waitaha wai

Canterbury mudfish/kowaro

- a taonga species for iwi

an environmental resource for schools

Photo courtesy of Leanne O'Brien

Environment Canterbury
Your regional council

In this resource

Photo courtesy of Angus McIntosh

Canterbury mudfish/kowaro.

We would like to acknowledge Environment Canterbury staff, Department of Conservation staff and Leanne O' Brien for their help and advice in developing and producing this resource.

A large Canterbury mudfish/kowaro.

Freshwater mussel.

Freshwater crayfish/koura.

A very special fish

The Canterbury mudfish/kowaro is one of five species of mudfish in New Zealand and the second-most endangered native fish in New Zealand. It is a small, cigar-shaped fish, with small eel-like fins and no scales. It is a light brown colour, with mottled spots and gold flecks.

Canterbury mudfish/kowaro are endemic to New Zealand. This means they are not found anywhere else in the world!

Mudfish are very special fish because they are an indicator of good water management practices. They do best in areas with generally high water quality.

They are not territorial, so many mudfish can occur in one area if the habitat is suitable.

Canterbury mudfish/kowaro are also considered to be an 'umbrella species'. This is very important because it means that protecting them and their habitat also protects other species such as dragonflies, freshwater mussels and koura (freshwater crayfish).

Mudfish swim in an eel like motion which allows for easy movement through dense aquatic vegetation.

Taonga

Mudfish species are descendants of tangaroa (nga uri o tangaroa) and as such are nga taonga tuku iho o nga tupuna matua (treasures handed down to us from our ancestors). Ngai Tahu regards Canterbury mudfish/kowaro as a taonga (treasured) species.

Ngai Tahu is the tribal group in the Canterbury region. Within Canterbury, each district is represented by runanga (a Maori equivalent of local government). Papatipu runanga are the collective runanga of the region.

All in a name

The scientific name for Canterbury mudfish/kowaro is *Neochanna burrowsius*. This has nothing to do with the mudfish's ability to burrow. It was given this name in honour of Mr. Alfred Burrows who discovered the fish on his farm near Christchurch in the 1920s. Mr. Burrows had sailed to New Zealand from England in 1874.

Canterbury mudfish/kowaro (bottom left) and Common bully (top right).

Did you know?

The biggest recorded adult Canterbury mudfish/kowaro is 18cm but most are smaller (less than 10cm).

The early years

Before the arrival of humans, much of the Canterbury Plains was wetland, covered with trees such as kahikatea. Polynesian fires removed these lowland swamp forests replacing them with tussock, scrub and wetland vegetation. By the 1920s, these areas had already been transformed from vast wetlands into productive farmland.

After finding the Canterbury mudfish/kowaro on his farm in the 1920s, Mr Alfred Burrows sent his discovery to the Dominion Museum in Wellington. The species was then classified and officially named in 1926 by William Phillipps who worked at the museum.

Further research took place from the 1960s to the 1990s. By this time, populations of the Canterbury mudfish/kowaro had been recorded from the Oxford/Rangiora area to the north side of the Waitaki River.

The largest protected area for mudfish is Dog Kennel Stream south of Waimate. The Department of Conservation (DOC) look after this area and some restoration has already taken place. Canterbury mudfish/kowaro are still found here today.

Traditional vegetation.

Photo courtesy of Leanne O'Brien

Dog Pond, part of Dog Kennel Stream

Fish and Chips!

Some of the first mudfish specimens found were dug up in a damp field of potatoes!

A fish out of water?

Mudfish can do something most other fish can't – they have the ability to survive out of water in moist conditions for up to two months!

During the summer months when water levels get low and water becomes stagnant (non-flowing water with reduced oxygen), mudfish will leave the water to find a moist hiding place. Then, when summer is over and water returns to the area, they can eat, swim and breed.

This means they can live in places other fish can't.

When the water is stagnant, Canterbury mudfish/kowaro will gulp air at the water surface and hold a bubble of air in their mouths and breathe through their skin. If the drought continues they will retreat into muddy underground hollows or burrow. If all else fails they may also move across land to find a new home.

However, this is not a long-term solution, as mudfish cannot survive for long periods of time in this type of environment. Mudfish are adapted to seasonally stagnant wetlands so a damp refuge is essential for survival during a drought. This is an area of growing concern as droughts are predicted to increase in the future.

Photo courtesy of Leanne O'Brien

A burrowing Canterbury mudfish/kowaro.

Where are they?

Once widespread in wetland areas, mudfish are now found only in a limited number of Canterbury Plains waterways between the Ashley River (North) and the Waitaki River (South). Most of these sites are on private land so Environment Canterbury and the Department of Conservation are working with landowners to protect these key remaining habitats.

Many populations of mudfish occur in waterways that are directly used for irrigation, stock water, land drainage or are close to roads. The naturally occurring populations closest to Christchurch are Woodend, Hororata and Oxford.

Did you know?

You are unlikely to see a mudfish as the adults are largely nocturnal (out and about at night), hunting for worms, snails, mosquito and midge larvae and other aquatic insects.

Midge larvae

Snail

Photo courtesy of Leanne O'Brien

Canterbury mudfish/kowaro have been found in areas similar to this.

Distribution

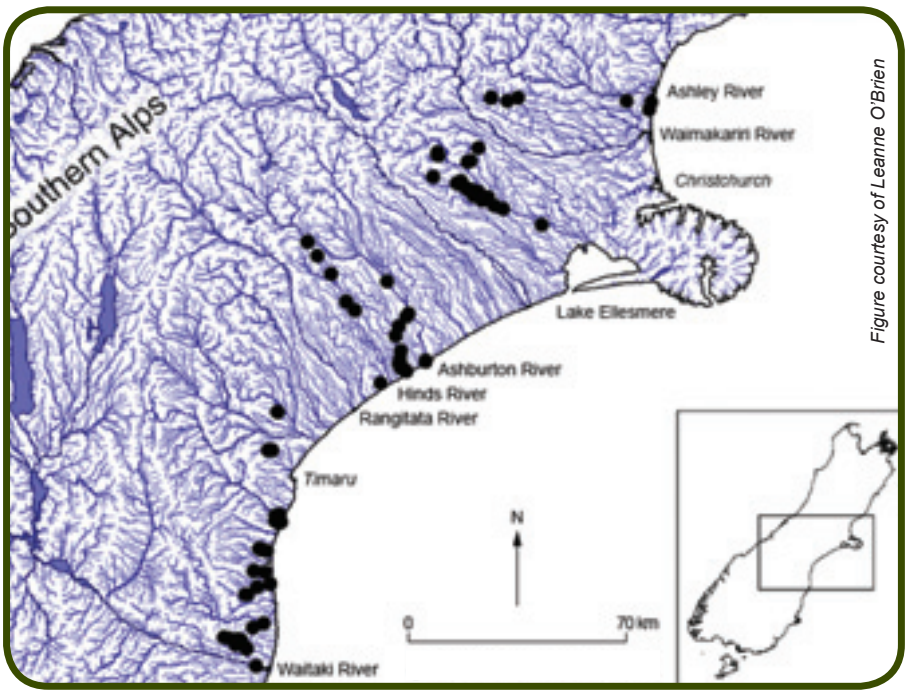


Figure courtesy of Leanne O'Brien

Distribution of Canterbury mudfish/kowaro to date.

