5.5 MATAMATA EATING WITH OUR TŪPUNA

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WHITE GOLD

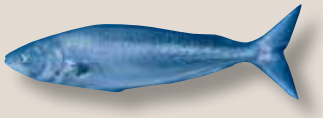
To some, matamata (whitebait, *Galaxias* spp.) are viewed as 'white gold' – delicate silvery fish highly coveted for their taste (especially when cooked up with egg and the right mix of flour). To others, whitebait represent more than a delicacy – they are an important way of life for a short few months of the year, with knowledge about harvesting and cooking techniques passed down through each respective generation. For tangata whenua (indigenous people), that knowledge system can also encompass an even broader set of social-environmental interactions and learning opportunities linked to the fishing environment.

This knowledge includes, but is not limited to:

- learning how to operate a boat and swim
- harvesting plants such as harakeke (NZ flax), kuta (giant spike sedge), wīwī (rushes), and kiekie (gigi bush) along the stream or river's edge
- learning how to harvest other species moving through or inhabiting the waterbody at the same time (Table 1)
- undertaking revegetation of important species such as the kahikatea.

And all of this can happen almost subconsciously while waiting for the matamata to swim into the net.

Table 1. Some examples of other freshwater and estuarine species harvested during whitebaiting

Māori and common name(s)	Scientific name	Key feature	Image
Porohe • Common smelt • Number two whitebait • Cucumber fish	*Retropinna retropinna*	Cucumber smell, slightly larger than whitebait and creamier colour. Has scales and a small fin between the dorsal and tail fin	 Photo: Stephen Moore
Tunatuna • Glass eels • juvenile tuna	*Anguilla* spp.	Longer length than whitebait and move in tight groups	 Photo: NIWA
Kāeo, kākahi • Freshwater mussels	*Echyridella menziesi*	Shellfish found in the sandy beds of large rivers or lakes	 Photo: Ngaire Phillips
Kahawai	*Arripis trutta*	Marine-based fish but will move into the more estuarine (saltier) areas of a river system, e.g. river mouths/entrances	 Photo: Malcolm Francis

Previous page: Matamata (whitebait). Photo: Philippe Gerbeaux

WHAT ARE MATAMATA?

Whitebait are the juvenile forms of fish from the Galaxiidae family, and are recognisable by their almost translucent (see through) appearance that can give the impression of 'glittering' in the water, similar to stars. It is this glittering effect that earned them the name '**Ngā Karu ō Matariki**' by kaumātua (elders) from Te Pūaha o Waikato (Port Waikato) as they enter the river mouth. As they progress through the waters, they are referred to by other names, including matamata, karohi, karohe, and īnanga.

There are 17 species of the Galaxiidae fish family but only five of these species – giant kōkopu (*Galaxias argenteus*), īnanga (*G. maculatus*), banded kōkopu (*G. fasciatus*), shortjaw kōkopu (*G. postvectis*), and kōaro (*G. brevipinnis*) – make up the 'whitebait catch'. These species will move out to sea for part of their early life (called diadromy), and are harvested when they return from their marine kōhanga (larval nurseries) to the freshwater systems that will become their adult habitats. The species referred to more commonly as 'īnanga' form the largest proportion of the whitebait catch.

