Ngā Kaitiaki o Ngāti Kauwhata

Ōroua River

Aquatic Insect Monitoring Report

Prepared for the Integrated Freshwater Solutions Project

2013

Ōroua River Aquatic Insects Monitoring Exercise February 2011-2013

This community based monitoring exercise on the Ōroua River was initiated in 2011, through the Integrated Freshwater Solutions (IFS) Project funded by the Foundation of Research, Science and Technology now known as the Ministry of Business, Innovation and Employment. The IFS project managed by Massey University uniquely involved a collaboration of three Iwi, Ngāti Kauwhata, Rangitane & Muāupoko.

A team of Ngāti Kauwhata (NK) kaitiaki engaged in learning the scientific practices involved in catching and identifying NZ Aquatic Insects present in their awa. The NK Kaitiaki Team consisted of Michael Cribb (Project Leader), Thomas (Tom) Tane and Anthony Bowler. The Project Leader reported regularly to hapū members and formerly to Ngā Kaitiaki o Ngāti Kauwhata Incorporated. Taiao Raukawa Environmental Research Unit is the Ngāti Raukawa ki te Tonga iwi environmental organization that was also involved and engaged to assist with funding administration and project management support.

Figure 1. Michael Cribb returning with a sample in the Ōroua River.

Figure 2. Tom Tane on the banks recording as Anthony Bowler wades into the awa.

The purpose of the monitoring was for the hapū to begin assessing the health of their awa by monitoring macroinvertebrates (aquatic insects). In order to undertake this assessment the team sampled aquatic insects at four of sites along the river. Training was provided by Fiona Death a lecturer of Massey University, Horowhenua Campus. As the project and the teams experience grew so did the number of sites to nine. The site locations for testing in order of flow from the head waters towards the Manawatū River and ocean are outlined in Table 1. The sites were chosen by the NK Kaitiaki Team due to easy accessibility including land ownership and topography. A map illustrating the location of the sites along the river is displayed in Figure 3. A poster has also been created for the hapū to accompany this report and visually portray these sites and likely insects found there. Notably the Feilding Sewerage Plant is between site 6 (Aorangi) and site 7 (Boness).

Table 1: List of the sampling site locations along the Ōroua River from the headwaters toward the Manuwatu River.

1	Kimbolton
2	Coulters
3	Almadale
4	Colyton
5	Kiwitea
6	Aorangi
7	Boness
8	Awahuri
9	Kopane

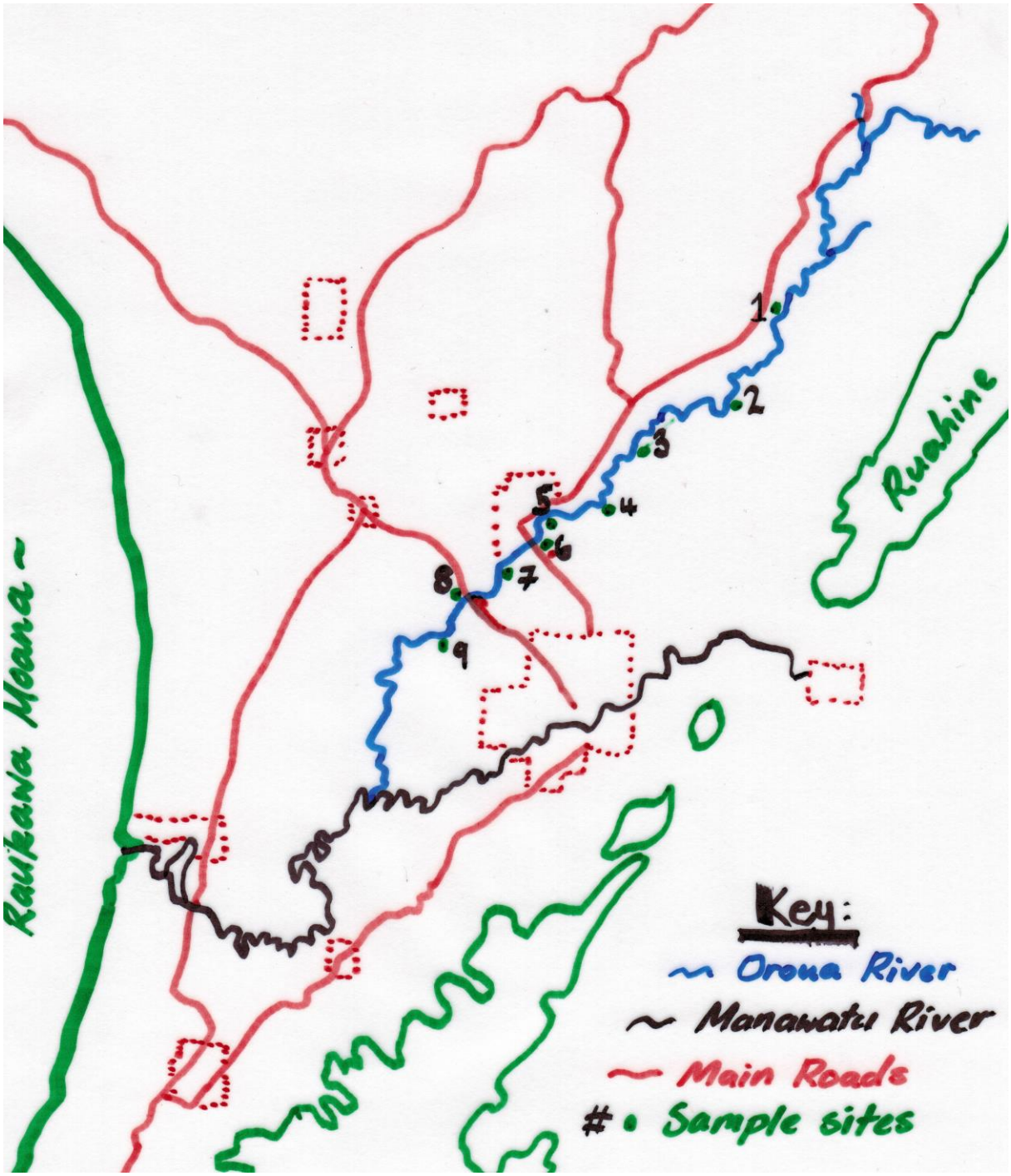

Figure 3. Map outlining the sampling sites.