Did you know?

Habitats are the places where plants and animals live. In a healthy habitat there is more diversity (variety) of species.

Habitat

Despite the name, Canterbury mudfish/kowaro like to live in small, slow flowing streams, ponds, drains and wetlands often with deep pools and lots of aquatic plants. They do not migrate to the sea but remain in fresh water throughout their lives.

However, mudfish habitat has changed significantly from the kahikatea wetlands that were once widespread across Canterbury. The Canterbury mudfish/kowaro has managed to survive extreme habitat loss, but the over-all population is now so small that the species is threatened with extinction. Fish have been found in small artificial ponds, water races and in the drains that have drained their wetland habitats!

Natural habitats for Canterbury mudfish/kowaro are mainly spring-fed streams flowing through wetland areas, with water sourced from either hill seepage or groundwater. However, most of the existing populations are found in habitats made by people. This includes dams, farm ponds, soakage pits, under road culverts, weed-filled creek beds or stockwater races inaccessible to trout. These areas tend to have few other fish species living there because they are isolated from main rivers or frequently dry up.

Fallen logs (mudfish can hide inside or under these), overhanging banks, tree roots (mudfish can follow these down to find moist hiding places), soft mud, between rocks as well as in and around aquatic plants are also important areas for mudfish to lay eggs and hide in.

Aquatic plants are another essential part of mudfish habitat and they are associated with the presence of certain native species, e.g. water milfoil, red pondweed/manihi, watercress.

Aquatic plant.

The top five

The ideal habitat for Canterbury mudfish/kowaro would have:

- No predatory fish species (fish that feed on mudfish)
- Lots of aquatic plants
- Permanent water or a suitable wet summer refuge
- A good food source for feeding
- High levels of oxygen in the water during breeding season.

Photo courtesy of Leanne O'Brien

Some habitats dry up during summer droughts, leaving only a few pools of water.

Photo courtesy of Leanne O'Brien

Hill seepage pool.

Photo courtesy of Leanne O'Brien

Dam pool.

Photo courtesy of Leanne O'Brien

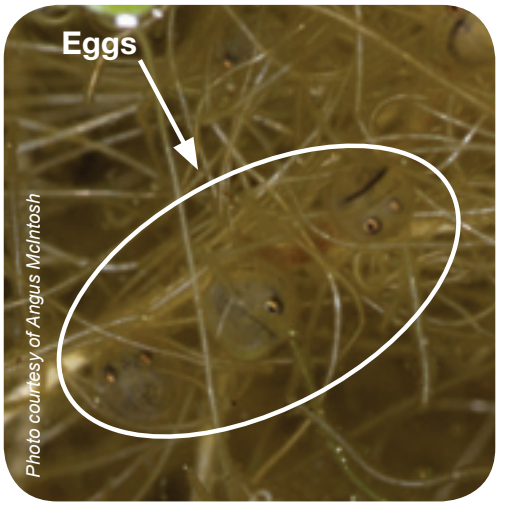
Stockwater race.

Reproduction

Canterbury mudfish/kowaro can reproduce in their first year. A female lays her eggs in late winter to early spring scattering them amongst stems and under the leaves of plants near the water surface. The plants camouflage the eggs and help protect them.

The eggs are transparent and look a bit like tiny (2mm) bubbles. After two weeks, a small 1cm long fry (baby fish) emerges with a tiny head and thin tail.

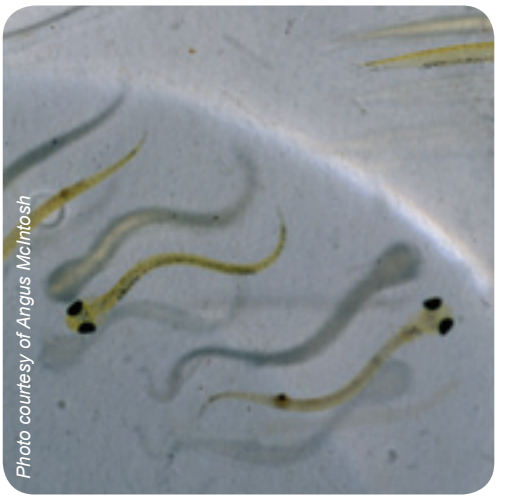
During spring and early summer, for a month or so after hatching, the fry swim out in the open during the day. They look and behave like very small whitebait. Calm, sunny afternoons are the best time to see fry, as it is often easier to spot the moving shadow of the small semi-transparent fish.



Mudfish eggs are spread amongst plants like this.