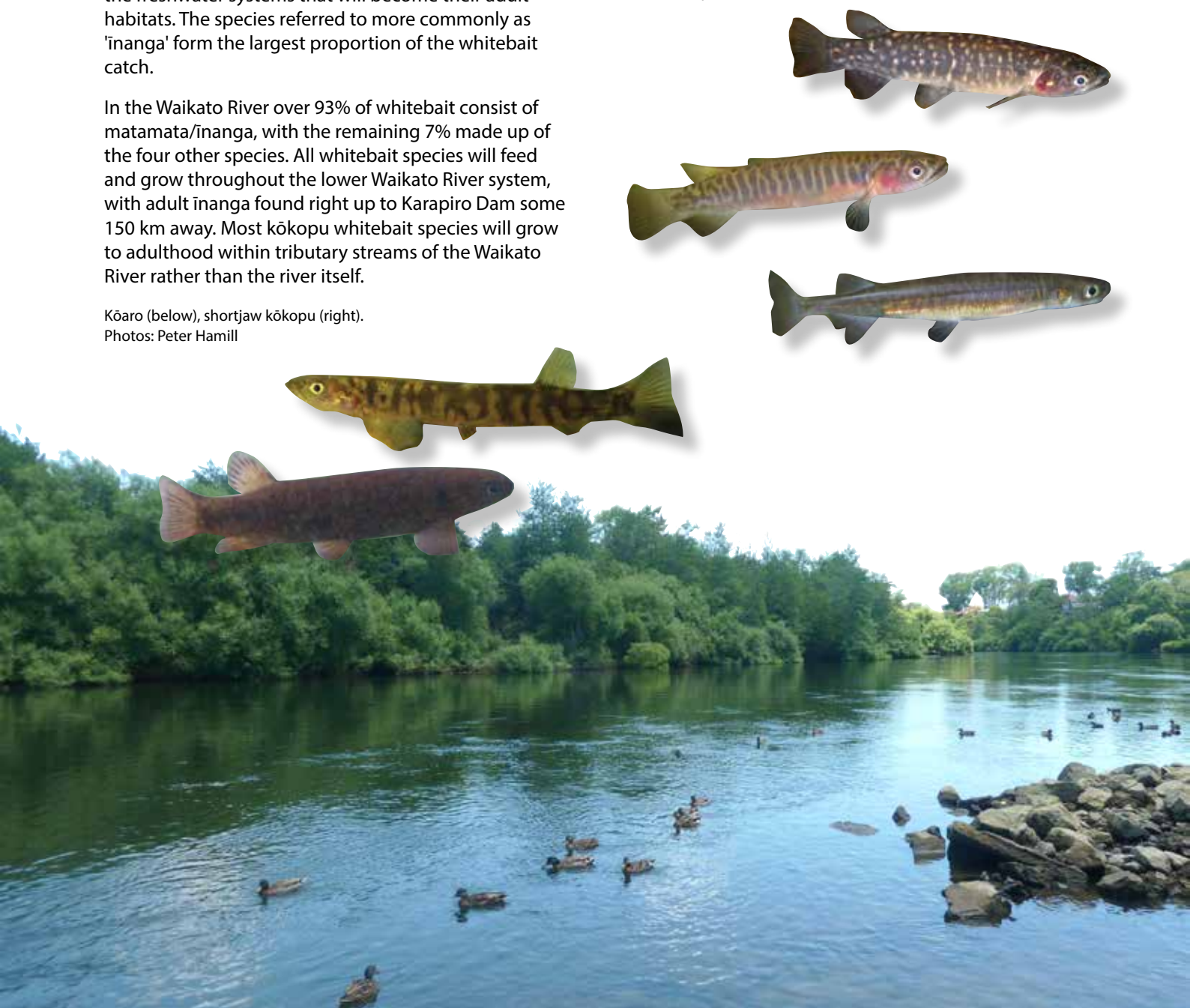
In the Waikato River over 93% of whitebait consist of matamata/īnanga, with the remaining 7% made up of the four other species. All whitebait species will feed and grow throughout the lower Waikato River system, with adult īnanga found right up to Karapiro Dam some 150 km away. Most kōkopu whitebait species will grow to adulthood within tributary streams of the Waikato River rather than the river itself.

Kōaro (below), shortjaw kōkopu (right).
Photos: Peter Hamill

Another important fish species that is caught during the whitebait season is the porohe (common smelt). Porohe are slightly larger in size and tasty to eat, but they can cause upset stomachs if not thoroughly cooked. Fish buyers refer to them as 'number 2 whitebait' as they run at the same time as the matamata, which are the 'number 1s'.

Other fish that also run during the main whitebait season are juvenile tuna, commonly referred to as tunatuna or 'glass eels' because of their almost transparent appearance (although they are longer than number 1 and 2 whitebait). Kōrero (conversations) from fisher-whānau on the Waikato River highlight that tunatuna (glass eels) can run as an almost 'impenetrable wall of fish'. Sadly, though, numbers are getting so low that whānau (families) have shared that they are lucky to catch half a cup (less than 250 gm) when once they could catch a net full.

