KŌURA IN THE ROTORUA TE ARAWA LAKES AND POTENTIAL EFFECTS OF CATFISH

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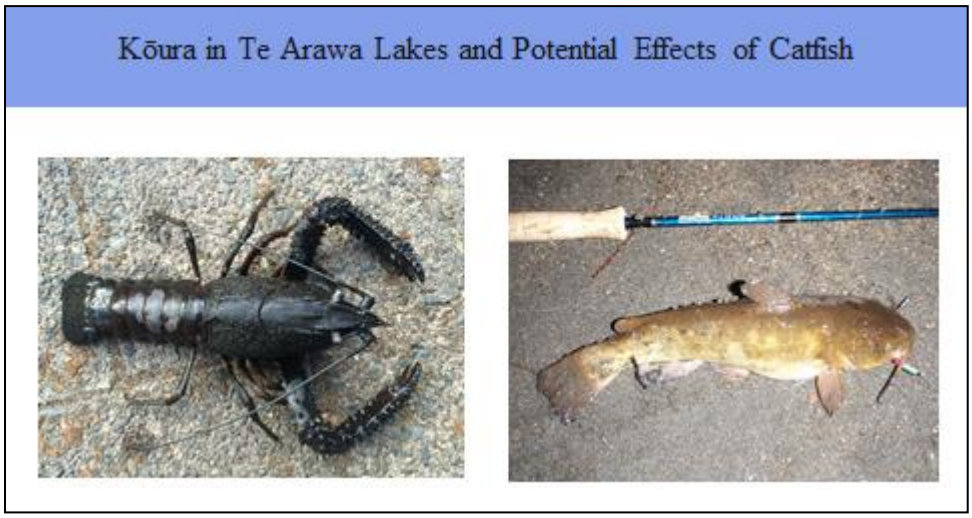
Ian is a self-employed freshwater fisheries scientist with more than 20 years' experience in freshwater fisheries consultancy, management, and research. He is a freshwater advisor to the Rotorua Te Arawa Lakes Trust and Tūwharetoa Māori Trust Board. Ian recently completed a PhD from the University of Waikato on kōura in the Rotorua Te Arawa Lakes. He is a member of the New Zealand Freshwater Sciences Society and International Association of Astacology. Ian currently resides at water-laden Lake Ōkāreka.

TRANSCRIPT

Tena koutou katoa

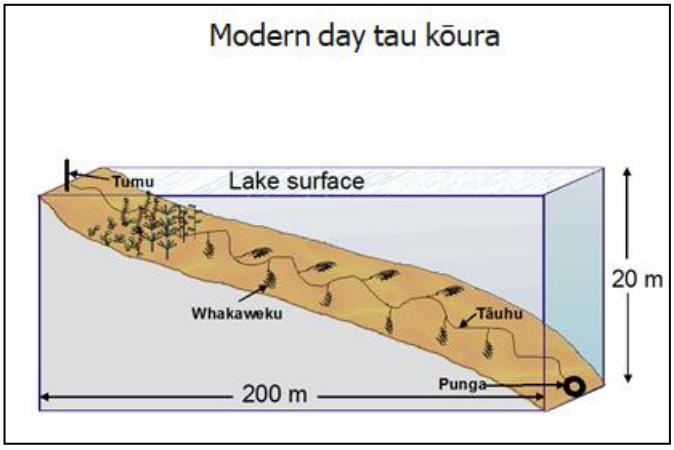
Welcome everybody to my presentation today on kōura in the Rotorua Te Arawa Lakes and the potential effects of catfish.



This shows the kōura, the northern species of freshwater crayfish (*P. Planifrons*), on the left-hand side, and the brown bullhead catfish on the right. That catfish picture was taken from one of our relations from Tūwharetoa, Kim Turia, and was captured fly-fishing at night at the Tauranga Taupō River mouth.