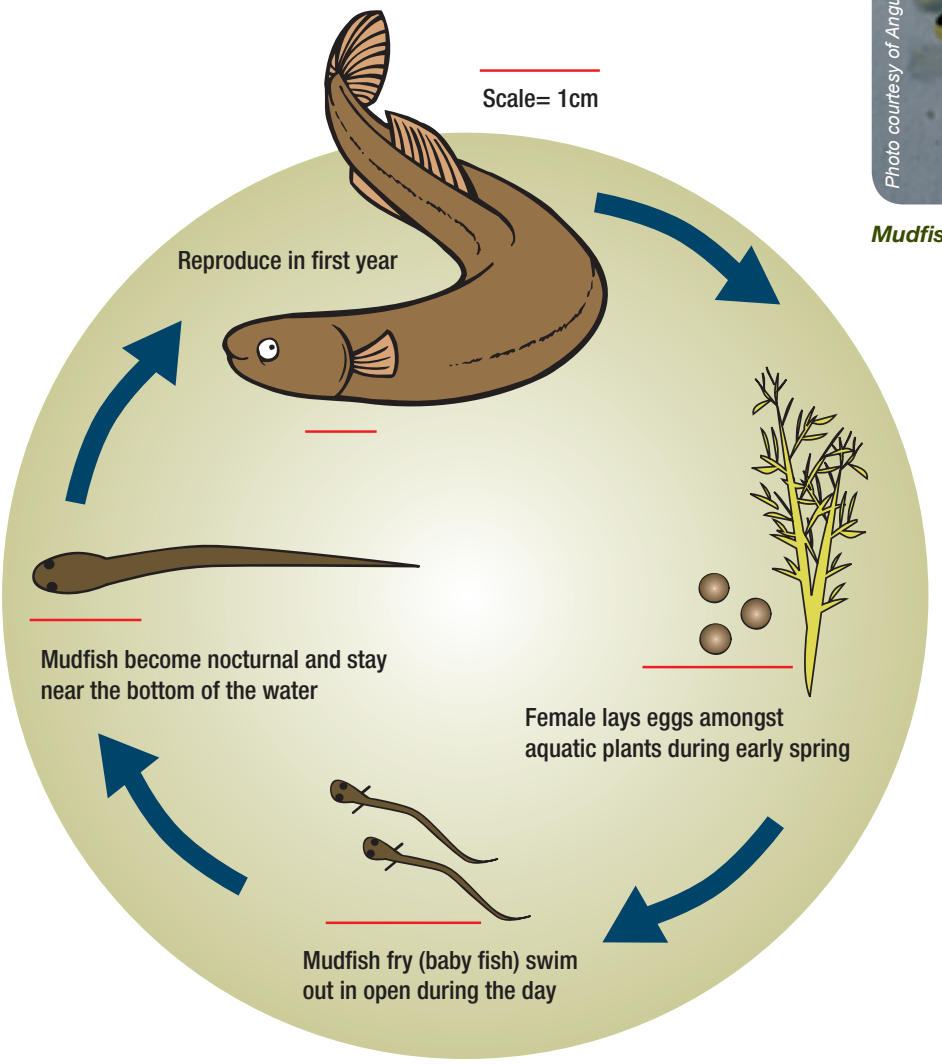
Did you know?

A 10cm-long female mudfish can produce up to 2000 eggs!



Mudfish fry (baby fish).

Lifecycle of the Canterbury mudfish/kowaro



Did you know?

Camouflage is a protective coloring that helps hide an animal by blending it in with the surrounding environment. The mudfish's light brown colour with dark brown stripes and splotches is a perfect camouflage amongst the dense vegetation in the water.

Threats

The Department of Conservation has classified Canterbury mudfish/kowaro as 'nationally endangered'. Once widespread throughout the Canterbury Plains, habitat loss and degradation are the main reasons for the decline of this fish.

The main threats to Canterbury mudfish/kowaro populations are:

- Land use change and development. This results in direct removal of habitat through wetland drainage, clearance and irrigation.
- Reduced water quality. This affects mudfish health, particularly the survival of mudfish eggs and fry.
- Introduction of other species, e.g. predatory fish such as trout and eel/tuna, which can move through connected drains and water races.
- Extreme environmental changes, e.g. drought.
- Removal of in-stream vegetation, e.g. through drain maintenance and stock grazing.

Stock grazing.

Trout.

Clearing of waterway.

Did you know?

Other nationally endangered species include the kakapo, takahe, brown teal/pateke and Maui's dolphin.

Does size matter?

Protecting networks of many small populations is essential as each population is important. This also allows populations to breed together, recolonise areas after local extinction and has minimal impact on agricultural activities.

Due to their low genetic diversity, high population numbers of mudfish are needed in order to ensure ongoing survival of the species. This means having many populations across different areas as well as habitats being provided on private farmland.

Photo courtesy of Angus McIntosh

Canterbury Mudfish/kowaro

Restoration

The wetland areas in which Canterbury mudfish/kowaro survive are in need of protection and improving. Managing areas so that there is in-stream habitat for Canterbury mudfish/kowaro is vital as mudfish requirements for survival differ from those of other native freshwater fish.

Through good sustainable land management, local populations of the fish can survive and flourish. It is possible to integrate Canterbury mudfish/kowaro habitat into a productive agricultural landscape if the area is managed responsibly.

Native stream vegetation.

The Department of Conservation (DOC)

In 2003, DOC produced a recovery plan for all five mudfish species found in New Zealand. This plan details the actions that need to happen to help protect the Canterbury mudfish/kowaro. The goal of the plan is to maintain and improve the geographic range, habitat and genetic diversity of all mudfish species. It sets in place actions for managing key mudfish sites and recognises that working proactively with the community is essential in order to protect mudfish habitat.

To shade or not to shade

Both sunlight and shade are important for mudfish habitat. Sunlight helps water plants to grow, which in turn increases the habitat and food resources available. Shading of a stream with vegetation also helps keep water temperatures cool.Streamside planting of sedges and rushes are best.

Being nocturnal, adult mudfish need cover during the day as many other species eat mudfish including herons, bitterns, eel/tuna and trout. Overhanging banks, spaces between stones, plants and debris on the streambed all help with this. Culvert barriers can also be useful as they prevent invasion of other fish species.

Survival

Mudfish have been able to survive despite these threats due to their early sexual maturity and high breeding rate. This enables populations to recover quickly after periods of disturbance.

They also have quite general food and habitat requirements as well as being tolerant of extreme environmental conditions and their ability to breathe through their skin. However, the Canterbury mudfish/kowaro is still a species that needs our help.

A well shaded stream

Get involved!

Anyone can get involved in the protection of mudfish. This includes identifying, maintaining and enhancing habitat for mudfish. Through good sustainable land management local populations of the fish can survive and flourish. Here are some ideas to help keep wet areas 'mudfish friendly':

- Take part in/help organise the improvement of your local waterway, e.g. a clean-up day.
- Maintain and encourage aquatic plants, e.g. water milfoil, red pondweed/manihi, and watercress.
- Maintain riparian vegetation, e.g. as part of a planting programme/planting day.
- Promote mudfish in your local community, e.g. host an information day, put up posters or give talks at school. This could be as part of World Habitat Day (held on the first Monday in October every year).
- Avoid introducing predatory fish into a waterway, e.g. trout.
- Look for signs of mudfish around Canterbury and send this information to Environment Canterbury.
- Visit the mudfish website www.mudfish.org.nz

Streamside planting.

Here are some other things you can do to help protect Canterbury's waterways

- Undertake a restoration project for one of the waterways in your local catchment, think about how to make this a 'mudfish friendly' area. Create a long-term plan looking at how it will be organised and tended to in the future. Section five of the Waitaha Wai water education resource gives more detail on how you could do this.
- Talk to your parents about directing the rainwater that runs down the spout away from the storm water drains and into a large plastic drum. This can be used to water the garden and recharge the groundwater (see your local recycling centre about a drum).
- Naturalise your garden so it can soak up rain: provide habitats and food for birds.
- Pick up rubbish around the streets to prevent it from finding its way into the river.
- Wash your car on the lawn not the road, and use a bucket instead of a hose.
- Research plant species that could be planted along riverbanks to assist restoration. This could be done as part of organising a planting day.
- Be respectful when walking and playing in and around waterways, they are home to many plants and animals.

