NGĀTI RANGI

TAU KŌURA

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NGĀTI RANGI

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Fig.1: Maimai used for the survey

INTRODUCTION

Tau kōura is a traditional Te Arawa technique which describes how freshwater kōura is caught.It has been used extensively in the lakes and slow flowing rivers around Rotorua by Te Arawa for catching food. In Ngāti Rangi oral testimony shared with the team a similar technique is described used in puna and lakes in the Ngāti Rangi rohe, This is known as maimai kōura. The maimai is the word Ngāit Rangi uses for whakaweku; the bundle of fronds tied together and submerged (tau kōura) in the waterway.

The technique relies on using fronds of aruhe (bracken – Pteridium esculentum). These are tied together in a bundle (maimai) (Fig. 1). The maimai kōura is attached to the bank of the stream or lake.

The tau kōura technique has potential as a means of monitoring kōura populations. The NIWA fish database lists 9291 entries for kōura. Most of these were discovered through electric fishing. Other common methods were different types of nets, and observations by SCUBA or spotlighting. Dr Ian Kusabs (Te Arawa), has published findings that show the tau kōura method is more efficient than these methods in terms of catch per unit effort, and in providing more representative samples that include smaller individuals. This has been confirmed through experiments in lakes[1] and in slower flowing streams[2] in the Rotorua region.

In the Ngāti Rangi region the traditional use of maimai (whakaweku) has been restricted to puna (springs), lakes and slower flowing waters. They have not been tested on the faster flowing rivers in our region.

Our investigation had four main objectives.

1. Using oral history to determine the traditional use of maimai kōura in the Ngāti Rangi region.

2. Testing the efficacy of the maimai kōura method in the faster flowing Mangawhero River and tributaries flowing into this.

3. Monitoring places where kōura are present and comparing with historical records. This data can be used to inform us on strategies to preserve or enhance habitat.

4. Gaining knowledge and understanding among Ngāti Rangi uri to the technique so they can carry on the tradition.

The stimulus for this investigation was the discovery of thousands of dead kōura in the Waitangi Stream in April 2024. While the cause of the mass death remains unknown, the presence of insecticides, likely cypermethrin, is a strong suspect.

Kōura numbers are declining due to habitat destruction, lack of riparian cover and invasive fish species such as trout and carp. They are classified as ‘threatened’ by the Department of Conservation.[3] The mass ‘kōuracide’ event was a wake up call to us to adapt ways of protecting and monitoring kōura, as well as raising awareness among our uri.

[1] Kusabs, I. A., & Quinn, J. M. (2009). Use of a traditional Maori harvesting method, the tau kōura, for monitoring kōura (freshwater crayfish, Paranephrops planifions) in Lake Rotoiti, North Island, New Zealand. New Zealand Journal of Marine and Freshwater Research, 43(3), 713-722.

[2] Kusabs, I. A., Hicks, B. J., Quinn, J. M., Perry, W. L., & Whaanga, H. (2018). Evaluation of a traditional Māori harvesting method for sampling kōura (freshwater crayfish, Paranephrops planifrons) and toi toi (bully, Gobiomorphus spp.) populations in two New Zealand streams. New Zealand Journal of Marine and Freshwater Research, 52(4), 603-625.

[3] Refer to Department of Conservation website “Crayfish/kōura”, Accessible here

Fig.2: Measuring orbital carapace length

Fig. 3. Kōura collected in the net under the maimai. How many can you see?

Fig. 4: Kōura with eggs

MATERIALS AND METHODS

URI EDUCATION

As mentioned in the preliminary report, project leads Joey McLeod and Te Hiiringa Mareikura Tane spent two days with Dr Ian Kusabs at Lake Tikitapu with Dr Kusabs. They were taught how to make tau kōura, how to set them, and how to record their findings. This included how to measure the kōura using the orbital carapace length, how to identify the sex and gravid state of kōura, and how to observe the moulting state.

The two project leads then advertised to the wider community including through Waatea Radio. Five uri members attended the tau kōura sessions, where the project leads passed on everything they had learned from Dr Kusabs.

Comments were positive and indicated enthusiasm and a desire to learn more. Uri gained experience in making, setting and monitoring the maimai kōura. They also measured and recorded sex and gravid state of kōura, and assisted in identifying other invertebrates caught, and commensal flatworms on the kōura.

After each monitoring day uri provided feedback and ways to improve the method.

Comments from those attending have been collated from the messenger chat. The diary providing experiences from each monitoring day is included in the Appendix.

STRUCTURE AND OPERATION OF TAU KŌURA

Uri made the tau kōura, under supervision from project leads, using bracken fronds tied with natural fibre (jute) (Fig. 1). The same fibre was used to secure the tau to the banks of the stream with a warratah.

Maimai kōura were left in place for one to two weeks in line with Dr Kusab's methods. On one occasion it was unsafe to lift the maimai due to flooding, so these were left for longer (see Table 1).

After lifting, the maimai were placed on a net to ensure all kōura were counted. The orbital carapace length (OCL) was measured (Fig. 2), as well as sex, presence of eggs and moulting state (see figures 3 and 4). Other invertebrates were identified where possible.

Joseph McLeod had designed a maimai kōura that was reinforced with manuka branches. This had been tested in the Mangawhero and had been successful in catching kōura in fast flowing water. However these were too heavy to lift safely and place on the net to monitor kōura, so these were abandoned.