The IFS project aimed primarily at building capacity amongst iwi and hapū members by their involvement in this community based monitoring project. Other objectives then included:

1) tangible outcomes relevant from a community perspective; a cultural impact report prepared by collating information from iwi/whānau and wider community surveying identified historical uses and understanding of the river, also creating an awareness of what could be possible i.e. what needs to be done to be able to swim freely and gather kaimoana from the awa;

2) an avenue to compare and combine insights from western science and cultural knowledge; through the process of relationship building required in order to train Michael and others to be able to monitor the awa, the non-Māori participants were offered insights into the cultural aspects of the awa workings and the developing iwi around it i.e. fauna and flora. The process of what we each already know, the sharing of information and how they blend to complete a story - what possible future outcomes can be achieved for the benefit of all;

3) develop the basis for dialogue with regional authorities; The evidence being gathered throughout the project, the combined knowledge and understanding of the awa, scientific process and project management has assisted in the still ongoing deliberations with Horizons, MDC, DoC on a Ngāti Kauwhata level as well as the Manawatu Rivers Leaders Accord and other Fisheries avenues;

4) build capacity through culturally relevant hui and events; The IFS project has blended into all Ngāti Kauwhata hui i.e. NK o Nga Kaitiaki monthly meetings, Marae Hui-a-iwi, Ngāti Kauwhata Hui-a-iwi, whānau hui and wānanga. The project also participated in a Muaupoko IFS project presentation, assisting them in the monitoring of the 'dig for clams'.

Figure 4: Anthony Bowler viewing a sample at the awa.

METHODOLOGY

In order to obtain these samples the team used a micro mesh insect net and scooped through the water column for one minute. Each sample was washed into a pottle preserved then Isopropanol was added to preserve the samples. The samples were then placed in a lidded bucket and transferred to the home laboratory set up in the Project Manager's garage.

Figure 5. Samples ready for transport to the lab.

At the laboratory the tiny insects taxonomy were identified using the *Guide to the Aquatic Insects of New Zealand, 1981, M.J. Winterbourn and K.L.D Gregson,* book as a reference and counted viewing on a laptop through a *Digitech Computer Microscope Digital Camera USB, QC3247*. Photo and video footage of the insects were uploaded to computer using this microscope. The team used a dissection kit with utensils to aid in the insect handling and identification process. Smaller samples were placed in smaller vials and labelled.

Figure 6. Scientific equipment in use.

Figure 7. A young hapū member Koha Lawton-Te oka learning the techniques.

Figure 8. Kuia Percina (Percy) Cribb contemplating this insect sample, the monitoring and the effects on her awa.

RESULTS

The results of each aquatic insect sampling event along the Ōroua River are shown in Tables 2-6 along with visual graphs in Figures 9–13 (respectively).

Table 2: Ōroua River Aquatic Insect Data 08/09/2011.

	Kimbolton	Almadale	Colyton	Awahuri
Aoteapsyche	0	0	0	3
Deleatidium	15	37	165	117
Hydrobiosella	15	6	0	0
Hydrobiosis sp.	2	1	0	4
Hydrobiosis parumbripennis	1	0	0	0
Zelandobius confusus	11	22	25	4
Caddis pupae	0	0	0	1

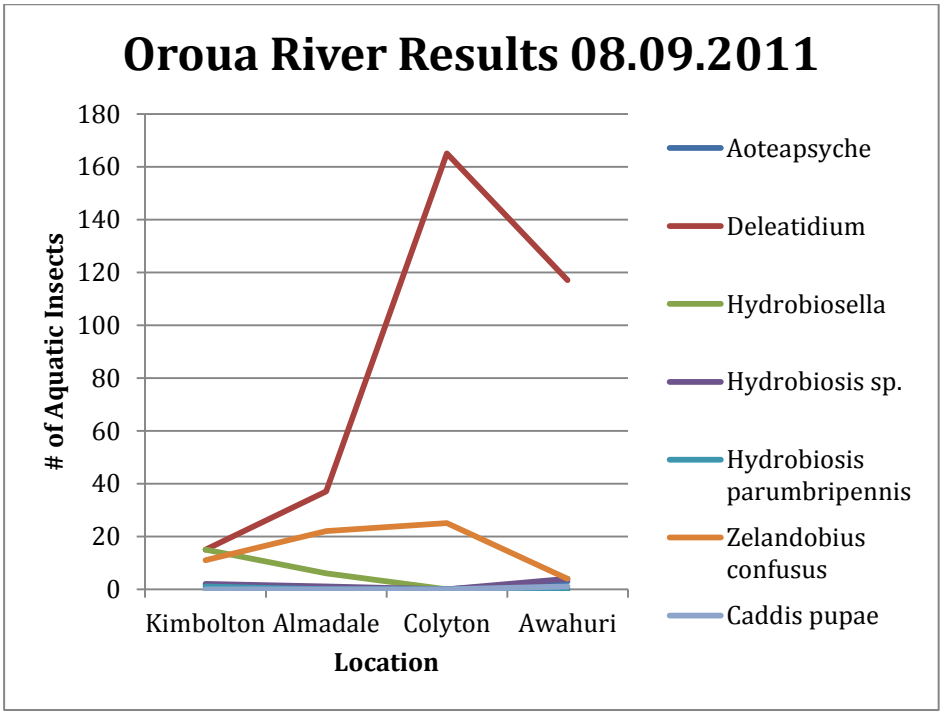

Figure 9: Ōroua River Aquatic Insect Graph 08/09/2011.

The results above show that the main aquatic insect specie present in the Ōroua River during this sampling was *Deleatidium*. There were low numbers of most species in the Awahuri location except for *Deleatidium*.

Table 3: Ōroua River Aquatic Insect Data 26/03/2012.

