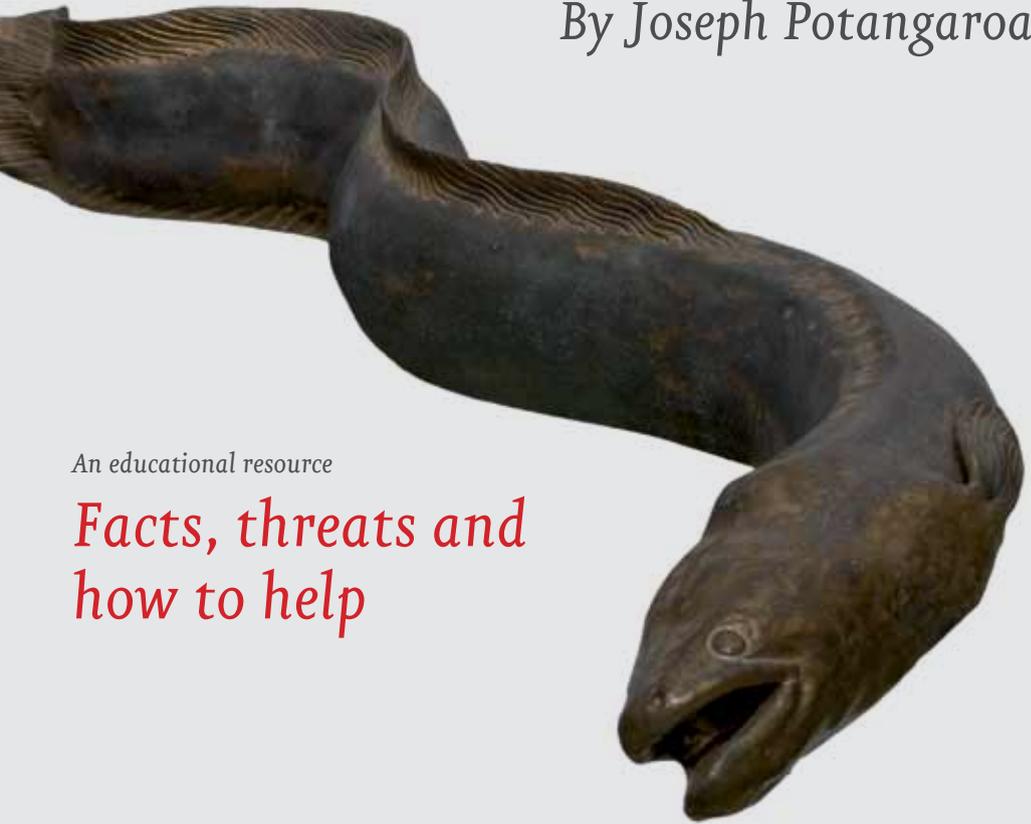


Tuna Kuwharuwharu

The Longfin Eel

By Joseph Potangaroa



An educational resource

*Facts, threats and
how to help*

Special thanks to the following people and organisations for the contributions made towards the production of this resource.

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PHOTO: ALTON FERRIE

Introduction

The longfin eel has lived in New Zealand for 80 million years. It is our top freshwater predator and therefore important to the biodiversity of our waterways.

Since the mid-1800s the longfin eel has been so undervalued that if we do not start to appreciate this fascinating fish it may soon be extinct.



STILLS FROM VIDEO: ALTON FERRIE

Nga taonga tuku iho – te tuna

The eel – An ancient gift from the gods

The special place of tuna or the eel is maintained in Māori culture through the stories contained in tribal histories. A means of illustrating the enduring relationship between man and eel can be found on meeting houses throughout New Zealand. The carvings on meeting houses act as a record of important events, people and animals. That images of eels appear beside tribal ancestors is a mark of their importance to Māori.

From the records of our ancestors we know that eels lived in abundant numbers throughout the waterways of the lower North Island. A landscape containing numerous swamps, lakes, streams and rivers proved to be an ideal home for eels, within which they thrived.



In plants such as flax, supplejack and mānuka the means to catch them were readily at hand. Māori grew crops, gathered edible plants, picked berries, caught birds or rats and fished for nutrition. Fresh water waterways provided homes for kākahi (freshwater mussel), kōura (fresh water crayfish), juvenile inanga (one species that makes up whitebait), inter-tidal fish and tuna.

