

Activity Title:

Impact of Climate Change on Coastal Animals and Plants

Learning objective

Investigate how sea level rise predictions are expected to affect sand dunes at a local / regional coastal site

Focusing question

How is climate change predicted to affect our / regional Bay of Plenty coastal plants and animals?

Resources required (resources marked * can be found on the following pages)

- Prior Knowledge Chart*
- PowerPoint presentation '[2a Native dune plants – what lives where and why?](#)'
- A3 copies of the blank dune plant sequence diagram*
- Copies of plant cards*
- Vegetation characteristic cards*
- Bird pictures*
- Copies of 'Kuaka story – the bar tailed godwit' and questions*
- Copies of 'Shorebirds of the Bay of Plenty'
- Pens, papers and photographic devices
- Access to internet
- Devices, screen or projector for viewing film clips / websites
- 'My Shore Bird Research Project' sheets*
- Summary quiz questions* / Kahoot quiz

Activity Title:

Impact of Climate Change on Coastal Animals and Plants

Education for Sustainability Aspect:

- Environmental Aspect

Key Competencies:

- Thinking
- Sustainability

Curriculum Links:

- Science
- Social science

See green panel below for detail

**Curriculum Links continued:****SCIENCE Level 1 & 2:**

The Nature of Science: Participating and contributing. Explore and act on issues and questions that link their science learning to their daily living.

Living World: Life processes. Recognise that all living things have certain requirements so they can stay alive.

Living World: Ecology. Recognise that living things are suited to their particular habitat.

SCIENCE Level 3 & 4:

The Nature of Science: Participating and contributing. Use their growing science knowledge when considering issues of concern to them. Explore various aspects of an issue and make decisions about possible actions.

Living World: Ecology. Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.

SCIENCE Level 5 and 6:

Living World: Ecology. Investigate the interdependence of living things (including humans) in an ecosystem. Investigate the impact of natural events and human actions on a New Zealand ecosystem.

SOCIAL SCIENCE:**Conceptual Strand: Place and Environment**

Level 2: Understand how places influence people and people influence places.

Level 3: Understand how people make decisions about access to and use of resources.

Level 4:

- Understand how exploration and innovation create opportunities and challenges for people, places, and environments.
- Understand that events have causes and effects.
- Understand how people pass on and sustain culture and heritage for different reasons and that this has consequences for people.

Level 5:

- Understand how people's management of resources impacts on environmental and social sustainability.
- Understand how the ideas and actions of people in the past have had a significant impact on people's lives.

Level 6 (Geography): Understand how people interact with natural and cultural environments and that this interaction has consequences.


Prior learning

5h(i) Climate change in the Bay

5h(ii) Climate Change: Changing Beach and Coastline Profiles

Method

PRIOR KNOWLEDGE: CLIMATE CHANGE AND DUNE COMMUNITIES

1. Review key learning from 5h(ii) Climate Change: Changing Beach and Coastline Profiles.
2. Inquiry:
 - What animals live on and around our beaches? [Think: birds, insects, mammals...]
 - What plants live on and around our beaches?
 - How will climate change alter the environment that coastal animals and plants inhabit?
 - How might coastal animals and plants adapt?
3. Use the Prior Learning Chart to record prior learning around the impact of climate change on coastal animals and plants.
4. Complete the Kahoot quiz  [Impact of Climate Change on BOP Coastal Animals and Plants](#) and add any new knowledge to the prior learning chart.

WHAT PLANTS LIVE ON THE DUNES AND HOW MIGHT CLIMATE CHANGE AFFECT THEM

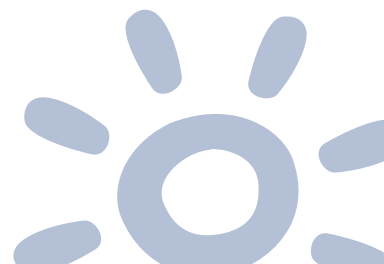
1. Inquiry:
 - What native dune plants live on our beaches?
 - Where are they found?
 - How might climate change induced changes impact on these plants?
2. View the PowerPoint presentation [2a Native dune plants – what lives where and why?](#) before using it with the class. The first part of the slide show will be helpful for your own knowledge.
3. Show the class slides to help them identify plants from Zones A-D. There are two versions of this PowerPoint. The [basic version](#) has a reduced number of plant species represented. The [advanced version](#) has the full complement of 37 plant species represented in slides. For most groups, we recommend the use of the basic version. The remainder of this activity can be conducted irrespective of which set of slides are used.
4. Allow time for questions and discussion. Inquiry:
 - Which of these plants have students seen on the beach?
 - Why do taller plants live further back on the dunes?
 - What are native plants?
 - What does indigenous mean?
 - Which plants are likely to be impacted most by climate change, king tides, intense storms and sea level rise?
5. Break into small groups. Each group has an A3 size copy of a blank dune plant sequence diagram (see following pages) or each group creates their own diagram using an A2 piece of paper.



6. Hand out a copy of the plant cards to each group. Students place plant cards in the four different zones on the dune plant sequence diagram. Some plants might sit on the transition line between different zones. In working out what plants go where consider the following:
 - The height and other physical characteristics of the plant.
 - The plant's ability to deal with salt water, spray and sand movement.
 - How the plant is pollinated and seed spread (there are few native insects on the foredunes).
 - Soil requirements – can the plant live on sand or does it require other organic matter?
 - How will plants withstand changes arising from climate change (storms, king tides and sea level rise)
7. Once all plant cards have been used up hand out the vegetation characteristic cards. Place these cards along the bottom of the diagram indicating which vegetation groups have which characteristics.
8. Use the teacher answer sheet to correct student placement of plant cards. Note that some plants can be found in more than one zone.
9. Inquiry:
 - Did each group get the same labels correct or incorrect?
 - What characteristics are evident of plants in each zone?
 - How will the plants in each zone likely be impacted by climate change (storms of increased intensity, king tides and sea level rise).

