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A COMPARISON BETWEEN THE LENGTH AND ABUNDANCE OF THE NEW ZEALAND LONGFIN EEL (*ANGUILLA DIEFFENBACHII*) AND ITS RIPARIAN STREAMSIDE HABITAT AT KATIKATI, BAY OF PLENTY.

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Contents

1. Introduction

1.1. Overview

Due to the longfin's unique development in size, it has always been a fished species as far back as the human discovery of New Zealand by the Maori. While historical fishery of the species did take place on a large scale, it wasn't until the introduction of the species to New Zealand's Quota Management System (QMS) in the 1970's that the nationwide fishery exploitation of the species began (Doole Graeme J., 2005). Longfin eels were New Zealand's second most fishery valuable export in 1975, yet since then the population has continued to decline to due to fishery exploitation and habitat alteration so much so that scientists now estimate that the annual recruitment of longfin eels has declined by 75% (Doole Graeme J., 2005). The industry currently contributes $15,000,000 NZD annually to the country's economy, as well as any multiplier effects. As of 2013 the New Zealand freshwater longfin has been declared threatened as a species (Goodman et al., 2014), yet the commercial fishing of the species continues with no foreseeable end in sight (Hoyle & Jellyman, 2002).

It is estimated that over the last few centuries of colonisation that 85% of lowland forest has been cleared (Ewers et al., 2006), as well 90% of wetlands drained (McGlone, 2009), and turned into pasture use. Therefore due to this vast human caused alteration of New Zealand's natural habitat and consequentially the longfin's natural habitat; it is important to ascertain what effects this has, if any, on the longfin eel's length and abundance. More research needs to take place to establish whether the effect is negative, positive or has no correlation at all to the riparian streamside habitat.

It is in New Zealand's best interest to study this declining species in all its aspects to ascertain how big of an effect it's environment can influence it, if any, as the data collected will be informative and perhaps predictive of the nationwide effect that pasture stream habitat may have on longfin eel populations.

Previous research has been undertaken examining any relationship between the abundance of longfin and shortfin eels with their riparian streamside habitat (Broad et al., 2002). Eels found alongside tussock and pasture riparian streamside habitat were found to have a higher abundance than compared to those elsewhere, but only in un-fished areas (Broad et al., 2001). However all cases of previous research were completed in geographical limited areas, with no previous research ever been undertaken in the Katikati freshwater river catchments.

Research carried out T.L. Broad and C.R. Townsend, amongst others, showed that the mean length of longfin eels in comparison to its riparian streamside habitat were found to be on average longest in pasture, intermediate in willow, and lowest in tussock settings (Broad et al., 2001). Similar results were found by Hick and McCanghon in 1997 (Hicks & McCaughan, 1997). The following proposed research aims to see if this trend can still be observed in longfin eels today, specifically in the Katikati freshwater river catchments.

1.2. Importance of Customary take to local Iwi

Historically, both the longfin and shortfin eels (known collectively to the Maori as 'tuna') were of significant cultural and dietary value to the Maori of New Zealand and were known as a taonga (natural resource/treasure). Some historians estimate that eels were became an important staple replacement source of protein and fat once the moas were hunted to extinction. Regardless of whether this is true or not, by the time of significant European settlement in the 1700 to 1800s eels were commonly reported as a widespread food. In light of this the plight of the declining longfin eel population gains extra importance as it is vital that this species is preserved to also preserve the important cultural and dietary value that it has to Tangata Whenua nationwide.

1.3. Biology of *Anguilla dieffenbachii*

The New Zealand freshwater longfin eel (*Anguilla dieffenbachii*) is the largest anguillid species worldwide and the only endemic eel species to New Zealand. Growing sometimes up to 3m in length, the longfin eel is found throughout New Zealand's freshwater waterways and feeds on an omnivore diet (D. J. Jellyman, 1989). Once reaching maturity, which according to Jellyman and Todd (1982) occurs between 23-34 years old depending on the gender, longfin eels migrate out into the Pacific Ocean to an undiscovered location somewhere between Tonga and Samoa where a frenzied orgy of broadcast spawning takes place. Once the eggs have been fertilised by the sperm in the water column the current belief is that the adult eels die, leaving the larvae to retrace their parents 'footprints' back through the Pacific Ocean and into New Zealand's freshwater waterways (Glova et al.,1998).

1.4. Objective

The aim of this research project is to establish if there is a correlation between the length and abundance of the NZ freshwater longfin eel (*Anguilla dieffenbachii)* and it's riparian streamside habitat. It is expected that extensive riparian vegetation will have a beneficial impact on the length and abundance of the longfin eel.

Therefore the hypothesis being stated is that streamside riparian vegetation of a pasture stream has a beneficial effect on the lengths and abundance of New Zealand freshwater longfin eels within it.

In contrast the null hypothesis is that streamside riparian vegetation of a pasture stream will have no beneficial effect on the length and abundance of the New Zealand freshwater longfin eels within it.

2. Method

2.1. Study sites

Three streams were selected for this research project in the Uretara and Tahawai catchments of Katikati, Bay of Plenty. The first stream, the Quarry Stream, is an example of a pasture stream with minimal riparian vegetation that has only been planted 10 years ago. Additionally the Quarry Stream also contains the runoff from the (Katikati) Quarry, hence the named so. It is expected that this sediment flow will have negative effects on the biodiversity of the Quarry Stream. The next stream, the Boyd Stream, is an example of stream still linked to pasture use, but for the most part surrounded by large amounts of riparian vegetation that has been present for a long timespan. Lastly, the Tahawai Stream is a pasture use stream with no established riparian vegetation however significant riparian vegetation was planted during the beginning of this research project in July, though the effects of this recently planted riparian vegetation on this research's project would be expected to null or next to null.