Even mixed with vegetables a number of kakahi or kōura would need to be caught to make a meal. The eel was much bigger, easier to catch, available all year round and was everywhere. For a people that relied on seasonal foods the eel was truly a gift from the gods.

Today eels are not relied upon as in the past but are still valued, as they are an important part of preserving the practice of cultural traditions. Of course some people still consider a feed of eel makes for a very tasty meal.



Kaumātua talk

“Here in the Wairarapa, goodness gracious I’ve never seen so many eels, that many over here that the drains at Te Hopai use to be 8 feet deep, just a mass of eels going out to sea. I’ve seen that, and we just put in a big wire, no barb and just pulled them out, out of the drains. Big wide drains, about 12 feet wide. The drains were thick with eels. You could hear them at night like ducks taking off and you know they’re running.”

From an interview with Wiremu Aspinall 2001

Facts about the longfin eel

- Māori name = tuna kuwharuwharu.
- Scientific name = *Anguilla dieffenbachii*.
- Has lived in New Zealand for 80 million years.
- Is the biggest freshwater eel in the world.
- Is our top freshwater predator.
- Is endemic, which means it is found nowhere else.
- Is diadromous, which means they migrate between freshwater and the sea. In particular eels/tuna are catadromous which means they spend their adult life in freshwater before swimming to the sea to breed and die. Salmon are anadromous which is the opposite to catadromous while kōaro stay in freshwater to spawn get washed out to sea for six months and then return to freshwater, this is referred to as amphidromy.
- Eels have a bone in their ears called an otolith. These bones have annual rings on them like a tree.
- The oldest eel found so far was 106 years old.
- Officially the heaviest eel weighed 24 kilograms. Some have been reported up to 50 kilos!
- Females can grow to 2 metres in length.



- Males are never more than 1 metre long.
- If moist can spend up to 48 hours out of water.
- Have slime that helps them to breathe and protects skin when out of water. Can absorb up to 50% of oxygen needs directly through the skin. They also get slimy when they are stressed.
- Have bad eyesight but amazing sense of smell. The nostrils are the tubes that stick out from the end of their nose.
- Have sensors that detect movement in front of them. The sensors look like white spots around the lips.
- Have scales embedded in their skin instead of on the outside.
- Like to spend daytime under banks, rocks and logs.
- Come out at night to feed on insect larvae, snails, fish, kōura, dead animals and birds.
- Have rows of small sharp teeth that point backwards into the mouth.
- Are not as active during winter as they prefer warmer water temperatures.
- Large females may require 400 metres of home territory.

Habitat

- They live mainly in rivers and inland lakes but can be found in almost all types of waters, usually inland from the coast.
- They prefer waterways with shade from overhanging trees or banks and clean water. But they can survive in farm drains, large ponds, farm dams and areas with quite murky water.

Breeding

- Eels breed once in their lives and then die.
- Females don't mature until they are 34 years old, males until they are 23 to 25.
- They could be 80 years old before they migrate.
- A female longfin eel can have between 1 to 20 million eggs.
- Each autumn millions of eels swim to Lake Onoke and coastal river mouths. In February the shortfin males leave, in March the shortfin females, in April the longfin males and finally the big longfin females in May.
- They swim 6,000 kilometres to deep warm trenches, possibly off the Tongan coast where each eel lays or fertilises eggs. All the adults then die.
- The eggs develop into tiny see through creatures called leptocephalus. These drift on currents back towards the New Zealand coast.
- Leptocephalus develop into glass eels. Between July and November large numbers of the tiny glass eels enter waterways. A week later glass eels develop dark skin pigment and become elvers.
- Elvers can climb straight up wet rock faces and other obstacles as they move inland. They can even make their way into landlocked lakes via underground streams.



Metamorphosis

Female longfin eels go through amazing changes to help them on their long journey. They need plenty of energy and an ability to hide from large sea based predators during the four month trek.

Longfin females normally have a big bulgy head but when they are preparing to migrate this becomes more tapered and looks like a bullet.

Their eyes grow to twice normal size to help with swimming through deep dark sea water.

They store fat and then stop eating. The sexual organs grow pushing internal organs into a small space of the stomach cavity.



This eel may be 60 years old, and still had not bred. We need to leave big eels like this alone.

How Māori used and preserved eels

Māori studied eels intensively to determine life cycles, ages, habitat and migration patterns. This knowledge helped them determine how many eels they could take for food before depleting numbers to a dangerous level.