	Kimbolton	Coulters	Almadale	Colyton	Kiwitea	Boness	Awahuri
Deleatidium	25	28	28	24	16	15	16
Hydrobiosella	8	14	18	23	16	14	13
Hydrobiosis sp.	1	0	0	0	0	0	0
Zelandobius confusus	13	8	5	6	8	7	5
Caddis pupae	0	0	0	0	1	0	0

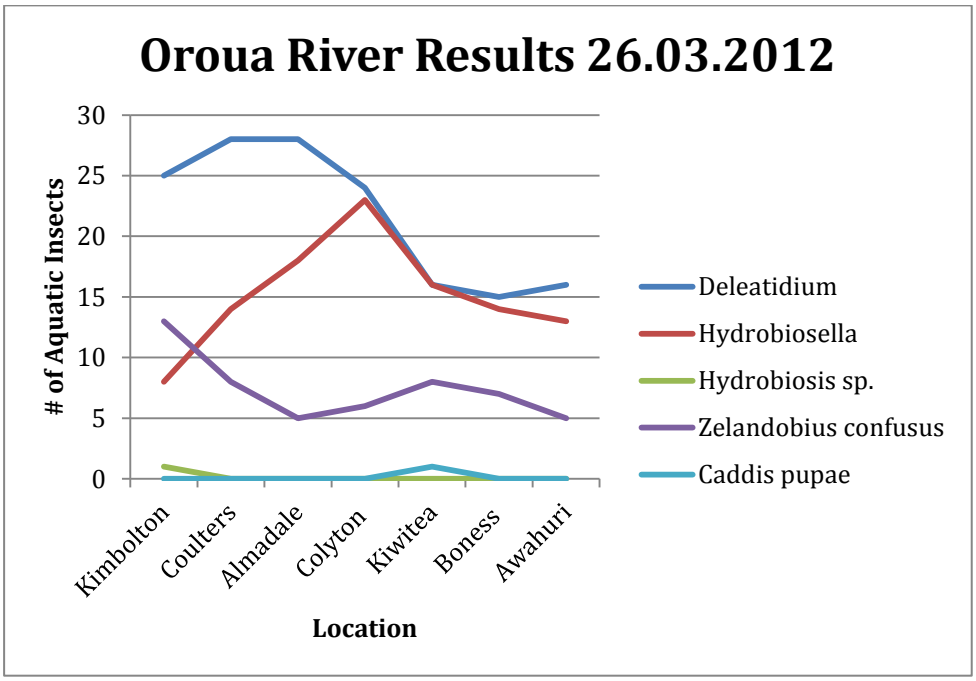

Figure 10: Ōroua River Aquatic Insect Graph 26/03/2012.

The results on this sampling date showed low numbers of all species. *Deleatidium* and *Hydrobiosella* were the top two aquatic insects present in six out of seven sites.

Table 4: Ōroua River Aquatic Insect Data 31/10/2012.

	Kimbolton	Almadale	Colyton	Awahuri	Kopane
Deleatidium	22	10	7	1	3
Hydrobiosella	10	6	3	0	0
Zelandobius confusus	7	9	6	2	0
Oligochaetes (large)	0	0	0	1	0

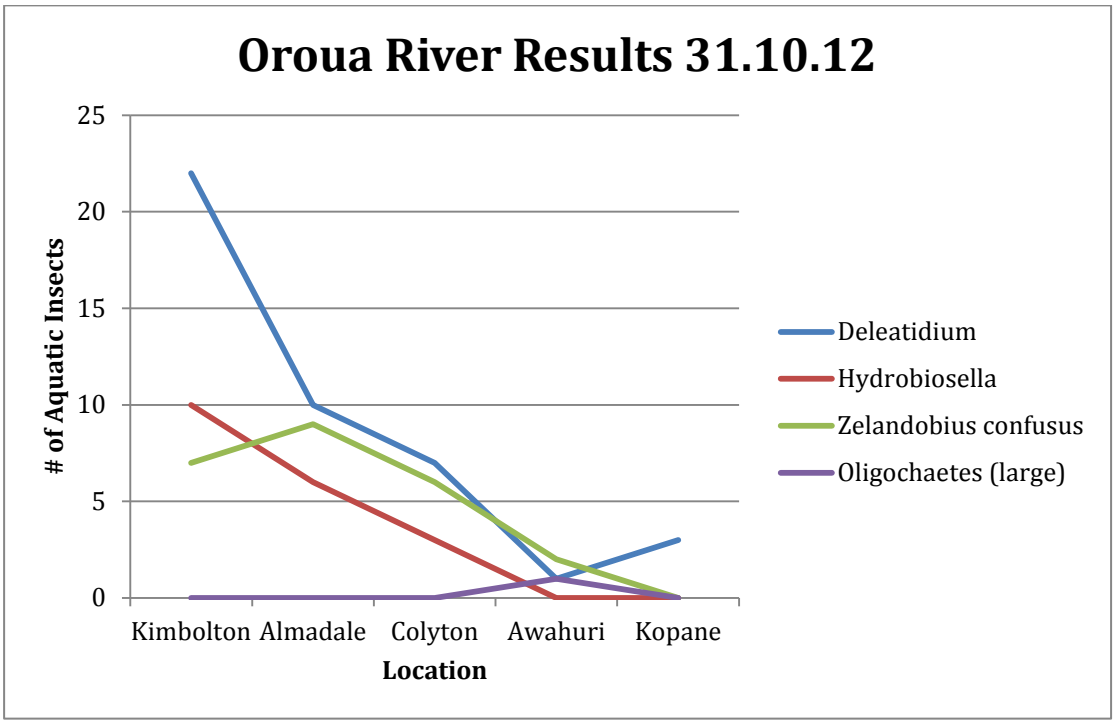

Figure 11: Ōroua River Aquatic Insect Graph 31/10/2012.

The results on this sampling date showed low numbers of all species. The Kimbolton site had more insects present than all other sites. The Awahuri and Kopane sites only had 4 and 3 insects (respectively) present in total.

Table 5: Ōroua River Aquatic Insect Data 23/04/2013.