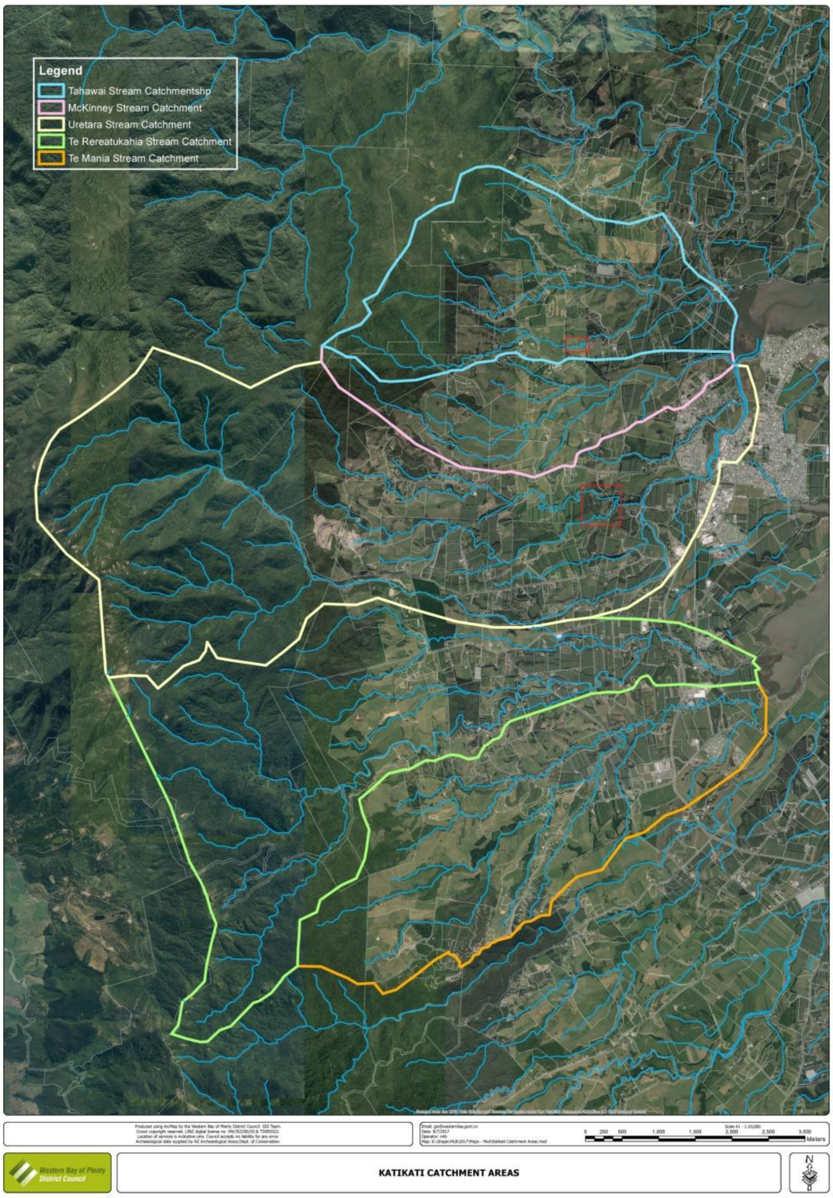


Figure 1. Satellite imagery of Katikati and the five catchments within it. The surveyed streams are highlighted by a red box.

2.2. Establishing survey sites

All three streams were walked along and examined visually with a local expert (Andrew Jenks) and three sites were selected along each stream. Three types of sites were selected by visual estimation, the first being a site without riparian vegetation (0% riparian vegetation present), the second being a site with little riparian vegetation (1%-50% riparian vegetation present), and lastly the third with plenty of riparian vegetation (50% -100% riparian vegetation present). However due to limitations of accessibility, location, vehicle access and land use of the study sites it was not possible to select a study of each one of these categories in each respective stream; so instead three sites of each category were selected over the course of all three sites in general. The sites were as follows:

Quarry

- Site 1 - Little Riparian Vegetation
- Site 2 - No Riparian Vegetation
- Site 3 - Plenty of Riparian Vegetation