MONITORING SITES, DATES AND DURATION

Monitoring was started on 2 July and maimai kōura were placed on three sites in the Mangawhero River. On later dates maimai kōura were placed on tributaries of the Mangawhero just before the confluence to compare kōura habitats in slower streams. Two maimai were also placed in the Waitaiki and Waiharuru streams.

The dates and sites that the maimai were placed and lifted is provided on Table One.

It was originally intended to only test sites on the Mangawhero. Several of these were washed away with floods, and on one occasion the river was too high to safely retrieve the maimai kōura. We therefore trailed a number of different sites on slower flowing streams (Table 1).

Maimai were replaced as needed. Most lasted around one month. One of them lasted for the entire duration of the project (four months).

ORAL HISTORY

Only one interview was conducted. This was with Che Wilson, who described what he knew about the history of tau kōura in the area.

Fig. 5. Kōura female with eggs

RESULTS

ORAL HISTORY

A partial transcript of Che Wilson's description is provided below.

"Koro Paul talks about making a mai mai. Tau kōura is a verb but it has become a noun because it is haere ki te tau kōura. We can only do it in lakes, otherwise you would rapu whawha i te tahataha o te awa. That's how kōura is done.

We call it crawlies or kōura but technically the word for a freshwater kōura is kewai. I have heard that from a number of different kaumatua. They would differentiate kōura for the sea, and kewai for the fresh water.

Then there is all the kinds of fishing. Hituna ramatuna, hoputuna hautuna. Different terms. Hoputuna is bobbing, hituna is going to fish, or going to look. Ramatuna is with a torch. Hautuna is using a hinake. Heaps of different forms, heaps of different korero".

URI IMPRESSIONS AND EDUCATION

The following are curated and collected from the Tau kōura messenger group. The Appendix also contains further comments and suggestions from uri.

Took the kids out today and set four maimai, then out the back to find a puna my Koro use to use for his rotten corn and found a couple out there (see Fig. 5).
6/7/25. Toni-Renee

Rawe Mikaere! I love dragon flies! I wonder what that's a sign of if it's plentiful of them guys down there? Would never have guessed they breed in the water, Arotake, -use bright coloured rope to tie maimai in grassy areas - be cool to map out the spots around town we have placed maimai, for comparisons also be neat to do comparisons between urban and rural kōura, when we start seeing results.
17/7. Toni-Renee's reaction to discovering dragonfly larvae

Just to share a bit of koorero, I filmed a White Kōura in the campsite S bend it's a real nice quiet deep run. I've fished for trout at Rauhamoa and that's a mean covered in spot. And the last one is at my partner's family land, not sure how that'll fare but it's a private spot.
5/8. Te-Oti.

Tenaa koutou, Attended my first waananga and it was awesome to see some hua of the waananga today. My whakapai installing multiple maimai at the various sites or along a stretch of the awa between 50-100 meters for example 1 maimai every 10 meters. Recommendations for other sites karioi behind the domain and down the road from tomotomo where we go eeling. Noreira e mihi ana ki a koutou katoa mo nga korero me nga waananga.
5/8. Neha

Chur whanau, it was a beautiful bay out today. I really enjoyed seeing everyone excited from our 1st catch of kōura in our maimai. I got a lot of learning out of today interms of hard bottom river beds and soft ones. I will sus out some of the farms out karioi to see if we can access their farms. Maybe for a bit of homework, if u can access it. If there is a site, u think we can set up some maimai go on to Google Earth and see how that site is and we can print it off and mark out we're we can put them.
5/8. Joseph

Tēnā tātau I really enjoyed today heaps of learning for me. Taking notes was a cool little job and helped with a better understanding of what we are up to Im looking forward to the next wānanga Arotake -Noticed that most of the maimai were not completely submerged under the water and that it was okay and still had life in there, Cousin Joey shared that the kēwai like to come out of the water to breathe every now and then so thinking about setting a maimai standing up somehow would be cool. -good weather = good results haha Hei tirohanga whakamua if it's a good weekend I'm going to make some maimai and head out to the spots I want to set them and hope we can go check them at our next wānanga Pai pō.
5/8. Mareikura

KŌURA CAUGHT

Table 1 provides information on the number of kōura caught in each location on each monitoring date. Maimai kōura were replaced in the same sites after being lifted. Table 1 also provides notes on which maimai were uplifted by the current, which were washed away, and which were interfered with. Other fish and invertebrates collected by the method are also noted.

Kōura were found on four sample dates. A summary of the age, sex and gravidity (the number of times that a female has been pregnant) of the kōura is presented on Table 2. The Appendix contains the original survey sheets. These have the same format as those used by Ian Kusabs.

TABLE 1: Locations and dates for tau kōura placements.