More resources

Waikaka Grows Up: Written by Marlene J Bennetts, illustrated by Trish Bowles. Emjay Publishing, 2006.

www.i-niche.co.nz

Lesson: Water biodiversity Levels: 2- 3 Teaching Time: 90mins

Programme description (focus of programme)

To become familiar with the term biodiversity, how this relates to the stream environment, and the habitat of the Canterbury mudfish/ kowaro. Key environmental education concepts: Interdependence, biodiversity, personal and social responsibility for action.

Level	Essential Learning Area	Strand	Achievement Aim	Achievement Objective
2	Science	Living World	Special characteristics of NZ plants and animals Investigating local ecosystems Interdependence of living organisms	Investigate the responses of plants or animals to changes in their habitat.
2	Science	Living World	Special characteristics of NZ plants and animals Investigating local ecosystems Interdependence of living organisms	Investigate the responses of plants or animals to changes in their habitat.
3	Science	Living World	Special characteristics of NZ plants and animals Investigating local ecosystems Interdependence of living organisms	Research and describe how some species have become extinct or are endangered
2	Social Studies	Place and Environment	People's interaction with places and the environment	How people's activities influence places and the environment and are influence by them.

Activities *(See Black Masters and additional information for activity examples)*

1. Biodiversity – What is it?

Brainstorm the term biodiversity with the students.

- What does biodiversity mean? It may be useful to do this by breaking the word into two parts – bio and diversity.
- What words do the students associate with biodiversity?
- What are the benefits of biodiversity?
- How is biodiversity affected?

Answers to these questions could be recorded and pasted around the room.

Definition: Biodiversity is the variety of all life on earth. Biodiversity of species is the diversity/variety of all plants and animals. A healthy waterway has many different species of plants, invertebrates (animals without a backbone) and fish.

2. Biodiversity in the river environment.

Introduce the river/stream environment. Ask the students what 'diversity of life' would exist here? E.g. types of plants and animals that live here.
Ask the students if they have heard of the Canterbury mudfish/ kowaro. Record their answers on the board to refer to later.

3. A very special fish

Introduce the Canterbury mudfish/kowaro as the 'special fish' that you will be looking at due to its role in the biodiversity of stream life in Canterbury.

4. Play 'Who am I?'

Ask the children 'Who am I?' Below is an example to start with. Ask the students to make their own 'Who am I' clues for a river/ stream plant or animal they know or have brainstormed.

Example:
I am not found anywhere else in the world!
I am shaped like a cigar.
I hide amongst the rocks and hunt for my food at night.
I can live out of water for a short time.
I am a..

Note: There are more examples supplied in the "Black Masters and additional information" sections.

5. What's in a habitat?

Discuss the term habitat with the students. Use the definition provided on page 5 of this resource as a starting point. Follow on from the 'Who am I' activity by asking the students:

What kind of habitat would the Canterbury mudfish/kowaro live in?

Where would you find this special fish?

What does it need to survive?

Use the mudfish habitat 'cut and paste' activity (supplied in this resource) and poster provided to get students thinking about what the Canterbury mudfish/kowaro needs to survive.

6. Follow up

Test the students knowledge by asking them to list 2-3 features (that are important for Canterbury mudfish/kowaro habitat) as listed in the 'cut and paste' activity e.g. aquatic plants, overhanging banks, between rocks and soft mud are all important areas for mudfish to lay eggs and hide in.

Where else could mudfish go to hide?

- Fallen logs (mudfish can hide inside or under these)
- Tree roots (mudfish can follow these down to find moist hiding places)
- Soft mud
- Between rocks on the streambed
- In and around aquatic plants

What changes to the land would have an impact on these features?

Discuss other places where mudfish might be found e.g. man made structures such as water races, drains, dams as well as wetlands, ponds and streams.

Note: The main information section of this resource has more details on this.

Lesson: Mudfish special Levels: 2-4 Teaching Time: 120mins

Programme description (focus of programme)

To increase knowledge and awareness about the Canterbury mudfish/kowaro and its environment. Key environmental education concepts: Interdependence, biodiversity, personal and social responsibility for action.

Level	Essential Learning Area	Strand	Achievement Aim	Achievement Objective
2	Science	Living World	Investigating local ecosystems Interdependence of living organisms Special characteristics of NZ plants & animals	Investigate the responses of plants or animals to changes in their habitat.
3	Science	Living World	Investigating local ecosystems Interdependence of living organisms Special characteristics of NZ plants & animals	Research and describe how some species have become extinct or are endangered
4	Science	Living World	Investigating local ecosystems Interdependence of living organisms Special characteristics of NZ plants & animals	Investigate and describe special features of animals or plants which help survival into the next generation.
3	Social Studies	Place and Environment	People's interaction with places and the environment	How different groups view and use places and the environment.
4	Social Studies	Resources & Economic Activity	People's allocation and management of resources	How and why people view and use resources differently and the consequences of this.
3	English	Viewing and Presenting	Use verbal and visual features to communicate information, ideas or narrative.	
2,3	The Arts	Developing Ideas in the Visual Arts	Generate and develop visual ideas in response to a variety of motivations, using imagination, observation and invention with materials.	

Activities *(See Black Masters and additional information for activity examples)*

1. Recap- Canterbury mudfish/kowaro

Recap on what students learnt about the Canterbury mudfish/kowaro in the previous lesson. Put them in pairs and ask each student to tell their partner 2 things they remember about this special fish.

2. Post box

Post key facts about Canterbury mudfish/kowaro around the classroom. Give the students an answer sheet for the following questions:

Why is the Canterbury mudfish/kowaro special?
Where does the Canterbury mudfish/kowaro live?
What is an 'umbrella species'?
How many species of mudfish are there in New Zealand?
What can a mudfish do that no other fish can?
How do Canterbury mudfish/kowaro protect themselves from predators?
What do Canterbury mudfish/kowaro eat?
List two threats to the Canterbury mudfish/kowaro population?

Note: Key facts and questions sheets are supplied in this resource.

3. Testing knowledge

Students could test what they have remembered about the Canterbury mudfish/kowaro using the fill in the gaps template supplied in this resource.