	Kimbolton	Coulters	Almadale	Colyton	Aorangi	Boness	Awahuri	Kopane
Aoteapsyche	0	0	0	0	15	0	0	0
Deleatidium	120	98	116	100	13	35	100	24
Hydrobiosella	22	35	16	26	0	12	10	12
Hydrobiosidae	0	0	0	0	10	0	0	0
Hydrobiosis sp.	18	13	11	15	0	5	12	9
Nesameletus ornatus	4	0	0	0	0	0	0	0
Zelandobius confusus	42	10	20	15	0	10	10	6
Oligochaetes (large)	0	0	0	0	0	0	1	0

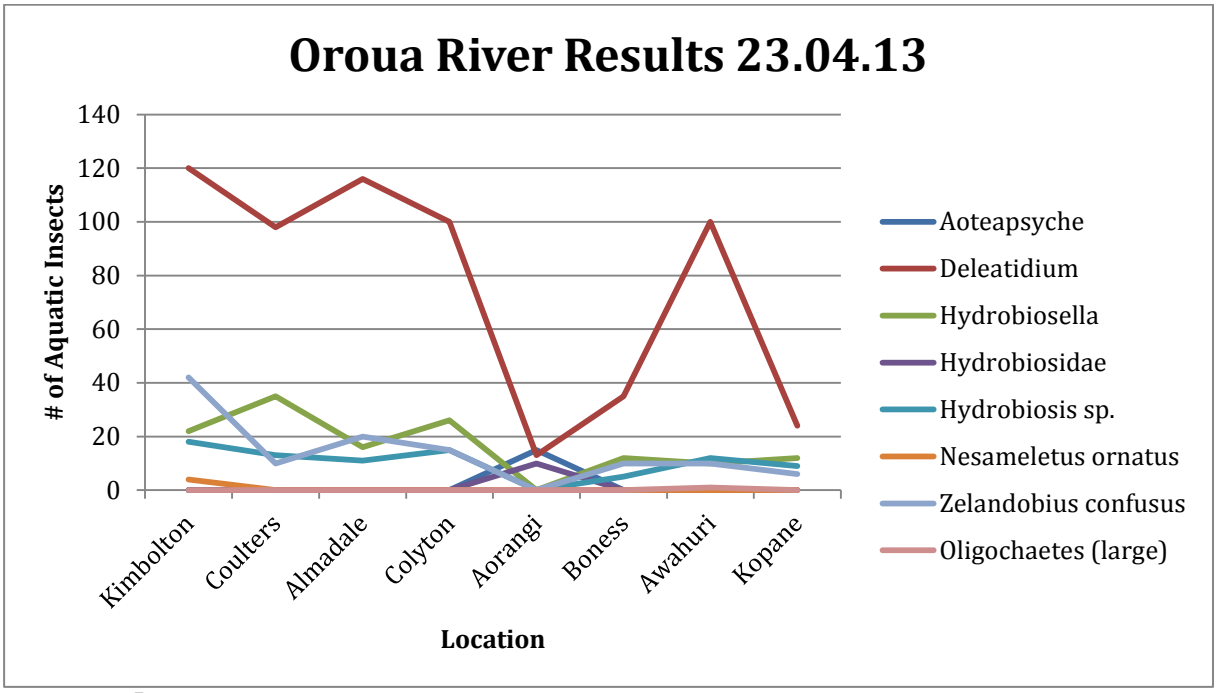

Figure 12: Ōroua River Aquatic Insect Graph 23/04/2013.

In general a relatively high number of insects for all species present in comparison to the winter sampling. *Deleatidium* were present in high numbers apart from near the Fielding Sewerage Plant Aorangi, Boness and Kopane sites.

Table 6: Ōroua River Aquatic Insect Data 18/06/2013.

	Kimbolton	Coulters	Almadale	Colyton	Boness	Awahuri	Kopane
Deleatidium	5	10	7	15	2	6	7
Hydrobiosella	2	3	5	5	0	0	0
Hydrobiosis sp.	8	6	6	5	0	0	0
Nesameletus ornatus	1	0	4	0	0	0	0
Zelandobius confusus	4	7	5	4	0	0	0
Oligochaetes (large)	0	0	0	0	0	1	0

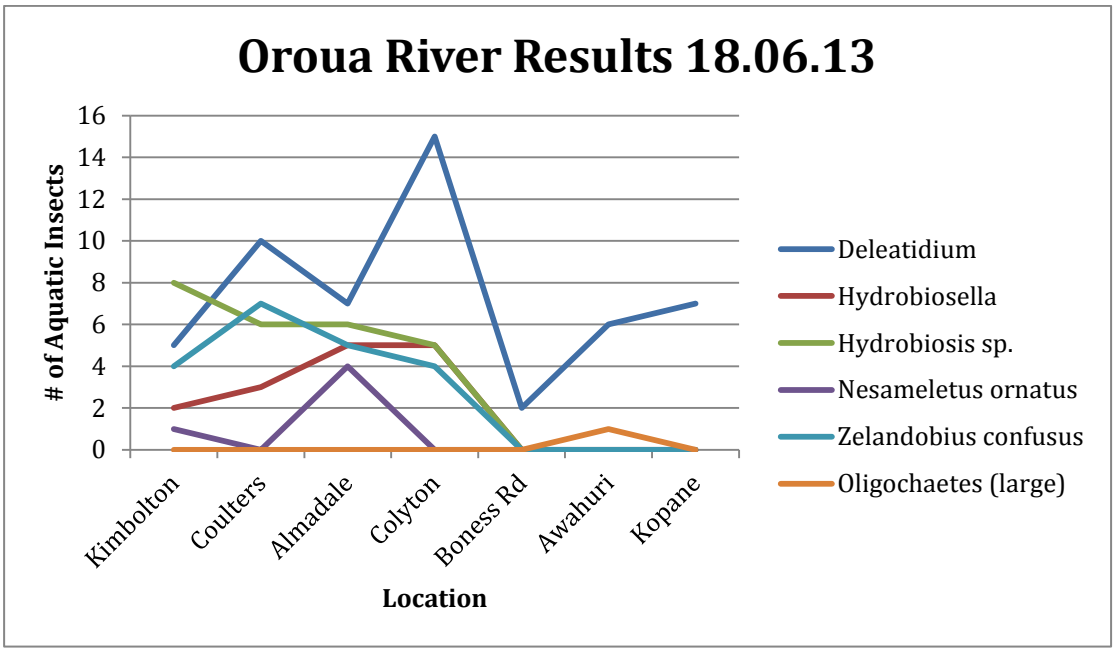

Figure 13: Ōroua River Aquatic Insect Graph 18/06/2013.

