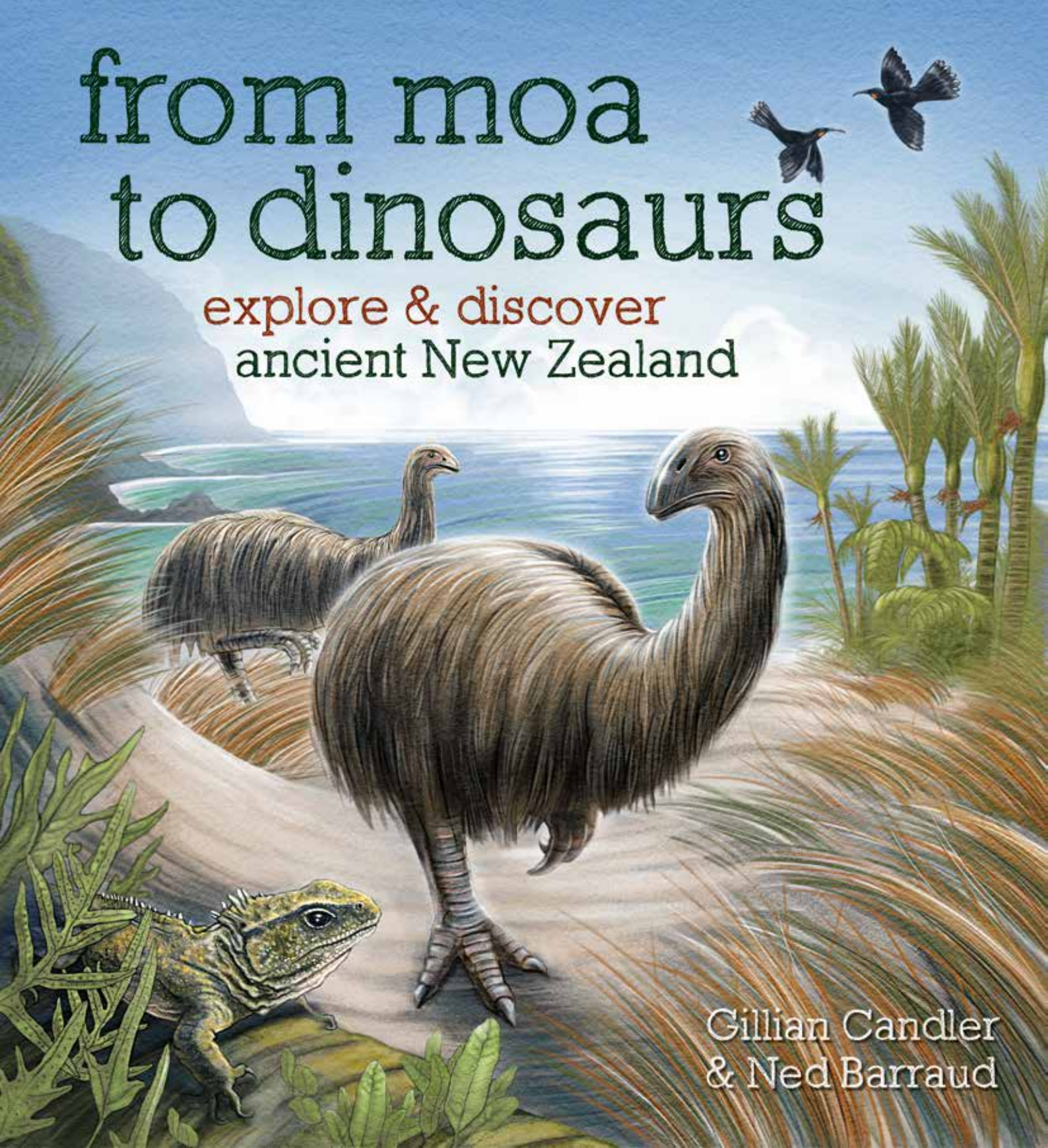
from moa to dinosaurs

explore & discover ancient New Zealand



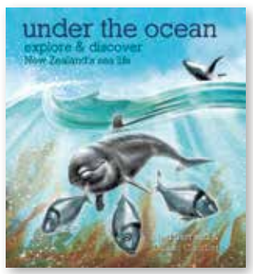
Gillian Candler
& Ned Barraud

For my brother Andrew, who found the best fossil — GC
For Graham, always a source of inspiration — NB

Gillian Candler is an award-winning author who brings her knowledge and skills in education and publishing to her passion for the natural world. She has always been intrigued by how New Zealand must have looked to the very first people who set foot here, and wanted to find out more about what animals lived here then. She found her first fossil when she was 5 years old – an experience she'll never forget – and it opened up a whole new world of interest.

