
CATFISH IN LAKE TAUPO

Michel Dedual

Department of Conservation
mdedual@doc.govt.nz

Michel works for the Department of Conservation and has been the science advisor in the management of Lake Taupo since 1992. Since the mid 1990's trout anglers have been raising their concerns about the potential impacts of catfish in Lake Taupo that lead the monitoring and research of catfish that will be presented today.

TRANSCRIPT



Good morning tena koutou katoa

I am here to explain how we have been dealing with catfish in Lake Taupo and also the research that we have done.

Worldwide there are about 3,000 species of catfish representing approximately one quarter of all fish species living in freshwater. In New Zealand there is only one species of catfish: the brown bullhead (*Ameiurus nebulosus*). These fish were officially introduced into New Zealand (Auckland region) early in the twentieth century and the first report of their presence in Taupo was made in 1985. This suggests that brown bullhead were probably introduced a few years earlier but it is still unknown how and especially why they were released in the first place. However we all agree that this was not a great idea and Iwi and anglers were very concerned. It is also worth noting that while many species of catfish are highly valued and economically important, the brown bullhead do not enjoy the same reputation. Furthermore, the knowledge of the ecology and behaviour of brown bullhead is very fragmentary.

What are the known impacts of catfish:

- Catfish damage other species by predating on and competing for food of small native fish species, and freshwater crayfish
- They stir up the bottom which reduces water quality for other animals and plants.

As manager of the largest trout fisheries in the country we obviously were very concerned and in 1995 we commissioned Grant Barnes, a Masters student from Waikato University, to look at the first thing that worried us - do catfish eat juvenile trout?

We also wanted to know their diet and their abundance, if we were dealing with a population getting bigger or if it had reached a maximum, and have they spread throughout the entire lake? Grant Barnes found that the catfish were abundant in the shallow weedy and rocky habitat especially in the southern part of the lake and that they did not prey on juvenile trout, so for us that was a relief.

However, his master thesis was based on a single year of observations. We decided to keep the programme going and since 1996 we have been monitoring the abundance of brown bullhead on a monthly basis in three sites using fyke nets. Two of these sites were where they were most numerous and another where we should not see any catfish according to our knowledge of their biology.



We first scuba dived in the lake to see what this species looked like. Originally brown bullhead lived in very murky waters in America but in Lake Taupo the water is so clear that for the first time it was possible to observe catfish in action. Slide 1 shows catfish schooling in mid-water above the sandy bottom. In these situations they are really curious and easy to approach and

observe.

In Slide 2 we can see another type of behaviour where bullheads are alone tacked on the bottom and really shy disappearing very quickly when approached.



