5.2 KŌURA THE ANCIENT SURVIVOR

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He manako te kōura i kore ai

Crayfish are scarce when they are expected

THE IMPORTANCE OF KŌURA

Freshwater crayfish are endemic to Aotearoa New Zealand where they are known locally by the Māori name kōura (and less commonly kēwai). Aotearoa has two species of freshwater crayfish, the northern kōura, *Paranephrops planifrons*, which occurs in the North Island and the West Coast of the South Island, and the southern kōura, *P. zealandicus,* which occurs in the east and south of the South Island.

Kōura are one of the original inhabitants of Aotearoa. They have a very ancient lineage that diverged from their Australian relatives about 109–60 million years ago. Because their entire life cycle requires freshwater, kōura are evidence that there has been continuous freshwater in Zealandia ever since our part of Gondwanaland broke up 60–80 million years ago. As far as our evolutionary history goes, kōura are as significant as tuatara, wētā, and kiwi (other native animals).

Kōura have an important role in freshwater ecosystems and are a food source for fish, kawau (shags), and people. Kōura are omnivores, consuming plant and animal food as well as detritus (i.e. rotting matter). They play a keystone role directly through predation, or indirectly by breaking down plant material and by cleansing the streambed of fine silt. This in turn affects other aquatic invertebrates (i.e. insects, crustaceans, molluscs, and worms). Furthermore, kōura increasingly feature as indicator species because of their important role in aquatic ecosystem food webs and their iconic and heritage values.

Previous page: Measuring a kōura. Photo: Ian Kusabs

Although the ecology of stream-dwelling kōura is well studied in Aotearoa, few detailed assessments have been carried out on populations of kōura in lentic (non-flowing) waterbodies, i.e. lakes, ponds, and wetlands. There is therefore little published information on kōura in repo (wetlands). As kōura generally prefer coarse bed substrates and avoid low-dissolved oxygen conditions (DO > 5mg l^{-1}), they are most likely to be present in areas of flowing water and on substrates composed of gravels and cobbles, as found in wetlands associated with rivers and lakes. Despite their ecological and cultural significance, this lack of quantitative information makes it difficult for iwi (tribes) and government agencies to manage kōura populations.

Until recently, the main reason for the lack of information on lake-dwelling kōura was the absence of suitable representative sampling methods. However, the development of the tau kōura (Fig. 1), based on a traditional Māori method for harvesting kōura, has stimulated research and monitoring on lake kōura populations. This method, using individual whakaweku (bracken fern bundles) can also be used in streams and ponds and, potentially, in wetlands.

Historically, kōura were an important food for the indigenous Māori people, particularly in the central North Island lakes where large numbers were harvested for consumption and trade. Today, kōura are considered a taonga (treasure) or heritage species and support important customary fisheries in some North Island lakes (Rotomā, Rotoiti, Tarawera, and Taupō) where large populations are still present. Nevertheless, there is considerable anecdotal evidence of declines in populations of kōura in Aotearoa since European settlement. Several environmental factors have been implicated in this decline, including introductions of exotic fish and plant species as well as reduced concentrations of dissolved oxygen in the bottom waters of lakes due to eutrophication (nutrient enrichment) predominately from farming activities and municipal wastewater and sewage.

This article is based on work funded by NIWA through the Ministry of Business Innovation and Employment programme on Maintenance and Rehabilitation of Aquatic Ecosystems (C01X1002).