Ned Barraud is an illustrator with a keen passion for the natural world. For him, this book was a perfect opportunity to put on paper some of the most bizarre and fascinating creatures from New Zealand's past. Ned lives in Wellington with his wife and three children.

other books in the explore & discover series



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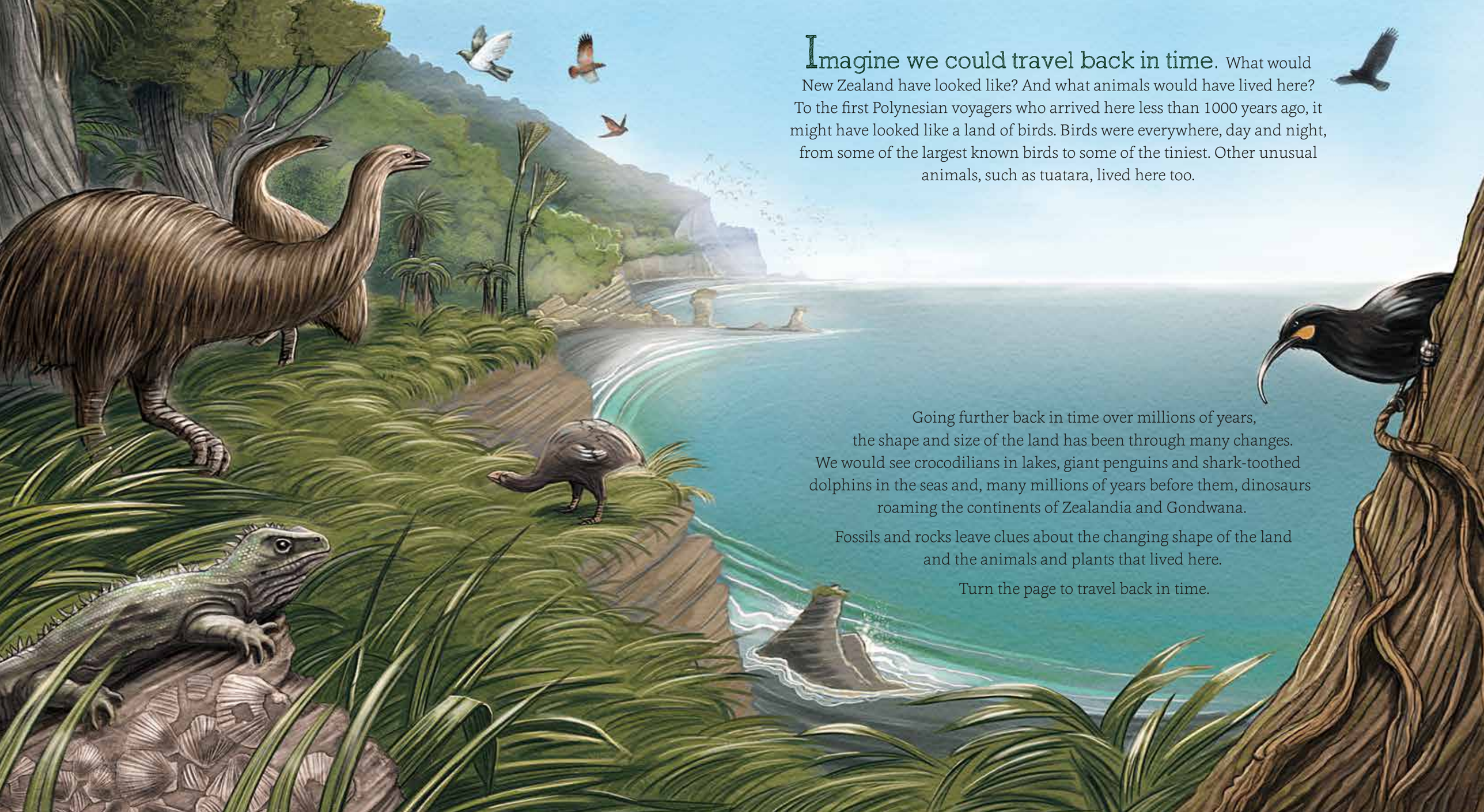


Imagine we could travel back in time. What would New Zealand have looked like? And what animals would have lived here? To the first Polynesian voyagers who arrived here less than 1000 years ago, it might have looked like a land of birds. Birds were everywhere, day and night, from some of the largest known birds to some of the tiniest. Other unusual animals, such as tuatara, lived here too.