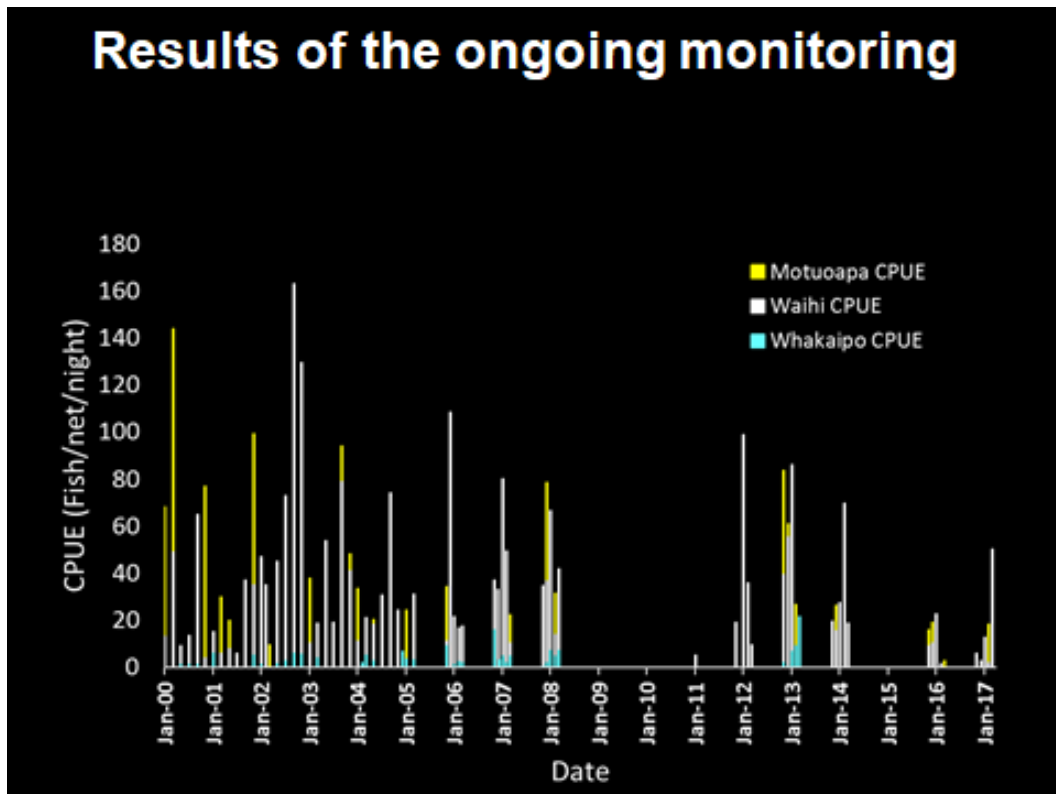
We do not know the reasons for these two types of behaviour and I do not know if it is the same in Lake Rotoiti, but this gives us a first clue: If you want to catch bullhead you need to target them both close to the bottom and in mid- water.

Slide 3 is another shot of those fish from underneath, not desirable but beautiful. In this situation we could virtually catch them with a hand net as they did not try to escape capture. That gives us another clue: they can be very vulnerable in some situations.



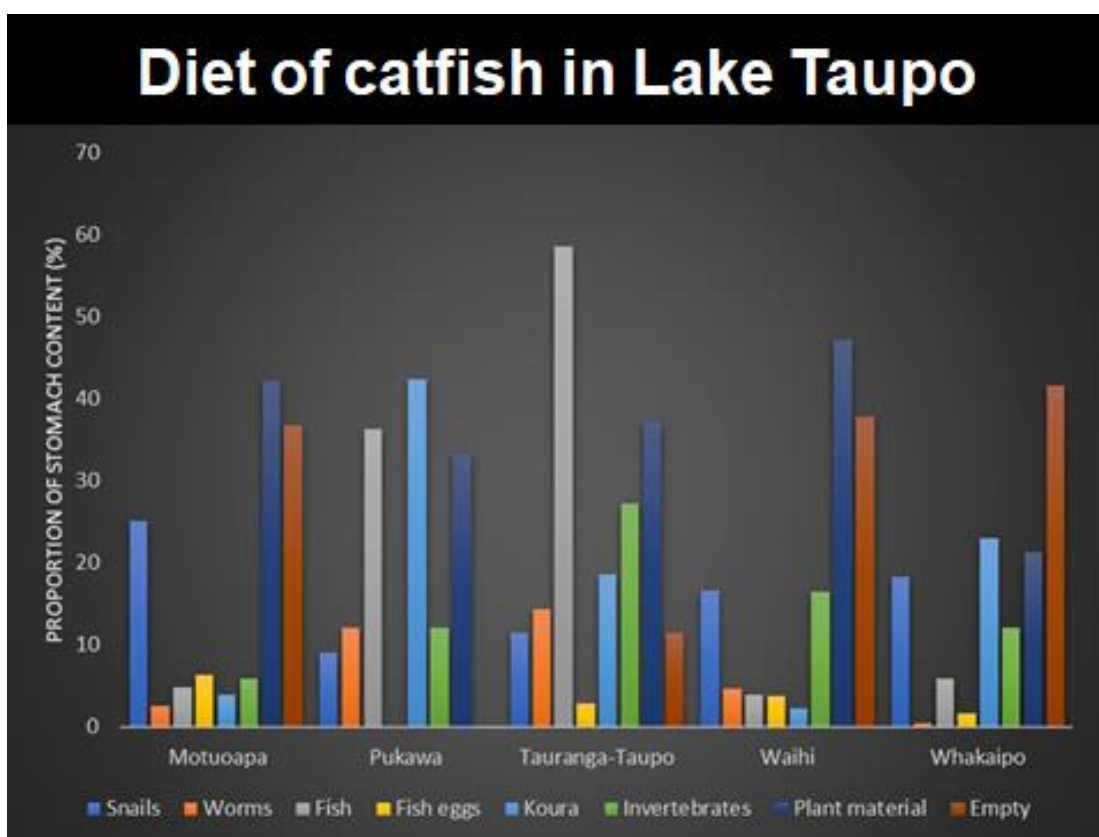
However, there were still some unknowns from Grant Barnes study that was carried out mainly in habitat with no trout. We wanted to know if catfish can share the same habitat as trout and if they did could they predate them?