The winter sampling showed low numbers of insect species present in the Ōroua River in comparison to the previous summer samples. Insect numbers dropped to zero at the Boness site except for *Deleatidium* which only had two present. Only *Deleatidium* and *Oligochaetes* were present in low numbers at the Awahuri site. Only two insects (*Deleatidium*) were present in the Kopane sample.

The combined total amount of insects caught at each location for each monitoring event along the Ōroua River are shown in Table 7 accompanied with a corresponding bar graph in Figure 14.

Table 7: Ōroua River Total Aquatic Insect Data for the Project 08/09/2011 to 18/06/2013.

	Kimbolton	Coulters	Almadale	Colyton	Kiwitea	Aorangi	Boness	Awahuri	Kopane
08.09.2011	44		66	190				129	
26.03.2012	47	50	51	53	41		36	34	
31.10.2012	39		25	16				4	3
23.04.2013	206	156	163	156		38	62	133	51
18.06.2013	20	26	27	29			2	7	7

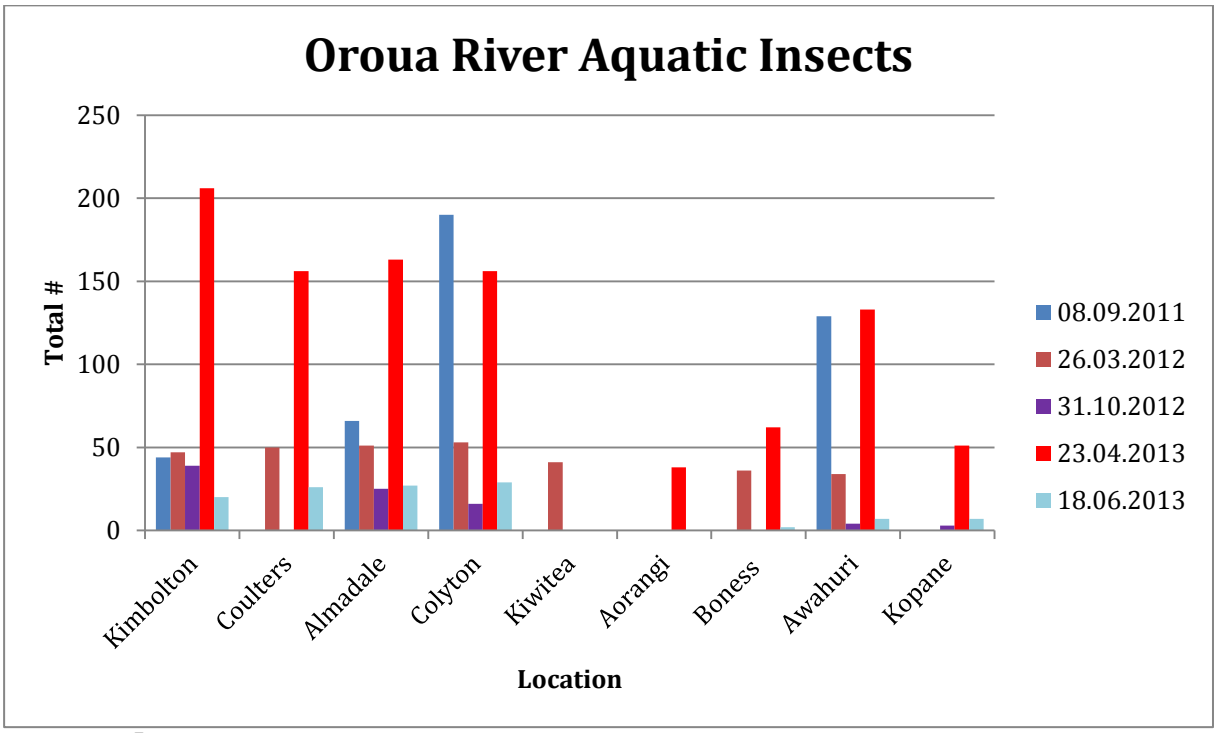

Figure 14: Ōroua River Total Aquatic Insect Bar Graph 08/09/2011 to 18/06/2013.

Kiwitea and Aorangi results cannot be heavily relied upon because of only one sampling set. The Kiwitea, Aorangi, Boness and Kopane sites show low numbers during the project including the April 2013 summer results. Aorangi, Boness and Kopane results were low in April 2013 which had high insect numbers at all other sites sampled. The April 2013 total total insect counts were particularly high for most sites along the river. The 31.10.2012 and 18.06.2013 had consistent low numbers of aquatic insects.

Below is a table showing the biotic indices calculated from the insect results using the Macroinvertebrate Community Index (MCI). MCI levels are commonly used in New Zealand to provide an indication of the health of the awa from the insect results. The outcomes below shoe the results for each location at every monitoring event (Table 8). A corresponding bar graph is then illustrated in Figure 15.

Table 8: Ōroua River MCI Results 08/09/2011 to 18/06/2013.