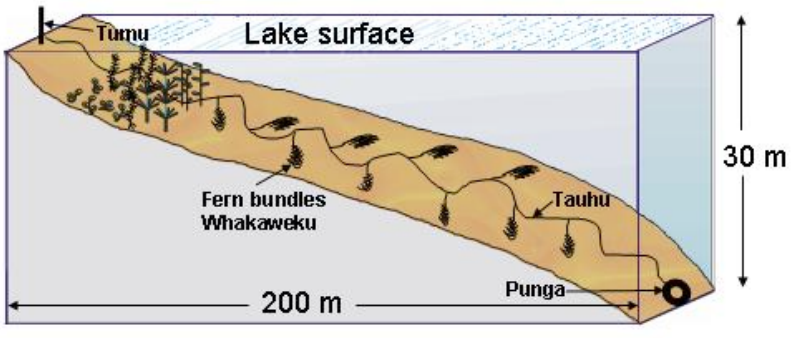

Figure 1: Schematic diagram of the modern day tau kōura. The depth and length of tau are indicative and can be varied depending on lake bathymetry.

HOW DO WE RESTORE KŌURA?

Key actions that we can take to increase our understanding of kōura based on our collective mātauranga (knowledge):

STEP 1: Kōrero (speak) with local kaumātua (elders) and other whānau (family) members about their memories and current interactions with kōura:

- The socio-cultural value of kōura: Is it important to bring it back as mahinga kai/hauanga kai (food gathering site), as a keystone species for conservation value, or both of the above?
- Record where, when, and how kōura were harvested.
- Identify how those populations and harvesting practices have changed.
- What may have caused decline: The cause may need to be addressed first, before any new populations can be reintroduced to the area, e.g. restoring bankside vegetation, and reducing introduced aquatic weeds and the abundance of pest fish (if present).

STEP 2: Consider the ecology and environmental whakapapa (connection) of the system to understand better:

- The best areas to restore kōura. Consider sites that have good water quality, low levels of fine sediment.
- Consider adjacent land use and how you can mitigate any adverse impacts from those where possible, e.g. fencing to exclude livestock access – kōura love undercut banks and lots of woody debris.
- Benefits (if any) for other organisms – fish species (i.e. tuna (freshwater eels), kōkopu (*Galaxias* spp.), īnanga (whitebait), porohe (smelt)) and aquatic invertebrates (i.e. caddis flies, mayflies, stoneflies, snails, limpets).
- An aquatic survey (e.g. Stream Health Monitoring and Assessment Kit – SHMAK) of what is there now is a good way to build a baseline to help monitor changes over time.

STEP 3: Building a monitoring and restoration framework:

- **What are the practices associated with harvest and have these changed?** Also consider whether they have any thoughts about the reasons why practices may have changed (if they have).
- **What are the local names (if any) for the kōura, 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. For example, insects, fish, and plants.
- **Where to monitor?** Identify your own monitoring areas based on what you have learnt from your people. Think about where the populations of kōura were (past) and are now. Note that some whānau may not wish to share the exact location of their harvesting areas, so consider instead asking if the populations have decreased and disappeared, and if there are any changes to the habitat, or adjacent land use they feel may be affecting kōura populations.
- **Who to talk to?** Talk to scientists and other communities with additional experience in kōura ecology and restoration, and work with them to help build a restoration framework that best meets the needs of your local community.

Figure 2: Constructing a whakaweku (bracken fern bundle) for catching kōura

Collecting bracken fern. Photo: Ian Kusabs

Binding 10 bracken fern fronds together using cable ties. Photo: Ian Kusabs

A finished whakaweku ready for deployment. Photo: Ian Kusabs

Figure 3: Using whakaweku in streams

A whakaweku set in a small stream for catching kōura. Photo: Ian Kusabs

How to measure a kōura. The OCL or orbit-carapace length is measured from behind the eye to the end of the carapace (above the tail) along the top and centre of the back. Photo: Ian Kusabs

The use of a korapa awa (a stop net composed of shade cloth) for retrieving a whakaweku. Photo: Ian Kusabs

Whakaweku monitoring tools, i.e. a korapa awa, measuring calipers, clip board, and a 2L ice cream container for holding the catch. Photo: Ian Kusabs

THE TAU KŌURA A TRADITIONAL MĀORI METHOD FOR HARVESTING AND MONITORING KŌURA

Crayfish monitoring methods world-wide are largely derived from traditional capture methods, and the tau kōura is no exception. The tau kōura was the preferred method of harvesting large quantities of kōura in the Rotorua (Te Arawa tribal area) and Taupō lakes by pre-European Māori. The tau kōura was the culmination of over 500 years of mātauranga and rangahau (research) that had proved it was superior to other methods such as baited traps (called pouraka; similar to modern day minnow traps), hīnaki (fyke nets), pae pae (dredge nets), and rama kōura (hand nets).