Slide 4 is the result of the monthly monitoring that we did from 2000 until 2017. The results show that the catch rate (the number of fish caught per night in each net) is extremely variable and that there is no clear long term trend. The lack of trend suggests that the population has reached a plateau and it is not exploding. That is good news.



The other thing to point out is the catch rate at Whakaipo which is in the northern end of Lake Taupo. The Whakaipo Bay has very clean water with a barren sandy bottom similar to the majority of Lake Taupo. We used that site as a control because if catfish can survive in that habitat we would have a major problem. It would mean that they are likely to invade virtually the entire lake. However, the results indicate that the population of bullhead in Whakaipo is extremely low with no increasing tendency suggesting again that bullhead are not likely to invade the entire lake.

It was also important to look at diet and in Slide 5 you can see the distribution of prey found in more than a thousand catfish. Every month we analysed the stomach content of catfish of different size classes. We found that in certain areas and at certain times there was a large proportion of fish in their diet, such as in Tauranga-Taupo, but overall snails, invertebrates and plant material were by far the most important prey in the diet of catfish in Taupo.



There were also a lot of empty stomachs which may sound very strange but in fact it is easy to understand. The fish got caught in the net soon after it started eating and its stomach remained empty simply because it did not have time to eat.

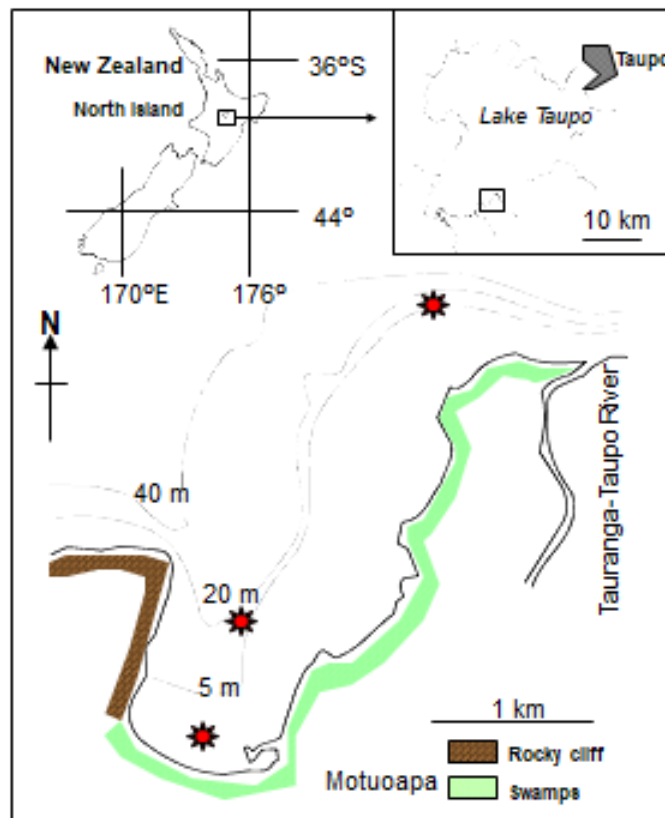
However, we were still not 100% satisfied that catfish are not a problem in Taupo so we did an acoustic tracking experiment using transmitters equipped with a pressure sensor allowing us to define at what depth tagged fish are swimming. In other words we observe if the fish stay in shallow water or go in deep water. We also had several listening locations allowing us to determine if there is any horizontal movement and how much the catfish are roaming in Lake Taupo.