Eeling would occur at special times of the month and year according to a range of environmental indicators e.g. lunar cycles.

Once caught, eels were preserved by drying on lines, or smoking over fires.

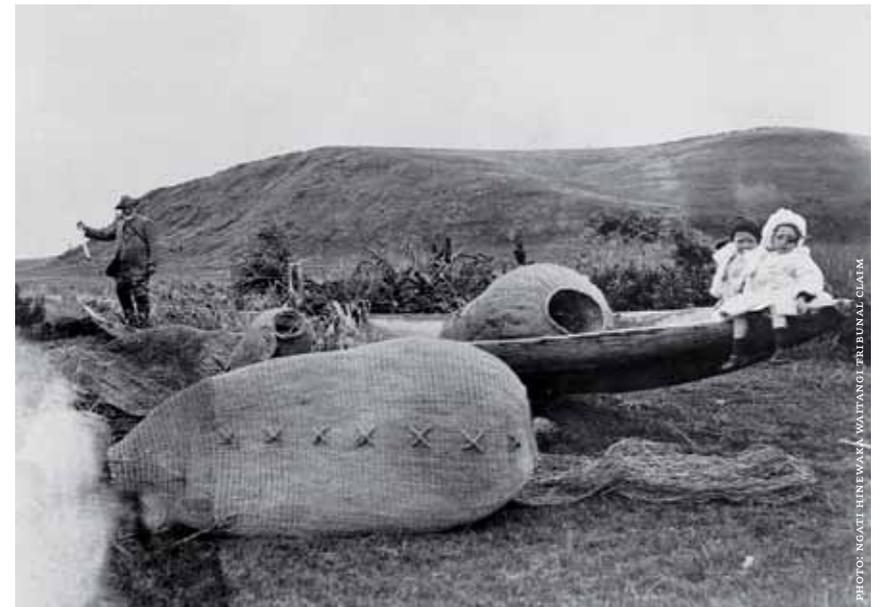
Farming' and 'reseeding' were not uncommon. This meant restocking waterways or holding eels in specially built enclosures. 'Blind trenches' were dug close to migration passages during the migrating season. This tricked the eel into thinking it was entering a normal stream. Once the trenches were filled with eel they were blocked off and the eels harvested.

An annual eel migration occurs at Lake Onoke during autumn of each year. The Wairarapa Moana (lake) is the second to largest eel fishery in New Zealand only being outsized by Canterbury's Lake Ellesmere.



Different sizes and species of eel had specific names, migrating in successive months according to size. Māori families with fishing rights at Wairarapa Moana only fished during the migration period and caught enough eels to last a year.

“When opened up, a migration-prepared eel is found to have no stomach or alimentary tract but instead has a heart, a liver and the whole rest of the stomach cavity filled with a roe-like fat. When steamed this roe is a delicious treat” (Tuhirangi Marae Opening (1991) page: 2).



This historic photograph shows several hinaki and the hull of a large waka. The photograph was taken about 1906. Major Tunuiarangi Brown, who was active in the movement to protect scenic and historic sites standing at the left.



The following comes from the Tuhirangi Marae book celebrating the opening and rededication of the south Wairarapa Marae in 1991.

With reference to the annual eel migration at Lake Onoke, they came in three migrations

1. **Hau** A small eel about 45 cm in length that didn't need gutting and was grilled whole and very carefully so the skin was not broken.
2. **Riko** About double the circumference of the hau, but even so a very clean fish that was stripped from the bone and kept attached by the tail. The bone with the hua still attached was when boiled a gourmet's delight.
3. **Paranui** A huge eel sometimes almost two metres long.

The paranui took a lot of processing because of its size and its oil content so it was either dried or smoked. The riko and the paranui were preserved for barter, but of course they were best fresh.



Kaumatua talk

"You know the road below Kohunui Marae? Well in the old days the eels used to be hung out on the fences to dry. The eels used to go for a couple of miles on both sides of the road. There would be thousands of them. When you were going towards the marae all you could see were the eels and all you could smell was the rotten corn (a Māori delicacy) cooking at the marae."

Interview with Sonny Te Maari 2003

Threats to eel survival – why kill eels needlessly?

Why do some people feel the need to go down to a stream armed with all manner of weaponry to kill eels for sport?