4. Threats to the Canterbury mudfish/kowaro

Once widespread throughout the Canterbury plains, habitat loss and degradation are the main reasons for the decline of Canterbury mudfish/kowaro. The main threats to the Canterbury mudfish/kowaro are:

- Direct removal of habitat through wetland drainage, clearance and irrigation.
- Reduced water quality = reduces mudfish health.
- Introduction of other species = predatory fish such as trout and eel/tuna
- Extreme environmental changes e.g. drought
- Removal of in-stream vegetation e.g. drain maintenance and stock grazing = reduced habitat

Consequence Wheel – brainstorm both positive and negative effects of land development. Try to think about social, cultural, economic and environmental impacts e.g. local iwi, visitors to the area, residents, the local business community, biodiversity. In the centre of the circle you will need to write your event that will have "consequences" e.g. wetland drainage and development. In each radiating outward circle write consequences, which in turn lead to other effects. Effects can be both positive and negative.

Please refer to appendix for black line masters.

Continued next page...

5. Spread the word

Ask the students why ***they*** think the Canterbury mudfish/kowaro is special. Brainstorm some key messages that they feel are important to share with the wider community e.g. threats to the survival of the Canterbury mudfish/kowaro and its habitat.

Students could think of ways to raise awareness about Canterbury mudfish/kowaro. Here are some ideas:

- Design a poster or bumper sticker highlighting why Canterbury mudfish/kowaro and their habitat need protecting. If using a slogan make it short and catchy and remember that it should be readable from a distance.
- Write a story, poem or play about a mudfish. This could be shared with junior students at school.
- Make up a 'Canterbury mudfish/kowaro Protection Code' that lists ways to look after mudfish and their habitat. Visit www.doc.govt.nz for examples of water and land care codes.
- Build your own mudfish. Students could use a range of natural and man-made materials e.g. sticks, leaves, cardboard, paper, wool, socks, buttons….whatever you can find!

Note: The mudfish drawing and habitat activity provided in the Black Masters section could be used as a starting point for this activity.

Lesson: Valuing the stream environment Level: 2-4 Teaching time: 30mins

Programme description (focus of programme)

For students to think about how they feel about the stream environment and what is important to them with regards to this. Key environmental education concepts: Interdependence, sustainability, personal and social responsibility for action.

Level	Essential Learning Area	Strand	Achievement Aim	Achievement Objective
2	Social Studies	Place and Environment	People's interaction with places and the environment	How people's activities influence places and the environment and are influence by them.
3	Social Studies	Place and Environment	People's interaction with places and the environment	How different groups view and use places and the environment.
4	Social Studies	Resources and Economic Activity	People's allocation and management of resources	How and why people manage resources
4	Social Studies	Place and Environment	People's interaction with places and the environment	How different groups view and use places and the environment.
3	English	Viewing and Presenting	Use verbal and visual features to communicate information, ideas or narrative.	

Activity - Values continuum

This lesson can follow on from the biodiversity brainstorming lesson. Introduce the focus of this lesson - waterways and streams.

As a class participate in a values continuum activity. Read out the statements below and ask students to move to the place on the continuum that represents their beliefs regarding the statements.

One end of the room represents "strongly agree" with the statement and the other end of the room represents "strongly disagree". Students will be asked to explain their position. As a result of other people's explanations students may choose to readjust their position.

Values continuum statements:

- Local waterways need to be protected.
- A variety of wildlife should be encouraged.
- Canterbury mudfish/kowaro and their habitat need protecting
- People should be involved in local environment care.
- New Zealanders care for the environment.
- It is better to use an unspoiled river for recreation, rather than keep it as a natural habitat.
- People should be made to spend some of their free time working towards helping the environment

Record where the students placed themselves. Ask the students to think about why they put themselves at this point on the continuum. They could discuss this in pairs.

This activity could take place before, after or during a visit to your local stream or waterway.

Adapted from TKI Streams and Waterways: Strife in Streamsville

Lesson: Local stream role play Level: 2-4 Teaching time: 90mins

Programme description (focus of programme)

For students to think about what impacts on the stream environment and how this effects those who use and live in this environment (people, plants, animals e.g. Canterbury mudfish/kowaro). Environmental education concepts: Interdependence, sustainability, biodiversity, personal and social responsibility for action

Level	Essential Learning Area	Strand	Achievement Aim	Achievement Objective
2	Social Studies	Place and Environment	People's interaction with places and the environment	How people's activities influence places and the environment and are influence by them.
3	Social Studies	Place and Environment	People's interaction with places and the environment	How different groups view and use places and the environment.
4	Social Studies	Resources and Economic Activity	People's allocation and management of resources	How and why people manage resources
4	Social Studies	Resources and Economic Activity	People's allocation and management of resources	How and why people view and use resources differently and the consequences of this.
3	English	Viewing and Presenting	Use verbal and visual features to communicate information, ideas or narrative.	

Role play activity *(See Black Masters and additional information for role play cards)*

A local town are concerned about the health of the stream that runs through their community. The water colour has changed and there are fewer plants and fish in the water. There were once large populations of Canterbury mudfish/kowaro but in a recent survey scientists only found a few. No one will take responsibility for the health of the stream.

The town residents held a meeting to discuss how and why the stream had become polluted and unhealthy. The opinions of some of the residents are recorded on the role play cards in the black masters section.

Copy and cut out each of the text boxes provided. Allocate each student one of these roles. Each student must 'play' this role in the meeting and respond to the following questions with these views in mind.

Questions:

- Why do you think animal and plant life in the stream is declining?
- What do you think is the main problem affecting the stream?
- Who do you think is responsible for the degradation of the stream?
- How have each of these people impacted on the stream environment?
- What do you think the residents should do about making their stream healthy again?

Debrief:

Ask the students how they felt about playing their role. Did they agree/disagree? Students could also place themselves on the values continuum again (as in previous lesson) to see if this activity has changed their personal view.

Adapted from TKI Streams and Waterways: Strife in Streamsville

I am not found anywhere else in the world!
I am shaped like a cigar.
I hide amongst the rocks and hunt for my food at night.
I can live out of water for a short time.
I am a Canterbury mudfish/kowaro.