The transmitters were about the size of a finger made by a Canadian company –

- Acoustic transmitter equipped with a pressure sensor (Vemco VR16-1H)
- 62 mm long, 16 mm diameter, 6 months battery life
- Automatic receivers (Vemco VR 1)

Slide 6 shows the study area in Motuoapa Bay, one area known to have a strong population of catfish due to the abundance of shallow water and weedy bottom. There were 3 listening stations (red stars), and we tagged about 25 catfish. We left the listening stations recording for one year and then downloaded the data.

Slide 6

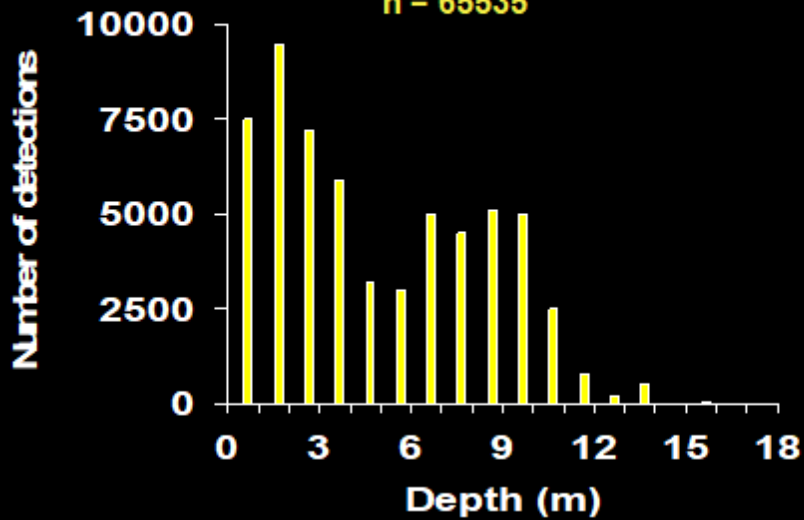


Slide 7 (next page): Immediately we found that catfish spend most of their time in shallow water. We did not get any signal from water deeper than 17 metres even though the listening stations could record in much deeper water. That was good news because Lake Taupo is like a bucket; if you cut through a bucket the edges are very narrow and then it gets deep very quickly. These initial results reinforced that we can be confident that catfish will not invade the pelagic zone of Lake Taupo.