SITE NO.	SITE DESCRIPTION	DATES	NO. KŌURA	NOTES
	MANGAWHERO RIVER AND TRIBUTARIES			
M1	Opposite 1 Mountain Rd	2/7-5/8	0	Uplifted
M1		5/8-13/8	0	
M1		13/8-10/9	0	Caddis & mayflies
M2	Mangawhero tributary opposite Railway row at confluence	2/7-5/8	4	
M2		5/8-13/8	0	
M2		13/8-10/9	na	Washed away
M3	Swing bridge opposite Shannon St	2/7-5/8	1	
M3		5/8-13/8	2	
M3		13/8-10/9	0	Caddis & mayflies
M3		10/9-8/10	3	
M3		8/10-5/11	0	
?	Second bridge entrance to Maungarongo marae (x3)	2/7-5/8	na	Washed away
M4	Arawa street Mangawhero tributary	16/7-5/8	0	Interfered with
M4		5/8-13/8	0	
M5	Mangawhero tributary opp. Wye St	16/7-5/8	0	Interfered with
M6	Mangawhero tributary, Christie Park	16/7-5/8	0	Uplifted
M7.1	S-bend at forest track near Mangawhero campsite	13/8-10/9	0	
M7.1		10/9-8/10	na	Washed away
M7.2	Same place ?m apart	13/8-10/9	0	
M7.2		10/9-10/10	na	Washed away
M7.3	Same place ?m apart	13/8-10/9	1	
M7.3		10/9-8/10	0	Caddis & mayflies
M8	Opposite Martin Place	5/11	na	Yet to monitor
	MĀKŌTUKU RIVER TRIBUTARY			
M0	1237 Parapara Rd (x 3)	26/6-16/7	0	Dragonfly & snails
	WAIHĀRURU STREAM			
M13	By SH49 upstream	13/8-10/9	0	1 brown trout
M13		10/9-8/10	0	1 brown trout
M13		8/10-5/11	0	Uplifted
M14	By SH49 50m downstream of M13	13/8-10/9	0	
M14		10/9-8/10	0	
M14		8/10-5/11	0	Uplifted
	WAITAIKI STREAM			
M15.1	Off Whangaehu Valley Rd	13/8-10/9	0	1 brown trout
M15.1		10/9-8/10	1	1 brown trout
M15.1		8/10-5/11	na	Washed away
M15.1		5/11		Yet to monitor
M15.2	50m downstream of M15.1	13/8-10/9	0	
M15.2		10/9-8/10	0	1 brown trout
M15.3		8/10-5/11	0	
	HAPUAWHENUA STREAM			
M5A	Marshalls Road 100m upstream from Old Coach Road bridge	5/8-13/8	0	
M5B	Marshalls Road at Old Coach Road bridge	5/8-13/8	0	

TABLE 2: Details of kōura caught. The orbital carapace length (OCL), the sex and the moulting state (hard or soft shell) was recorded. None of the females contained eggs.

DATE	SITE	OCL (MM)	SEX	MOULTING STATE
5/8/25	M2	18	M	Hard
		7.5	F	Soft
		7.5	F	Soft
		6	F	Hard
	M3	11.5	F	Soft
13/8/25	M3	21	F	Hard
		11	F	Hard
10/9/25	M7.3	16	F	Hard
8/10/25	M15.1	29	M	Soft
8/10/25	M3	12	M	Soft
		13	F	Soft
		15	M	Soft

TABLE 3: Orbital carapace length (OCL), sex and moulting status of kōura caught in a dam on a dairy farm.

OCL (MM)	SEX	MOULTING STATE
51	M	Hard
38	F	Hard
28	F	Hard
34	F	Hard
11	F	Hard
37	F with eggs	Hard
26	M	Hard
30	M	Hard
34	F	Hard
36	M	Hard
28	F	Hard
24	F	Hard
28	F	Hard
20	F	Soft
28	F	Soft
28	M	Hard
30	F	Hard
27	M	Hard

DISCUSSION

EFFICACY OF TAU KŌURA IN FAST FLOWING RIVERS

We only interviewed one kaumatua, though this was informative in letting us know that maimai kōura were only used on still water in the Ngāti Rangi rohe, similarly to the way Te Arawa used them. Kōura were fished on rivers by 'tickling' the side of the rivers.

This project demonstrated the difficulty and danger of using maimai kōura on fast streams. Several maimai had been washed away and in other cases they had been uplifted from the bottom of the shallower and faster flowing streams (Table 1).

A total of twelve kōura were found on only six maimai, from four sites, three of which were on or close to the Mangawhero. The site with the most kōura found in one maimai (M2), was in a slow flowing tributary (Table 2). The site with the most kōura found overall (M3) was located in Ohakune. Far fewer kōura were caught when compared to those caught in Rotorua Lakes. In addition, on one day the Mangawhero was in flood, and retrieving the maimai was too dangerous.

Although numbers were low, the maimai kōura did appear to catch a representative sample, similar to findings in Rotorua. The kōura caught after cleaning a dam were all large and mostly had hard shells. The maimai kōura caught a mixture of large and small kōura, and a mixture of hard and soft shelled. It is possible that softer shelled more vulnerable kōura are more likely to hide among the aruhe fronds in the maimai. When maimai were not swept away or uplifted, they remained in one piece and effective at catching kōura.

The NIWA fish data base provides only three records for kōura in the Mangawhero River. Two of these are from 2018, and one from 2015. Both were from e-fishing. A survey by Horizons using eDNA on 4 Feb 2021 identified eels, trout and bully, but not kōura. In spite of the hazards of flooding and the strong current washing away the maimai, they have proved effective at detecting kōura.

Ian Kusabs records whakaweku as being effective at catching bullies as well as kōura. In this project, we found some of them were effective at catching trout. Caddis flies, mayflies, snails and dragonflies were also caught. (Table 2).