I would just like to acknowledge the following organisations - NIWA, the Bay of Plenty Regional Council and Andy Bruere in particular, the Rotorua Te Arawa Lakes Trust and Sir Toby Curtis.

I am going to talk about kōura and the novel sampling method we are using, then talk about the population characteristics of kōura in the Rotorua Te Arawa Lakes, including results from my PhD research, the Lake Taupō experience with catfish, which Michel Dedual has more than adequately described, and also future work.



The sampling method we use is called the tau kōura, a modern day take on a traditional Te Arawa/Tūwharetoa method. Bunches of fern bundles called whakaweku are put onto the lake bed and the kōura colonise them. We then retrieve and harvest them. There are a number of advantages over standard western methods.

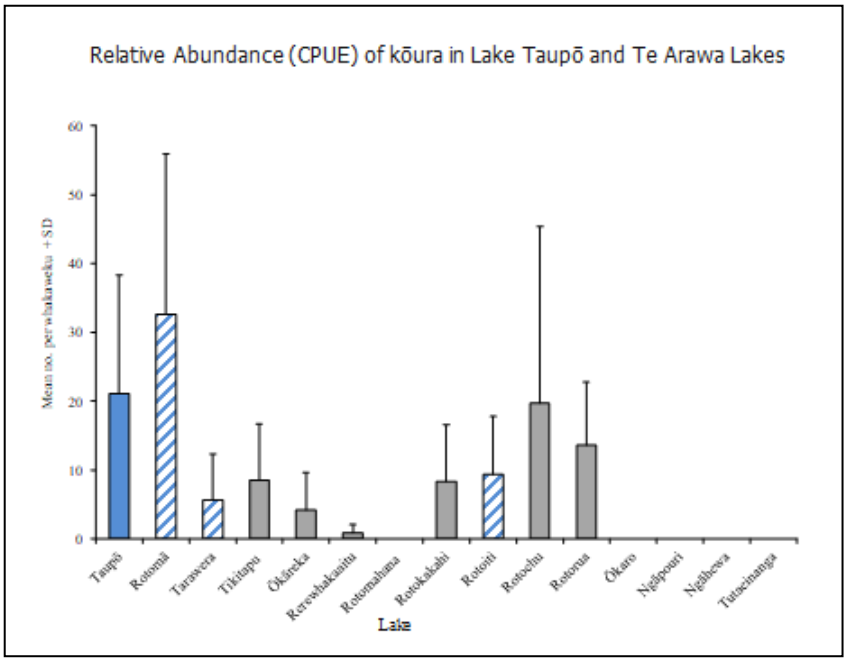
The bracken fern grows along the roadside. We collected 10 - 12 fern fronds, bundle them together with cable ties and make the ice-cream shaped whakaweku.

Below is a muddy, sandy bottom at Lake Tarawera. Kōura hang on to the whakaweku until it hits the air and then start jumping off. A kōrapa (landing net) goes underneath it to collect all those kōura jumping off.

At this point, I would like to acknowledge Willy Emery for sharing his traditional knowledge with us; he also designed the modern-day kōrapa. We would not be where we are today without his contribution.

Below - Willie Emery with a tau kōura being retrieved in Lake Tarawera

That fern bundle was in Lake Tarawera for about 2 years but in the more eutrophic lakes whakaweku only last about 6 months. After retrieval they are returned to the water and used on the next sampling occasion. We like to have two tau kōura, consisting of 10 whakaweku, per lake. The neat thing about this method, which no western standard methods do, is it collects kōura of all size classes; as small as a thumb nail right up to the biggest sized kōura. It also does not have sex biases inherent in other methods. Traps or nets generally only catch big males, no small ones and not too many females. It is a legitimate crayfish sampling method that is now being used in Europe and North America. The name tau kōura is the traditional Māori named and is acknowledgement to our tupuna.