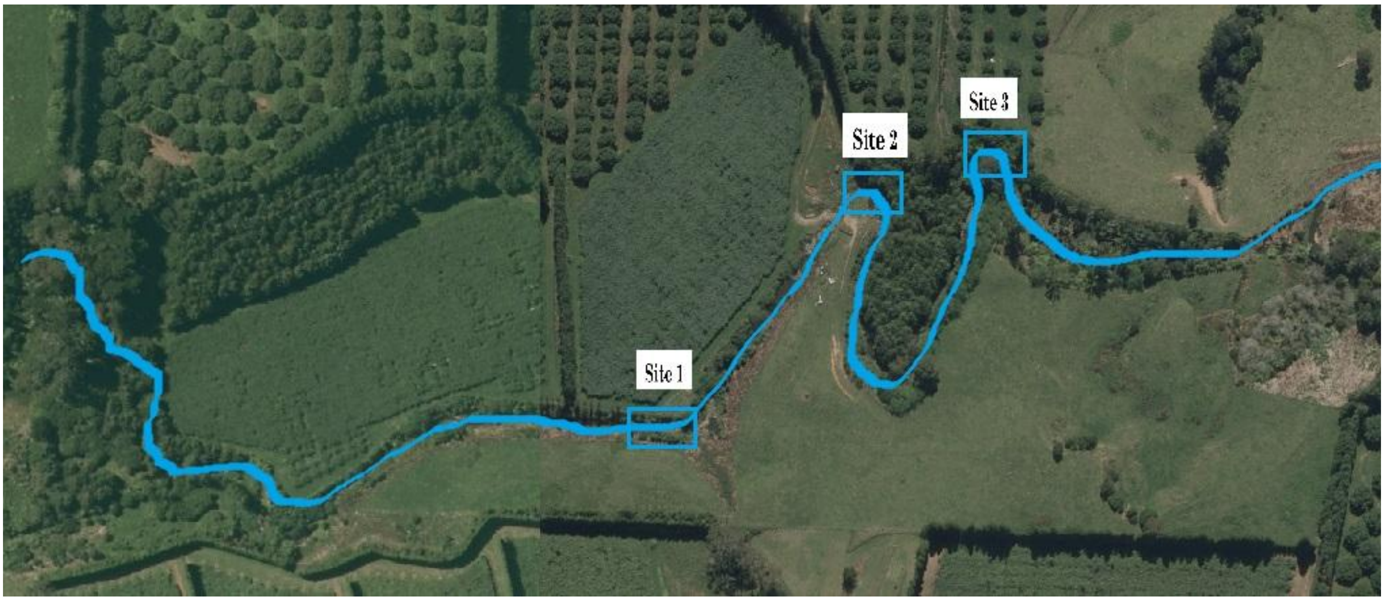


Figure 2. Satellite imagery of the Quarry Stream and the three sites surveyed within it.

Boyd

- Site 1 - Little Riparian Vegetation
- Site 2 - Plenty of Riparian Vegetation
- Site 3 - Plenty of Riparian Vegetation

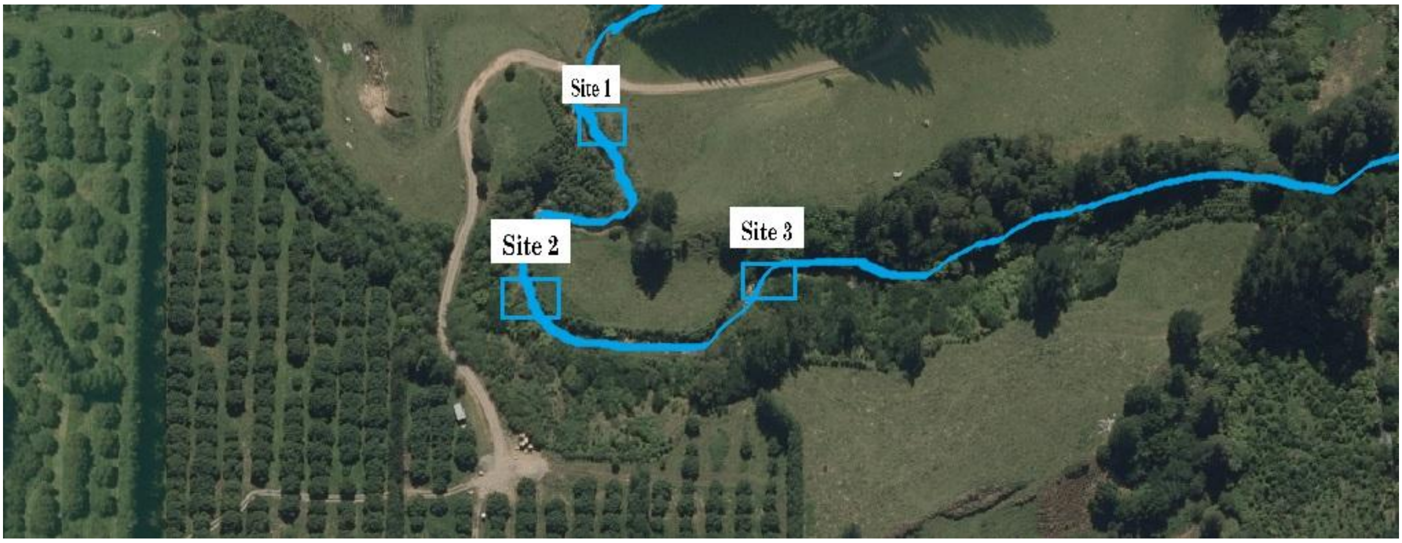


Figure 3. Satellite imagery of the Boyd Stream and the three sites surveyed within it.

Tahawai

- Site 1 - No Riparian Vegetation
- Site 2 - Little Riparian Vegetation
- Site 3 - No Riparian Vegetation

Figure 4. Satellite imagery of the Tahawai Stream and the three sites surveyed within it.

Due to both quantity of established riparian vegetation it was expected that the sites in the Boyd Stream would yield the greatest length and abundance of longfins. The distance between each site was on average around 100m. It was expected that adjacent sites in each stream might both fall under a single large female longfin's individual territory, as they have been known to patrol distances exceeding 200m of stream . However in most instances both shortfin and longfin eels share territory easily, with the only interspecies competition taking place over food.

2.3. Surveying

Surveying began in July and occurred throughout the following months ending in October. A fyke net was placed at each site, mouth pointing downstream with a small jar/capsule of fish cat food located at the end of the fyke. The fyke nets were secured with a wooden post at each end in that was securely grounded into the stream substrate. These nets were put out between 4-6pm in the afternoon / evening and were then checked immediately first thing the next morning between 8-9:30 am. Upon examination of the fyke nets, if any eels were caught in the nets the net would be removed, carefully carried onto shore, upon which examination of the eel would begin to establish whether it was a shortfin or longfin and then respective eel(s) would be carefully guided into an eel length tool upon which the length of the eel could easily be measured next to the outstretched tape measure. Upon successful measurement and identification of the species of the eel individual, the eel would then be carefully released back into the stream habitat that it was netted in. Checking of the sites began in the most downstream site and continued backwards upstream in case disturbance to the stream sediment and flow affected the project in any way.

To further establish and discern an accurate indication of the overall biodiversity health of each respective stream, minnow traps were also set out once at each site at the same time as the fyke nets, and were checked first thing before the fykes in the following morning. Once the minnow traps were lifted out of the water, they were opened and any fish caught in them were emptied in a bucket filled with stream water. At this point each fish was individually caught and lifted out the stream, at which time photos were taken of it and identification of the fish's species made.

