length.

QUESTION AND ANSWER TIME

Mrs Ann Fibian from Plop Pond in Hopping has asked if frogs fart?
Tahi: Such a personal question Mrs F, well yes we do, just like you do!

Ms Lily Padd from Duckyly wants to know if frogs can hear?
Tahi: Yes, but I will let you in on a freakish secret. Our ears are connected to our lungs!

Mr Todd Toad has asked why we don't have cane toads in New Zealand?
Tahi: Because we have very strict controls at the airports, such as x-ray machines and sniffer dogs to check for toads 'hopping' into your luggage from overseas.

JOKES

What is a frog's favourite year?
A leap year!

What did the mummy frog tell the baby frog to do when he got cramp?
Rubit rubit!

What did the frog say to the fly?
Nothing. He ate it!

What happened to the frog's car parked on a yellow line?
It got 'toad'.

What do you say to a hitch-hiking frog?
Hop in!

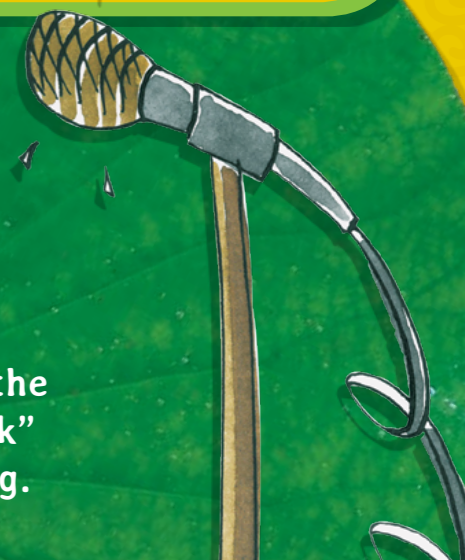
What kind of shoes do frogs wear?
Open toad.

How does a frog feel when he has broken a leg?
Unhobby!

I saw a hen walking with a book under her wing. She walked towards a frog in a pond.

She gave the book to the frog, who gave it back and she walked away again.

The next day she returned to the pond and gave the frog the book she was carrying. "Book-book-book" she clucked. Read-it, read-it, read-it said the frog.



QUIZ

1. How many species of native frogs are there in New Zealand?

- a) None
- b) Two
- c) Three
- d) Four



2. What happens if you lick a cane toad?

- a) You turn into a princess
- b) You get warts and turn green
- c) It tastes horrible and you get sick
- d) You explode



3. Do frogs have teeth?

- a) Yes, little fangs
- b) No they fell out
- c) Yes, little bumpy ridges
- d) Yes, but they wear false ones



4. What is Chytrid?

- a) A rock band
- b) A fungus
- c) An annoying insect
- d) A type of toad



QUIZ

5. Do native frogs have a tadpole stage?

- a) No
- b) When they want to
- c) Sometimes
- d) Only when they want to impress their friends

6. How many eggs can cane toads lay in a year?

- a) 10,000
- b) 20,000
- c) 30,000
- d) 40,000

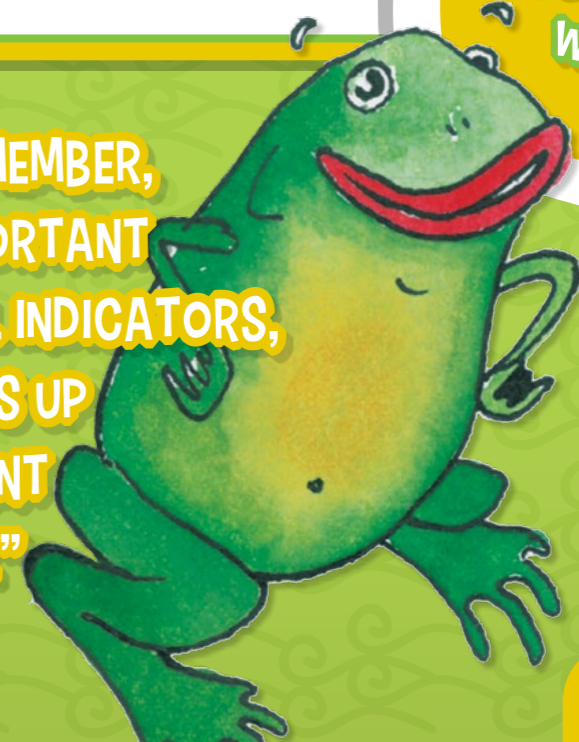


ANSWERS

1:D, 2:C, 3:C, 4:B, 5:C, 6:D

HOPE THIS BOOK MADE YOU 'HOPPY' AND YOU WEREN'T 'TOADLY' BORED!