KAITIAKITANGA: OBSERVING SIGNS OF ANIMAL COMMUNITY AT YOUR LOCAL BEACH

1. Discuss how Māori were traditionally close observers of the natural world who had intimate knowledge of the natural world; and that observation is a key tool used in Western Science also.
2. Explore the idea of kaitiakitanga (guardianship) and how we can be good kaitiaki of our local beach and understand better how plants (and animals) might be affected by climate change by spending time observing our local beach and dune communities. See the additional useful information links below for more information around Kaitiakitanga and science.
3. Organise a hikoi or walk to your local beach. In buddy pairs, encourage students to explore, looking for evidence of animals and insects – either the animals or insects themselves (look and leave, or return them to their home) or their tracks in the sand.
4. Have students take photos of sand dune animals and insects and their tracks, and bring these back to class for discussion.
5. Inquiry:
 - What animals, birds and insects did you see?
 - What tracks did you find?
 - In what part of the beach or dune system did you find evidence of the different creatures?
 - Which animals are sand dune visitors and which are permanent dwellers?
 - Explore how the animal community is likely to be impacted by climate change. Consider each of the following:
 - a. Changing climate (warmer temperatures, changes to rainfall patterns etc)
 - b. Storms – increasing in intensity, king tides and storm surges
 - c. Sea level rise



SHORE BIRDS AND CLIMATE CHANGE (YOUNGER LEARNERS)

1. Tell or read a story about a shore bird like the Kuaka (godwit) (ideally one found locally).
2. Watch video clips online, such as the Dotterels or Kuaka / Godwit films from Department of Conservation's 'Meet the Locals' series
3. Allocate each student a shore bird.
4. Give them a picture of the bird (see bird pictures or use the photographic guidebook 'Birds of the Eastern Bay of Plenty Harbours and Estuaries').
5. Pair share – What do you know about your bird? What did you observe about your bird?
6. Draw and label the bird.
7. Write down three to five facts / observations about your bird.
8. Inquiry:
 - What do we know about coastal birds?
 - What do we know about how coastal birds might be affected by climate change (e.g. changing temperatures, storm surges, king tides, sea level rise)?
 - What do we want to know?
 - How can we find out?
 - What have we learnt?
9. Use recycled and natural materials – as a class group build a model of a bird. (You could use an old ball or something round as the body, feathers for the wings and tail, paper or card for the beak and beads for the eyes).

KUAKA AND CLIMATE CHANGE

1. Either use the story provided about 'Kuaka – the bar-tailed godwit' to talk about kuaka or have learners read the story and answer the questions. **Teacher Answers 1a, 2b&c, 3a, 4b, 5d, 6b**
2. Inquiry:
 - What is special about kuaka?
 - How is climate change impacting on the kuaka?
 - What can we learn from the kuaka?

MY SHOREBIRD RESEARCH PROJECT (OLDER LEARNERS)

1. Tell or read a story about a shore bird like the Kuaka (godwit) (ideally one found locally).
2. Read the 'Shorebirds of the Bay of Plenty' resource and watch video clips online, such as the  [Dotterels](#) or  [Kuaka / Godwit](#) films from Department of Conservation's 'Meet the Locals' series. More detailed information may be found on these sites:
 - New Zealand Birds Online: www.nzbirdsonline.org.nz
 - Te Ara - The Encyclopedia of New Zealand: www.teara.govt.nz/en/birds-of-sea-and-shore
 - Department of Conservation Te Papa Atawhai: www.doc.govt.nz/nature/native-animals/birds/sea-and-shore-birds
 - Western Bay Wildlife Trust: www.westernbaywildlife.nz/our-wildlife
3. Have each student choose a shore bird to research.
4. Use 'My Shore Bird Research Project' sheets (see following pages), to record learning and share findings.

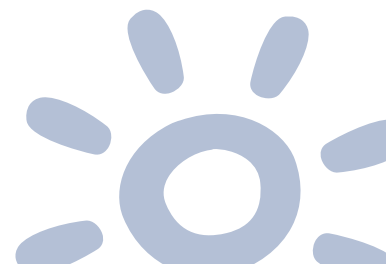


Possible next steps

- Complete the summary quiz 'Impact of Climate Change on Coastal Animals and Plants'.
(Teacher answers 1C, 2A, 3C and D, 4C, 5B and C, 6D, 7A, 8B)
- Create your own KAHOOTZ quiz about climate change and its impact on our Bay of Plenty coast. Students to pair up and test each other's knowledge.
- Create an observation diary and record ngā tohu o te taiao – things you notice about animals, plants and weather conditions at your local beach.
- Study adaptations of coastal animals and plants to climate change. Write a story about these adaptations. Consider what we can learn from the adaptability of our friends from the animal and plant kingdoms?
- Create an imaginary animal or plant that is highly adaptable and resilient to climate change. Draw, label and describe your imaginary animal or plant and its adaptive capabilities!