	Kimbolton	Coulters	Almadale	Colyton	Kiwitea	Aorangi	Boness	Awahuri	Kopane
08.09.2011	Excellent		Good	Poor				Good	
26.03.2012	Good	Fair	Fair	Fair	Good		Fair	Fair	
31.10.2012	Fair		Fair	Fair				Poor	Poor
23.04.2013	Excellent	Good	Good	Good		Poor	Good	Good	Good
18.06.2013	Excellent	Poor	Excellent	Good			Poor	Poor	Poor

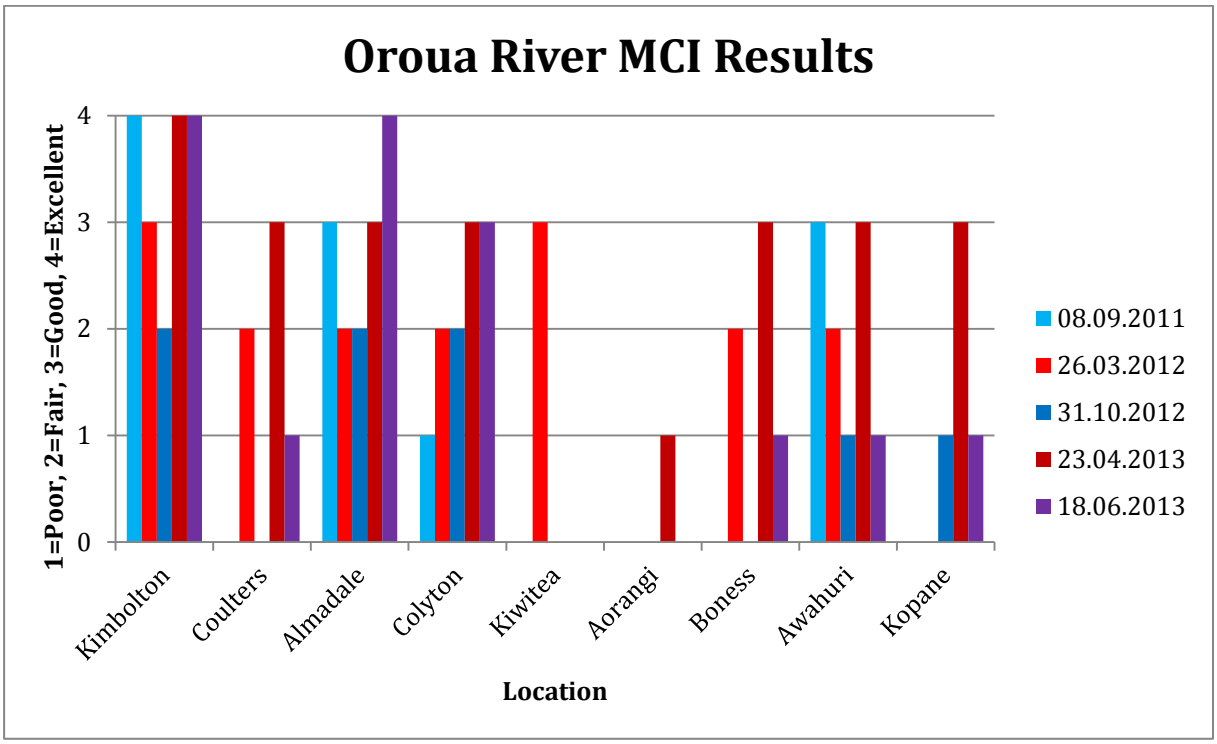

Figure 15: Ōroua River MCI Results Bar Graph 08/09/2011 to 18/06/2013.

The Kimbolton site had the best MCI results during the project and scored the most 'excellent' grades. Awahuri and Kopane scored the most 'poor' MCI results. The Aorangi site also scored a 'poor' MCI result although only one sample so it cannot be heavily relied on yet provides an indicative result.

The total sum of each insect species caught at each location along the Ōroua River during the monitoring project is shown in Table 9 and Figure 16 below.

Table 9: Ōroua River insect species total catch at each location 08/09/2011 to 18/06/2013.

	Kimbolton	Coulters	Almadale	Colyton	Kiwitea	Aorangi	Boness	Awahuri	Kopane
Aoteapsyche	0	0	0	0	0	15	0	3	0
Deleatidium	187	136	198	311	16	13	52	240	34
Hydrobiosella	57	52	51	31	16	0	26	23	12
Hydrobiosidae	0	0	0	0	0	10	0	0	0
Hydrobiosis sp.	29	19	18	20	0	0	5	16	9
Hydrobiosis parumbripennis	1	0	0	0	0	0	0	0	0
Nesameletus ornatus	5	0	0	0	0	0	0	4	0
Zelandobius confusus	77	25	61	56	8	0	17	21	6
Oligochaetes (large)	0	0	0	0	0	0	0	3	0
Caddis pupae	0	0	0	0	1	0	0	0	0