RESULTS

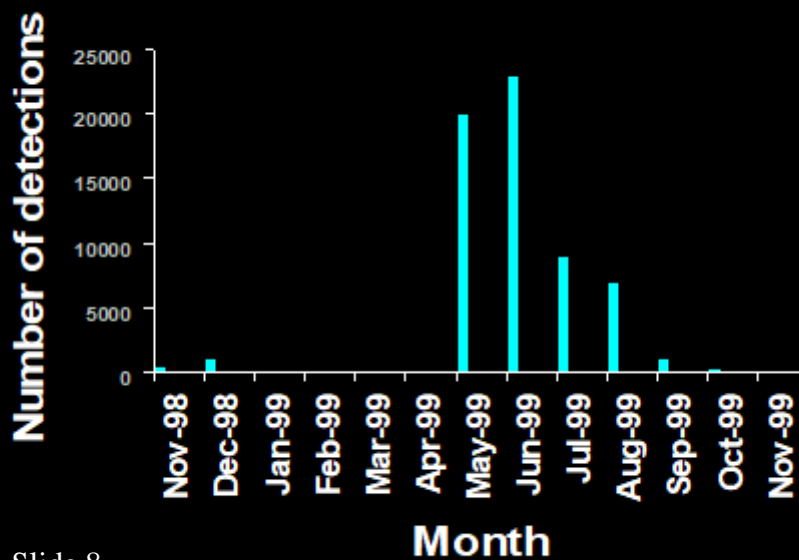
Slide 7

Swimming depth distribution n = 65535



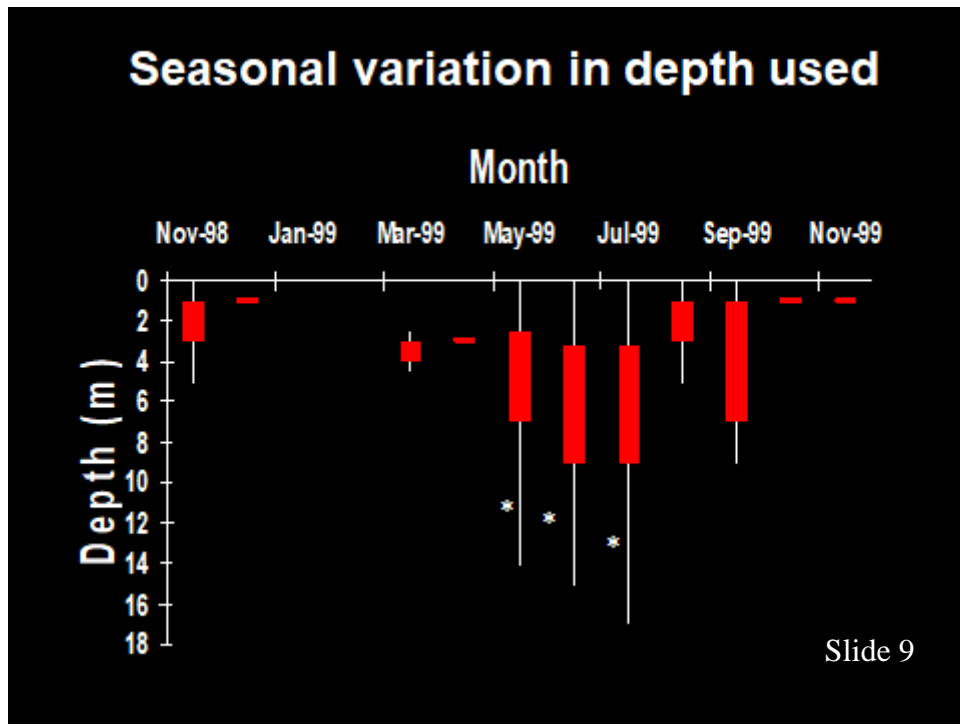
We also looked at the seasonal number of detections to assess when catfish are particularly active. (Slide 8) During summer they were difficult to locate, they were not where we tagged them and away from our listening stations. However, by April they returned to the Motuoapa Bay where they stayed until August. These movements in and out of the bay indicate when and where is the best time to target them.