Different invertebrate types are indicators for stream health. Macroinvertebrate Community Index (MCI) scores or simpler approximations such as proportions of ephemeroptera, trichoptera and plecoptera (%EPT) can be used to quantify these indicators[4]. Even the simplest of these are however expensive and time consuming. Ian's whakawetu could provide a quick approximation.

WHERE TO FROM HERE?

The experience of using a traditional monitoring method in various waterways was positive for all the uri who participated. They learned practical skills in kōura monitoring. More importantly they demonstrated enthusiasm to learn more. Many of them expressed interest in conducting their own monitoring in waterways near their home. We plan to add our records on the Mangawhero to the fish database, with tau kōura (maimai kōura) as the sampling method. The uri who participated and learned will be able to contribute their own findings.

In terms of our main objectives listed in the introduction, we have succeeded in testing the method on faster rivers (objective 2). We have contributed to historic records on the fish database (objective 3). Ngāti Rangi uri have gained knowledge and understanding that they can use to inform on strategies to preserve habitat (objectives 3 and 4).

Objective 1 was partially achieved. We only interviewed one kaumatua, but this was certainly informative in confirming the tradition use of the tau kōura method (maimai kōura) in still waters. Extending our interviews with kaumatua to include their memories of how, when, where and how many kōura they caught as rangatahi is one of our objectives for a follow-up study.

We also intend to leverage on the keenness of our uri to collect data on other watercourses, including those on private land. We would like to experiment on different ways of building maimai so they are better able to withstand the stronger flows. We are already planning to continue our monitoring of existing sites on the Mangawhero River.

[4] Stark, J. D.; Boothroyd, I. K. G; Harding, J. S.; Maxted, J. R.; Scarsbrook, M. R. 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No. 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5103. 57p

APPENDIX

PROJECT DIARY. BY TE HIIRINGA MAREIKURA TANE

2nd of July 2025

We started our Tau Kōura waananga. Four uri and community members attended alongside three staff members from Ngā Waihua O Paerangi. The uri members were Suraya Hollands, Te-oti Mareikura, Riwaru Tihema and Kelvin Mcleod. The staff members were Joseph Mcleod, Toni-renee Henare and Te Hiiringa Mareikura Tane.

We started with whakawhanaungatanga (introductions) and our reasons for being a part of this Kaupapa. The main consensus throughout the roopu was the care and passion they have for the taiao and that this method of monitoring was new to us. Although there are archives of our tupuna speaking about this way of monitoring and harvesting kōura, most uri members were intrigued by this way of monitoring and harvesting and wanted to learn more about it. Joey and I presented our tau kōura haerenga by Dr Ian Kusabs to the crew and explained what we got out of the haerenga.

Following on from that we headed into the field where we started making maimai. We started by harvesting Aruhe (bracken fern) approximately ten per maimai. When harvesting we left enough of the steam intact to promote regrowth. Each member of the crew made their own maimai ready to set at the three different sites along the Mangawhero.

All the maimai were set in the Mangawhero River.

Two were set opposite 1 Mountain Road

Two were set at the Swing bridge opposite Shannon Street exit onto Goldfinch Street

The remaining three maimai were set at the second bridge entrance on to Maungarongo Marae.

We then headed back to Te Pae Tata; shared lunch together and debriefed on the day we had.

We planned for every wānanga to be held fortnightly; this helps our monitors with availability and being able to schedule these dates into their calendars as most members of this wānanga work as well. Based on Dr Ian Kusab's work, fortnightly checking provides time for useful results.

We found that fortnightly works best for everyone involved. We can schedule as much as we like to work better for us but if the taiao has other plans such as severe weather and torrential rainfall. We need to listen to these tohu as it affects how we can monitor our maimai.

16th July 2025

Our second time together. Over the week prior we have experienced a lot of rain within our region, and I was not hopeful that our maimai were still intact after previously visually inspecting them. However, when we all went to inspect, we confirmed that three were still present and the other three were unconfirmed. This was a great sign for us all.

Because it was too dangerous to enter the river, we left the maimai to check on the next wānanga.

The maimai that were still present were opposite 1 Mountain Road,

Recorded coordinates are:

- M1 Position: 1807913 5636098 Elevation: 628m
- M2 Position: 1807791 5635972 Elevation: 621m

The other one that was confirmed is at the swing bridge site opposite the Shannon Street exit on to Goldfinch Street.

Recorded coordinates are:

- M3 Position: 1807191 5634998 Elevation: 594m

Due to the heavy rainfalls and unpredictability of the Mangawhero, we decided to find tributaries that flow into the Mangawhero. There are three main reasons why we chose to do this.

Three reasons:

1. There is less increase in the flow during wet weather.

2. These tributaries are safer and easier to monitor when in flood.

3. The tributaries are naturally slower in flow so would be suitable for kōura to live in.

The first location M4, is known to have kōura in. The tributary was on Arawa Street, about 50m up from the corner of Conway Street. The other two maimai that were set were in tributaries on Goldfinch Street (M5). One was set 50m down from Wye Street and the other was at Christie Park next to the fire station.

All recorded points are:

- M4 Position: 1806939 5634289 Elevation: 597m
- M5 Position: 1806970 5634561 Elevation: 594m
- M6 Position: 1806670 5634280 Elevation: 595m

Following on from setting these maimai we got together to discuss what we were going to do next. Toni-Renee had set some maimai down at her homestead and was happy for us to check these and monitor them.