Lastly, in addition to this chemical tests were undertaken on the water of all three sites of all three streams to help identify the chemical health of each respective stream and any chemical factor that might be affecting the health of the streams biodiversity and therefore the research project's results in turn.

2.4. Data analyses

Once all the data of all the lengths and abundance of longfin eels recorded each site of each respective stream was recorded, examination would then be undertaken to establish if there is any correlation to the data and proof of whether either the hypothesis or null hypothesis is correct. This would be accomplished through ANOVA single factor tests being undertaken to compare means of each respective stream's data.

At the end of this process the findings will be written up in a research paper, as well as a summary of the findings being presented in a seminar on the 18th to 19th of October.

3. Results

3.1. Longfin Eel Length

As shown in the data below there was an observable difference in the lengths of the longfins measured in each respective stream with the stream with most riparian vegetation, the Boyd Stream, yielding the greatest length and length range of longfin eels caught (43cm - 135cm) as well as the greatest longfin eel mean length caught on average per site (76.92cm) of all three streams. The Quarry Stream contained the next smallest length range (44cm - 105cm) and longfin eel mean length per site (72.29cm). Lastly the Tahawai Stream produced the smallest length range of longfin eel lengths (41cm - 92cm) and smallest mean eel length per site (66.25cm). Yet in spite of this, the differences in the length of the longfin eels caught in each of the three streams was not found to be a significant difference (*ANOVA single factor test* , P=0.65).

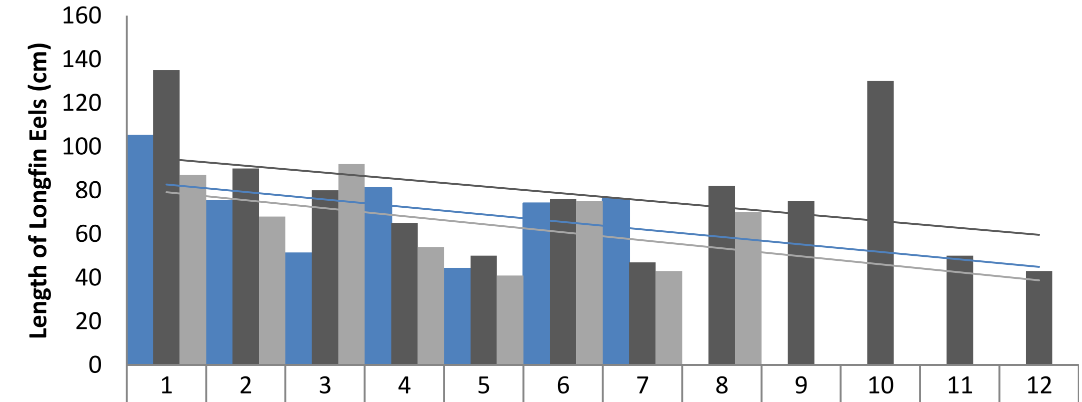
Table 1. Longfin eel individual lengths (cm) caught in each site of each of the three respective streams

Quarry Site #1	Quarry Site #2	Quarry Site #3
105	75	44
74		76
51		81

Boyd Site #1	Boyd Site #2	Boyd Site #3
135	80	65
90	130	50
43	82	47
	75	50

Tahawai Site #1	Tahawai Site #2	Tahawai Site #3
87	54	92
70	68	43
	41	
	75	

Table 1 lists the lengths of all the longfin eels caught throughout this project. It is interesting to note the noticeable differences in lengths between the longfin eels caught from the Boyd Stream in comparison to those caught from the Tahawai Stream.



	1	2	3	4	5	6	7	8	9	10	11	12
Quarry	105	75	51	81	44	74	76					
Boyd	135	90	80	65	50	76	47	82	75	130	50	43
Tahawai	87	68	92	54	41	75	43	70				

Longfin Eel individuals caught

Figure 1. The lengths of all longfin eel individuals caught in each respective stream in chronological order, with a relevant trendline included for each stream.

Figure 1 lists the lengths of all longfin eels caught in chronological order for each respective stream. As shown by each of respective stream's trendline, the mean size of longfin eels caught decreased overall throughout the timeline of the conducted research.

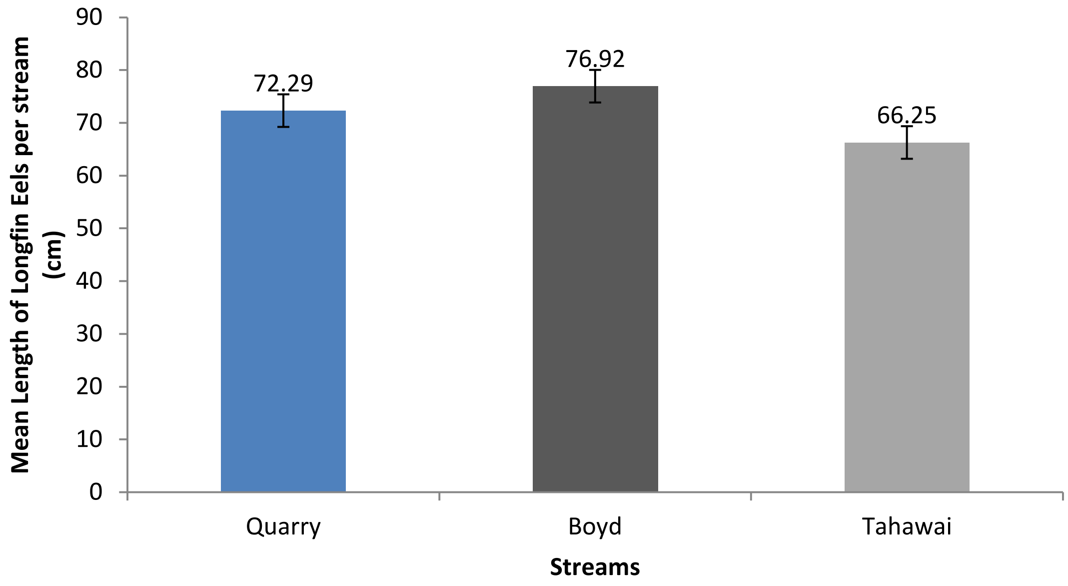


Figure 2. The mean length (cm) of all caught longfin eels in each respective stream (error bars ± SD)