Yes, eels do eat little ducklings and the occasional introduced sport fish, but is this reason enough to kill or maim an eel for the sake of it?

Eels are fish, not snakes. They are not evil legless dragons or necessarily taniwha either.

They can be territorial and predators however they need to eat and have a home the same as humans. In fact, if an eel gets stroppy around your legs it probably means you are plodding around in its territory.

HISTORICAL THREATS

Man has been the main culprit in the decline in longfin eel populations. Clearing of native forests causing temperature levels to change in streams and rivers from constant to varying. Swamp drainage, irrigation schemes and river diversion destroyed habitat. Most settlers saw eels as being of little or no value.

Dead eels on a stream bank near Lake Wairarapa



Growing populations of introduced sport fish such as trout and salmon ate small eels.

During the early twentieth century employees of acclimatisation societies massacred tuna by the thousands to make way for trout. Records describe how huge piles of eels were left to rot on river banks.

More recent threats include:

URBAN

Over zealous recreational fishing in streams

Chemical discharges into streams and waterways from factories

The building of artificial concrete liners and stone banks to protect streams destroys habitats.



Kaumātua talk

“Those eels up the Kaiwhata (river) were scary looking things, they were huge with big horns on the front of their heads. We used to be too scared to get in the water.”

Interview with Mere Kerehi 2001

“I remember uncle Jim put his hand in the hole to get this eel once. The damn thing bit his finger and stripped it to the bone. He pulled his arm back out, had a look and then went back into the hole, he wasn’t going to let the eel win!”

Interview with Kingi Matthews 2003

RURAL

Ninety percent of pre-European wetlands have now been drained along with the cutting down thousands of hectares of forest. The rapid transformation of the local landscape caused a rapid decline in eel numbers.

Sewerage, effluent, dairy run off and chemical discharges to water result in loss of oxygen, poisoning and/or loss of food source. Most life either dies or is forced to move away.

Culverts and dams

restrict access up and down waterways

(traditional migration passages). Small eels are known to climb up walls but large concrete structures are impassable.

High levels of nitrate use on some farms have a negative affect on water quality.

Stock entering streams is a major invasion of eel habitat and contributes to bank erosion and siltation of streams. Stock effluent reduces water quality and adds nutrients to the waterway and construction of water races has dramatically changed eel habitat and contributes to lessened water quality.

Urban impacts on natural waterways have added to the deterioration of water quality. Impacts include: industrial pollution, road runoff, storm water, domestic cleaners, domestic herbicides and fertilisers; and property development sometimes leads to culverting of waterways and therefore loss of habitat.



RECREATIONAL

Negative recreational hunting impacts can occur through lead-shot poisoning water in lakes.

Fishing enthusiasts of introduced species at one time undertook intensive removal projects to encourage the spread of trout and salmon populations using the fact that eels were eating juvenile sport fish as justification.

Failure of some recreational boat users to thoroughly clean their vessels has led to the spread of noxious weeds around the countries waterways threatening eel habitats

Current fisheries regulations restrict fishermen to catching six eels a day. If caught in a hīnaki (eel catching basket) people adhering to the law will often keep the biggest eels while throwing back the rest. As the longfins are bigger than the two other species of New Zealand eel it is the longfin that will be kept.

COMMERCIAL FISHING

Commercial fishing has grown markedly since the 1960s. Intensive commercial activity that didn't allow for sustainable practices have impacted negatively upon eel populations in many areas.

Over zealous operators invading other commercial zones have upset the sustainable management of local eel habitat. Recently calls to place a moratorium on all commercial eeling have arisen.



CHANGE IN LAND USE

Removal of riparian plantings has led to soil disturbance and bank erosion around traditional eel habitat, it also removes natural shading of streams that protects eels from harsh sun and helps maintain water temperature.

Introduction of exotic forest plantations has led to a rise in tannic acid runoff.

Exotic plantations such as Pinus Radiata and use of willow as a soil stabilising tool has contributed to a higher extraction of water from streams and sub-surface water tables impacting on eel habitat.

Increases in water extraction, either through bores and/or pumps contribute to lower water levels in streams and loss of habitat such as spring fed swamps.

WEEDS AND WEED REMOVAL

- Invasive plant species such as hornwort are a major threat to eel habitat removing oxygen from the water and clogging waterways
- Landowners tending to noxious weed eradication inadvertently remove everything else in waterways depleting the natural habitat and
- Spraying of noxious weeds in waterways threatens species.