Additional resources

- Science Learning Hub. 2017. Understanding Kaitiakitanga.
www.sciencelearn.org.nz/resources/2544-understanding-kaitiakitanga
- Te Ahukaramū Charles Royal. 2007. 'Kaitiakitanga – guardianship and conservation'.
Te Ara – the Encyclopedia of New Zealand.
www.teara.govt.nz/en/kaitiakitanga-guardianship-and-conservation
- Department of Conservation. 2019. Short Film - Meet the Locals: Kuaka / Godwit
www.youtube.com/watch?v=3CqBfJN4qts
- Department of Conservation. 2019. Short Film – Meet the Locals: Dotterels.
www.youtube.com/watch?v=xOIMt0-r9ww
- NZ Birds Online. www.nzbirdsonline.org.nz
- Western Bay of Plenty Wildlife. www.westernbaywildlife.nz/our-wildlife
- Te Ara – Encyclopedia of New Zealand. Birds of Sea and Shore.
www.teara.govt.nz/en/birds-of-sea-and-shore
- Department of Conservation. Sea and Shore Birds.
www.doc.govt.nz/nature/native-animals/birds/sea-and-shore-birds

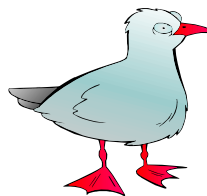


Prior knowledge chart

How will climate change impact on coastal plants and animals?		
What we know	What we would like to know	What we have learned



Plant cards



TIP!

For more detailed information on and to view other images for each plant click on the photo to go to the relevant page on the New Zealand Plant Conservation Network website www.nzpcn.org.nz



Kōwhangatara, (spinifex) *Spinifex sericeus* [60cm high]

A silvery-green spiky-looking grass that spreads quickly. Long runners grow across bare sand with plants developing along them. Animals like rabbits don't like to eat them very much but cars and people running over them do harm the soft growing tips. The seed heads look just like spiky balls and are pollinated and spread by the wind and water. Spinifex doesn't mind the salt water and spray or being blasted with sand blown by the wind.



Pīngao, *Desmoschoenus spiralis* [80cm]

This plant is from the sedge family. It is a bronze-green colour but in winter it turns more gold-orange. It traps sand really well with runners like the spinifex. Pīngao is not a tough plant and is easily damaged from being eaten and tramped on. Outer leaves from the fully grown Pīngao plants are sometimes taken for weaving (kete and tukutuku panels especially). The seeds are pollinated and spread mostly by the wind. It doesn't mind the salt water and spray or being blasted with sand blown by the wind.



Hinarepe, (sand tussock) *Austrofestuca littoralis* [60cm]

This plant looks like clumps of light-brown, tall grass. It has golden seed heads. There are not very many Hinarepe plants left in the Bay of Plenty, so we need to take care of them and plant more. Seed is pollinated and spread mainly by the wind. It doesn't mind the salt water, spray and being sand blasted.



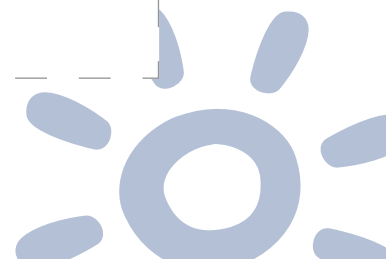
Waiū-o-kahukura, (shore spurge) *Euphorbia glauca* [80cm]

This is a very beautiful plant with blue-green leaves. The flowers are a deep maroon colour. It is also very good at trapping sand. It is almost extinct in the North Island - there are hardly any plants left at all here and so we need to look after them and plant more. Animals like eating it, especially rabbits. This plant can be damaged by a lot of salt spray and sand blasting. Seeds are pollinated and spread mainly by the wind.



Tauhinu, *Ozothamnus leptophylla* [1.5m]

Tauhinu is a really tough plant and can handle salt the most. It sometimes grows right on top of the sand dunes where it is really windy and salty. It has small silver-green leaves and lots and lots of bunches of small cream flowers in summer time. Tauhinu can handle some salt spray and sand cover. Seed are pollinated and spread mainly by the wind.





Wiwī, (knobby clubrush) *Ficinia nodosa* [1m]

Wiwī is a tough plant with strong dark green stems and dark brown clusters of seeds near the tips of the stems. Wiwī is found in lots of places, from on top of the sand dunes to wet dips and hollows. It can handle salt spray and sand blasting. Seed are pollinated and spread mainly by the wind.



Pōhuehue, (wire vine) *Muehlenbeckia complexa* and Puka, *M. australis* [variable, from 0.3 to 1m]

This is a creeping vine which is very tough and can climb up other plants and fences. It also grows along the ground. Pōhuehue has brown stems and bright green leaves. Te Rauparaha's copper butterfly caterpillar only eat these plants; they can't live without them. The silver berries that grown on it in autumn are often eaten by pheasants. It can cope with some spray and sand. It doesn't like to live on the sand, more where there is a little soil and leaves etc for water and food. Birds, native insects and lizards pollinate and spread the seeds.



Tarakupenga, (sand coprosma) *Coprosma acerosa* [0.5 to 1.0m]

This plant has orange-brown bended stems that grow all twisted through each other. It has narrow green leaves. In autumn it has shiny blue or silver berries. Tarakupenga is not found in a lot of places any more, especially in the eastern Bay of Plenty. It can handle small amounts of salt spray and sand and does trap a little sand. It likes to live where there is some leaves and soil. Birds, native insects and lizards pollinate the flowers and spread the fruit.



Perehia, (sand wind grass) *Lachnagrostis billardierei* [40cm]

A native dune grass with outstanding fine gossamer-like seed heads, coloured pink when young, that were used for dried arrangements when plants were more abundant. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



Anawhata, (carex) *Carex testacea* [35cm]

This very hardy and adaptable plant is frequently seen in reserves, traffic islands and increasingly in garden plantings. The flowing rich orange tussock-like foliage sways in the wind. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand).