Seasonal variation in number of detections

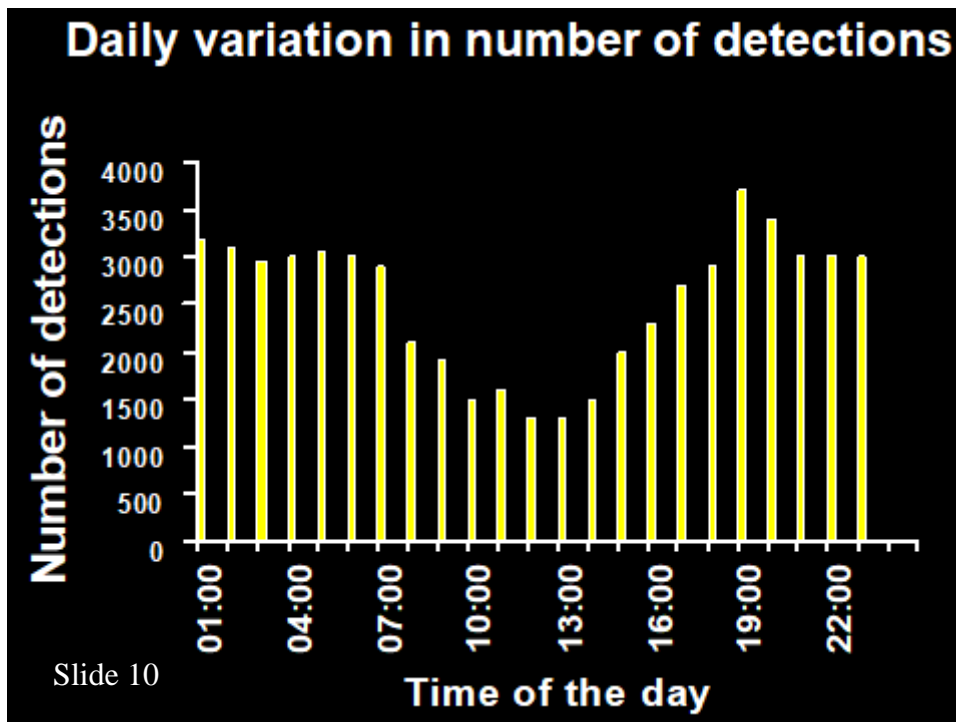


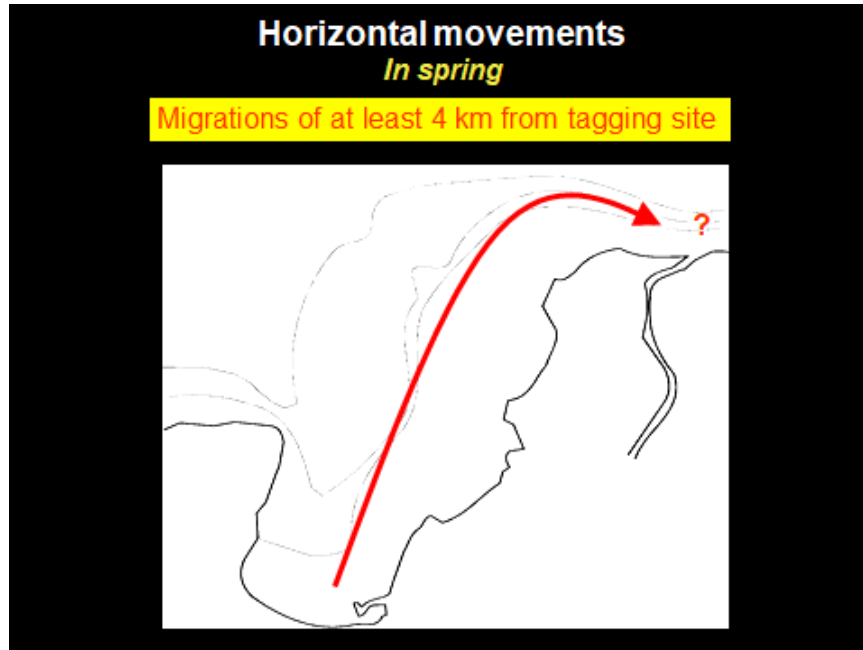
Slide 8

Let's have a look at what depths catfish generally swim in Lake Taupo. (Slide 9) Generally in winter catfish are in slightly deeper water than during the rest of the year especially in summer and spring. This indicates where to find them at different seasons.