Top to bottom: Giant kōkopu, banded kōkopu, īnanga.
Photos: Stephen Moore



IMPACTS OF DECLINING MATAMATA NUMBERS ON TRADITIONAL PRACTICES

Changes to whitebait harvesting practices

The traditional scoop nets are known as 'kaka' to some Waikato fishers. These were hooped nets usually made from netting and the aka aka (native vine supplejack), attached to a long pole handle that was usually made from kahikatea, and mānuka (kahikatoa) or mauku (tī kōuka, kōuka, cabbage tree). The kaka (scoop net) based fishing technique required the fisher to stand either in the river (sometimes up to chest height), or on perches (trees, rocks or 'river beaches') to catch the fish.

Catching the fish therefore required much skill both to:

1. understand where the fish were going to run within the river stem each day of fishing and why (i.e. environmental conditions dictating movement)
2. get the correct timing and scooping action on the kaka.

To help fishers, another technique used was the 'ariari board'. Traditionally, this was the white interior bark of the mauku that was placed in the water to enhance visibility of the fish when they moved through the water towards the kaka. As the water quality of the river has declined, so too has the visibility, and the ariari board is now relegated to cultural history and memory in many parts of the river catchment.

This was a very different approach compared with the techniques now commonly used in whitebaiting.

Present-day set nets allow the fisher to place their nets in the water, with screens (legally up to 6 m long) 'guiding' the fish into the mouth of the net. The size of the nets (no larger than 4.5 m around the 'inside edge'), use of the screens, and wire framing can allow very large catches (sometimes over 80 kg) to be taken from the river in one sitting.

In comparison, catches in the kaka (scoop net) rely on the strength of the fisher and the carrying capacity of the kaka. Because the volume of the net is generally smaller than the set net, it takes more effort to pull in the same amount of fish. This is a key reason why the set net has gained in popularity, particularly on big rivers like the Waikato.

Women fish for matamata on the Waikato River near Tuakau. Photo: Te Ara – The encyclopedia of New Zealand

Fisher from Mokau with set net. Photo: Supplied by Cheri van Schravendijk-Goodman

Loss of local dialects and names for species associated with whitebaiting

With the increasing interest in traditional Māori names for plants, there are issues about the dialects from which these names come. Work with fishing whānau at Te Pūaha o Waikato has highlighted that many of the local names for plants and fish species are being overwhelmed by the 'common Māori names' used by nurseries and scientists, or the names have disappeared with the loss of kaumātua.

Localised names for plants, for example, not only provide clues to the amazing level of understanding of our tūpuna (ancestors) as botanists (plant experts), but can also highlight unique interactions with other species, environments, practices, uses of the species, and individual tūpuna. Losing these names from the local memory and dialect, therefore, has much wider implications than the loss of the name alone (Table 2).

Table 2. Examples of native plant species associated with whitebait spawning habitat in the lower Waikato as described by Te Pūaha kaumātua in the early 1990s

Local (Waikato) and common name	Scientific name
Tūtunāwai* Swamp willow weed	*Persicaria decipiens*
Pūrekireki, pūrei Swamp sedges	*Carex virgata* and *C. secta*
Kōwhai*, kō'wai Kowhai	*Sophora* spp.
Mauku, tī kōuka, kōuka Cabbage tree	*Cordyline australis*
Mouka Water fern, hen and chicken	*Histiopteris incisa* (also known as mātātā) *Asplenium bulbiferum*