Taupata, *Coprosma repens* [2-3m]

The very shiny bright green leaves of this native plant are well known in many gardens globally, but it now occurs only locally on our dunes, although it would have formerly been abundant. The numerous contrasting orange berries are attractive and great food for native birds and reptiles through summer/autumn. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



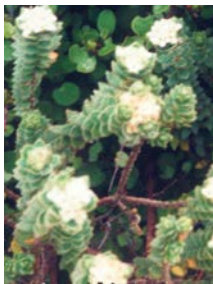
Toetoe, *Cortaderia fulvida* [1m leaves, 3m flowers]

Many people confuse this graceful native dune inhabiting plant with the invasive pampas grass. It is smaller, less common and more elegant than pampas, and does not have the large accumulation of dead leaves that burn easily or harbour rats. Flowers in spring/early summer, compared to autumn for pampas, and is not a weed threat. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



Oioi, (jointed wire rush) *Apodasmia similis* [90cm]

Not a common plant on our dunes, preferring damp hollows; abundant on estuary margins. The stems move gently in the wind (oioi = shake gently), and are coloured from soft green to rich orange, depending on the environment they grow in. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



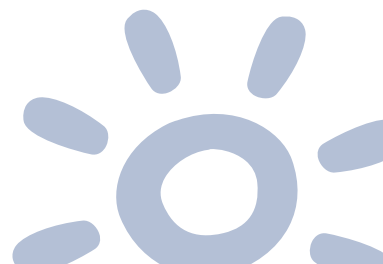
Autetaranga, (sand daphne) *Pimelea arenaria* [20cm]

Only about six of these attractive plants remain on the mainland Bay of Plenty dunes, although greater numbers still occur on Matakana Island. Soft green foliage clothes this multi-stemmed low growing plant. They produce many small, orange-centred, cream flowers in spring. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



Ti kōuka, (cabbage tree) *Cordyline australis* [Up to 12m]

Often considered to be a plant of wetland margins, these also grow naturally on dunes. The copious flowers are intensely fragrant, the berries are great bird food. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.





Harakeke, (NZ flax) *Phormium tenax* [leaves 2m, flowers 3m]

Stiff upright leaves and red flowers on tall stalks that attract nectar-feeding creatures like birds, lizards, and bees (including native bee species). Seed pods are black. Adaptable, but best planted in damper dune hollows. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



Ngaio, *Myoporum laetum* [1m to 6m]

Glossy, wavy waxy willow shaped leaves. The open habit makes it a good shade tree, and great for kids to climb. The 10mm white flowers with red or purple "freckles" attract many insects, and are followed by large numbers of small purple berries in autumn/winter. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



Karo, *Pittosporum crassifolium* [2m to 5m]

A popular small tree in gardens. Seeds spread by birds are resulting in natural establishment of seedlings in some dunes. Leaves are similar to pōhutukawa. The deep crimson velvety flowers appear in early spring, with a delightfully sweet nocturnal scent. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



Houpara, (coastal fivefinger) *Pseudopanax lessonii* [2m to 5m]

Leathery glossy leaves usually arranged in three to five "fingers", with toothed edges. Quite versatile as it will grow in the open or under trees. Produces copious small black berries most of the year that are attractive to birds, making it is self-seeding in dunes near existing specimens. This plant will tolerate small amounts of salt spray and sand movement. Collects and traps some sand. Requires organic matter in the sand to help retain moisture and nutrients (can't just live on shifting sand). Flowers/fruit pollinated and spread by birds, native insects and lizards.



Wharangi, *Melicope ternata* [2m to 6m]

Striking lime-green glossy and wavy leaves that have a lemon scent when crushed (it is related to citrus). The small green fragrant flowers in early spring (attractive to bees) mature to many shiny black seeds through spring/summer, contrasting nicely with the leaves.





Mānuka, *Leptospermum scoparium* [up to 2m]

This plant is well known to gardeners, but again, is now very uncommon in our dune areas. Where it is found, it seems to favour open exposed sites where it is often wind-shorn. The numerous usually white flowers are produced over an extended period from spring to late autumn, providing a nectar source for a range of creatures.



Whau, *Entelea arborescens* [2m to 5m]

The very large, distinctive, heart-shaped soft leaves up to 250mm long give this small tree a distinctly tropical appearance. The large clusters of yellow centred white flowers each up to 30mm across are very attractive, both to humans and insects. Only about four to six plants left on the Bay of Plenty dunes, probably as the leaves are relished by stock.



Pōhutukawa, *Metrosideros excelsa* [3m to 20m]

No Bay of Plenty beach is complete without these beautiful iconic trees. They can grow more seaward than this zone. Now cattle droving has stopped, seeds are germinating and growing naturally on rotting driftwood near dune crests. The lower branches of tall trees can be trimmed for great views through them, and for people shade in hot summers. The bountiful, nectar-laden crimson flowers provide nutrition for vast numbers of native creatures, including lizards.



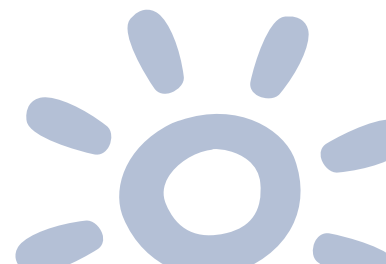
Pūriri, *Vitex lucens* [10m to 20m]

The “food tree of the forest” is also locally common on parts of our coast. The shining dark green slightly “blistered” looking leaves provide a great contrast to the abundant 25mm long soft-red nectar-laden flowers. These are produced through most of the year, as are the 20mm succulent (to birds) berries, hence the “food tree” name tag.



Kohekohe, *Dysoxylum spectabile* [10m to 15m]

The very large glossy leaves are made up of three to four pairs of leaflets. Long panicles of attractive flowers (up to 40cm long) are produced in autumn, emerging, unusually, directly from the trunk. Flowers are seldom seen however, as possums eat them voraciously.