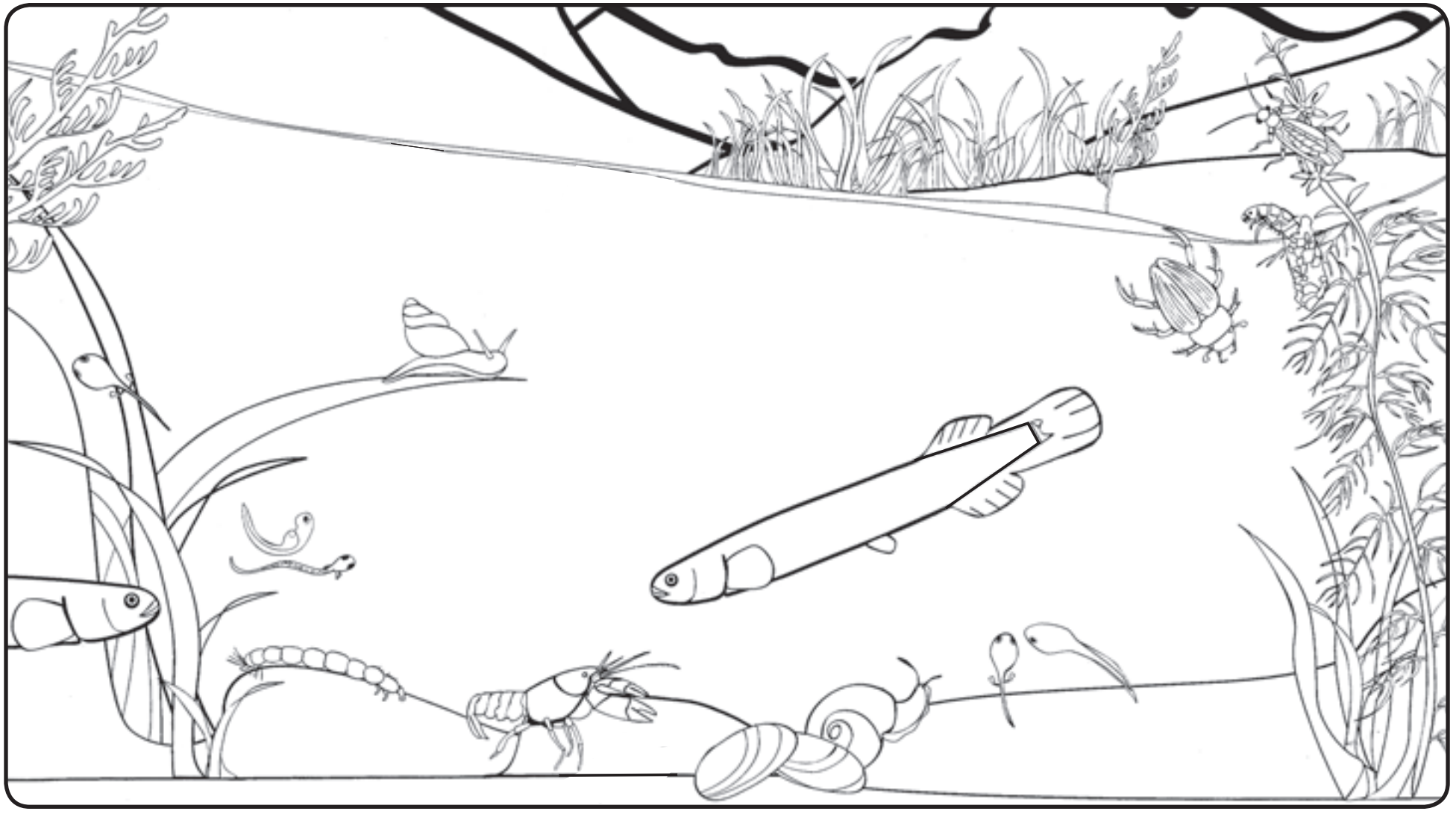
I am cool and wet to touch.
I move between rocks and plants.
I am home for many small animals and fish.
I can get very sick if I am not looked after properly.
I am a stream.

I am very small; you have to be quick to see me!
I am the helicopter of the insect world.
I have pretty coloured wings that sparkle in the sunlight.
I am food for birds and fish.
I am a dragonfly.

I help provide shade for the stream.
I am one of New Zealand’s oldest plants.
I have beautiful red flowers with nectar that the tui love.
My leaves are very good for weaving.
I am flax/harakeke.

I am an insect that lives in the stream.
I hide under stones so the water doesn’t wash me away.
I get chased by fish who love to eat me!
I have six legs and a long tail.
I am mayfly larvae

Make a mudfish habitat



Match the plants and animals that help make up mudfish habitat.

Cut the labels out and stick them onto the correct plants and animals.

Aquatic plants		Freshwater mussel		Canterbury mudfish/ kowaro		Mudfish fry (baby fish)		Streamside plants		Overhanging streambank		Caddisfly
Snail		Rocks		Muddy stream bottom		Midge larvae		Freshwater crayfish/ koura		Diving Beetle		Tadpoles

1. Why is the Canterbury mudfish/kowaro special?

_____

_____

2. Where does the Canterbury mudfish/kowaro live?

_____

_____

3. What is an ‘umbrella species’?

_____

_____

4. How many species of mudfish are there in New Zealand?

_____

_____

5. What can a mudfish do that most other fish can’t?

_____

_____

6. How do Canterbury mudfish/kowaro protect themselves?

_____

_____

7. What do Canterbury mudfish/kowaro eat?

_____

_____

8. List two threats to the survival of Canterbury mudfish/kowaro

_____

_____

The Canterbury mudfish/kowaro is special because:

- They are the second most endangered native fish in New Zealand
- They are not found anywhere else in the world
- They are an indicator of good water management practices. They do best in areas with generally high water quality.

Canterbury mudfish/kowaro like to live in small, slow flowing streams, ponds and wetlands. However, most mudfish are now found in habitats made by people. This includes dams, drains, under road culverts and stock water races.

Canterbury mudfish/kowaro are considered to be an 'umbrella species'. This means that protecting them and their habitat also protects other species such as dragonflies, freshwater mussels and koura (freshwater crayfish).

There are five species of mudfish in New Zealand.

Mudfish can live in places other fish can't. They can survive out of water for up to two months! During the summer months when water levels get low, mudfish will leave the water to find a moist hiding place. Then, when summer is over and water returns to the area, they can eat, swim and breed.

Canterbury mudfish/kowaro protect themselves by:

- Being nocturnal (out and about at night)
- Hiding under overhanging stream banks
- Hiding between rocks and around aquatic plants

Canterbury mudfish/kowaro eat worms, snails, mosquito and midge larvae.

The main threats to Canterbury mudfish/kowaro populations are:

- Land use change and development
- Reduced water quality
- Predatory species e.g. trout and eel/tuna (which eat mudfish)
- Extreme environmental changes e.g. drought
- Removal of in-stream vegetation

The _____ is not found anywhere else in the world!

Not many people know that this special _____ can survive out of _____ for

a while. The Canterbury mudfish, known to Maori as _____ like to live in _____

flowing streams, _____ and drains. During hot _____ months when water

_____ get low _____ will leave the water to find a _____ hiding place

like an overhanging _____ bank or damp holes in the _____.