One of the main advantages of the tau kōura is that it is a representative (non-biased) sampling method, catching a wide size range and equal numbers of male and female kōura. In contrast, baited traps and nets catch mainly large, aggressive male kōura. Moreover, the tau kōura does not depend on good water clarity or suitable weather conditions, which are required for visual methods such as rama kōura or underwater dive surveys. However, although these methods have disadvantages they are still useful harvesting methods and for obtaining presence/absence data.

The tau kōura involves the placement of bracken fern bundles (known as whakaweku in Te Arawa Lakes and as koere and taruke in other districts) on the lake/stream/wetland bed for kōura to take refuge in (Fig. 1). To harvest the kōura, the whakaweku are lifted onto a net to prevent the kōura from escaping. Whakaweku are composed of approximately ten fern fronds bound together with 250 mm industrial cable ties (Fig. 2). Whakaweku can be set together as in a traditional tau kōura, which is used in lakes and large ponds (Fig. 1), or individually (Fig. 3), for use in streams, rivers, wetlands, or the lake margins. For kōura to colonise them, the whakaweku should be left for about 6 weeks in lakes, and 2 weeks in streams.

Egg-bearing kōura are mostly found from April through to November. Therefore, the best time to harvest kōura is from December to March so as not to disturb the breeding females.

Whakaweku are not only effective for catching kōura, they can also be used for sampling small, bottom-living fish such as bullies, as well as freshwater snails and insects.

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

Hiroa TR 1921. *Māori food supplies of Lake Rotorua, with methods of obtaining them, and usages and customs appertaining thereto*. Transactions of the New Zealand Institute 26: 429–451.

Kusabs IA, Quinn JM 2009. *Use of a traditional Māori harvesting method, the tau kōura, for monitoring kōura (freshwater crayfish, Paranephrops planifrons) in Lake Rotoiti, North Island, New Zealand*. New Zealand Journal of Marine and Freshwater Research 43: 713–722.

Useful websites

NIWA – Monitoring Kōura

www.niwa.co.nz/our-science/te-kuwaha/research-projects/all/monitoring-koura/monitoring_koura

www.niwa.co.nz/our-science/te-kuwaha/research-projects/all/monitoring-koura/monitoring_koura/background

www.niwa.co.nz/our-science/freshwater/research-projects/all/restoration-of-aquatic-ecosystems/monitoring_koura/protocol

NIWA – Measuring kōura – Orbit Carapace Length (OCL)

www.niwa.co.nz/our-science/te-kuwaha/research-projects/all/monitoring-koura/monitoring_koura/protocol/ocl

NIWA – New Zealand Freshwater Fish Database

www.niwa.co.nz/our-services/online-services/freshwater-fish-database

NIWA – SHMAK (Stream Health Monitoring and Assessment Kit): www.niwa.co.nz/freshwater/tools/shmak

Manaaki Whenua – Landcare Research

www.landcareresearch.co.nz/resources/identification/animals/bug-id/what-is-this-bug

Author research

Ian's PhD research thesis:

Kusabs IA 2015. *Kōura (Paranephrops planifrons) populations in the Te Arawa lakes: An ecological assessment using the traditional Māori tau kōura harvesting method and recommendations for sustainable management*. Unpublished PhD thesis, University of Waikato, Hamilton. http://researchcommons.waikato.ac.nz/handle/10289/9346

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