Going further back in time over millions of years, the shape and size of the land has been through many changes. We would see crocodilians in lakes, giant penguins and shark-toothed dolphins in the seas and, many millions of years before them, dinosaurs roaming the continents of Zealandia and Gondwana.

Fossils and rocks leave clues about the changing shape of the land and the animals and plants that lived here.

Turn the page to travel back in time.

the changing land

New Zealand has not always been the shape it is today. Going back through time, we would see all sorts of changes – mountains rising, ice ages, tropical periods and the sea level rising and falling.

The islands that make up New Zealand today are part of the continent of Zealandia, much of which is now under the ocean. Many millions of years ago, Zealandia was part of a much, much larger continent called Gondwana. Follow the timeline to see how the shape of the land has gradually changed over time.

gondwana

180 million years ago

Australis

Zealandia

Australis breaking away from Gondwana

pages 32–33

ammonite

theropod

80 million years ago

Zealandia drifting away from Australis

pages 28–31

dinosaur extinction

waimanu penguin

60 million years ago

pages 24–27

shark-toothed dolphin

25 million years ago

Zealandia mostly under water

pages 20–23

19 million years ago

tropical climate

crocodilian

humans arrive

pages 4–5 and 8–19

ice ages

Southern Alps formed

New Zealand formed

moa

false-toothed pelican

New Zealand today

how long is a million years?

A million years is a very, very, very long time. People have lived in New Zealand for less than a thousand years. Imagine time stretching back, another thousand and another thousand years, until you have a thousand thousands stretching back in time. That is one million years. Try this: time how long it takes you to count to 100, then multiply this by 10,000. That is how long it would take you to count to one million.

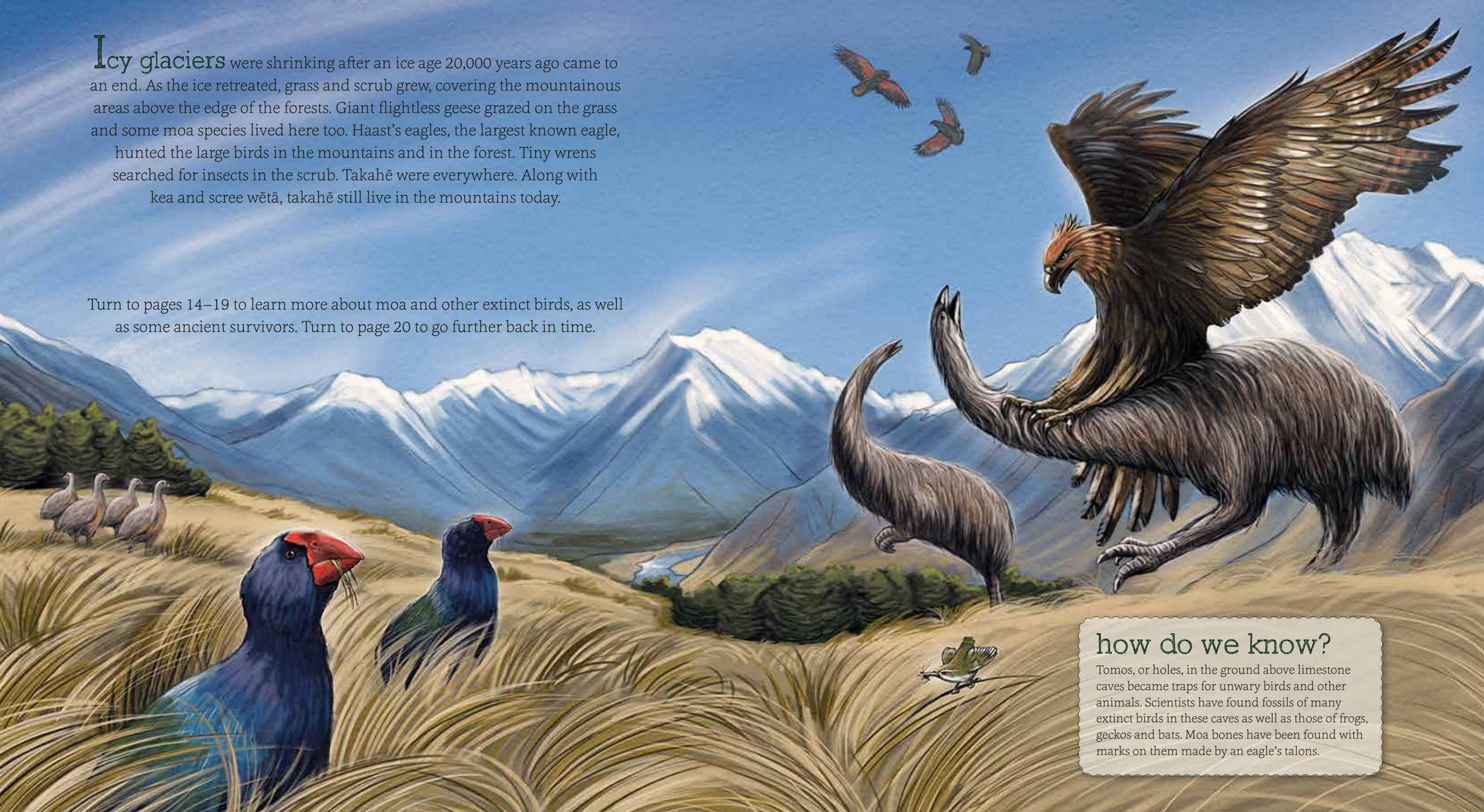
why does the land change?