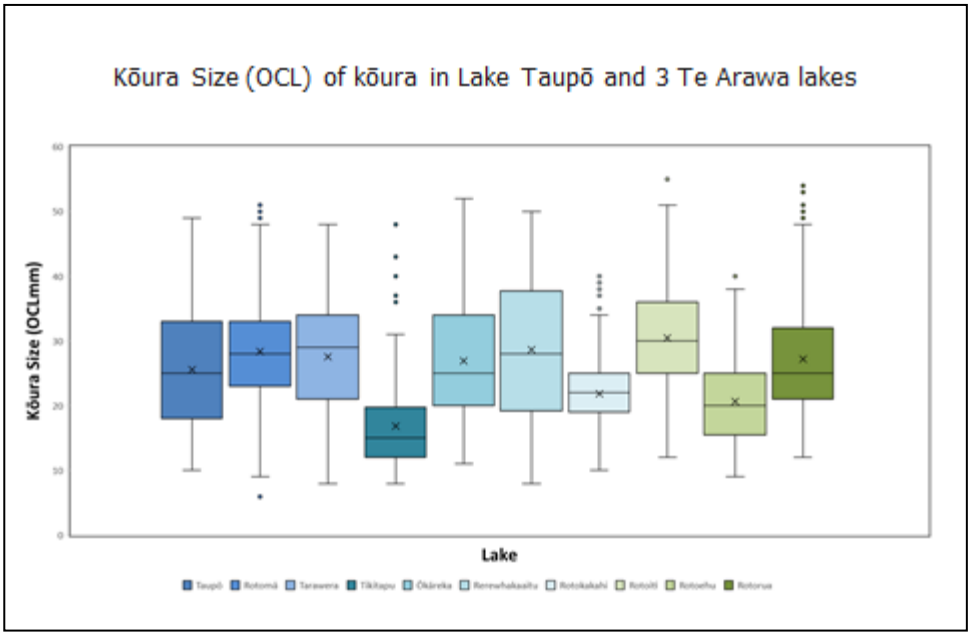


This graph shows the relative abundance of kōura in the Rotorua Te Arawa Lakes and Lake Taupō. The lakes are ordered along the X axis with increasing chlorophyll A concentration, the clean oligotrophic lakes on the left, moving into mesotrophic and then super eutrophic on the right. On the Y axis we have the mean number of kōura per fern bundle and as you can see there is no obvious pattern in regard to trophic state. It is notable in the super eutrophic lakes, which have very little dissolved oxygen for 8-9 months of the year, that there are no kōura at depth. There might be a few around the lake shore at the stream mouth or where wave action puts dissolved oxygen into the water but nothing at depth.

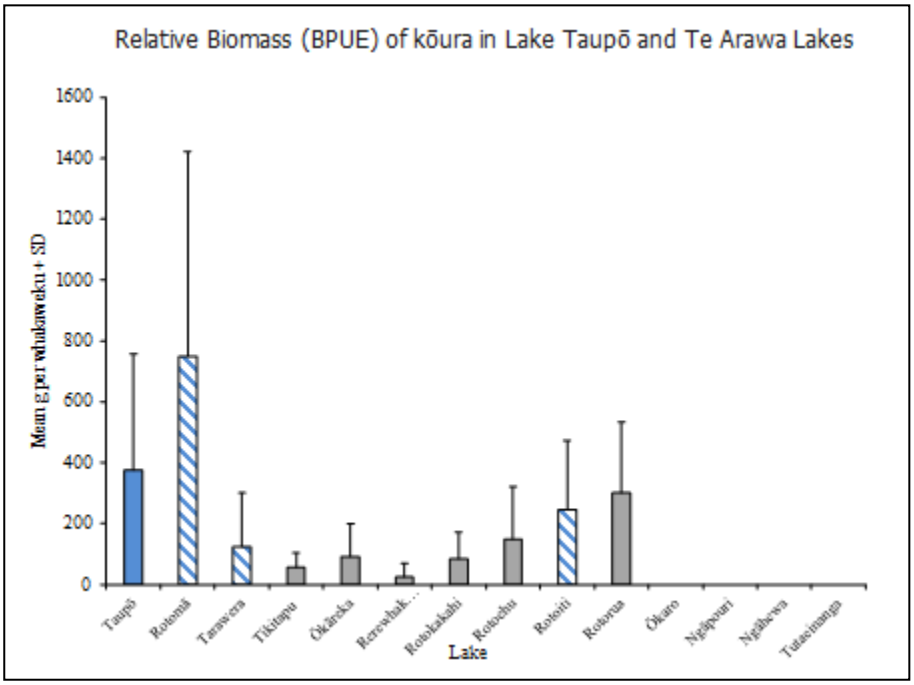
Lake Taupō has catfish but there are also still plenty of kōura. In the next slide Rotoma is a stand out. Lake Tarawera has few kōura at depth, we think that this is due to the eruption of Mt Tarawera in 1886 which put a lot of Rotomahana mud into the bottom sediments. Rotomahana mud is very fine and silty, not ideal for kōura. They prefer rocks. In addition, Joe Butterworth and I have only carried out one sampling at neighbouring Lake Rotomahana, and also did not collect any kōura at depth. There is also very significant geothermal input to that lake.