Figure 2 describes an overall mean length of longfin eels caught in each of three researched streams. There is 10.67cm difference in the mean length of longfin eels in the Boyd Stream to those found in the Tahawai Stream. The mean length of longfin eels in the Quarry Stream on the other hand is only 4.63cm smaller than those found in the Boyd Stream and 6.04cm larger than those in the Tahawai Stream. Error bars of one standard deviation were included in this graph.

3.2. Longfin Eel Abundance

The difference in longfin eel abundance between the three different streams was minimal, though noticeable. Once again the Boyd Stream produced the highest results with a total abundance count of 12 longfin eel individuals caught overall and a mean of 0.8 longfin eels caught per site, over the course of the research undertaken (with some recaptures occurring as well). Recaptures were not included in the data below and were identified as best possible by the same length longfin eel (to the cm) being captured in the same stream. The Tahawai Stream contained the second highest results with a total longfin eel abundance count of 8 individuals and a mean of 0.53 longfin eel individuals caught per site. Lastly the Quarry Streams' abundance count was that of 7 longfin eel individuals and a mean of 0.47 longfin eels caught per site. Conclusively, the differences in the abundance of the longfin eels caught in each of the three streams was not found to be significant (*ANOVA single factor test* , P=0.46).

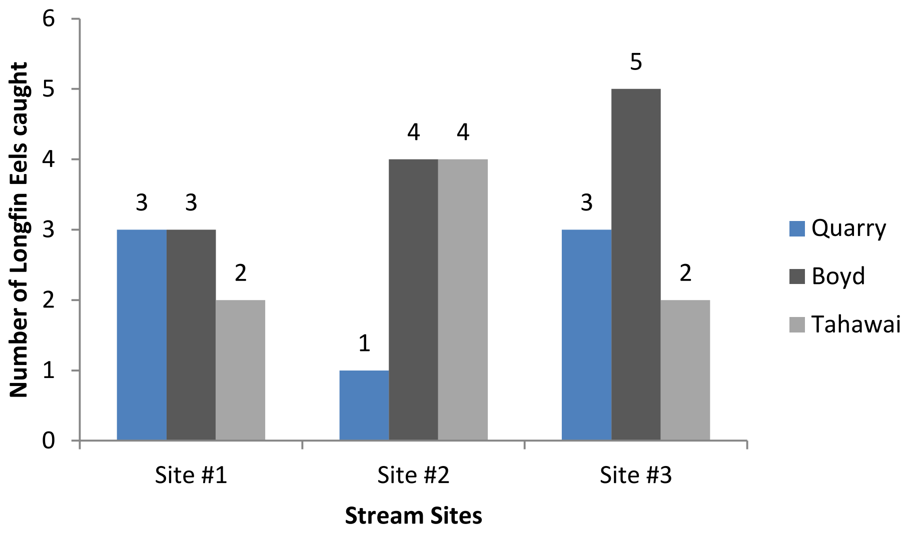


Figure 3. The total abundance of all longfin eels caught in each site of each respective stream

Figure 3 illustrates the total number of all longfin eels caught in each of three sites of each of three streams. Certain sites such as Tahawai Site #1 and #3 and especially Quarry Site #2 proved to be ineffective locations to catch longfins throughout the overall course of the research project.

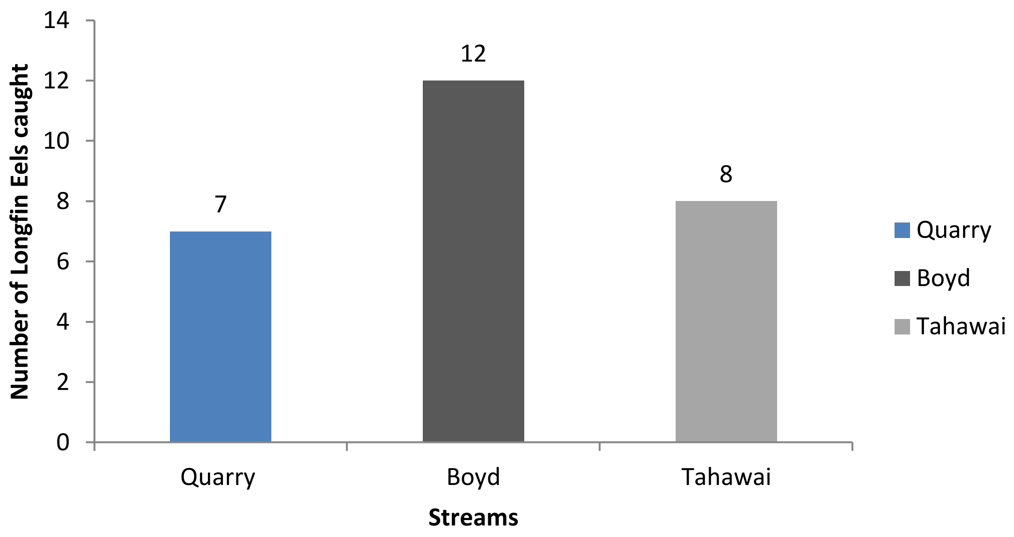


Figure 4. The total abundance of all longfin eels caught in each of the three streams

Figure 4 describes the total abundance of all longfin eels being caught in each respective stream over the entirety of this research project. In total only 27 longfin eel individuals were caught, with there only being a small disparity of 5 individuals between the best site (Boyd Stream) and the worst (Quarry Stream) abundance wise.