Kaumatua talk

“You should see the eels up the Whangaehu (river). You know they come up onto the bank and bark like a dog. Never seen anything else like it, we left those ones alone.”

Interview with James Rimene Snr 2001



Leave the big girls alone

A few thoughts – eel conservation

This resource has been written to educate people about the plight of the New Zealand longfin eel. If we do not let them grow to maturity and then migrate to breed they could become extinct.

We encourage everyone to think about how human activity has and will continue to effect the long term future of this fish that is found no where else but in New Zealand.

Remember that longfin eels breed only once in their lifetime, then die. Usually an urge to migrate will occur in females when the eel is between 34 and 60 years old, for some it might not happen until they are more than 80 years old.

Longfin eel numbers have been greatly reduced due to a number of factors.

If you see a big longfin female why not just watch her and marvel at what she represents. The very fact that you have seen her means that she has not migrated to breed. If we continue to remove the big females out of the eel life cycle we will put at risk the survival of the whole species.

For anyone that catches an eel please do not leave it on a bank to die, or kill it for no good reason. In fact why not return her to the water.

Landowners can create fish passageways when building dams and culverts.

Examples of good fish passage around dams or culverts include:

- Steps or a succession of pools that give the eel a chance to rest as it climbs up and around structures

- Ropes let the eel curl its way around it so it can climb upwards
- Provision of a slope using rocks or rip rap let the eel gradually climb up and over structures, and most importantly eels need moisture to help them move, breathe and to provide protection from the sun
- Businesses can use other methods of disposal rather than discharges into water
- When cleaning out waterways of noxious weeds use scoops with escape holes.

Support Government, iwi and industry moves to put in place sustainability measures for the commercial eel fishery. Make an eel a friend by feeding it; and

If you are just curious about eels, use a hinaki instead of a spear, gaff or hook to catch some. In this way you can observe their behaviour and return them without any harm being done.



The future of longfin eels depends on big eels like this being able to breed”.

Leave the big girls alone.

Tuna activities and games

Rather than just read or talk about tuna why not have some extra fun by playing games or getting out by a stream. Here are a number of ideas on how you can learn more about tuna.

KIA TŪPATO – TAKE CARE

Even though games and class based exercises are great for learning you can't beat observation. But we encourage everyone to be careful in or near water.

Remind young children to never go near water without an adult. Bigger children should be wary of water conditions and general aspects of water safety.

They should also be aware that a tuna hunts through smell and sensing movement. If a set of little fingers with food on them are swishing around in water, a tuna might be tempted to have a nibble on the little fingers.

Pet tuna

Have you ever tamed a wild tuna?

By tame we mean have you ever tempted one to come to the same spot by offering it food?

Find a place on a stream and put the same food into the water at the same time each day. Try red meat, cheese or twisties. Soon you will find that the tuna will come out of the water to get the food, you might even be able to stroke it.

Some come by a stomp on the ground and we like to think that they get to know the sound of our voice.



PHOTO: JOSEPH POTANGAROA

There are old stories within Māoridom where a person would sing a song composed especially for a tuna kaitiaki on a special piece of stream. The tuna would always come.