Dune plant sequence diagram

Fore Dune
Sand binding
grasses

e.g. Spinifex, Pīngao

Mid Dune
Ground covers
and shrubs

e.g. Pōhuehue, Wīwī

Back Dune
Tree and shrubcover

e.g. Taupata, Pōhutukawa

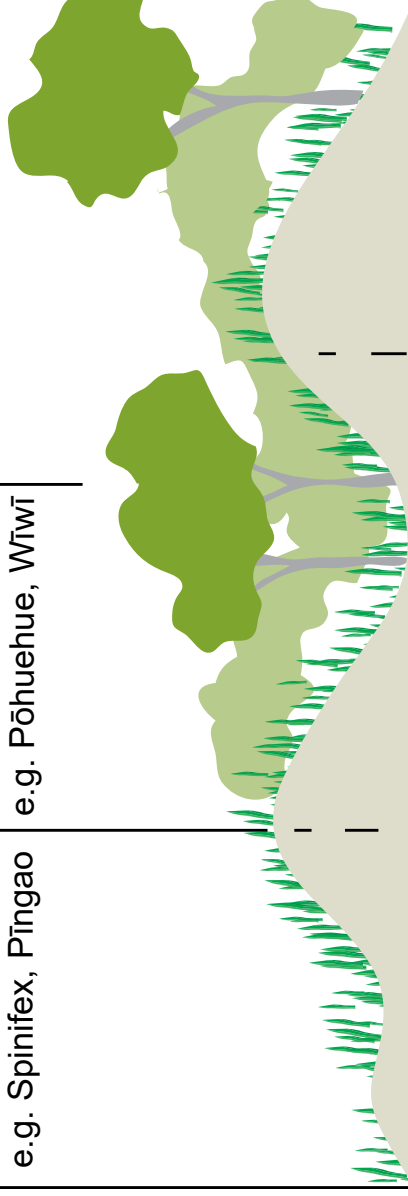
**Beach
face**

Zone A

Zone B

Zone C

Zone D



Vegetation characteristic cards

Maximum tolerance of salt water, spray and sand blasting.

Almost totally reliant on wind for dispersion and pollination of seeds.

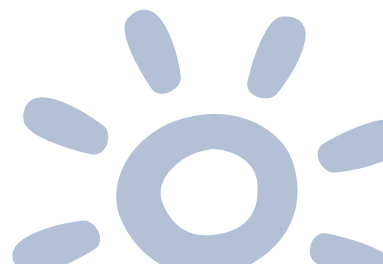
Moderately tolerant of salt spray and some sand movement.

Predominance of wind dispersion and pollination of seeds.

↓ Decreasing tolerance of salt spray and sand movement.
Most of these plants will still collect and trap some lower velocity sand.

↑ Increasing supply and requirement for organic matter in the sand (to help retain moisture and nutrients).

↑ Flowers/ fruit increasingly pollinated, used and spread by birds, lizards and native insects.



Teacher answer sheet

Zone	Plant	Vegetation characteristics		
A and B	Kōwhangatara	Maximum tolerance of salt water, spray and sand blasting	Almost totally reliant on wind for dispersion and pollination of seeds.	
A and B	Pīngao			
A and B	Hinarepe			
A and B	Waiū-o-kahukura	Moderately tolerant of salt spray and some sand movement.	Predominance of wind dispersion and pollination of seeds.	
B and C	Tauhinu			
B and C	Wīwī			
B and C	Pōhuehue	<p>↓ Decreasing tolerance of salt spray and sand movement. Most of these plants will still collect and trap some lower velocity sand.</p>	<p>↑ Increasing supply and requirement for organic matter in the sand (to help retain moisture and nutrients).</p>	<p>↑ Flowers/ fruit increasingly pollinated, used and spread by birds, lizards and native insects.</p>
B and C	Tarakupenga			
B and C	Perehia			
C	Carex			
C and D	Taupata			
C	Autetaranga			
C and D	Tī kōuka			
C and D	Harakeke			
C and D	Ngaio			
C	Oioi			
C and D	Houpara			
C and D	Karo			
C	Toetoe			
D	Wharangi			
D	Mānuka			
D	Whau			
D	Pōhutukawa			
D	Pūriri			
D	Kohekohe			



Bird pictures



Karoro
Black backed gull



Tarāpunga
Red billed gull



Tōrea pango
Oystercatcher



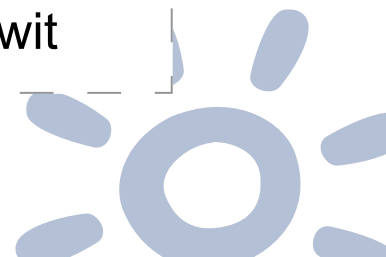
Tūturiwhatu
NZ dotterel



Tara
Tern



Kuaka
Bar-tailed godwit



Kōrero pukapuka / read

Kuaka story – the bar-tailed godwit

*Ka ngau kit e turikakao te paringa o te tai,
e tika te rere o te kuaka*

*The spinifex (seaside grass tuft) wanders
along the beach like the incoming tide,
the kuaka flies direct*

The kuaka or bar-tailed godwit don't look very fancy! They are small and a speckly brown colour. But they are incredible little birds with amazing endurance. Every year, 75,000 kuaka fly non-stop from Alaska to New Zealand: a journey of around 12,000km completed in just eight or nine days (Rykers, 2017).

In ancient times for Māori, the return of the kuaka was seen as a celebratory event (He Kuaka – Te Mana Kaha O Te Whānau, 2022).

In September and October these small brown birds can be seen around the Bay of Plenty. They are most commonly found in Tauranga Harbour, Ōhiwa Harbour, Maketū Estuary, Pukehina / Little Waihi Estuary. And can sometimes be found at Waiotahi River estuary, Waioeka River estuary and Waiaua River estuary.

Keith Woodley from the Miranda Shorebird Centre says kuaka will lose half their body weight during their long flight from Alaska. He says “when they get here, they look absolutely exhausted. The first thing they do is have a drink... and then they go to sleep. Eventually, they start feeding to make up for the huge amount of weight they lose during their flight” (Forest & Bird, 2018).