Rotoiti has good numbers of kōura and Rotoehu and Rotorua, which are eutrophic, also have good numbers. The sediments are good in these lakes, quite coarse with plenty of sand and pumice. They are also shaped like dinner plates so they are exposed to the wind and therefore their bottom waters do not deoxygenate like some of the other lakes.

The kōura size is on the Y axis and the lakes on the X axis in the same order as the previous slide, from Taupō to the super eutrophic lakes on the right. Good sized kōura are found in Taupō, Rotoma, Tarawera, Ōkāreka, Rerewhakaaitu and Rotoiti; if you want to harvest kōura to eat then these are the best lakes. Kōura were significantly smaller in Lake Tikitapu which this may be due to the low calcium concentrations in the lake. Interestingly, in terms of breeding season kōura in Lake Tikitapu appear to be out of sync with the other lakes.

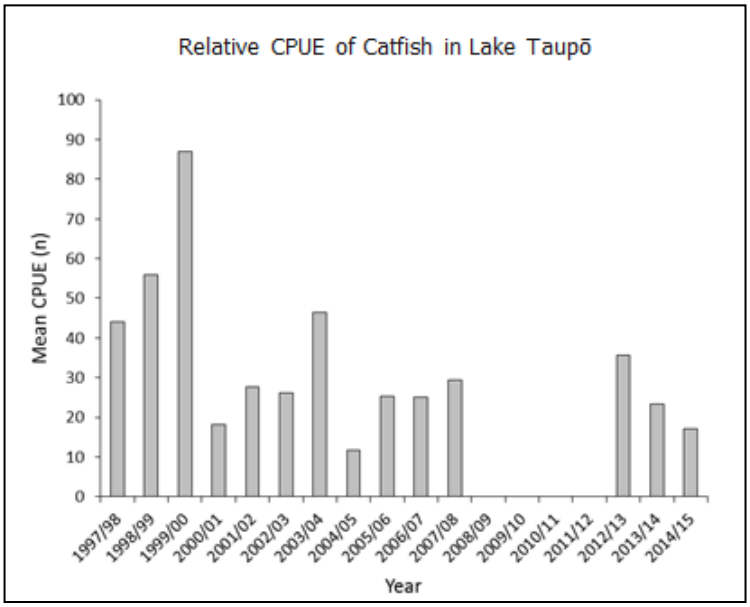


We also looked at biomass, which is the combination of average size and abundance, with Taupō, Rotoma, Rotoiti and Rotorua the standouts.



We have done a number of kōura surveys in Lake Taupō including Hiruharama Point, Motuoapa, Waihi and Pukawa bays. The stars indicate DOC's catfish monitoring sites. High numbers of catfish are found in Waihi Bay and Motuoapa.