The maimai were set at a Creek on the Parapara Road. The creek is muddy with no riparian vegetation. We monitored all three of the maimai. No kōura were found. We found plenty of snails, indicative of more polluted water, as well as dragonfly larvae. All good learnings for us all.

Below there are suggested improvements from everyone who was a part of the waānanga today.

Mareikura Kaire: “How can we better stabilize the maimai to stay submerged in the water? Through any weather conditions? (actively thinking more on this)”

“An active monitoring of the weather is essential”.

Suraya Hollands: “bring paperwork into the field, mostly survey sheets and enter data.”

Te Oti Mareikura: “Bring lunch on the road. I go out in all conditions, and it is good to see regardless of the ideal conditions for any given activity. I think we should set maimai in all our lakes and see what’s there.”

Toni-Renee Henare: “use bright coloured rope to tie maimai in grassy areas. Be cool to map out the spots around town we have placed maimai, for comparisons also be neat to do comparisons between urban and rural kōura, when we start seeing results”.

Kelvin McLeod: “weight packs! Could help so our maimai are submerged into the awa better, and stable”.

“Regular monitoring is key especially during big rain events, felt it played a big part in yesterday’s monitoring.”

5th August 2025

Our third time together. Due to severe weather we had to postpone from the 30th of July to the 5th of August. M1 was uplifted out of the water due to the recent floods so we reset it at the same spot and are thinking of ways to better anchor it so that it does not come up on to the bank. However, at M2 Position: 1807791 5635972 Elevation: 621m, we were lucky to monitor four koura. Please refer to the stream survey sheet for all data recorded.

There were kōura present in sites two and three, but none of the other sites. This is because the other sites had been interfered with. The numbers of kōura were not as great as those found by Dr Ian Kusabs in the Rotorua Lakes after a comparative time. This reflects the difference between still and flowing water.

M2 is located within a tributary storm water system that feeds into the Mangawhero, this maimai is located opposite Railway Row where it meets Mountain Road. It was covered with shrubs and black berry and had a rocky substrate.

The next maimai was M3, and it had one kōura in it. Due to children touching and floods two of the following three maimai were out of the water. We have reset them at the same location and are thinking of more secluded locations to set them so they can't be interfered with. Some feedback and suggestions for improvements from the crew is as listed:

Neha Kaire:
"Tenaa koutou, attended my first wānanga and it was awesome to see some hua of the wānanga today.
My whakapai installing multiple maimai at the various sites or along a stretch of the awa between 50-100 meters for example one maimai every ten meters.
Recommendations for other sites Karioi behind the domain and down the road from tomotomo where we go eeling not sure what awa that one is @Joseph McLeod and @Kelvin Mcleod will know.
Noreira e mihi ana ki a koutou katoa mo nga korero me nga waananga."

Mareikura Kaire:
"Tēnā tātau
I really enjoyed today heaps of learning for me.
Taking notes was a cool little job and helped with a better understanding of what we are up to. I'm looking forward to the next wānanga.

Arotake
-Noticed that most of the maimai were not completely submerged under the water and that it was okay and still had life in there, Cousin Joey shared that the kēwai like to come out of the water to breathe every now and then so thinking about setting a maimai standing up somehow would be cool.
-good weather = good results haha
Hei tirohanga whakamua. If it is a good weekend I'm going to make some maimai and head out to the spots I want to set them and hope we can go check them at our next wānanga.
Pai pō"

Stream Kōura Survey Sheet

Date 5/8/2025

Location .....

Water Temperature n/a

Equipment:
Callipers
Folder/pencils
Kōrapa
Ice cream container
Bucket

Key: **OCL** - orbital carapace length (measured from behind eye to the end of the carapace)
Sex - male/female/unknown (it is difficult to determine sex of kōura smaller than 12mm OCL)
Females – note presences of eggs or juveniles/young
Moulting - note if shell is soft
Examples – 33 fej = 33mm female kōura with eggs & juveniles; **22 ms** = 22mm male, soft
Bottom fauna – Type = mayflies, caddis flies, snails etc. **Abundance** = Abundant, common, present