* Refers to names that are also common to other iwi

Tūtunāwai, swamp willow weed. Photo: Jeremy Rolfe

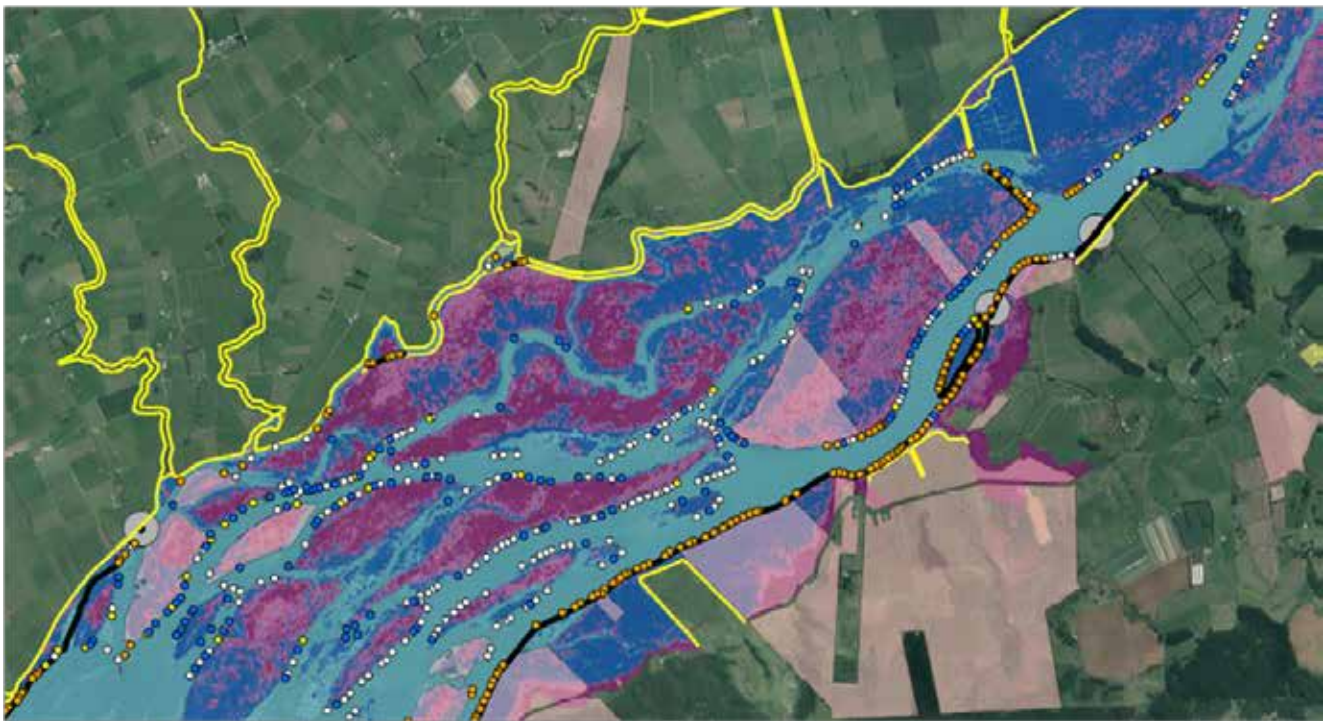
Pūrekireki (also known as pūrei), swamp sedge. Photo: Beverley Clarkson

Mouka (also known as mātātā), water fern. Photo: Jeremy Rolfe

Other issues – access

For the people in the lower Waikato, policy related to 'stand registration' with the Regional Council has also had an effect on the ability of whānau to fish in their traditional areas. A recent baseline survey in 2011–2012 highlighted that the number of baches and benches being built on the river, and in most cases, 'registered' with the Council, were reaching unsustainable numbers, and were also encroaching on traditional fishing stands, and beaches (Figure 1).

The challenges for access to sites are complicated by a range of issues that goes beyond just policy barriers. Much of the challenge in the lower Waikato is the absence of whānau who, in most cases, have moved away for work, and who cannot get home to protect their areas during the season. Mapping these impacts, therefore, has been helpful for monitoring purposes, but there is still much to do to ensure long-term protection of access rights for whānau in the lower river.



Black lines mark the areas still being fished by whānau but at risk of encroachment from other fishers registering stands with the Regional Council.

Orange dots mark benches/stands.

White dots indicate stands with small baches (one room, larger than 10 m^2) behind them.

Blue dots indicate stands with baches (more than 2 rooms) behind them.

Yellow lines indicate agricultural drainage/flood protection systems.

Pink and purple areas indicate river flooding potential.

