



# Bats of Aotearoa

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resource

The short-tailed bat, Te Papa, CC BY 4.0.

*Our country is unusual for having only one type of native land mammal. Bats are found all over the world, but, like many of our indigenous species, ours are unusual and unique. While they are found in bush and we don't often see them, there are populations in some cities. Bats can be a useful context to teach about mammals, adaptations, sound, conservation and indigenous species. NZASE Science Communicator Mike Stone investigates.*

## Our two remaining bat species

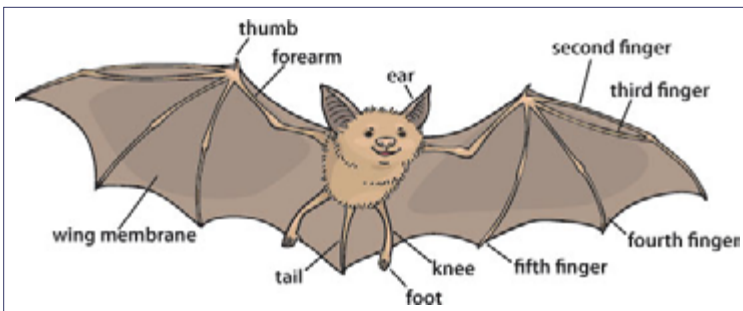
We have two different types of pekapeka in Aotearoa New Zealand; pekapeka-tou-poto (lesser short-tailed – STB) and pekapeka-tou-roa (long-tailed – LTB). They are both small, about the length of your thumb.

Bats belong to the large Chiroptera order of mammals – a quarter of all mammals are bats. They are the only mammals that can fly, using a thin membrane stretched between the bones of their fingers with their thumbs free.

Both of our bat species are microbats, which have small eyes and large ears and rely on sound (echolocation) and smell to find prey. They are mainly found in the bush.

While there has been some argument, fossil evidence suggests both arrived here from Australia. They were here before humans arrived so are considered **indigenous**, and they are also **endemic**.

*Stylised bat anatomy. Ask a biologist, Arizona State University.*



## What they have in common

Bats as a group are **crepuscular**, active at dawn and dusk, or **nocturnal**, active at night.

During the day, indigenous bats roost (hang together) singly or communally in a range of shelters, including hollow trunks, bark crevices, and occasionally in caves or old mine-shafts. Both bat species tend to change their roost every night. It is thought that their short velvety fur, like that of a mole, is an adaptation for their tight-fitting habitats.

Pregnant and nursing females often roost in large colonies. The resulting warmth and humidity of these enclosed spaces is necessary for birth and raising of the young before they develop hair. Like most mammals, female bats give birth to live young and feed their newborns milk.

Bats usually give birth to only one pup per year in summer. During their first weeks of life, newborn bats cling to their mothers when relocating between roosts, but by six weeks they are flying and **weaned**.

Like whales and dolphins, microbats use echolocation to find their way when flying, and to find food in the dark. Bats emit sound over a wide range of frequencies, which are too high for most people to hear. After sending these clicks from their mouth or nose, they listen for the echoes bouncing back off objects. The reflected sounds give the bat information about the location, size and identity of objects around them, including flying prey.

In temperate regions like Aotearoa/NZ, insects are much less abundant in winter, so to conserve energy our bats go into a state of torpor. This means their metabolic rate slows for a short time, and their body temperature

also drops. This is an unusual feature for mammals. Bats will remain torpid for days or weeks at a time, especially in winter, but this state is temporary. If the air temperature rises above 9°C the bats will wake, emerge and feed.

Both bat species live with a **symbiont**, the bat-fly, a wingless insect which feeds on bat guano (droppings). It is not a **parasite**, but can be found in bat fur, because it needs to hitch a ride when the bat changes roost.

### What is unique about the LTB?



Long-tailed bat, by Colin O'Donnell, Forest and Bird. Pekapeka-tou-roa, *Chalinolobus tuberculatus*, is related to five other species in the Western Pacific. Tuberculata is derived from the unusual, primitive-looking, double tubular nose that extends over its lips.