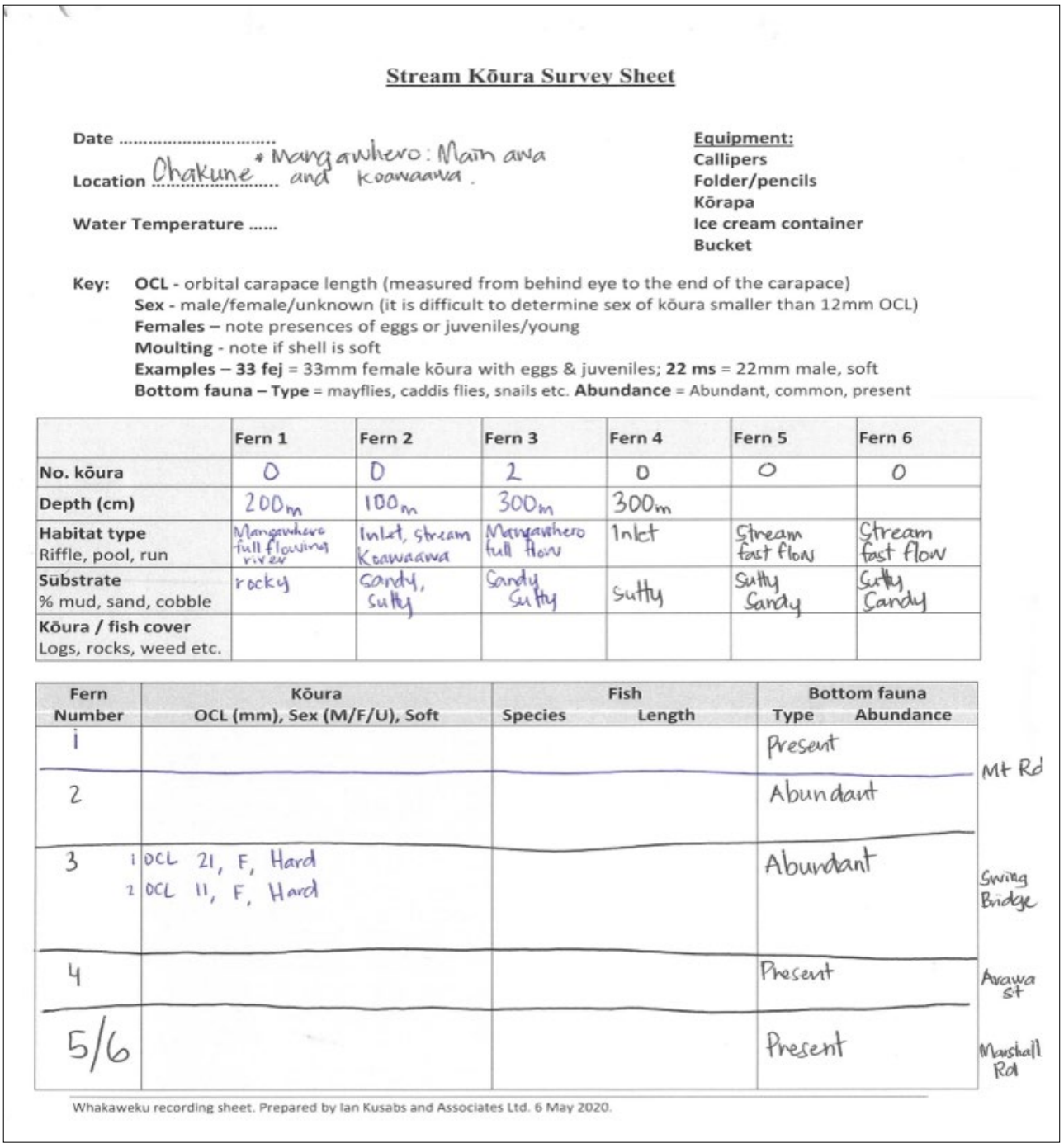
	Fern 1	Fern 2	Fern 3	Fern 4	Fern 5	Fern 6
No. kōura		4	1	0	0	0
Depth (cm)		500mm	500mm half in the water	200mm	300mm	200mm
Habitat type Riffle, pool, run		Slowflow Kowaowa	Fast flow main Awa	Shallow Light flow	Soft Flow	Fast flow main awa
Substrate % mud, sand, cobble		Rocky . Sandy	Rocky . Sandy	Rocky . Sandy	Muddy Sandy	Rocky Sandy
Kōura / fish cover Logs, rocks, weed etc.		11 bugs 2 spiders	20bugs	10+ Snails 2 bugs	n/a	n/a

Fern Number	Kōura OCL (mm), Sex (M/F/U), Soft	Fish Species Length	Bottom fauna Type Abundance
1	Uplifted out of the water ~~to~~ due to the flood will recheck on the 13th.	5. Alot of cut found Kēwai could be burrowing back into the bank. Maimai was taken to a new destination and set up at Marshalls Rd	
2	1 OCL 18 M H 2 OCL 7.5 F S 3 OCL 7.5 F S 4 OCL 6 F H was reset in the same spot		
3	OCL 11.5 F S was reset in the same spot	6. Uplifted out of the water due to flood maimai was removed and reset up at Marshalls Rd	
4	maimai was found out of the water, maimai was reset in the same spot		

Whakaweku recording sheet. Prepared by Ian Kusabs and Associates Ltd. 6 May 2020.

13th August 2025:

Our fourth time together. We monitored maimai at Mountain Road, the swing bridge and at Arawa street. The only maimai that had kōura present was at the swing bridge. We found two kōura present. One was an adult, and the other was Juvenile. Both were female with no eggs present. Attached is the survey sheet that has all data we recorded that day.



Stream Kōura Survey Sheet

Date .....

Location Ohakune * Mangawhero : Main awa and Koawaawa.

Water Temperature .....

Equipment:
Callipers
Folder/pencils
Kōrapa
Ice cream container
Bucket

Key: **OCL** - orbital carapace length (measured from behind eye to the end of the carapace)
Sex - male/female/unknown (it is difficult to determine sex of kōura smaller than 12mm OCL)
Females – note presences of eggs or juveniles/young
Moulting - note if shell is soft
Examples – 33 fej = 33mm female kōura with eggs & juveniles; **22 ms** = 22mm male, soft
Bottom fauna – Type = mayflies, caddis flies, snails etc. **Abundance** = Abundant, common, present

	Fern 1	Fern 2	Fern 3	Fern 4	Fern 5	Fern 6
No. kōura	0	0	2	0	0	0
Depth (cm)	200m	100m	300m	300m		
Habitat type Riffle, pool, run	Mangawhero full flowing river	Inlet, stream Koawaawa	Mangawhero full flow	Inlet	Stream fast flow	Stream fast flow
Substrate % mud, sand, cobble	rocky	Sandy, Sulty	Sandy Sulty	Sulty	Sulty Sandy	Sulty Sandy
Kōura / fish cover Logs, rocks, weed etc.						