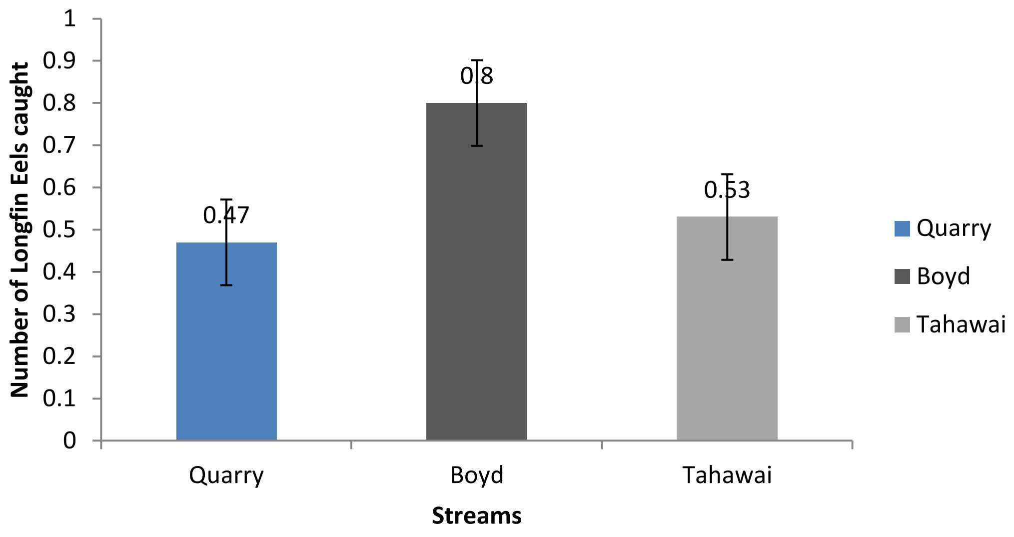


Figure 5. The mean number of longfin eels caught per site per stream (error bars ± SD)

Figure 5 displays the mean number of longfin eel individuals caught per site in each of the three respective streams. In each of the three Boyd Stream sites there was an 80% chance on average to catch a longfin eel individual per fyke net. In contrast to this there was only a 53% and 47% chance on average to catch a longfin eel individual per fyke net in the Tahawai and Quarry Streams respectively. Error bars of one standard deviation were included in this graph.

Table 2. The abundance of all caught longfin eel individuals caught per site per stream per site visit

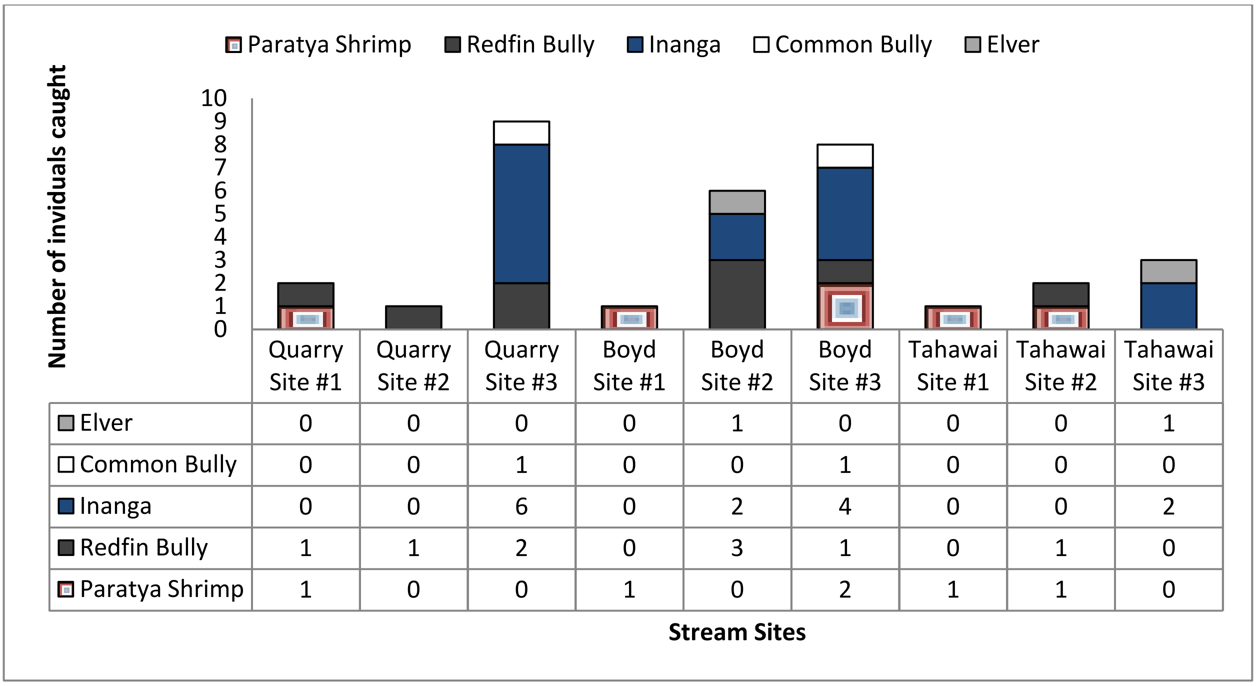
Quarry	20/08/2018	5/09/2018	15/09/2018	27/09/2018	12/10/2018
Site #1	3	0	0	0	0
Site #2	0	1	0	0	0
Site #3	0	0	2	0	1
Total	3	1	2	0	1

Boyd	20/08/2018	5/09/2018	15/09/2018	27/09/2018	12/10/2018
Site #1	2	0	1	0	0
Site #2	1	2	0	1	0
Site #3	2	0	3	0	0
Total	5	2	4	1	0

Tahawai	25/07/2018	27/08/2018	22/09/2018	26/09/2018	14/10/2018
Site #1	0	0	0	1	1
Site #2	2	1	0	1	0
Site #3	2	0	0	0	0
Total	4	1	0	2	1

Table 2 is comprehensive list of all longfin individuals caught per site per stream per respective date. Due to a limitation on the number of fyke nets available to this research, it was only possible to set up 6 nets at a time. Therefore due to the close proximity of the Quarry and Boyd Streams, these streams were surveyed at the same time with the Tahawai Stream survey being undertaken at another date. It is interesting to note that just as in the case of the trend of sizes of longfin eel individuals, the abundance of longfin eel individuals caught also decreased throughout the timeline of the conducted research.