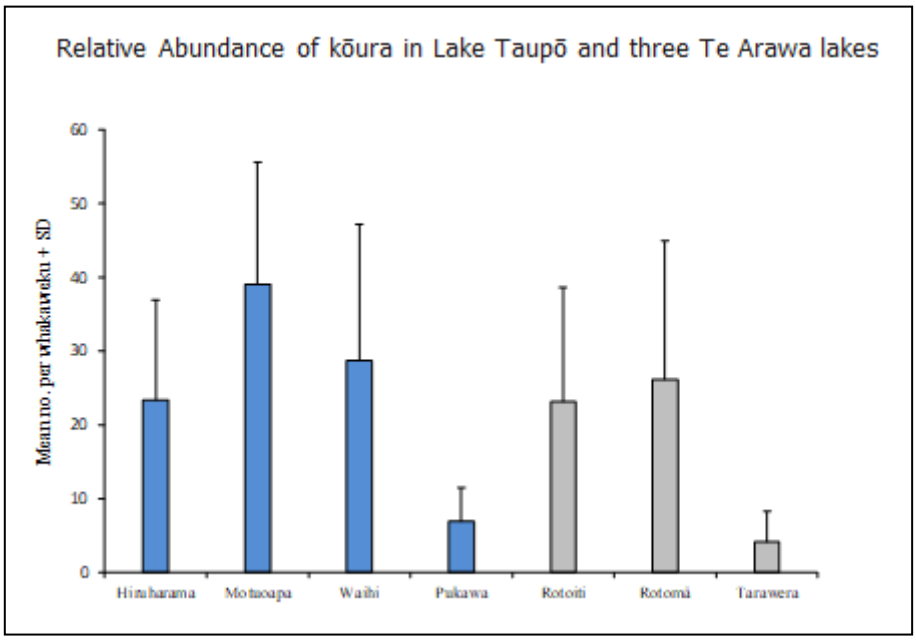
This is a summary of Michel Dedual's data and shows that the catfish population seems to have plateaued, but there are still plenty of catfish in Lake Taupō.



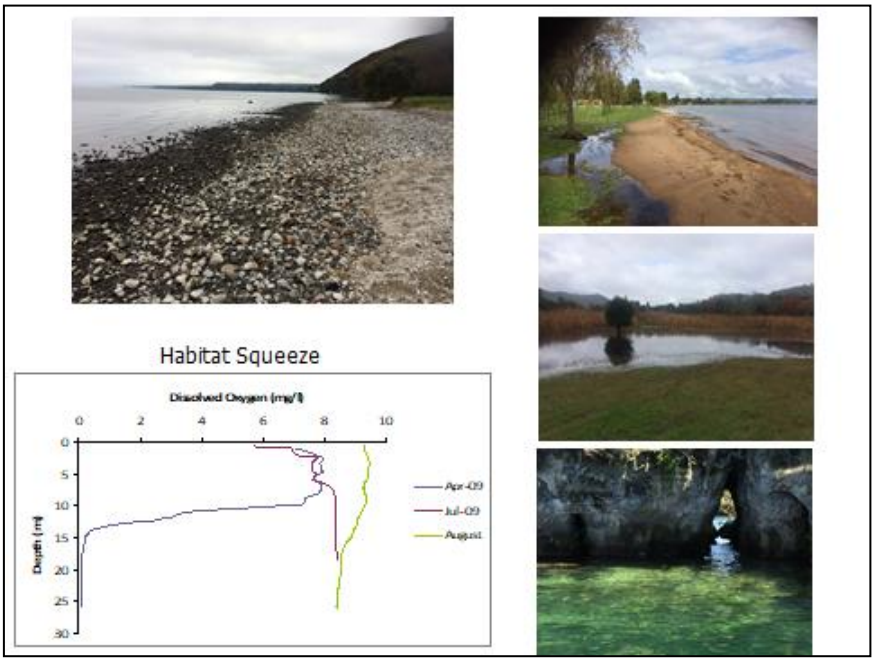
The juvenile life stage of kōura is the most vulnerable to predation. The Department of Conservation research in Taupō shows that most catfish are found in water depths less than 10 - 15m. In Lake Taupō, our tau kōura surveys caught kōura at water depths from 10m down to 35m. Therefore, there seems to be little overlap between kōura and catfish.