Fern Number	Kōura OCL (mm), Sex (M/F/U), Soft	Fish Species	Fish Length	Bottom fauna Type	Bottom fauna Abundance	
1				Present		Mt Rd
2				Abundant		
3	1 OCL 21, F, Hard 2 OCL 11, F, Hard			Abundant		Swing Bridge
4				Present		Arawa st
5/6				Present		Marshall Rd

Whakaweku recording sheet. Prepared by Ian Kusabs and Associates Ltd. 6 May 2020.

As a group we decided to set whakaweku in various locations along Mangawhero in addition to the ones that have been in there since the beginning of the wananga.

We also placed two in the Waiharuru and in the Waitaiki, which are in Karioi.

10th September 2025

Today three of us went out to monitor the maimai set within the Mangawhero, Waiharuru and Waitaki.

There are six ferns set within the Mangawhero. Fern two that is labelled M2 was washed away from the rain. Fern 6 which was located by the S bend on the Mangawhero walking track was the only fern that had kōura in it. The other ferns had invertebrates like caddis flies and mayflies present.

The next lot of ferns set were in the Waiharuru and Waitaki. One out of the two in the Waiharuru and one of the two in the Waitaiki had a brown trout with body lengths of 53mm and 89mm respectively.

Below is a survey data sheet that was completed in the field at the time of monitoring.

Stream Kōura Survey Sheet

Date 10/9/2025

Location mangawhero site 1/2/3/4/5/6 (1MR ×2, S-B ×1, CAMP ×3)

Water Temperature .....

Equipment:
Callipers
Folder/pencils
Kōrapa
Ice cream container
Bucket

Key: **OCL -** orbital carapace length (measured from behind eye to the end of the carapace)
Sex - male/female/unknown (it is difficult to determine sex of kōura smaller than 12mm OCL)
Females – note presences of eggs or juveniles/young
Moulting - note if shell is soft
Examples – 33 fej = 33mm female kōura with eggs & juveniles; **22 ms** = 22mm male, soft
Bottom fauna – Type = mayflies, caddis flies, snails etc. **Abundance** = Abundant, common, present

	Fern 1 1MR	Fern 2 1MK	Fern 3 S-B	Fern 4	Fern 5	Fern 6
No. kōura	~~stonewashed~~ washed away	Wash away	None	None	None	1
Depth (cm)	" "	" "	30cm	300mm	1 metre	1.5 metre
Habitat type Riffle, pool, run	" "	" "	All	~~Pool~~ Sand	Pool/run	Pool
Substrate % mud, sand, cobble	" "	" "	Sand & cobbles	Sand	Rocks	rocks/stones
Kōura / fish cover Logs, rocks, weed etc.	" "	" "	weeds & Rocks	Rocks	Rocks	logs

Fern Number	Kōura OCL (mm), Sex (M/F/U), Soft	Fish Species	Fish Length	Bottom fauna Type	Bottom fauna Abundance
6	16mm, Female, Hard,				
7	None 70cm Sand	Rocks			
8	None 500mm ~~End~~	Rocks			
9	None 500mm Sand	trout	53mm	Brown	
10	None 500mm Pool Sand Wood	trout	89mm	Brown	

Whakaweku recording sheet. Prepared by Ian Kusabs and Associates Ltd. 6 May 2020.

8 October 2025

Today we monitored eight maimai. The first ones we monitored were in the Waitaiki stream. We found one kōura in Fern1, we also found a brown trout in the maimai that measured 71mm. The other maimai had a brown trout measured at over 150mm.

We continued to the next site where we had two maimai set within the Waiharuru stream. One maimai contained a brown trout that measured 59mm. After recording the data we then proceeded to the next site which was at the Mangawhero campsite. Two maimai that were set had washed out due to floods so we couldn't monitor those, so we moved on to the next site which was further down stream at the swing bridge located half way between the campsite and the town centre.

Out of all the sites we have monitored from the beginning the maimai placed here has lasted the longest and still remains there even after heavy rainfall. This maimai contained three kōura. The bottom fauna in this was mainly mayflies and cased caddis flies.

The last maimai that we checked along the Mangawhero had only two mayflies. Below is the Stream Kōura Survey sheet with all the data that was recorded on the day.

Stream Kōura Survey Sheet

Date 8/10/25

Location Multiple locations around ohakune

Water Temperature .....