Like a giant jigsaw, the Earth is made up of pieces that fit together. These pieces of the Earth's surface or crust are called tectonic plates. Heat moving below the crust causes the plates to jiggle about. Over millions and millions of years, this movement caused the pieces of Gondwana to change and drift apart to create the countries that we see today. The land is still changing but so very slowly that, except for earthquakes, people don't notice these changes.

At night the forest was alive with birds, bats and creatures such as giant snails. The flightless kiwi and kākāpō searched for food in the safety of darkness, away from the eyes of the giant eagle. The laughing owl looked for smaller prey, such as geckos, bats and small birds like this fairy prion, which hopes to return safely to its burrow.

how do we know?

Scientists have found fossil remains of kiwi and kākāpō, so they know that the kākāpō, which is now very rare, was once a common bird. Bones and other remains found at nest sites of the laughing owl tell us what animals this now extinct bird ate.



Icy glaciers were shrinking after an ice age 20,000 years ago came to an end. As the ice retreated, grass and scrub grew, covering the mountainous areas above the edge of the forests. Giant flightless geese grazed on the grass and some moa species lived here too. Haast's eagles, the largest known eagle, hunted the large birds in the mountains and in the forest. Tiny wrens searched for insects in the scrub. Takahē were everywhere. Along with kea and scree wētā, takahē still live in the mountains today.

Turn to pages 14–19 to learn more about moa and other extinct birds, as well as some ancient survivors. Turn to page 20 to go further back in time.

how do we know?

Tomos, or holes, in the ground above limestone caves became traps for unwary birds and other animals. Scientists have found fossils of many extinct birds in these caves as well as those of frogs, geckos and bats. Moa bones have been found with marks on them made by an eagle's talons.

all about moa

giant moa

The North Island giant moa and South Island giant moa were different species but would have looked similar. Female giant moa were much larger than males. While giant moa females could reach 3 metres high if their necks were stretched, moa usually held their head out in front of their body. They lived in forests as well as open areas, eating leaves, fruit and twigs.

male
1 m high to top of back

female
2 m high to top of back, up to 3 m long

moa species

- People often talk about moa as if they were all the same kind of bird, but scientists now know that there were nine different species.
- For many years scientists thought there were many more than nine species until they discovered that males and females of some species were quite different sizes.
- The upland moa on page 13 lived in mountains of the South Island. It had feathered legs, which would have helped to keep it warm.
- The little bush moa on page 9 was the most widespread of all the moa. It was common in forest on both North and South islands.