It should be noted that trout eat kōura as well but feed mainly on smelt and fish. This picture shows a kōura that was consumed by a catfish.

The next graph looks at abundance of kōura in various sites in Lake Taupō compared with Lakes Rotoiti, Rotoma and Tarawera, the big oligotrophic/mesotrophic Rotorua Te Arawa Lakes. Interestingly, Pukawa Bay in Lake Taupō and Lake Tarawera both have low numbers of kōura, this may be due to the fine muddy sediments present at these sites which suggests that bottom substrate may be more of a factor influencing kōura abundance than the presence of catfish.

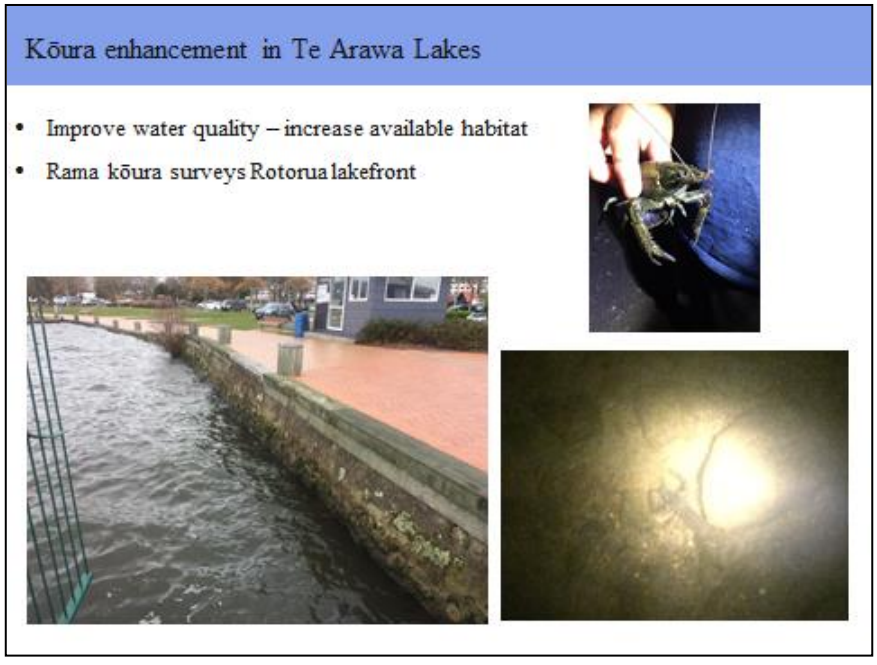


So, what is different about Lake Taupō? First of all there are lots of cobbles. The photo on the left (next page) is by the Waipehi Stream. The whole eastern side of Lake Taupō has greywacke gravels coming off the Kaimanawa Ranges. Top left is Lake Rotorua at Hannah's Bay with not one cobble in sight. The middle photo is a flooded Lake Okareka, raupo and mud. Nothing there. The bottom picture from the diving rock at Lake Okareka. Lots of bedrock but not many cobbles.



What is also good for kōura in Lake Taupō is that the bottom waters have dissolved oxygen all year round. Many of the Rotorua lakes stratify and their bottom waters deoxygenate for up to 8 months of the year. This graph from Joe Butterworth shows dissolved oxygen concentrations in Lake Rotokakahi. In autumn when the lake stratifies below 11 or 12 metres there is not enough oxygen for kōura. Kōura prefer dissolved oxygen concentrations greater than 5mg per litre. Once it gets below that kōura move into shallower oxygenated depths. In these kōura and catfish distribution will inevitably overlap.