Science communicator and bird lover Ellen Rykers says that “at every stage of their epic migration, kuaka face new challenges thanks to climate change.” Here in New Zealand, the greatest climate change threat to Kuaka comes from rising sea levels. If there were no people living around our coast then as sea level rises kuaka would just move a little further inland to adapt. But people like to live around estuaries, and we tend to build barriers around our coasts, harbours and estuaries, which means there is less habitat and less space for kuaka.

In Alaska, warming temperatures mean trees are encroaching on the open spaces or tundra where Kuaka like to breed. Kuaka time their eggs to hatch just as insect food supply peaks. Climate change is affecting the seasons which in turn makes the amount and timing of insect food supplies less predictable.



JJ Harrison CC BY-SA 4.0



Paul van der Velde CC BY 2.0

Climate change may also alter wind patterns, which are important to kuaka when they fly between Aotearoa New Zealand and Alaska. The incidence of severe storms is increasing and also shifting in time, with uncertain effects on birds like kuaka (EAAFP, 2017a).

Recent studies have found that climate change is causing some birds to change their centuries old ways (EAAFP, 2017b) causing scientists to conclude that “what we're potentially seeing is evolution at work as they adapt their ways to make sure they reach their breeding grounds in time to find food and give their offspring the best chance of survival. If they arrive too late, the food has already declined so the timing is crucial.”

We can learn from the ability of migratory shore birds like kuaka to adapt and evolve to changing conditions. We too can adjust our ways and adapt and evolve as our climate changes.

REFERENCES / RESOURCES

- EAAFP. (2017). “Studies show climate change having an adverse effect on migrating waterbirds”. Accessed 30 January 2022, <https://www.eaaflyway.net/studies-show-climate-change-having-an-adverse-affect-on-migrating-waterbirds/>
- EAAFP. (2017). “Deakin University: New study shows climate change impacting shorebird migration”. Accessed 30 January 2022, <https://www.eaaflyway.net/deakin-university-new-study-shows-climate-change-impacting-shorebird-migration/>
- Forest and Bird. (2018). Bar-tailed godwit (kuaka) crowned Bird of the Year. Accessed 30 January 2022, <https://www.forestandbird.org.nz/resources/bar-tailed-godwit-kuaka-crowned-bird-year>
- He Kuaka Te Mana Kaha o te Whānau. 2022. Accessed 30 January 2022, <http://www.hekuaka.co.nz/the-kuaka-project/lessons-from-the-kuaka>
- Rykers, E. (2017). “Five native birds affected by climate change”. Accessed 30 January 2022, <http://blog.forestandbird.org.nz/five-native-birds-affected-by-climate-change/>



How well did you read the Kuaka story?

1. Why are kuaka or bar tailed godwits are admired for their endurance?

- a. They can fly for thousands of kilometres non stop over many days)
- b. They are a speckly colouring and long beak or bill
- c. They have a bar shaped tail (evident when flying)
- d. They can be seen in the Bay of Plenty from around September or October

2. Which of the following are reasons why rising sea level a threat to kuaka here in New Zealand?

- a. Kuaka have amazing endurance and can fly long distances
- b. Kuaka like to live in coastal places that will disappear as sea level rises
- c. It will be hard for kuaka to just move further inland as people live there
- d. In ancient times for Māori, the return of the kuaka was seen as a celebratory event

3. True or False? Climate change is affecting kuaka ability to find enough food (seasonal insects) during breeding time.

- a. True
- b. False

4. What do we mean by the term migratory or migration when we are talking about Kuaka?

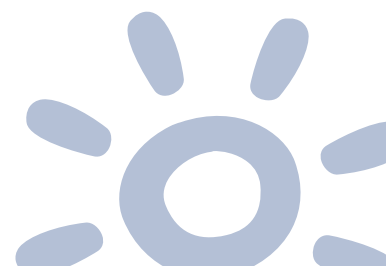
- a. They feed on insects during breeding time
- b. They fly each year from Aotearoa New Zealand to Alaska to breed
- c. They are small birds with brown plumage
- d. They are coastal birds - they live on the coast, in estuaries and harbours

5. Climate change may also alter global wind patterns and increase the number of severe storms. Why might this affect kuaka?

- a. They are a speckly brown bird
- b. They have a long black bill or beak
- c. They are good at adapting and evolving as conditions change
- d. They fly between Aotearoa New Zealand and Alaska

6. Adaptation is the process of adjustment to actual or expected climate and its effects. Humans can learn from the ability of migratory shore birds like Kuaka to adapt and evolve with our changing climate. Which of the following is NOT an example of adaptation to our changing climate?

- a. Enhancing and protecting sand dunes to make a strong natural buffer between land and sea
- b. Building on or removing sand dunes that are a natural buffer between land and sea
- c. Changing what we build on the coast so any new building can withstand coastal storms
- d. Changing where we build on the coast to stop new building too close to the sea



My Shore Bird Research Project

Choose a coastal bird that you want to know more about. Using as many different methods of research as you can, answer these questions about your bird.

My shore bird is:

Its scientific name/Māori name:

Draw a diagram of your bird here and label as many features as you can.

What is its nest like. and where is it?

What challenges will climate change present for your bird?

Does your bird need help. if so. what can be done?

What type of sounds does your bird make? Have a go making its bird calls! 🎵

What does it eat?

How does it go about getting food?

Other interesting facts you have found out about your bird:

Kōrero pukapuka / read

Shore Birds of the Bay of Plenty

Article and photography by: Julian Fitter
(all photos are by J Fitter unless credited otherwise)

James Cook named our bay the Bay of Plenty for many reasons, one of which must have been the plenitude of seabirds he saw as he sailed across the bay. Out at sea he would have seen mainly petrels, shearwaters and albatross, many of which breed on the islands in the bay. Had he come ashore, he would have seen huge numbers of shorebirds that we can still find today.