Equipment:
Callipers
Folder/pencils
Kōrapa
Ice cream container
Bucket

Key: **OCL -** orbital carapace length (measured from behind eye to the end of the carapace)
Sex - male/female/unknown (it is difficult to determine sex of kōura smaller than 12mm OCL)
Females – note presences of eggs or juveniles/young
Moulting - note if shell is soft
Examples – 33 fej = 33mm female kōura with eggs & juveniles; **22 ms** = 22mm male, soft
Bottom fauna – Type = mayflies, caddis flies, snails etc. **Abundance** = Abundant, common, present

Waitaki Waitaki Mangaehuehu Maryawhero Campsite x3

	Fern 1	Fern 2	Fern 3	Fern 4	Fern 5	Fern 6
No. kōura	1	0	0	0	0	
Depth (cm)	1m	2.5m	1m	1m	1M2	
Habitat type Riffle, pool, run	Pool	run	run	run	POOL	
Substrate %-mud, sand, cobble	Sandy/mud	Sandy/mud	Sand	Rock/Sand	ROCK/orb sand	
Kōura / fish cover Logs, rocks, weed etc.	Nil	trees / Bridge	Nil	trees.	trees	

Fern Number	Kōura OCL (mm), Sex (M/F/U), Soft	Fish Species	Fish Length	Bottom fauna Type	Bottom fauna Abundance
1 Waitaki	1 koura OCL 29mm MS	Trout Brown	71mm	Nil	
2 Waitaki	Nil	Trout Brown	150+mm	Nil	
3 Manga ehuehu	Nil	Trout Brown	59mm	Nil	
4 Manga ehuehu	Nil	Nil		Mayflies caddisflies present	
3 Maryh Wero 4.	NIL	NIL		Bugs	
	Nil				

Whakaweku recording sheet. Prepared by Ian Kusabs and Associates Ltd. 6 May 2020.

Maryawhero campsite x3 tau have thinned out due to floods, will need to make new tau

Fern Number	Kōura OCL (mm), Sex (M/F/U), Soft	Fish Species	Fish Length	Bottom fauna Type	Bottom fauna Abundance
5 Mangawhero Swing Bridge	112mm MS 213mm FS 315m MS	Nil		Abundant in all	
6 Mangawhero River Corner	Nil	Nil		Mayflies present	
7 Mangawhero river & on mangawhero terrace.	Both have washed out				

Whakaweku recording sheet. Prepared by Ian Kusabs and Associates Ltd. 6 May 2020.

5th November 2025:

Today we monitored five maimai: two in the Waitaiki, two in the Waiharuru and one in the Mangawhero. The first one we monitored within the Waitaki had been washed out due to the heavy rain falls. The second maimai was present but had nothing in it. We moved on to the Waiharuru stream site where both maimai had been uplifted and ended up being beached on the banks.

We then moved into town and monitored the last whakaweku within the Mangawhero located at the swing bridge . May flies and caddisflies were the only thing present within the maimai.

As a group we decided to make two more maimai to set within the Mangawhero and Waitaiki. We set the first one 100m upstream from the maimai that is located at the swing bridge, and we set the other within the waitaiki 50 m up stream from where the remaining maimai is. These will be checked at a later date.

My cousin who is a dairy farmer for Atihau on Hapuawhenua farm was cleaning out a dam on his farm and had caught a number of kōura for us to monitor. We measured nineteen kōura, so that the crew could get some experience on measuring various sizes of kōura. Below is a stream survey sheet that has all the information of the maimai and the kōura we monitored.

Stream Kōura Survey Sheet

Date 5/11/25

Location Waitaki, Waiharuru, mangowhero

Water Temperature nil

Equipment:
Callipers
Folder/pencils
Kōrapa
Ice cream container
Bucket

Key: **OCL** - orbital carapace length (measured from behind eye to the end of the carapace)
Sex - male/female/unknown (it is difficult to determine sex of kōura smaller than 12mm OCL)
Females – note presences of eggs or juveniles/young
Moulting - note if shell is soft
Examples – 33 fej = 33mm female kōura with eggs & juveniles; **22 ms** = 22mm male, soft
Bottom fauna – Type = mayflies, caddis flies, snails etc. **Abundance** = Abundant, common, present

	Fern 1 (Waitaki)	Fern 2 (Waitaki)	Fern 3 (Waiharuru)	Fern 4 (Waiharuru)	Fern 5	Fern 6
No. kōura	/	0	/	/	0	
Depth (cm)		1.5			.5m	
Habitat type Riffle, pool, run		S.1f			Run	
Substrate % mud, sand, cobble		Sand			Cobble	
Kōura / fish cover Logs, rocks, weed etc.		Logs			Rocks	

Fern Number	Kōura OCL (mm), Sex (M/F/U), Soft	Fish Species	Length	Bottom fauna Type	Abundance
1	Whakaweku not present, has been washed out.				
3	Wai mai ~~washed~~ Beached.				
4	not wai Breached.				
5	Half in Half out Invertebrates / Snails / mollys				

Hapuwhenua

Fern Number	Kōura OCL (mm), Sex (M/F/U), Soft	Fish Species	Fish Length	Bottom fauna Type	Bottom fauna Abundance
1	51 OCL M ~~Soft~~ Hard				
2	38 OCL F Hard				
3	28 OCL F Hard				
4	34 OCL F Hard				
5	34 OCL F Hard				
6	11 OCL F Hard				
7	37 OCL F Hard – Berried.				
8	26 OCL M Hard				
9	30 OCL M Hard				
10	34 OCL F Hard				
11	36 OCL M Hard				
12	28 OCL F Soft				
13	24 OCL F Hard				
14	28 OCL F Soft				
15	20 OCL F Soft				
16	28 OCL F Soft				
17	28 OCL M Hard				
18	30 OCL F Hard				
19	27 OCL M Hard				


NGĀTI RANGI