Here, they wait quietly until the next _____ brings_____ flowing into the

pond or drain again. Early New Zealand _____ sometimes found mudfish in their

damp_____ gardens!

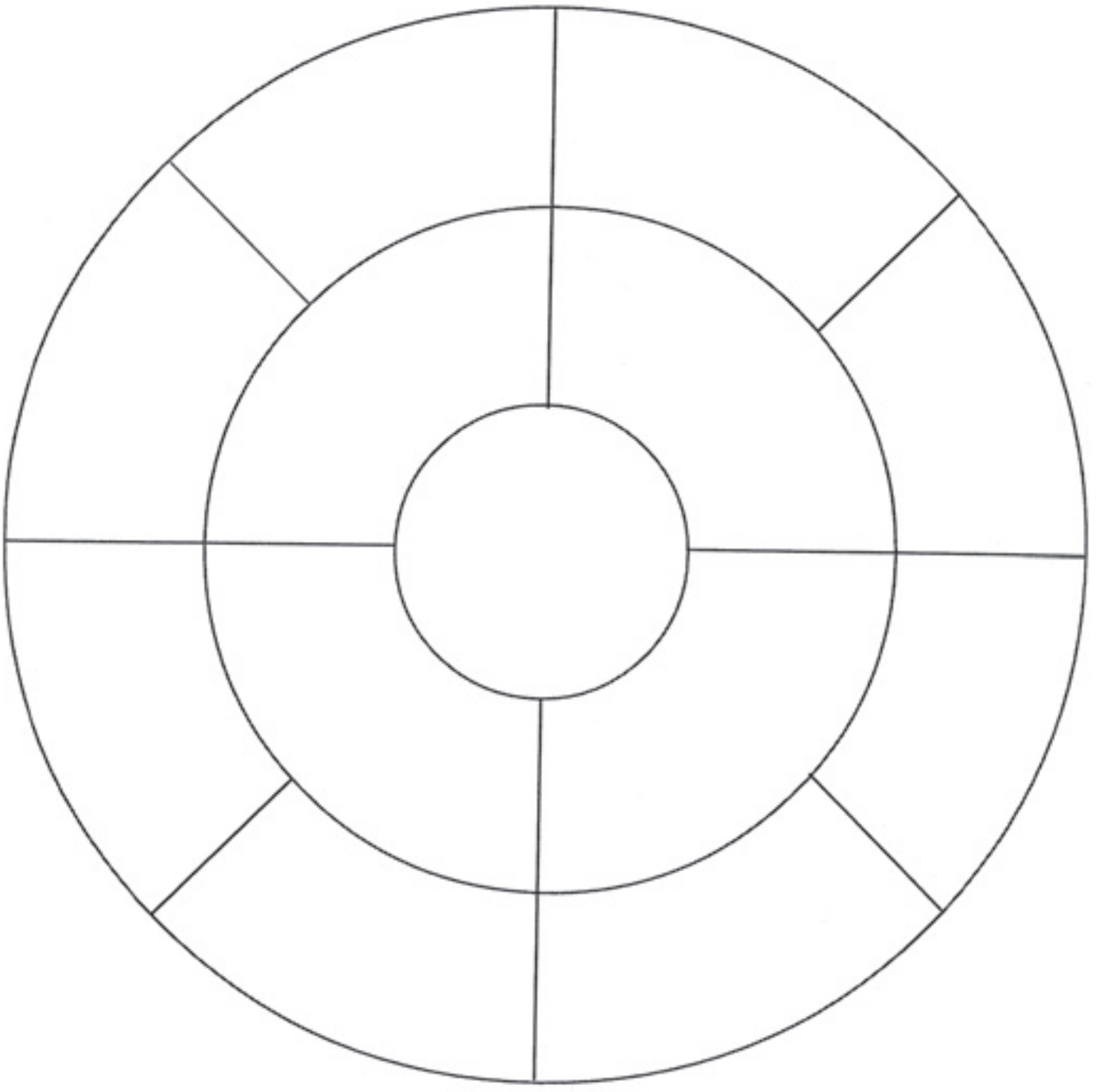
Words:

Potato, Water, Damp, Summer, Settlers, Fish, Mudfish, Stream, Slow, Canterbury mudfish, Rain, Ground, Water, Wetlands, Levels, Kowaro

Model answers:

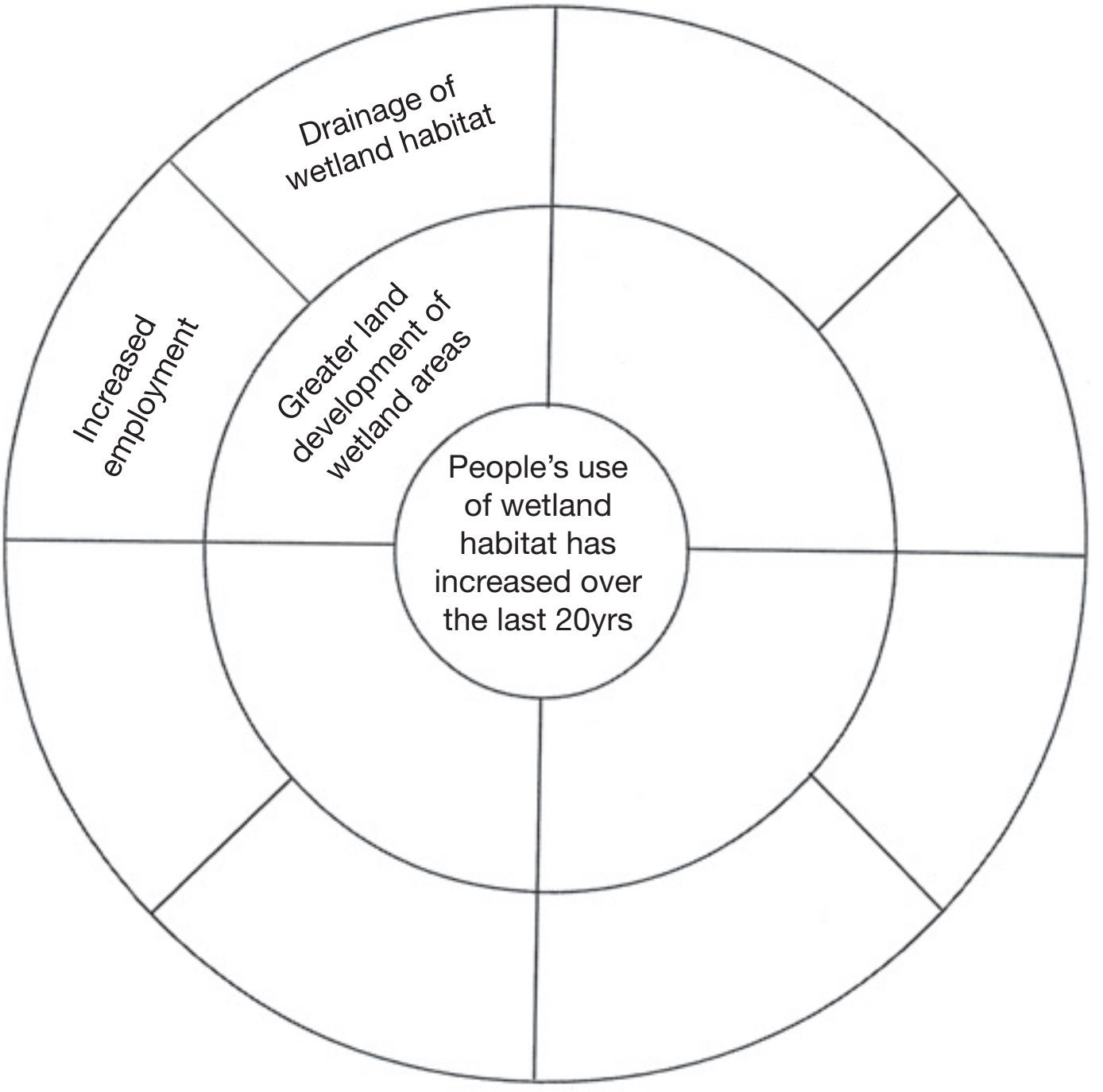
The **Canterbury mudfish** is not found anywhere else in the world! Not many people know that this special **fish** can survive out of **water** for a while. The Canterbury mudfish, known to Maori as **kowaro** like to live in slow flowing streams, **wetlands** and drains. During hot **summer** months when water **levels** get low **mudfish** will leave the water to find a **damp** hiding place like an overhanging **stream** bank or damp holes in the **ground**. Here, they wait quietly until the next **rain** brings **water** flowing into the pond or drain again. Early New Zealand **settlers** sometimes found mudfish in their damp **potato** gardens!