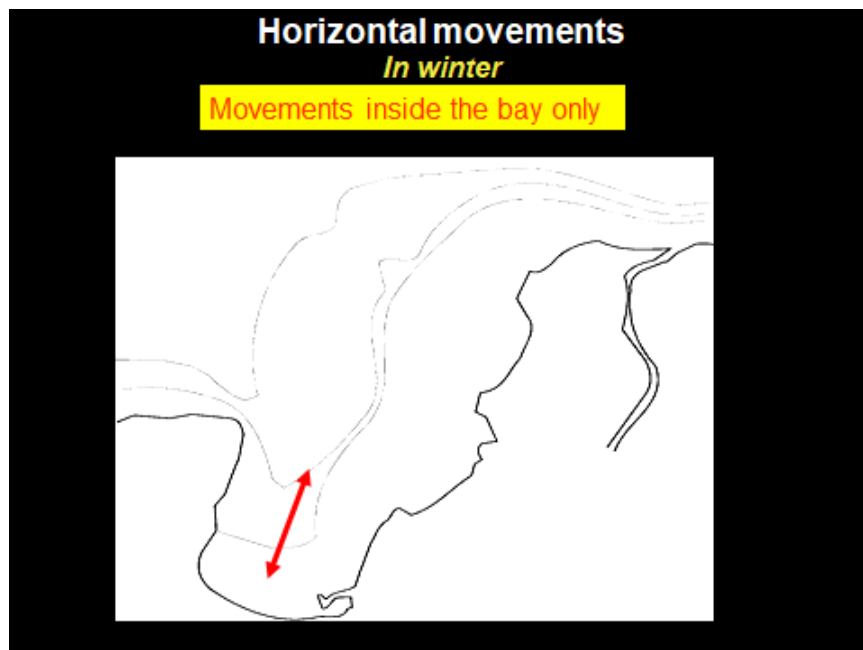
Looking at the daily variation we found that the fish were very active throughout the night but become much less active from dawn onward. (Slide 10)





Because we did not see them in summer we were wondering where they went. One possible explanation is that they go out of the Motuoapa Bay in spring but we could not know exactly where because such movements were unexpected and we did not have enough listening stations to monitor a more extensive part of the lake.

However, we detected catfish close to the mouth of the Tauranga/Taupo River which is about 4 kilometres north from Motuoapa Bay where they were marked. This shows that they can make substantial migration. From another subsequent tagging re-capture experiment that we did in Waihi Bay we found that these fish can move between Waihi Bay and Motuoapa 15 kilometres away.



In winter they park in Motuoapa Bay and do not move much. The overall horizontal movement of bullheads suggest that the most effective way of targeting them would be to stop their migration in and out of the bay.

In Conclusion

- Catfish in Lake Taupo are mainly found between the surface and 17 m deep
- They are unlikely to colonise the pelagic zone of the lake
- They are active during the hours of dim light especially at dusk and dawn
- They change their swimming depth by series of dives and ascents
- They make substantial seasonal migration (spawning?) in spring
- They use deeper water and are less active in winter
- Fyke netting would be an efficient control method because of its selectivity for large catfish that are causing the main concerns.
- Fyke netting would be particularly efficient during spring migration.

It is important to target catfish which are showed to cause a real problem. For example, if it is identified that eating koura is the main impact of catfish then target the large catfish that are predating on koura. We saw that catfish need to be at least 250 mm long to deal to and eat koura. Koura do not wait to be eaten and our underwater observations show that they will put up a good fight and not be gobbled up easily.

However, there are still some unknowns about the possible subtle impacts that catfish have on the ecosystem of Lake Taupo. Research on the trophic chain in Lake Taupo by Simon Stewart, from University of Waikato cannot rule out the possibility that catfish may have an impact on traditional pelagic fish like smelt and trout when those traditional fish species need access to the literal productivity. If this is the case then it would be at this stage that catfish could compete with trout and smelt. I believe Simon is not going to talk about this but it is another path we would like to further explore before being absolutely 100% confident that we do not have a problem with catfish in Taupo. Thank you.

Don Atkinson

Very insightful looking at what is happening in Taupo. Unfortunately our lakes are far more vulnerable because they like shallow conditions and that is what we have in Western Rotoiti and Lake Rotorua.