Figure 1: Part of the main map generated for the whitebait structures scoping study – Te Pūaha o Waikato (Port Waikato), Waikato River (adapted from Morris et al. 2011, and Jones and Hamilton 2014)

Other issues – pest plants that are important spawning habitat

Perhaps one of the biggest problems for the respective restoration of spawning habitat and wetland restoration is the interesting adaptation of our whitebait (in part) to many pasture grasses and other introduced plants that are found along drains and waterbodies. Some of the most important plants for matamata/īnanga spawning are recognised wetland and forest invasives such as Yorkshire fog, kikuyu grass, and wandering jew (Table 3).

In the absence of intact native ecosystems, the issue of pest plants providing important habitat and, in other cases food sources for native species, presents challenges for wetland restoration. This is similar to the debates on the need for crack willow control/removal to support native restoration, balanced against the important role they can also play as habitat for our tuna (freshwater eels) that provide the same complex instream cover.

For whitebait, the lack of intact native ecosystems has therefore created gaps in our understanding about:

- where whitebait species, the banded, shortjaw, and giant kōkopu in particular, are actually spawning[1] in streams that have been modified through human development
- the native plant mixes that can provide the best indigenous spawning habitat. We do have some examples from recent work, but these are not necessarily what they might have spawned on historically and require further research.

For the moment, we must work with what we have. This includes testing current knowledge and boundaries of what might be possible (based on our collective knowledge sets), and focusing on restoration methods that support native wetland restoration, but which do not compromise the only habitat that our fish may have to use in the meantime.

[1] Only one documented site has been recorded for the giant kōkopu in Hamilton. This site was discovered by NIWA scientists in 2013.

Table 3. Some plants commionly associated with īnanga eggs (Note although suitable for īnanga spawning, the exotic plants indicated by * outlined here are not ideal for wetland restoration)

Common name	Scientific name	Where eggs are commonly found
Tall fescue*	*Schedonorus arundinaceus*	Around the root hairs or on the decaying grass blades around the base
Creeping bent*	*Agrostis stolonifera*	Under the mat of runners that forms on the soil surface
Mercer grass*	*Paspalum distichum*	Attached to the leaves and stems
Wandering jew*	*Tradescantia fluminensis*	Attached to the leaves and stems
Kikuyu*	*Cenchrus clandestinus*	Attached to the leaves and stems
Yorkshire fog*	*Holcus lanatus*	Attached to the leaves and stems
Twitch, couch*	*Elytrigia repens*	On the thick root mat
Water celery	*Apium nodiflorum*	Attached to roots and stems
Wiwi	*Juncus edgariae*	Around bases and lower stems
Harakeke/NZ flax	*Phormium tenax*	Around bases, often in association with grasses in the periphery
Raupō	*Typha orientalis*	Attached and under decaying leaves

HOW DO WE RESTORE MATAMATA?

Because whitebaiting is an activity around which other practices occur, it is also important to consider the wider range of activities, and the impacts (if any) on those activities.

The following steps outline what we can do to build our understanding of our whitebait (including the five galaxiid species, and the porohe) based on our collective mātauranga (knowledge):

Showing our next generation the adult kōkopu species present in our rivers. Photo: Joanna Katipa

STEP 1: Kōrero (speak) with local kaumātua (elders) and other whānau (family) members about their memories and current interactions with whitebait and other fish and plants during the season:

- **The socio-cultural value of the fish.** What activities do whānau do during whitebaiting (see earlier), and have these changed? If there have been changes to these activities during whitebaiting, do they know why?
- **Pinpointing and mapping** spawning sites of the fish, also mapping locations of other associated mahinga kai (food gathering site) within the fishing area.
- **Identifying how fish populations have changed**, i.e. generational changes in catch, or changes to the fishery regime in their area.
- **What may have caused declines in the fishery?** NOTE that the 'cause' may need to be addressed first, before any new revegetation can occur, e.g. addressing nutrient run-off, fencing off spawning sites, and removing serious pest plants like reed sweetgrass and alligator weed.