The Bay of Plenty coast is one long sand beach with a few rocky outcrops and four large shallow harbours. The two largest of these are Tauranga to the west and Ōhiwa in the east, with two smaller ones, Maketū and Little Waihi, in the middle. The sandy beaches are also breached by rivers whose exits to the sea often change from year to year. These harbours and river mouths are the main reason why the Bay of Plenty coast is so rich in birdlife.

This birdlife divides easily into four distinct groups - waders which feed on invertebrates, shags which are fish catchers, gulls which are mainly scavengers and terns who are also fishers.

Native waders

As their title indicates, waders have long legs to enable them to wade in shallow water. Many of them also have very long bills to enable them to probe into the mud and sand in search of their favourite food. Those with shorter legs and bills tend to feed closer to the shoreline.

Most prominent of these waders is the Tūturiwhatu or New Zealand dotterel. There are approximately 2000 of these birds, which are found only in New Zealand, with nearly 10 percent of them found in the Bay of Plenty.

Two other native waders that breed in the bay are the much smaller banded dotterel, which breeds mainly in the Eastern bay, and the variable oystercatcher. The variable oystercatcher is a large, almost all black wader, with an impressive orange-red bill and legs, which is found throughout the Bay.

There are a number of much larger wading birds which are found mainly in the harbours – these are the white-faced and reef herons, and the royal spoonbill with its impressive spoon-shaped bill. Spoonbills do not breed in the bay, but there are several flocks in the harbours which increase in numbers during the winter.



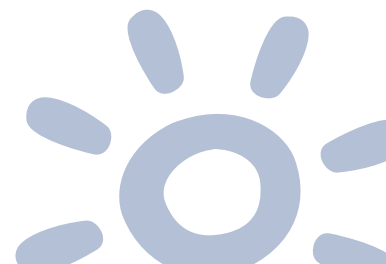
Tūturiwhatu,
New Zealand
dotterel,
*Charadrius
obscurus*



Tōrea pango,
variable
oystercatcher
and chick,
*Haematopus
unicolor*



Matuku
moana,
white-faced
heron, *Ardea
novaehollan-
diae*





Kuaka, bar-tailed godwits
Limosa lapponica



Left: Kawau, black shag,
Phalacrocorax carbo

Right: Kawau/kāruhiruhi, pied
shag, *Phalacrocorax varius*



Karoro, Southern black-backed
gulls, *Larus dominicanus*



Tarāpunga, red billed gull,
Larus novaehollandiae
scopulius (Photo: CC)



Tara, white-fronted tern,
Sterna striata

Migratory waders

In addition to the native waders that breed along the coast, there are huge numbers of migratory waders, some of which migrate from the South Island in the winter. These include the South Island pied oystercatcher, and the wrybill. The wrybill is the only bird in the world with a bill that curves to the right, apparently to help it turn stones over when searching for food.

The other migratory waders are the long distance guys, led by the bar-tailed godwits. These wonderfully long-legged and long-billed birds fly all the way to Alaska to breed, and then all the way back. Perhaps the most amazing feature of this 22,000 km annual journey is that, on the way south, if the weather conditions are right, they will do it in one single flight – eight days and eight nights, non-stop! That really is awesome! Some godwits, most likely the very young and the older ones, stay in New Zealand all year round. So godwits can be seen in all of our harbours at any time of the year.

Shags

Shags nest in trees on or close to the coast. They are large birds that sit very low in the water when swimming and then dive down to catch fish using their large webbed feet to propel them. They can spend a lot of time underwater, and when they have finished fishing they can often be seen resting on the beach, a post, or tree, with their wings held open to dry. There are two all black species and two black and white species. Shags have been far less affected by the arrival of humans than many other species. Because they nest high up in trees and feed underwater they are less likely to be attacked by mammalian predators.

Gulls

These common coastal birds are mainly white. Gulls are the ultimate scavenger and the red-billed gull will be known to many for its liking for picnic scraps. Its larger cousin, the black-backed gull, has also adapted well to humans and has increased in numbers to the detriment of a number of native species. Because they like a breakfast of baby dotterel chicks, black-backs need to be controlled close to dotterel nesting areas.

Another much less common gull is the black-billed gull; this is very similar to the red-billed gull but has a finer black bill and black legs, in contrast to the red bill and legs of the red-billed gull. The black-billed gull is endangered and found mainly in the South Island, but we have breeding colonies at Maketū and in Ōhiwa Harbour.

Terns

Terns are graceful relatives of the gulls; most common in the Bay are the handsome white-fronted terns with their jet black caps and long v-shaped tails. They often breed close to the red-billed gulls while their cousins, the much larger Caspian tern breeds individually or in small scattered colonies. Caspians are the largest terns in the world and, like all terns, feed by diving into the sea to catch small fish. Just occasionally you may also be fortunate enough to see the smallest tern in the world, the very rare and very small fairy tern.



Important Bird Area

The designation 'Important Bird Area' or 'IBA', is one given by BirdLife International to sites which are particularly important for one or more threatened or endangered bird species. In mid 2014, they announced a list of 141 Seabird IBAs in New Zealand. Most of these are on offshore islands but, of only 15 sites on the North Island, one is Maketū in the Bay of Plenty. This is a significant recognition, as it raises the profile of the area and can make it easier to obtain support for the protection of the birds in the area.

Threats

Like many other native birds, shore birds have been hard hit by a loss of habitat from human activities, and the introduction of mammalian pests. Rats, stoats, weasels, ferrets, hedgehogs, cats and dogs are a pretty formidable army to have to deal with.