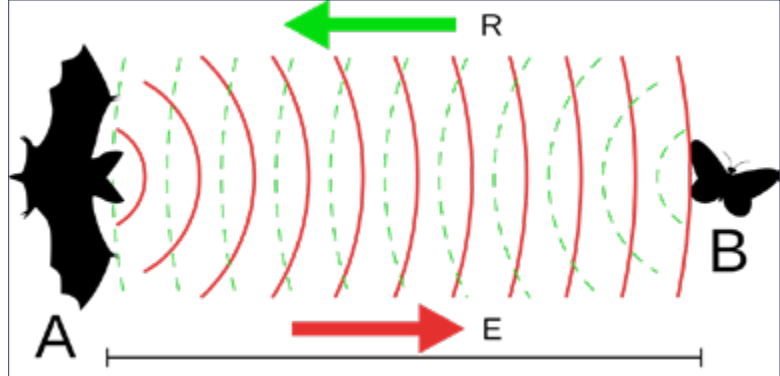
Long-tailed bats are widely distributed throughout the mainland and on several offshore islands. They are found in greater numbers than STB, including in Auckland, Hamilton and Rotorua. Despite being more common, these bats are rarely seen.

Long-tailed bats are smaller than the STB, and darker in colour, with smaller ears.

Pekapeka-tou-roa are fast fliers, having been recorded at 60km/h. They cover a vast area looking for food: their **home range** is said to be over 100km<sup>2</sup>. LTB are found in the canopy and at forest edges, over farmland, streams and lakes, and sometimes even in caves.

They are active both at dusk and into the night. LTB eat only flying insects, especially those that are found over water sheltered by overhanging branches – small moths, midges, mosquitoes and beetles.

Pekapeka-tou-roa roost differently to STB.



LTB select roosts at low altitude at the bottoms of valleys, close to the woodland edge. Their roosts tend to be higher and in larger, older trees and they tend to live in smaller social groupings than STB.

### What is unique about the STB?

The pekapeka-tou-poto has the binomial name *Mystacina tuberculata*. This bat is not closely related to any living species, so has been hard to classify. Recently, DNA analysis has determined they are in the superfamily Noctillionoidea.

There is now only one species, with the greater pekapeka-tou-poto thought to have become extinct in 1967. The STB is found at a few scattered sites, with northern, central and southern subspecies (see map on page 4).

The STB has evolved characteristics not found anywhere else in the world and has become a biological oddity. The pekapeka-tou-poto is the larger of our two bats, weighing 12-15g, with a lighter colour and bigger ears.

They roost in colonies of 20-60 bats, usually in the forest, but they have been reported in farmland and shrubland, in hollowed logs and abandoned seabird burrows. Scientists think STB may even dig holes in fallen kauri trees, due to the heavy wear on their incisors and wood chips on the ground below their roosts.

Compared to pekapeka-tou-roa, these bats are poor fliers, moving more slowly, less far and not as high. The STB is adapted to feed on the ground up to 70% of the time. They fold each wing under flaps on its leading edge, using the elbow parts of the wing bones as front legs. Talons on their thumbs and feet give the STB grip on the ground and when climbing trees.

STB start feeding later in the evening than LTB and inside the forest, rather than at its edges. They find flying food by echolocation, but smell and sound are more useful on the ground.

Observations of STB behaviour and guano

Bat using echolocation to hunt prey. Image compiled by Marek Mazurkiewicz CC BY-SA 3.0.



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show they feed on insects, fruit, nectar, and pollen. Like other nectar and pollen feeders, pekapeka-tou-poto have a brush of fine hairs on the tip of their tongue. This bat is an important pollinator for a number of indigenous forest plants, including pōhutukawa, kiekie, wood rose, and perching lilies.

Like the kākāpō, STB are **lek breeders**. This means that males assemble in a special area and compete for the attention of females. Male bats gather at strategic trees near communal roosts, and take turns calling to attract mates.