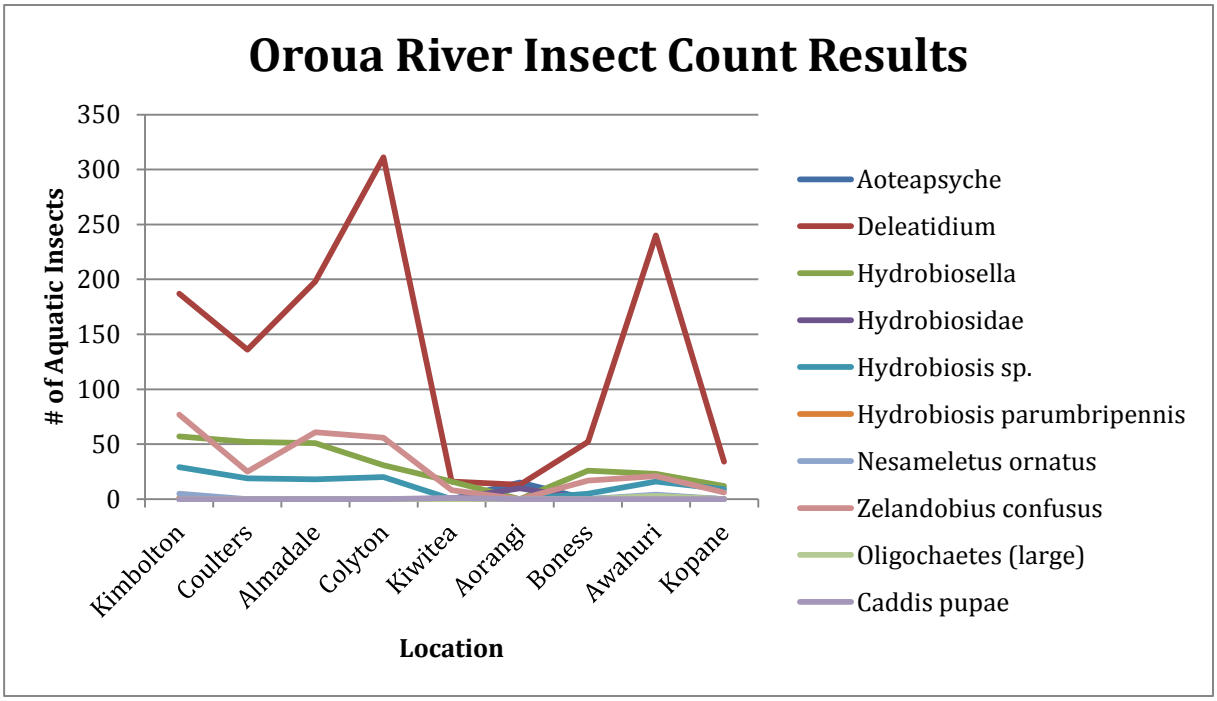

Figure 16: Ōroua River insect species total number caught at each location line graph 08/09/2011 to 18/06/2013.

Deleatidium insects were the most common aquatic insect present in the Ōroua River during this monitoring project. The numbers of *Deleatidium* dropped dramatically at Kiwitea, Aorangi, Boness and Kopane sites.

DISCUSSION

The NK Kaitiaki Team found that during the summer period insect numbers were higher in general. As long as the awa is at a low flow situation the run-off from the sewerage plant did not appear to have an effect. At those times we found large numbers of insect species at all sites including the Awahuri. During summer periods if there was a low rainfall then no run-offs from the sewerage plant occurred so macro-invertebrate numbers were high, such as before the April 2013 monitoring event. At winter more rain events occurred so the sewerage plant discharged waste into the river as well as increased run-off from other land use such as fertilizer on farms all influenced the insect results. The aquatic insects did not have time to recuperate so results were low.

The team noted a few observations from their monitoring an obvious one was that the April 2013 results had more adult sized aquatic insects then all other monitoring events. In the team's opinion the river results were seasons dependent. During a very cold very wet winter the insect results were very low in their opinion the insect populations did not have time to recuperate. The river needs to regenerate itself. The recent 2013 results showed that the river was in relatively good shape at the time of testing.

A major influence on sampling was that weather patterns constrained the opportunity to monitor the awa and plans often had to change as heavy to moderate rainfall would provide biased results as the insects would be hiding from the current and silt etc. The project brought insights to the team on the meteorology effects on the hydrology of their awa as well as the effects on the biodiversity and populations of aquatic insects present.

The team learnt about the different scientific monitoring techniques used in water quality assessment, their indicators and the use of these methods to illustrate the health of an awa. This knowledge could then be used by Māori to support local hapū knowledge to debate the health of awa with authorities (e.g. local and regional councils), industrial organisations (e.g. as AFFCO meat works), scientists and the wider community. Over the duration of the project the team gained more confidence in their techniques, findings and communicating their results to others. The team became very familiar with the aquatic insect species present and gained easy pronunciation of the scientific names.

NK supported their monitoring team throughout this project and hapū members gained interest in the project and their results. This project brought about a general awareness by hapū members of how active scientific monitoring by their own kaitiaki is an internationally recognised method. They also gained the insight that this is another useful tool to assess and deliver the message on the health of a water body to polluting industrial organisations as well as authorities including their local district and regional council. One NK hapū member, Lisa (Lil) Keen enrolled in the Heke Kaitiakitanga Putaiao (Diploma of Environmental Management) course at the Maori University, Te Wānanga o Raukawa for the 2014 academic year.

Figure 17. Lisa Keen, Pukohurangi Te Apa Hapeta, Ursula Keswick aquatic insect monitoring at Lake Waiorongomai.

The team recommends further aquatic insect monitoring should be done on their awa to provide a historical pattern and substantial data to encourage a robust argument for change. The team attended the NZ Freshwater Science Society Conference in Dunedin December 2012. This was a valuable experience for the team. *"It was my first time that I'd been to Dunedin and the few days I spent there was an excellent learning experience. I met new people, and it was awesome to see so many interested in saving our water systems, especially all the young people in their twenties like myself. I never got to meet any of the speakers but their speeches and sharing of information were valuable. Two speakers Mike Joy from Massey University, Palmerston Nth and David Dudgeon from Hong Kong, I found grabbed my attention. Most of my time I spent reading books and other info that was given to me. It is very frustrating for me to see the waters of New Zealand in such a state. I will take what I learnt and use it to the best of my ability. Anthony Bowler." "My name is Thomas Tane. I attended the New Zealand freshwater sciences society conference 2012. I had a few goals I wanted to achieve to do with the health of our awa before I came to Otago. I was definitely looking forward to the experience. I wanted more knowledge of how when and where to test the rivers and what else needed to be done as an iwi to make our rivers beautiful and clean. I also would like to be able to bring this knowledge back to my iwi so as a whole we can work together to clean our waterways. I attended a few different lectures/speakers during my time at the university. I would rather be out in the field doing hands on work at the river, however; I round that these conferences were extremely informative, it helped me to see that cleaning the rivers/waterways is not just about visiting and testing these waters, but knowing more about the environment around the rivers and what is causing the water to be contaminated. Not just fixing the problem but been proactive to put a stop to the*

contamination in the first place. I am looking forward to bringing my new found knowledge back to the people of my marae so we can continue to move forward in the world of science which will improve our waterways which will benefit every New Zealander. Overall this conference was an eye opener and I really enjoyed it. I now hope to pass all my knowledge on to our future generations. And one day would love to see our country truly '100% clean and green'."

Figure 18.Tom Tane and Anthony Bowler in Dunedin.