3.3. Minnow Nets



	Quarry Site #1	Quarry Site #2	Quarry Site #3	Boyd Site #1	Boyd Site #2	Boyd Site #3	Tahawai Site #1	Tahawai Site #2	Tahawai Site #3
Elver	0	0	0	0	1	0	0	0	1
Common Bully	0	0	1	0	0	1	0	0	0
Inanga	0	0	6	0	2	4	0	0	2
Redfin Bully	1	1	2	0	3	1	0	1	0
Paratya Shrimp	1	0	0	1	0	2	1	1	0

Figure 6. The number of individuals of each species caught in the minnow traps set at each site of each respective stream.

Figure 6 shows the number of individuals of each species that was caught in the minnow traps set at each site. Due to time constraints only one survey of each site was possible. Redfin bullies were the most widespread of all the species above, being found in six out of the total nine sites, yet it was inanga that was found in the most abundant numbers. Quarry Site #3 and Boyd Sites #3 and #2 were the most plentiful of all the sites in general with 9, 7 and 6 individuals being found in each. Inanga were the only species against which hostile behaviour was observed, with a 50% mortality rate being inflicted on the inanga trapped at Quarry Site #3 before the minnow trap was even checked. Elvers were not expected to be found in these traps, but the presence of them nonetheless is interesting and worth of note.

3.4. Water Quality

Table 3. Water quality tests of all nine sites within the three streams

Sites	**Temp ◦C**	**DO(%)**	**O_2 ppm**	**NH_4 mg/L**	**NO_3 mg/L**	**pH**	**Ca**
Quarry Site #1	15	102	8.3	0.25	5	7.2	40mg/L
Quarry Site #2	15	101	8.3	0.25	5	6.4	40mg/L
Quarry Site #3	15.5	107	8.1	0.25	5	6.4	40mg/L
Boyd Site #1	14.1	100	8.3	0.5	0	6.6	20mg/L
Boyd Site #2	14	99	8.3	0.5	0	6.8	20mg/L
Boyd Site #3	14.1	99	8.2	0.5	0	6.6	20mg/L
Tahawai Site #1	16	100	8	0.25	5	6	40mg/L
Tahawai Site #2	16.3	99	7.9	0.25	5	6	40mg/L
Tahawai Site #3	16.2	100	7.9	0.25	5	6	40mg/L

Table 3 is a comprehensive table detailing all the water quality tests undertaken at all nine sites surveyed. The water quality tests were taken on the 12th of September on a semi cloudy day.

4. Discussion

4.1. Longfin length

While there was an observable difference in both the length ranges of longfin eels caught in each of the three streams: Quarry Stream (44cm - 105cm), Boyd Stream (43cm - 135cm) and the Tahawai Stream (41cm-92cm); and the mean length caught per site: Quarry Stream (72.29cm), Boyd (76.92cm) and the Tahawai Stream (66.25cm), there was no significant difference found between each of the three streams (*ANOVA single factor test* , P=0.65).Therefore we can accept the null hypothesis that riparian vegetation of a pasture stream has no significant effect on the length of longfin eels.

This result may be due to the fact that overall all three of the streams selected were in good health and enough biodiversity present to support a healthy longfin eel population due to their role as apex predators in the New Zealand freshwater ecosystem. Another factor may also be the healthy presence of juvenile longfin eels between the observed size range of 41cm - 50cm that may have skewed the data analysis. It is interesting to note that the healthiest stream, the Boyd Stream, contained the largest longfin eels caught with this pattern continuing with decreasing sizes of longfin eels caught in decreasing water quality, with the lowest quality stream containing not only the smallest longfin eels caught but also the smallest longfin eel mean length. Perhaps a stream of the Tahawai's quality does not affect the presence of juvenile and smaller longfin eels as there is still enough prey to predate on to support them, but is incapable of supporting larger more older female longfins that require a far more extensive biodiversity and environment to support their presence. Additionally perhaps the longfin eel as a species is just mostly tolerant to the pollutants affecting pasture streams.

4.2. Longfin abundance

Similar to the results seen above, while there was a small difference, albeit noticeable though, between the abundance of longfin eels between the three sites: Quarry Stream (7), Boyd Stream (12) and the Tahawai Stream (8), the differences observed was not found to be significant (*ANOVA single factor test* , P=0.46).

Once again the healthiest stream, the Boyd Stream, produced the highest abundance count of longfin eels (12) as well as the highest mean of longfin eel individuals caught per site (0.8). It is worthy of note that the Quarry Stream's abundance count (8) was minimally lower than that of the Tahawai Stream (7), but perhaps that maybe as a result of the increased sediment flow present in the water column of the Quarry Stream due to the Katikati Quarry located further upstream.

It is noteworthy that the rate of recaptures was far lower than expected with only a few recaptures occurring throughout the entirety of the conducted research. It is also interesting that the amount of longfin eels caught per site declined in general over all three streams. One could hypothesise that this maybe a result of a lack of food present in the streams in the cold late winter / early spring month of August, which then began to change as the warmer spring months of September and October came about bringing a boom in both macro invertebrate and freshwater fish species. This would also explain why the largest longfins caught throughout the conducted research were caught only in August and September, and soon as food became more readily available through the respective streams, they left the cat food to the younger, hungrier juvenile eels.