## Pekapeka and Māori

Māori consider pekapeka an ancient creature, pets of Hine-nui-te-pō, the goddess of the night.

The whakataukī “He hōkioi rere pō, he pekapeka rere ahiahi” – the hōkioi flies at night, the bat flies at twilight – urges haste on travellers, as the hōkioi, a mythical nocturnal bird, foretells death or disaster.

Māori interpret bats as creatures who symbolically act as an interface between the spirit world and the world of the living – the seen and the unseen.

Māori are involved when species are translocated for conservation. DoC is developing processes that truly include iwi stakeholders in decision-making, rather than asking them to endorse proposals after development.

Research by McMurdo, Hamilton, et al (2021) describes the decision-making process used in 2014 to decide on a bat translocation. The stakeholder group, including iwi, decided on the objectives, incorporating values of mātauranga Māori. The central value was mauri, which is influenced by whakapapa, tapu/noa, and kaitiakitanga.

## Conservation of bats

Our bats arrived here when there were no mammalian predators, and evolved features that now make them particularly vulnerable. Roosting in colonies means a large number of bats can be killed at one time. Feeding on the ground and roosting during the day, sometimes in torpor, also make them easy prey.

Bats here have always been preyed upon by predator birds, such as the laughing owl,

now extinct. Now these bats are also threatened by efficient and ruthless mammalian predators, especially rats, stoats and possums. Cats are also significant predators of bats, with post-mortem gut contents and DNA evidence showing that one house cat in 2010 was responsible for killing 102 STB.

As well as predators, habitat loss is a problem for bats, including old trees being removed and forests being felled for farms or pine planting. Mammals, birds and wasps can also compete for roosts.

DoC conservation focuses on protecting roosting sites, enhancing habitats and controlling predators, as well as education. Some populations have been translocated to predator-free islands, but sometimes they do not stay. Captive husbandry of bats is possible, and captive breeding is being attempted.

Scientists are investigating aspects of bats' way of life to create best practice. Bats are located with electronic devices tuned to their echolocation frequency (27 Hz for STB and 40 Hz for LTB). Harp traps and mist nets are used to catch them safely. While radio tagging has been tried, these are small animals, so the batteries are tiny and have a short life.

Live bats are protected by the Wildlife Act 1953, and must not be disturbed. Found dead bats should be taken to a museum or DoC, along with where and when they were found.

These unique creatures are in danger of extinction if we don't protect them. We can join a conservation group and help with bat surveys. We can help protect native forest in our areas by encouraging landowners to retain dead and old trees, replant natives, and pro-

## Ngā Kupu

**Kaitiakitanga** – Guardianship

**Mauri** – Life force, essence

**Mōrearea** – Endangered

**Noa** – Ordinary, unrestricted

**Tapu** – Sacred or prohibited

**Tauira kārangaranga** – Echo pattern

**Whakapapa** – Genealogy

**Whakataukī** – Proverb

**Whāngote** – Mammal

**Whāomomo** – Conservation.

Te Aka Maori Dictionary and *Pekapupu*



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tect trees around ponds and along streams.