Alligator weed choking potential whitebait spawning habitat. Photo: Cheri van Schravendijk-Goodman

Waikato River whānau learning about fish pass design for whitebait access. Photo: Joanna Katipa

STEP 2: Consider the ecology and environmental whakapapa (connections) of the system to get a better understanding about how to restore whitebait populations:

- Identify the best areas to restore whitebait habitat and spawning sites. NOTE that our different whitebait species have slightly different habitat preferences, so it is important to get reliable information about this early in restoration planning (see useful references later)
- Re-plant stream margins to provide food and cover for growing whitebait such as wīwī, carex, and raupō. To provide bankside shading and help keep water temperatures low, increasing canopy cover by planting trees is also important
- Consider adjacent land use and how you can mitigate any adverse impacts from those where possible, e.g. fencing off stock
- Potential for other organisms – fish species (i.e. tuna, matamata, porohe, kanae (grey mullet)); birds, water invertebrates (i.e caddis flies, mayflies, beetles, etc.)
- Doing a vegetation survey of all native and exotic plant species on site, and the ratio of native to exotic, is a good way of building a baseline to help monitor change and guide restoration over time.

HOT TIP: A good way to gather information about fish numbers is to monitor daily catch weights over the season, and the time taken to bring the catch in (i.e. 30 kg in a 4 hour day).

This will require identifying key fisher people in the whānau/community to record their information in a diary, which can then be shared with those collecting the data during and at the end of each season.

The greater the number of years you can measure this, the better the information to understand fish patterns and densities.

Waikato River whānau learning about impacts of urban design for native fish habitat. Photo: Joanna Katipa

STEP 3: Building a monitoring and restoration framework

- **What does the whitebait look like, smell like, and taste like?** Our senses (eyes, nose, ears, and taste buds) are very good at picking up changes, provided we pay attention to them! Recording these sensory changes is just as important as collecting scientific-type information about population densities, fish sizes, and the quality of their habitats:
  i. A change in colour and size might suggest changes to food sources (note connection also to marine environment here). It might also provide clues to illnesses affecting the fish.
  ii. A change in smell might suggest pollutants in the water.
  iii. Changes in taste might suggest changes to the water quality (i.e. 'muddy tasting'), or changes to food sources, i.e. "you are what you eat".
  iv. Changes to the length of time that fish can be stored is also important. Overall health and wellbeing of the fish can affect its storage potential. However, little is understood at this stage as to what might influence that.
- **What are the local names (if any) for the whitebait, and what other species are they connected to (whakapapa)?** This is key to building a bigger, more holistic picture of connections and associated health and wellbeing of the whole system.
- **Who to talk to?** Talk to scientists and other communities with additional experience in whitebait ecology and restoration, and work with them to help build a restoration framework that best meets the needs of your local community and the fish.

Understanding barriers to fish passage (NIWA experiment). Photo: Joanna Katipa

Waikato River whānau learning about impacts of urban design for native fish habitat. Photo: Joanna Katipa

WANT TO LEARN MORE?

Note: If you are having problems with the hyperlinks below, try copying and pasting the web address into your browser search bar.

References

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Useful Websites

Whitebait Connection: www.whitebaitconnection.co.nz

Whitebait regulations: www.doc.govt.nz/parks-and-recreation/things-to-do/fishing/whitebaiting

About whitebait: www.niwa.co.nz/freshwater-and-estuaries/faq/what-are-whitebait

Science Learning Hub (web-based resource for schools): http://sciencelearn.org.nz/News-Events/Latest-News/News-Archive/2008-News-archive/Stopping-whitebait-from-frittering-away

Examples of website-based resources and projects

EOS Ecology: www.eosecology.co.nz/Our-News

Whaka-Inaka-Causing-Whitebait.asp and see also: www.doc.govt.nz/news/stories/2016/february/increasing-whitebait-spawning-habitat

NZ Landcare Trust – resources focused on fish restoration, written in Te Reo Māori and English: www.landcare.org.nz/Regional-Focus/Hamilton-Office/Hooked-On-Native-Fish/Fish-Fact-Sheets1

NIWA Kaitiaki Tools: www.niwa.co.nz/freshwater/management-tools/water-quality-tools/kaitiaki-tools

WETMAK monitoring and assessment kit. Module 4. Mapping wetland vegetation: www.landcare.org.nz/wetmak

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