Consequence wheel



Activity template courtesy Environment Waikato

Consequence wheel (partly completed)



Activity template courtesy Environment Waikato

Plant and animal conservationist

There are far fewer plants in the stream than there used to be. Plants on the stream bank are being trampled on and even taken. This means the fish have less food and their numbers are greatly reduced. Less food means the fish are not breeding in the numbers that they used to.

Areas where we used to find Canterbury mudfish no longer exist. There is less diversity of species in the stream.

Walker

I love walking along the stream. All of the people in my walking group are keen gardeners so we enjoy finding unusual plants along the stream bank. I took some plants from the stream for my own garden.

We don't see any harm in taking a few plants. This helps increase the number of native plants in the community and there are just so many plants alongside the stream.

Child

My friends and I used to go exploring in the stream all the time. Sometimes, if we went out at night we would see mudfish hiding under the stream bank. But since all the land changes, we hardly see them anymore.

I don't put any rubbish in the stream but sometimes I throw my left over lunch to help feed the fish and birds.

Kaumatua

The stream is a life-giving gift. It is a source of mahinga kai (food sources and their inhabitants) and must be protected from pollution. My ancestors used this stream, and I want it to be available to my grandchildren and theirs. The Canterbury mudfish/kowaro is a taonga (treasure) that should be protected in this stream.

People should be allowed to use the stream as long as they respect it. They should only take what is necessary, and the use must be sustainable so the stream can be enjoyed by generations to come.

Representative from water conservation

We need to educate the community about the importance of protecting our waterways to ensure they stay healthy. Too many people take the stream for granted and are unaware of how they may be impacting on the stream's biodiversity. The Canterbury mudfish is an indicator of good water management and by protecting this special fish, we help other species in the river too.

I fear that if the community does not act now, irreparable damage will be done.

City councillor

My role is to work with the Council and local citizens to try and come up with a solution that meets everyone's needs. I also like to use the stream, my dogs love to run through it and swim.

The stream runs through the back of our section and we used to see Canterbury mudfish there but I haven't seen any since we cleared all the weeds away.

Factory owner

I see that the problem lies with people who throw away their food wrappers and drink cans when they are on their picnics, or people who throw rubbish out of their car window. All that rubbish looks so disgusting. You can't see any rubbish around my factory. The factory grounds are pristine with lovely flower beds.

I feel that the farmer has to take some responsibility, I have seen him rinse out his spraying machine in the stream.

Farmer

I own a large farm and need good access to water for irrigation and drinking water for my stock. It is a landowner's right to have access to waterways. The stream runs through my paddocks and is much cheaper than putting in troughs and irrigation.

We also have a pond on our farm that our kids think might have some mudfish in it.

Adapted from TKI Streams and Waterways: Strife in Streamsville

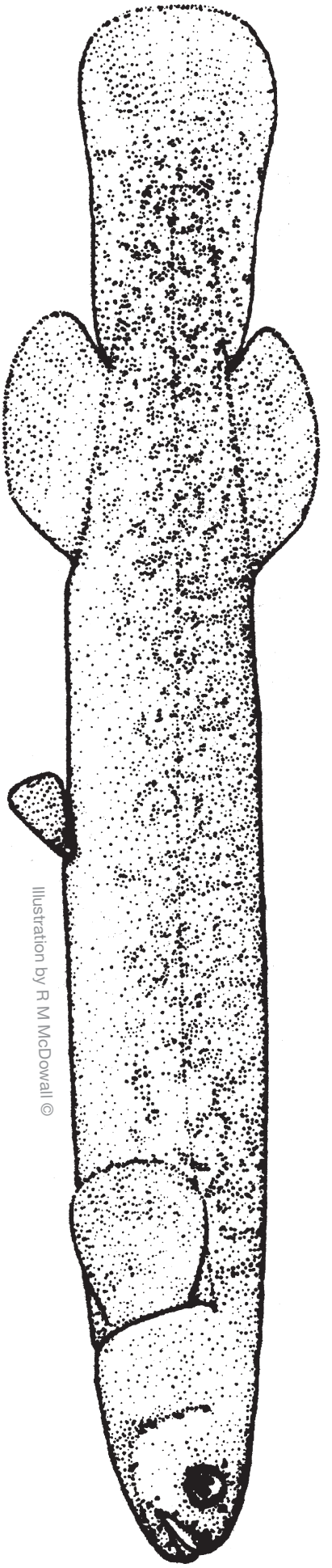


Illustration by R M McDowall ©

canterbury MUDFISH

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