TAHI: "JUST REMEMBER, FROGS ARE IMPORTANT ENVIRONMENTAL INDICATORS, AND IF YOU MESS UP OUR ENVIRONMENT WE WILL CROAK"



GLOSSARY

Biology: The study of living things (called organisms)

Camouflage: Disguising or hiding to blend in with the background

Chytrid: A fungus which can kill frogs

Diurnal: During the day

Evolved: Changed over time

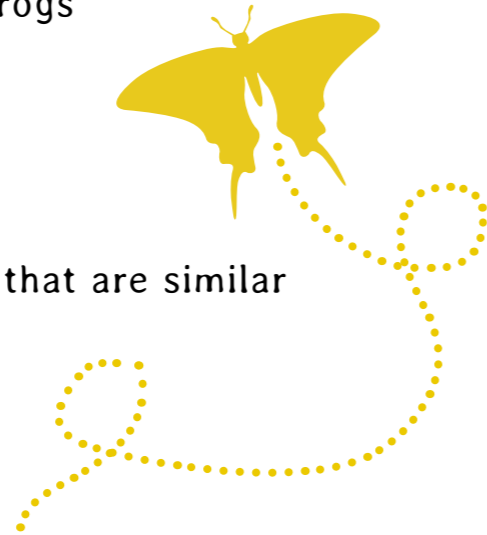
Extinction: Dying out

Genus: A class or group of things that are similar

Invertebrates: No back bone

Metamorphosing: Changing

Nocturnal: During the night



REFERENCES AND COOL WEBSITES

www.nzfrogs.org/

www.allaboutfrogs.org/

www.frogsonice.com/froggy/

[www.suzy.co.nz/suzysworld/
Factpage.asp?FactSheet=270](http://www.suzy.co.nz/suzysworld/Factpage.asp?FactSheet=270)

www.amphibiaweb.org/lists/index.shtml

www.reptiles.org.nz/

[www.doc.govt.nz/conservation/native-
animals/reptiles-and-frogs/](http://www.doc.govt.nz/conservation/native-animals/reptiles-and-frogs/)

[www.sciencelearn.org.nz/Contexts/
Saving-Reptiles-and-Amphibians](http://www.sciencelearn.org.nz/Contexts/Saving-Reptiles-and-Amphibians)



ACKNOWLEDGEMENTS

Rachael Goddard is the Environmental and Sustainability Manager, at the University of Waikato in New Zealand. The University has generously supported publishing this book, and has made 500 copies available as a gift to the community, to raise awareness about ecology and conservation. The 500 books are for non-profit environmental and educational groups and primary schools in Hamilton, Waikato. A free PDF version is also available for anyone to download at www.waikato.ac.nz/professionallearning/learning4-stores

Rachael has a pond full of gratitude for the following people who freely gave their time and support to make this book happen:

University of Waikato; John Cameron and Monica Peters, the amazing team at Communications and External Relations; especially Simon Bush, Libby Cameron (for her great designs) and Lauren Hall. The Faculty of Education; Professor Roger Moltzen and Jan Martin.

Also, Kara Goddard (formerly from Hamilton Zoo), Professor Phil Bishop from Otago University. My Whanau; Cheryl Reynolds, Pam Goddard, and Moira Corridon (for her very accurate caricature of me!). Ellie Hemmings from KT Design, Dave Hills from Waikato Print, and Dru MacKerracher from Finger Puppet Heaven.

© Rachael Goddard 2015

ISBN: 978-0-473-30459-1





Everything you ever wanted to know about our special native frogs, and other visitors who have 'hopped' over the ditch! Our four native frog species are ancient. They have some unusual things that make them different to other frogs around the world. Many of our frogs do not have a tadpole stage. Some daddy frogs carry froglets on their backs. Some of our frogs do not croak. Most breathe through their skin as well as their nose. Some are not much bigger than a \$2 coin. They are all rare and some are endangered. You will also find about the yucky poisonous cane toad from Australia.