The Project Manager delivered a presentation to the audience with Heike Shiele a Massey University PhD student involved in the IFS project. Michael highlighted the aspects of the IFS project that interested the NK hapū and the valuable contribution they were making to their iwi and hapū increasing awareness and knowledge of aquatic life within their awa. Presentations at this conference provided the team with freshwater scientific information on other current methods in use around the nation as well as other iwi experiences. The team then explored the use of Cultural Health Index (CHI) Monitoring and recommend that it could be incorporated into another monitoring project to support the insect sampling. CHI monitoring are gaining in popularity and use by Māori. The CHI could be used by NK to provide further scientific evidence to support and describe their hapū assessment on the mauri of their awa. Chemical water analysis assessing levels of faecal bacteria and nutrient levels in the water might also be useful knowledge for the hapū to illustrate the effects on their awa as well as assess the current state.

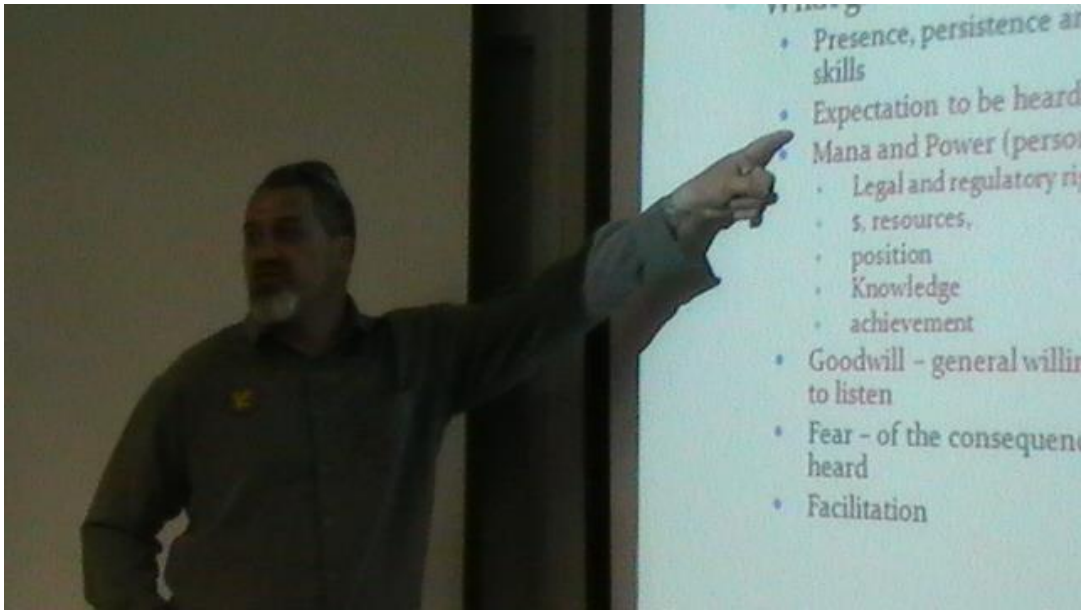

Figure 19. Michael Cribb presenting at the NZ Freshwater Sciences Society Conference.

The team noted sadly during an exercise to use a Cultural Health Index that the indicator of 'mahinga kai' could not be entered into their results because there is no longer any areas left for that practice. Wāhi tapu areas were also not present due to the areas of testing is very public places. So they could see the potential for these areas were mostly recreational and would not be returned to wāhi tapu sites due to that reason. The sites that the hapū had wāhi tapu associations with were closed off and they no longer had access. This was mostly due the areas being in private ownership mostly farms. The historical access point to the awa near the Kauwhata Marae is downstream of the Fielding Sewerage Treatment Plant with no opportunity for the hapū to use the water for the purposes of swimming and drinking.


Figure 20. Preparation in the kitchen at Kauwhata Marae.

CONCLUSION

In conclusion Massey University IFS Project Manager Professor Marjan van den Belt posed a number of questions to the NK Kaitiaki Team in relation to the benefits of their involvement in this project and the positive outcomes for their hapū and iwi. Michael Cribb reflects on these below:

1. **What did you learn from the IFS project?**
   "The training I received to test the microintervebrae life in the river, along with the varying testing environments – the high and low flow of the awa will again affect the testing through its variance. That the microinvertebrae testing from time to time can vary. The awareness of testing is only a snapshot. In order to collate the vast information needed, the testing must continue over a period of time in order to eliminate factors.

   The importance of communication and relationship building in order to capture wider skills to advance the learning and outcomes i.e. Massey testing staff, other organisations. You need good relationships within the environmental sector."

2. **In regards to the Health of the River did you see any comparisons between your monitoring results and iwi knowledge/understanding?**
   "Yes."

   If so, please describe and detail why that is important to your hapu?
   "We noticed that things can change overnight. That information held by authorities we learnt, is only as we said before a 'snapshot' of that period in time.

   We noticed that the information our iwi held was the same as our findings through our testing. The important aspect of this is that we had the scientific evidence that could back up the iwi knowledge."

3. **Did the IFS project provide any opportunities to communicate with councils or other external organisations?**
   "Yes it did, it hooked us into Massey, Horizons MW, MDC and other iwi authorities dealing with the awa. This is ongoing."

   Did the IFS project create any other opportunities for your iwi?
   "Scientific knowledge that backed and/or enhanced the knowledge of the iwi around the awa. The opportunity to show and train other iwi members testing, river movement and changes. The main thing we should be the proudest of is the reawakening of the awa to our iwi."

   Did the IFS project inspire any future opportunities for iwi members?
   "Gave the iwi a future possibility for a productive awa whereby once again, the possibility of harvesting from and around the awa as well as usage in recreational activities is our future."

4. **Do you feel that you the IFS project and related hui built iwi capacity? If so, please describe…**
   "Instead of just holding iwi hui, the project was also introduced into whānau and marae activities and feedback received was always encouraged and accepted. The knowledge built within these forums became very important not only to the project but to the whānau as a whole iwi. The project had an interactive 'buy in' from all sectors including some 'break off' members of the iwi.

   Encouragement through camping trips involving the rangatahi were successful in introducing the awa to those that weren't aware, and utilising whānau members to teach skills they learnt in their youth to our current rangatahi."

Figure 21. Kaumatua at the front of Kauwhata Marae.

Report prepared by Michael Cribb, Thomas Tane, Anthony Bowler and Aroha Spinks (Taiao Raukawa Researcher)