## Pātai/questions

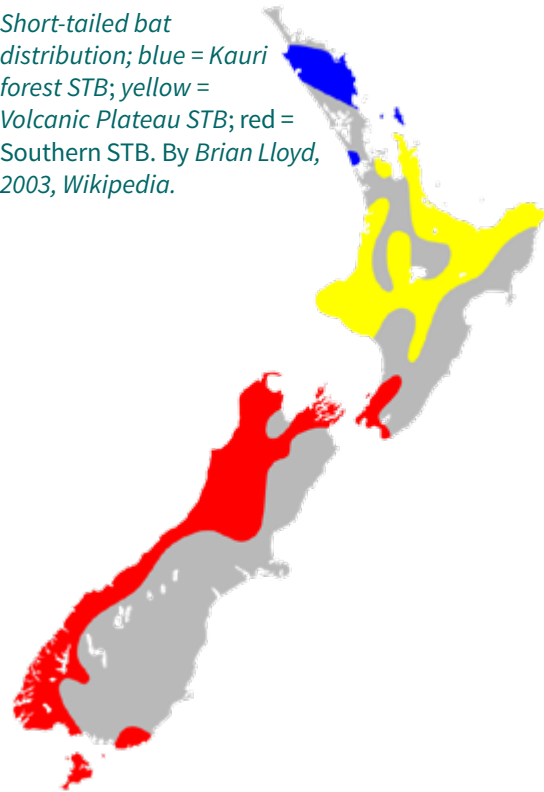
- 1 Give a meaning for the 10 bold, blue-green terms in the text.
- 2 Why are STB considered an oddity?
- 3 Compare and contrast STB and LTB, considering only three or four features only.
- 4 Find the names of five other classification groups of mammals.
- 5 From this information, where would you go to find bats?
- 6 Why do you think the LTB was nominated for the 2021 Bird of the Year competition?
- 7 Find out more about the introduced predators named here – why are they such a problem for our native animals?
- 8 Find out more about bats: eg, the differences between megabats and microbats, how our bats compare with those found in Australia, the truth about vampire bats ...
- 9 Talk with an expert on bats: eg, Auckland Council senior biodiversity advisor Ben Paris.
- 10 Ask a kaumātua from an area where bats are found to talk about the iwi's connection with the animal, and any stories about them.

## Activities

- Compare [the arms of humans and bats](#).
- Research what bats need for their habitat, then [design and make an artificial bat-roosting box](#).
- Read about bats: eg, a [School Journal story on STB](#); a [Connected article on sound](#); the picture book *Peka and Koro*; or the 4min video [Meet the locals: Pekapeka](#).
- Try [the echolocation game](#).
- Listen to a video to find out more: eg, [Ghosts of Gondwana](#) (~50min); DoC on [feeding and roosting](#) (2min); or [Ben Paris on helping our native bats thrive](#) (~13min).

Article critiqued by Mere Manning  
(Kahungunu ki te Wairoa)

*Short-tailed bat distribution; blue = Kauri forest STB; yellow = Volcanic Plateau STB; red = Southern STB. By Brian Lloyd, 2003, Wikipedia.*



## References

- Borkin, Easton & Bridgman, 2022, [Bats attacked by companion and feral cats: Evidence from indigenous forest and rural landscapes in New Zealand](#). *NZ Journal of Zoology*, 1-8.
- Daniel, 1979, [The New Zealand short-tailed bat, \*Mystacina tuberculata\*: A review of present knowledge](#). *NZ Journal of Zoology*, 6(2), 357-370.
- DoC, [Bats-Pekapeka](#).
- Lloyd, B. D. 2003, Intraspecific phylogeny of the New Zealand short-tailed bat *Mystacina tuberculata* inferred from multiple mitochondrial gene sequences, *Systematic Biology*, 52(4), 460–476, <https://doi.org/10.1080/10635150390218187>
- McMurdo Hamilton, et al., 2021, [Applying a values-based decision process to facilitate co-management of threatened species in Aotearoa New Zealand](#). *Conservation Biology*, 35(4), 1162-1173.
- O'Donnell, Christie, Hitchmough, Lloyd, & Parsons, 2010, [The conservation status of New Zealand bats](#). *NZ Journal of Zoology*, 37(4), 297-311.
- Scrimgeour, Beath & Swanney, 2012, [Cat predation of short-tailed bats \(\*Mystacina tuberculata rhyocobia\*\) in Rangataua Forest, Mount Ruapehu, New Zealand](#). *NZ Journal of Zoology*, 39 (3), R 257–26
- Science Learning Hub, [NZ bats/pekapeka](#).
- Piper, 2022, [Critically endangered long-tailed bat found in new spot in Whangārei](#), *Stuff*.
- Meduna, 2007, [Bats](#), Te Ara.
- Wikipedia, 2023, [NZ Lesser short-tailed bat](#); 2022, [NZ Long-tailed bat](#).