Some shore birds nest and lay their eggs in the sand on the beach above the high tide mark, and in the sand dunes, and these may also be affected by vehicles, and pedestrian use of the beach.

Climate Change

Climate change presents a number of new threats and challenges for Bay of Plenty coastal birds. Birds living or nesting close to the waterline are finding their homes and nests increasingly affected by king tides, storm surges and rising sea levels. In many places human settlements close to the coast leave little room for birds to move their homes or nests inland.

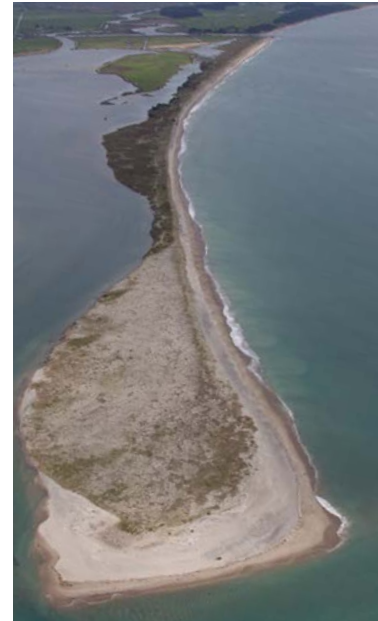
Some coastal birds are already being impacted by changing temperatures and rainfall patterns which can in turn impact food availability. Insects are an important source of food for many coastal birds and insect lifecycles depend on seasonal weather patterns. Migratory birds are also impacted by the increased intensity of storms, changing seasons and climate (such as wind patterns) during migration.

Restoration programmes

There are various restoration programmes, spearheaded by DOC, and supported by the Bay of Plenty Regional Council, as well as local Councils, and voluntary groups such as Forest & Bird and the Maketu Ongatoro Wetland Society. The main focus of these programmes are to control mammalian predators during the breeding season from August through February, while at the same time looking to restore the ecology of the main breeding sites. The protection being given primarily to our shore birds benefits many other native species of birds, reptiles and invertebrates.

What can you do to help?

- Watch out for 'Bird nesting' signs on beaches and stay outside of fenced areas. Use designated accessways to the beach.
- Keep your pets under control at all times at the beach. Dogs should be kept on a leash during nesting season. Be aware of local Council bylaws relating to dogs on beaches.
- Follow local Council bylaws on vehicle use at beaches. Ideally, keep vehicles off beaches during the shore bird nesting season (August through to February) and stay below the high tide line whenever possible.
- Become a bird minder! Volunteer your time or provide other support for pest control programmes through DOC, your local Council or other conservation groups.



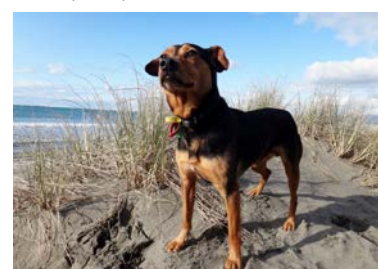
Maketū Spit



Variable Oystercatcher Nest



Stoat (DOC)



Dog in dunes (CC)



Hedgehog (DOC)



Summary Quiz questions

Impact of Climate Change on Coastal Animals and Plants

1. Which of the following aspects of climate change is less likely to create tough challenges Bay of Plenty coastal animals and plants?

- a. Increasing strength and severity of storms
- b. King tides
- c. Reduced number of frosts each year
- d. Rising sealevel

2. Foredunes are closest to the sea. Foredune vegetation has to be highly tolerant of wind and salt water. Where would you expect dune plants like Pīngao and Kowhangatara to be found on the dunes?

- a. Foredune
- b. Mid dune
- c. Back dune

3. Which native sand dune plants do a particularly good job of trapping sand to help form and protect coastal sand dunes in the Bay of Plenty?

- a. Marram grass
- b. Lupin
- c. Pīngao
- d. Kowhangatara or Spinnifex

4. Why will the New Zealand Dotterel or Tūturiwhatu be particularly affected by rising sea level, king tides and storm surges caused by coastal storms of increased intensity?

- a. Tūturiwhatu lay their eggs in trees
- b. Tūturiwhatu spend most of their time in the upper dunes
- c. Tūturiwhatu lay their eggs on the beach
- d. Tūturiwhatu eat sandhoppers

5. Which of the following are reasons why rising sea level a threat to kuaka here in New Zealand?

- a. Kuaka have amazing endurance and can fly long distances
- b. Kuaka like to live in coastal places that will disappear as sea level rises
- c. It will be hard for kuaka to just move further inland as people live there
- d. In ancient times for Māori, the return of the kuaka was seen as a celebratory event

6. Climate change may also alter global wind patterns and increase the number of severe storms. Why might this affect kuaka?

- a. They are a speckly brown bird
- b. They have a long black bill or beak
- c. They are good at adapting and evolving as conditions change
- d. They fly between Aotearoa New Zealand and Alaska

7. If there were no people living around our coast then as sea level rises coastal animals and plants would just move a little further _____ to adapt.

- a. Inland
- b. Out to sea
- c. Up in the trees
- d. Underground

8. Adaptation is the process of adjustment to actual or expected climate and its effects. Humans can learn from the ability of migratory shore birds like Kuaka to adapt and evolve with our changing climate. Which of the following is NOT an example of adaptation to our changing climate?

- a. Enhancing and protecting sand dunes to make a strong natural buffer between land and sea
- b. Building on or removing sand dunes that are a natural buffer between land and sea
- c. Changing what we build on the coast so any new building can withstand coastal storms
- d. Changing where we build on the coast to stop new building too close to the sea

Or you could take the Kahoot quiz:



[Impact of Climate Change on BOP Coastal Animals and Plants](#)