4.3. Minnow Traps

The results of the minnow traps laid out at each of the nine sites were not surprising. Redfin bullies were found relatively widespread throughout all streams, with many displaying the very dark almost black colours that the males exhibit during mating season. Inanga, when found, were found in relatively plentiful abundance: however it was the presence of elvers that proved to be the most interesting and unexpected result, though definitely a positive indication overall of the stream's health.

Once again the Boyd Stream proved itself to be healthiest of three streams, displaying overall the greatest abundance and variety of species, though Quarry Site #3 was definitely an unexpected outlier result. It is also interesting to note that the research of a fellow academic on the size and abundance of koura (insert scientific name) at the same three streams also showed that the Boyd Stream contained the greatest abundance and size of koura of the three streams (Lindstrom blah 2018). However upon statistical analysis this difference in the size and abundance of koura was proven not be significant (insert p value).

4.3. Water Quality

The water quality results for all three streams were overall healthy for each stream, with the ammonium levels of the Boyd Stream and nitrate levels of the Quarry and Tahawai streams being higher than optimal, though not toxic. The Tahawai Stream also had minimally slight acidic pH.

The temperatures found were all at a healthy range, considering the weather and time of year, and are suitable for the longfin eel, though admittedly short of its optimal temperature at 24◦C . The stream with highest amount of riparian vegetation and riparian cover, the Boyd Stream, unsurprisingly produced the lowest temperatures. The Tahawai Streams' almost utter lack of riparian vegetation allowed it to attain the highest temperatures

The dissolved oxygen levels were all at a suitable range for all three streams, with the Quarry Stream having the highest water velocity. The dissolved oxygen concentrations (O_2 ppm) were more than suitable for longfin eels, as they have been found to be not even affected by dissolved oxygen levels as low as 3 O_2 ppm and even 1 O_2 ppm .

The pH levels of the Boyd and Quarry Streams were in the neutral range and therefore excellent for stream life, with the Tahawai Stream having a slightly acidic pH but still within acceptable range for stream life most likely due to non-natural inputs from the surrounding farming .

Ammonium levels (NH^4) are reported to be toxic for most New Zealand freshwater fish species between a range of 0.75mg/L and 2.35mg/L, although the toxicity threshold of ammonium changes with the pH level of the surrounding water as well. Longfin eels however have been shown to survive in ammonium levels as high 2.35mg/L, therefore making all ammonium levels at all nine sites within acceptable limits for them, however the same cannot be said for the species upon which they prey on and rely on for food. Certain species such as the crustacean *Paracalliope fluviatilis* and freshwater shrimp *Paratya curvirostris* however suffer an ammonium toxicity level as low as 0.18 mg/L and 0.8 mg/L respectively.

Nitrate (NO^3) was surprisingly not present at any of the three sites in the Boyd Stream, although the stream is still adjacent to pasture use, though the Boyd Stream was the only stream where effluent was not witnessed seeping into the stream. As for the nitrate levels of both the Quarry and Tahawai Streams they were both 5mg/L which is far above the optimal 1.0mg/L - 3.6mg/L nitrate range for New Zealand freshwater stream life, including longfin eels .

The calcium levels of all three streams was above the minimum required levels needed for healthy biodiversity of calcium dependant New Zealand freshwater . Longfin eels themselves do not need much if any calcium in the water column, however it is very important for some of their prey species such as the koura (Lindstrom ,. 2018).

5. Recommendations

While this study was an interesting beginning to the relationship between the length and abundance of longfin eels in pasture streams and the stream's riparian vegetation, additional research on the matter could provide more detailed extensive results that may even exhibit different data trends to those discussed in this research report. Future research on the matter could be benefited in the following matters.

Firstly, select streams to survey that stayed relatively if not completely the same in regards to its surrounding riparian vegetation throughout the entirety of the surveyed length of streams.

Secondly only survey pasture streams with no riparian vegetation and those with plenty of riparian vegetation, surveying four of each, therefore highlighting the differences found in the two extremes. However also conduct a 'Rapid Habitat Assessment' of each stream, acquiring a condition score of the each stream's health and biodiversity in addition to the water quality tests taken.

Thirdly the surveying of the longfin eels will be accomplished through electric fishing only, with each stream only being surveyed once along the 100m - 200m stretch selected. Electric fishing will allow for a more accurate survey of the longfin eel population in each stream, also eliminating inhibiting variables such as surveying recaptures, using ineffective bait, traps collapsing, high sediment flows inhibiting the bait plume downstream and recreational fishing affecting the local population.

Lastly each survey of the eight streams will be completed within a two week timespan, weather permitting, to minimise as much as possible any effect that changing of the seasons has on the activity and therefore also abundance and length of the longfin eel.

6. Conclusion

In conclusion, there has been a vast increase in agriculture land use throughout New Zealand over the last 150 years. While this increase of this type of land use has been proven to have a negative effect on water quality and the macro invertebrate community, it is important that quality science is undertaken to establish whether it also has a negative effect on longfin eel populations. Due to this, coupled with the overfishing that this threatened species is still being exposed to, the longfin eel stands in a historically important crossroads where the population could be brought back into plentiful abundance through careful management and scientific research, or just left to decline into extinction. Therefore, the importance of mitigation techniques such as planting of riparian vegetation possibly negating this negative effect on longfin eel populations needs to be researched and is of vital importance to all.

While the data collected from this research project showed an observable difference, but not a significant difference, between the length and abundance of longfin eels in pasture streams with riparian vegetation compared to those without riparian vegetation, further more detailed researched is advised in the future. With the recommendations listed previously in this project it is believed that a far more comprehensive, detailed set of data may be acquired that might show different data trends to that that this project did.

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