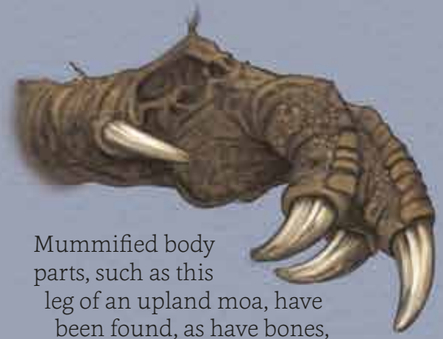
heavy-footed moa

up to 1.2 m long

The latin name for this moa means 'elephant-footed'. It was a heavy, round moa with big feet, and was only found in the South Island. A related species called Mantell's moa was only found in the North Island.

crested moa

The crested moa's skull had holes at the top front, which would have held a crest of feathers. Fossils and remains of this moa are rare and are only found in the South Island.



Mummified body parts, such as this leg of an upland moa, have been found, as have bones, eggs and feathers.

eastern moa

The eastern moa had a long windpipe, which meant it would have had a loud, deep call. It is thought to have lived in flocks, at least for some of the year.

up to 1 m long

stout-legged moa

female
up to 1 m long

male
up to 0.5 m long

Some stout-legged moa weighed up to 100 kilograms, others weighed as little as 9 kilograms.

moa facts

- Moa couldn't fly. Unlike other flightless birds, such as kiwi, they didn't even have wing bones.
- Moa ate plant material such as leaves, twigs and fruit.
- Moa bones were first discovered by scientists in the 1830s. Moa remains have been found in swamps, caves, sand dunes and middens (rubbish piles).
- The first people who arrived from Polynesia, founders of Māori tribes, hunted the moa for food. In just a couple of hundred years of hunting, the moa became extinct by around the 1400s.
- Since then some people claim to have seen moa in remote parts of New Zealand, and it is possible that some moa lived on into the 1800s, but some sightings were probably hoaxes.

other extinct birds

Haast's eagle

With males weighing up to 10 kilograms and females weighing up to 15 kilograms, Haast's eagle was the world's largest eagle. Once the moa and other large birds, such as South Island geese, were extinct, the eagles would have struggled to find enough food to eat.

extinct bird facts

- Since the arrival of people, first from Polynesia and then from Europe, around 50 New Zealand bird species have become extinct.
- Extinctions were caused by people hunting birds for food and by the introduction of predators, such as rats, stoats and cats.
- Polynesians brought the kiore (rat) with them. Europeans, who began to arrive from 1769, brought the Norway and ship rats, stoats and cats with them. Mammal predators found it easy to catch and kill flightless or semi-flightless birds.
- Nearly half of the extinct species were birds that lived on the ground – rails, ducks and geese, including the huge flightless geese on page 12.

laughing owl

The last sighting of a whēkau was in 1914. It was named laughing owl by Europeans for the noise that it made, but its call was more like a shriek than a happy laugh.

Finsch's duck

Once a very common duck, Finsch's ducks were relatives of the still-living Australian wood duck. Fossils show that over time the Finsch's duck became flightless – its wings got shorter and shorter. It lived mostly on land eating leaves, grass and other vegetation.

bush wren
mātuhi

Extinct since 1972, bush wrens were tiny birds. Also extinct are the long-billed wren, stout-legged wren and Lyall's wren. Their closest living relatives are the endangered rock wren and the rifleman.

New Zealand quail

When Europeans first arrived there appeared to be lots of koreke, but their numbers dropped quickly and they were extinct by 1875. Apart from being hunted, koreke would have been eaten by cats and rats.

huia

Male and female huia had quite different shaped beaks. They lived in North Island forests eating insects, berries and leaves. They have been extinct since at least the 1920s. They were named after their call.

piopio

Some people said that the piopio was one of the best singers in the New Zealand bush. It has been extinct since around 1900. Europeans called it the New Zealand thrush because it looked a bit like the thrushes in Europe.

adzebill

These strange flightless birds had large strong beaks for catching and eating prey, such as lizards, wētā, small birds and tuatara. Adzebills became extinct about the same time as moa.