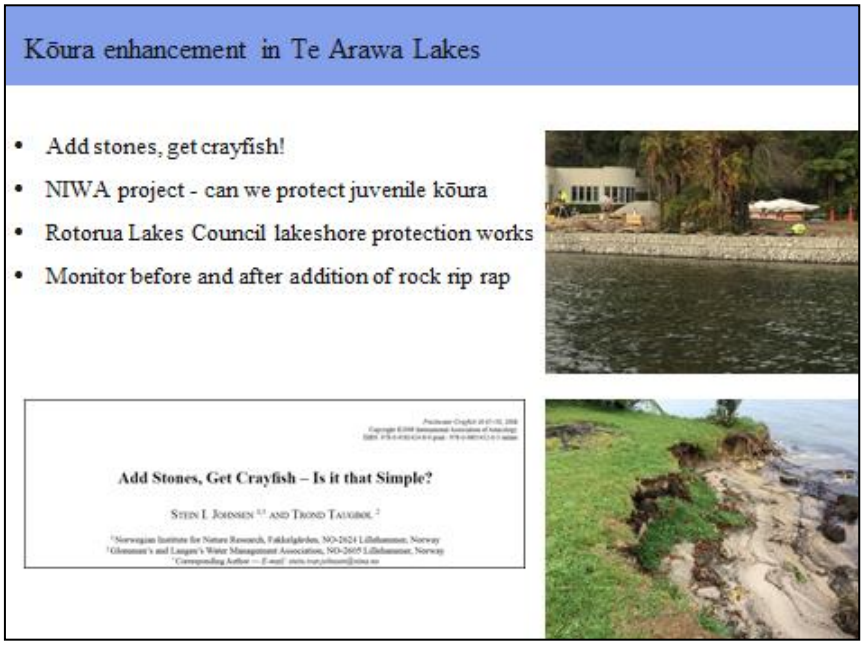
What can we do for kōura? Firstly, we need to improve the water quality and increase the dissolved oxygen concentrations at depth and thus increase available habitat for kōura. I have recently been doing some work for the Bay of Plenty Regional Council at the Rotorua Lake front where kōura are present in quite good numbers. Below shows one that



we caught almost right in the middle of town. We did night spotlighting surveys up and down the foreshore and counted over 100 kōura.

We found lots of kōura around rock walls but hardly anything near the timber retaining walls. It got me thinking about what we could do now that catfish are here. Can we do a pre-emptive strike and provide some habitat for juvenile kōura, which is the most vulnerable life stage? Below is a solid rock gabion wall constructed out at Te Akau Point, Lake Rotoiti, which is perfect for little kōura to get away from catfish.

We have had a number of cyclones this year and at Hamurana, in Lake Rotorua, there has been considerable lakeshore erosion. The Rotorua Lakes Council and Bay of Plenty Regional Council are looking to protect the lake shore by adding rock structures; we intend to work with them to make these structures kōura-friendly.



There was a paper in Norway called, ‘Add Stones, Get Crayfish - Is it that Simple?’ Well, yes it is that simple in Norway because in winter when the lakes freeze over all you need to do is drive a truck full of rocks on to the ice, unload, them, drive home and wait for spring. When the lake thaws the rocks fall to the lake bed. Obviously, that is a lot harder to do in a Central North Island lake in New Zealand. That is why we are looking at lakeshore protection works comprised of rocks to give kōura a helping hand.

In conclusion:

- Kōura are still common in Rotorua Te Arawa Lakes and Lake Taupō
- Kōura prefer coarse lake bed substrates and it is especially important for juvenile kōura
- There is a little overlap in the habitat distributions of kōura and catfish in Lake Taupō
- The best thing we can do is improve water quality and add cobbles where it is practicable
- Stop the spread - **CHECK CLEAN and DRY!!!!**
- We can’t have catfish getting into other lakes