Monitoring

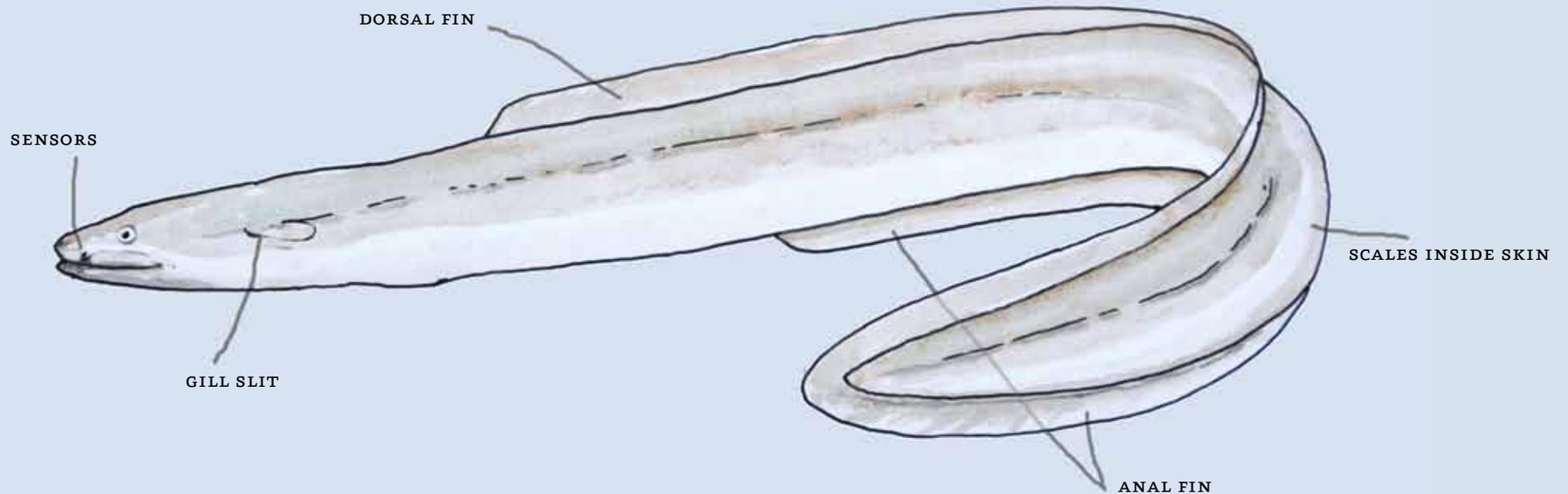
You can monitor tuna through basic counts either by catching them in a hinaki or by placing food in the water. Keep records on numbers and approximate sizes. Think how you can improve the lives of the tuna, make a plan and implement the plan.

A tuna suffering from a lack of oxygen



PHOTO: ALTON PERRIE

If you wanted to take monitoring further by weighing and measuring tuna your local regional council will be able to advise on how to do this.



Tuna monitoring can go hand in hand with stream restoration projects. You can measure changes in size and number of tuna over time as the health of your chosen stream increases.

Tuna facts

Draw or paint a tuna related poster.

Type, guillotine and laminate forty questions about tuna.

Make twenty questions correct, fifteen false and five total fantasy.

Place the students into groups and ask them to put the questions on the poster under true, false and fantasy columns. They can stick the labels onto the poster or take them off and put them into an envelope.

After ten minutes of group time have a class discussion about why the groups put each question into a column.

Tuna travels

Make up a tuna travels board game. Base your game on snakes and ladders except the tuna takes you up and a hazard brings you down.

Anatomy poster

Get students to draw a picture of a tuna and correctly label anatomical features.

Oral interviews

Interview an older person in your community, someone over 70 years would be great. Ask them about how tuna numbers have changed, how big they were, how they used to catch them.

Compare the interviews, analyse the korero, make conclusions, plan future action.

If you want to see a longfin eel

Visit the National Wildlife Centre at Pukaha (Mount Bruce) north of Masterton in the Wairarapa. There are a number of mature longfin eels living at Mount Bruce. Department of Conservation staff feed the eels each day and a display provides more information on New Zealand's three eel species.

Or throw some bloody smelly meat or cheese into a stream near you and see what you can find.



A final thought...

It is calculated that exploiting 5% of the longfin eel population will result in an 83% reduction in recruitment. Fishing 10% of the population will result in a recruitment drop of 96%.

S Hoyle and D Jellyman 2002

In other words killing a small percentage of eels now will mean a huge reduction in eel numbers in the not to distant future. If humans are not careful we stand to condemn the longfin eel to the same status as the huia – an extinct species.





About the author

Joseph Potangaroa and his family live on a farm north of Masterton. He thinks tuna are so special that he decided to write this book.

One of his earliest memories is going eeling at Dalefield, Carterton, during the early 1970^s. For the past ten years he has researched eels but now finds watching them far more satisfying than catching them.

Save our endangered eels!

This resource tells the story of the tuna kuwharuwharu, the New Zealand longfin eel.

Tuna kuwharuwharu are one of New Zealand's most ancient inhabitants but have decreased in number so rapidly that it is now nearing endangered status.

Learn how tuna went from being considered a gift from the gods by Māori to a pest by trout fishermen.

Facts about tuna and its incredible life cycle are provided. Who would think that a fish could live over 100 years?

There are sections on threats and reasons for tuna decline. These are followed by ways that we can help tuna numbers to increase.

